รายงานฉบับสมบูรณ์

โครงการการออกแบบผลิตภัณฑ์ข้าวมูลค่าเพิ่มเพื่อการส่งออกไปยังประเทศคู่ค้าที่มีศักยภาพของไทย

โดย รศ.ดร. ปริศนา สุวรรณาภรณ์

กรกฎาคม 2551

สัญญาเลขที่ RMU 4880039

รายงานวิจัยฉบับสมบูรณ์

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รศ.ดร.ปริศนา สุวรรณาภรณ์
ภาควิชาวิทยาศาสตร์และเทคโนโลยีการอาหาร
คณะอุตสาหกรรมเกษตร มหาวิทยาลัยเกษตรศาสตร์

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ABSTRACT

Project Code : RMU 4880039

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Investigator : Dr. Prisana Suwannaporn Department of Food Science and Technology
Faculty of Agro-Industry, Kasetsart University, Jatuchak, Bangkok 10900

E-mail Address : prisana.s@ku.ac.th

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Rice consumption per capita in many Asian countries decreased but it is consumed more in non-rice eating countries. This study aimed to investigate consumer preferences and attitudes towards Jasmine rice among consumers in target rice export countries to identify opportunities and strategic implications. Exploratory primary data were collected through qualitative focus group research and quantitative questionnaire with 1128 consumers of target nationalities. Rice products were grouped with factor analysis and could be characterized by their preferences into (1) convenience (explained variance 33.9%), grain variety (21.2%), and tradition/ naturalness (12.8%). Rotated factor score plot showed a similarity in the preference for the tradition/natural concept. Convenient products were preferred in higher income Asian countries and the non-rice eating countries. Concerning taste, there were differences in perception between consumers from countries which had different rice grain preference. Rice texture was the best discriminator. It could correctly predicted consumers from non-specific grain preference, short grain preference, and Basmati preference at 63%, 71%, and 81% respectively. Jasmine rice had its unique quality, which was highly differentiated between people who prefer and not prefer it (α = 0.00). Jasmine rice aroma was not a decisive quality attribute for consumers in general. However, it was a desirable quality trait for those who specifically prefer. Consumers from the non-rice eating countries preferred harder and less sticky rice that was a threat for Jasmine rice in this region. Consumers' buying decision criteria of rice was grouped into 4 factors; marketing activities (26.8%), quality (13%), price (10.5%) and country of origin (7.7%). There were differences between traditionally rice eating and non-rice eating countries (p=0.000). Marketing activities, price, and country of origin were the best discriminators, while quality was a poor discriminator. Rice was not a substitute to other staple foods due to price change. Product quality, differentiation and price play an important role. Building a reputation by quality and clear statement on the country of origin should be a priority for Thailand.

Keywords: Jasmine rice, product concept, consumer preference, eating quality, buying criteria

บทคัดย่อ

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ชื่อโครงการ : โครงการการออกแบบผลิตภัณฑ์ข้าวมูลค่าเพิ่มเพื่อการส่งออกไปยังประเทศคู่ค้าที่มีศักยภาพของไทย

ชื่อนักวิจัย : รศ.ดร.ปริศนา สุวรรณาภรณ์ ภาควิชาวิทยาศาสตร์และเทคโนโลยีการอาหาร คณะอุตสาหกรรมเกษตร มหาวิทยาลัยเกษตรศาสตร์

E-mail Address : prisana.s@ku.ac.th

ระยะเวลาโครงการ : 29 กรกฎาคม 2548 - 28 กรกฎาคม 2551

การบริโภคข้าวต่อประชากรของหลายประเทศในเอเชียมีแนวโน้มลดลง แต่การบริโภคข้าวในประเทศที่ไม่ได้บริโภคข้าวเป็นอาหารหลักมีแนวโน้มเพิ่มขึ้น การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาความชอบและทัศนคติของผู้บริโภคต่อการบริโภคข้าวหอมมะลิในประเทศที่เป็นเป้าหมายในการส่งออกของไทยเพื่อหาโอกาสทางและกลยุทธ์ทางการตลาด ข้อมูลปฐมภูมิได้จากการทำวิจัยกลุ่มและแบบสอบถามเชิงปริมาณ จำนวน 1128 ชุด ในกลุ่มผู้บริโภคในประเทศเป้าหมาย แนวคิดผลิตภัณฑ์ข้าวถูกจัดกลุ่มตามความชอบเป็น 1) ความสะดวก (ความแปรปรวน 33.9%) 2) ชนิดของเมล็ดข้าว (21.2%) และ 3) แบบดั้งเดิม/ธรรมชาติไม่ปรุงแต่ง (12.8%) ค่าคะแนนแฟกเตอร์ที่ได้จากการหมุนแกนแสดงความเหมือนกันของแนวคิดแบบดั้งเดิม/ธรรมชาติไม่ปรุงแต่ง ความสะดวกเป็นแนวคิดที่ได้คะแนนสูงสุดในประเทศเอเชียที่มีรายได้สูงและประเทศที่ไม่ได้บริโภคข้าวเป็นอาหารหลัก พบความแตกต่างในคุณภาพการบริโภคระหว่างผู้บริโภคที่มีความชอบชนิดข้าวที่แตกต่างกัน คุณภาพเนื้อสัมผัสเป็นเป็นปัจจัยแยกแยะความชอบได้ดีที่สุด และสามารถใช้คาดเดาผู้บริโภคข้าวหอมมะลิออกจาก ผู้ที่ไม่บริโภคข้าวเป็นอาหารหลัก ผู้บริโภคข้าวเมล็ดสั้น และข้าวบาสมาติ ที่ 63% 71% และ 81% ตามลำดับ ข้าวหอมมะลิมีคุณภาพการบริโภคที่เป็นเอกลักษณ์ โดยมีความแตกต่างระหว่างผู้ที่ชอบและไม่ชอบบริโภคอย่างชัดเจน (α = 0.00). กลิ่นของข้าวหอมมะลิไม่ใช่คุณภาพที่สำคัญในการตัดสินใจซื้อโดยทั่วไป แต่เป็นคุณภาพที่ต้องการของคนที่นิยมบริโภคข้าวหอมมะลิ ผู้บริโภคที่ไม่ได้บริโภคข้าวเป็นอาหารหลักชอบบริโภคข้าวที่แข็งและมีความเกาะติดกันน้อยกว่า ซึ่งเป็นข้อด้อยของข้าวหอมมะลิในกลุ่มตลาดนี้ การตัดสินใจซื้อข้าวของผู้บริโภคถูกจัดกลุ่มเป็น 4 ปัจจัยคือ การตลาด (26.8%) คุณภาพ (13%) ราคา (10.5%) และประเทศผู้ผลิต (7.7%) โดยมีความแตกต่างระหว่างปัจจัยที่ใช้ในการตัดสินใจซื้อระหว่างผู้บริโภคที่บริโภคและไม่บริโภคข้าวเป็นอาหารหลัก โดยการตลาด ราคา และประเทศผู้ผลิต เป็นปัจจัยแยกแยะที่ดีที่สุด คุณภาพไม่สามารถแยกแยะกลุ่มได้ ข้าวไม่สามารถถูกทดแทนด้วยอาหารให้พลังงานชนิดอื่นแม้ว่าราคาจะเพิ่มขึ้นก็ตาม คุณภาพและภาพพจน์ที่ดีของประเทศผู้ผลิตเป็นกลยุทธ์ที่สำคัญของประเทศไทยในการส่งออกข้าว

คำสำคัญ : ข้าวหอมมะลิ แนวคิดผลิตภัณฑ์ ความชอบของผู้บริโภค คุณภาพการบริโภค ปัจจัยซื้อ

1. OBJECTIVE

This study tried to investigate consumer preferences, eating quality and buying attitudes towards rice and rice products, especially Jasmine rice, among consumers in some of Thailand's target rice importing countries. The increase in rice consumption in traditional non rice-eating countries leads to new promising markets for Thailand. This study aimed to identify opportunities, strategic recommendation and assess priorities for further future research in rice product development.

2. INTRODUCTION

Rice is grown in thousands of different varieties around the world. The commercial types were divided into long grain, medium grain, and short grain. Long grain, Indica type, was Thailand's main rice variety. Aromatic rice varieties, such as Jasmine and Basmati rice, belong to the long grain category, but were usually mentioned separately due to their distinctiveness and commercial importance. When properly cooked, most long grain rice has dry, fluffy kernels (Scarpa 1992). Basmati rice has a distinctive odor; grains are double their length after cooking and remain separate. Basmati rice is preferred in India, Pakistan, and the Middle East. Jasmine rice, which is preferred in some Asian countries, is soft, moist, and clingy after cooking. The kernels of medium grain and short grain rice are moister and tend to stick together. Italian medium grain rice is called Arborio rice, which gives the characteristic 'al dente' texture to Risotto. The waxy or sweet glutinous rice is short, plump, chalky white and opaque, which becames sticky and shapeless after cooking (Scarpa 1992).

Thailand is the world's largest rice exporting country. Its export volume increased from 1 million tons in 2002 to around 7.6 million tons in 2005 (USDA 2005). Thailand competes with the USA in markets for high quality, long grain rice, primarily within the European Union (EU), the Middle East and South Africa. Thailand also competes with Vietnam, India, China, and Pakistan in medium to low quality, long grain markets. Thailand exportes mostly Indica rice, including parboiled rice and premium Jasmine rice. Aromatic rice primarily Jasmine rice from Thailand and Basmati rice from India and Pakistan accounted for 14% of global rice trade (Childs and Livezey 2006). Jasmine rice is Thailand's unique rice specialty, which sold at a higher price and with fewer competitors due to its unique flavor and texture. It is produced from Khao Dowk Mali 105 (KDML 105) and Kor Kho 15 (RD15) varieties. Jasmine rice has a niche market in certain Asian countries, especially in Thailand, some Southeast Asian countries, and the Asian expatriates worldwide. Thailand would like to export more Jasmine rice on account of its relatively high

price. The annual export quantities of aromatic rice were as high as 1.06–1.45 million tons and represented 20–27% of the total quantity export (Agricultural statistics of Thailand 2005; Childs and Livezey 2006). The USA was a major market of Jasmine rice with the yearly quantity of more than a million tons (USDA 2002). Aromatic rice accounted for about 90% of USA rice imports. However, Jasmine rice has struggled for acceptance among traditional non-users, who were unfamiliar with its unique characteristics. Japanese consumers, for example, have complained about the strange smell and cooking method of Jasmine rice (Asian Business 1994; Economist 1994). As Jasmine rice was one of the most important export commodities for Thailand. Competition in terms of trade and technology such as the US plant breeding program to develop rice varieties that was able to compete with Aromatic rice put pressure for Thai to reevaluate its competition strategy.

Rice consumption per capita in many Asian countries is decreasing steadily, amongst other reasons, due to changing dietary habits. Nowadays the new wealthy Chinese middle class, for example, eschews simple, traditional meals in favour of meat-laden Chinese and Western style food (Roberts, 1996). Rice consumption in Japan has declined from more than 100 kg per capita to about 70 kg in 1993 (Economist, 1993) and 58 kg in 2001 (Kennedy *et al*., 2002). Similar developments are taking place in South Korea and Taiwan, where a rise in income is accompanied by a decrease in per capita rice consumption (USDA, 2002); the demand for rice shrinks since western food became popular. The same situation can be observed in major rice eating countries such as Thailand and Indonesia (Chataigner, 1992). The contribution of rice to the energy intake of the consumers show a marked decrease and is replaced by wheat, beans, and other field crops (Inoue, 1996). As a consequence, rice farmers in major rice producing countries will face the problem of a decreasing demand in the near future.

By contrast, American and European citizens are eating more rice nowadays (Chataigner, 1992; Weiss, 1993; Suwansri, 2002; USDA, 2005, Childs and Livezey, 2006). Moreover, rice consumption is expected to continue to increase. However, the annual consumption growth rate of 3% in Europe is lower than that in the USA (5%) (Chataigner, 1992). Rice consumption per capita increased mainly in Northern European countries, such as the Netherlands (8.9 kg), France (7.4 kg), Finland (6.9 kg), Norway (6.5 kg), Belgium (5.8 kg), Germany (5.6 kg), Ireland (5.1 kg), Denmark (5.0 kg), and the UK (4.1 kg) (FAO, 2002). In the UK, increased rice consumption was partly because consumer move away from the traditional meal toward international cuisine such as Indian,

Mexican, and Asian foods (Hogg and Kalafatis 1992). European countries with the highest rice consumption per capita include Portugal, Spain, Italy, and the Netherlands (Eurostat 1990).

USA rice imports have risen sharply over the past 20 years and accounted for 15% of total domestic disappearance compared to 4% in 1985/86 (Childs and Livezey, 2006). In the USA, rice is moving away from being merely a side dish to a proper meal component, because of the fast growing groups of Asian Americans and Hispanic Americans. Annual per capita rice consumption in the USA rises from 4.7 kg in 1980 to 12.3 kg in 2000 (USA Rice Federation, 2000); people belonging to the Asian ethnic groups consume 10 times more rice than the average American consumer (Goodwin *et al*., 1996; Childs, 1993). Within Europe, rice consumption increases most in the Northern European countries, such as the UK, Belgium, Germany and the Netherlands. The highest rice consumption per capita is in Portugal, Spain, Italy, and the Netherlands (Eurostat, 1990). The growing popularity of rice is attributed to several factors, *e.g.*, its popularity in ethnic cuisine, healthy image due to the existence of gluten free products, appealing flavour, ease of preparation, menu versatility, the fact that it is relatively cheap, and many restaurants serve rice dishes (Weiss, 1993; Childs, 1993). In the UK, the growth of rice consumption is partly because consumers move away from the traditional meal to more exotic dishes such as Indian, Mexican, or Asian foods (Hogg and Kalafatis, 1992). In contrast, total carbohydrate foods remained stable for many years at around 45% of total energy intake. Only 50% of the UK respondents recognized the increased intake of complex carbohydrate such as bread, pasta and rice as general health guidelines to achieve dietary goal recommended by the UK Department of Health (Cannon, 1992; Goode et al, 1995). Starchy foods are generally viewed as a “boring but filling” and do not help weight control (Stephen et al, 1995). As a consequence, the overall perceptions to increase starchy food are low. Most consumers believed that starchy food intake has to reduce to achieve healthier diet. Stubenitsky and Mela (2000) studied the consumer attitudes toward starchy foods in the UK. Results showed that those who have positive attitudes toward increased starchy food diets thought that starchy food was good for health, nutritious, easy to prepare and cook, help control weight and not high in energy. But the negative attitude consumers were less convinced in health and nutritious status, energy and weight control.

3. METHODOLOGY

The research was based on both secondary and primary data collection. The secondary data included exploratory surveys of rice and its products which were conducted in some of Thailand’s potential rice export markets, which were Taiwan, China, Japan, the USA, France,

Italy and the Netherlands. Survey places were supermarkets, Asian grocery stores, and trade fairs, which were FOODEX JAPAN 2002 (Tokyo, 12-15 March 2002), IFT Annual Meeting and Food Expo 2002 (California, USA. 15-19 June 2002), Anuga 2005 (Cologne, Germany 8-12 October 2005). The market products' characteristics from the exploratory research was collected as a set of product attributes that represented various ideas such as features, utility, health/nutrition, taste etc.

Exploratory primary data were collected through qualitative focus group research. Focus group provided insights in consumer decision making and attitude towards rice and rice products. Focus group studies were moderated following the focus group moderating training procedure of the Burke Institute (1993). Panels participated in this study were the natives of target rice export countries that we were able to access namely a) Japanese housewives (10 persons age 28 – 40), b) Chinese students (10 persons age 27 – 32), c) Taiwanese students (10 persons age 27 – 32), d) 2 groups of French working people (6 persons age 22-44 and 24-52) and e) 1 group of French elderly (8 persons age 62-68). The participants in each focus group knew each other and were encouraged to give their opinions on selected topics, such as their everyday meal, how they prepared foods, types of rice they preferred, what they thought about Jasmine rice and about selected rice market samples etc. The purpose of this study was to collect a comprehensive view of eating and cooking behaviour and attitudes towards rice and rice products. Data from the focus group studies helped understanding rice eating preference of each target country. And the product ideas from market survey were used to form product concepts that could represent their preferences and attitudes in rice. Both sets of information were then applied for developing a questionnaire to use in a larger follow-up study in a quantitative survey.

A quantitative questionnaire was designed to access consumer attitudes and preferences with respect to rice and rice products. Respondents were preliminary screened. Those who ever eat rice and rice products were selected using a quota sampling method with age and gender as quota control variables as shown in Table 1. The target age was between 20-50 years old and the proportion of women was comparatively higher since they were mostly responsible for the household food purchase. The questionnaire was translated into 5 languages by native speakers, which were Thai, Chinese, Japanese, English and Dutch (other nationalities were asked to use English version). After translation it was tested with people of the same nationality until the same perception was achieved. Questionnaires were distributed by means of person-to-person contact. Target persons were Thai, foreign expatriates living in Thailand, Asian

expatriates living aboard, and consumers from target countries. Data were collected from target export countries (Taiwan, Japan, UK, USA) and within Thailand (Bangkok International Airport, International School in Bangkok for expatriates living in Thailand).

Questionnaires consisted of 23 questions using 1-5 Likert scale. First, respondents were asked to indicate their cooking and rice eating frequency together with their attitudes towards natural / processed food. Second, attitudes and preference in all market products concepts were asked to rate according to their interest in those rice products. Purchase decision criteria for rice products were rated by their view of importance. The questionnaire was pre-tested and modified before starting the field survey. Questionnaires were coded, data were analyzed with SPSS version 10 (SPSS Inc., USA.) The analysis included comparison of means using analysis of variance and t-test. Since consumers usually think in more general evaluative dimension rather than specific items, factor analysis with Varimax rotation was then applied aiming for data reduction and concepts formation.

Filled-in questionnaires were obtained from 1128 consumers. Consumers were then grouped into 9 groups according to our previous study using consumers' sensory preference and habits in rice (Suwannaporn and Linnemann, 2007). These 9 groups were Thai, North Chinese/Taiwanese, Japanese/Korean, Australian/New Zealander, British/Irish, American/ Canadian, South Chinese/Southeast Asian, South Asian/Middle East and European. Demographic details of the respondents were presented in Table 1.

Table 1 Characteristics of the consumers in the survey

Characteristics	Category	Number	%
1.1 Gender	Male	416	38.0
	Female	687	62.0
1.2 Age	< 20	23	2.0
	20-34	494	43.8
	35-49	322	28.5
	50-65	125	11.1
1.3 Nationality	Thai 1)	243	21.5
	North Chinese / Taiwanese2)	151	13.4
	Japanes / Korea	113	10.0
	South Chinese / Southeast Asian[2)]	102	9.0
	South Asian / Middle East	85	7.5
	British / Irish[3)]	99	8.8
	American / Canadian	98	8.7
	Australian / New Zealander	61	5.4
	European	116	10.3
	Others	24	2.2
1.4 Married Status	Single	497	44.1
	Married with at least 1 dependent child	280	24.8
	Married without children	125	11.1
	Married with adult children only	187	16.6
1.5 Occupation	Housewife	156	13.8
	Teacher	94	8.3
	Government officer	118	10.5
	Private sector	256	22.7
	Student	213	18.9
	Others	255	22.6

1) Thai was excluded from Southeast Asian since there are many Thai respondents which may dominate the other Southeast Asian data.

2) Chinese was separated into southern and northern Chinese since their rice preferences are different

3) British/Irelish was separated from Europeans since it is one of our target study countries

4. RESULTS AND DISCUSSION

4.1. CONSUMER PREFERENCE MAPPING FOR RICE PRODUCT CONCEPTS

(Ref: Suwannaporn, P., A. Linnemann and R. Chaveesuk. *Consumer Preference of Rice Products : The Application of Preference Mapping in New Product Development*. **British Food Journal** 2008; 110(6): 595-606.)

4.1.1. Rice Products Concepts

The rice products obtained from the preliminary market survey were grouped by their processing characteristics into 8 categories. The means of consumer preferences for these differently products were shown in Table 2. .

Table 2 Means of consumer preferences for differently processed rice products.

Rice Products	Means[1]	SD
Rice Grain	2.02	1.12
Minute Rice Grain	2.22	1.34
Fortified Rice Grain	2.40	1.27
Seasoned Rice Grain	3.18	1.31
Rice Grain + Ready to Eat Dish	3.18	1.40
Frozen / Chilled Rice Dish	3.21	1.27
Microwavable Rice Dish	3.65	1.43
Canned / Pouch Cooked Rice	3.85	1.32

1 Question: “What type of rice product do you prefer?”

Scale 1 = high preference 5 = low preference

Apparently, consumers’ preferences decreased with degree of processing. Non-processed, natural rice grain was mostly preferred, followed by semi-processed products such as minute and fortified rice. The moderate preference consisted of rice products with added ingredients such as seasoned grain and further processed products like frozen/chilled rice dishes. According to focus group study, frozen food was perceived as good quality food by the Europeans, since they consider that nutrients were preserved in such products. By contrast, these dishes were perceived as unhealthy food by Asians, because they were not freshly

prepared. The least preferred rice products were the long lasting, and severely processed cooked (heat treatment) products such as canned cooked rice or microwavable rice dishes. In conclusion, the data in Table 2 showed that the preferences for the different rice products were related to the image that consumers had about the healthiness of the product, as deduced from the degree of processing and additives used. Rice was a staple food for many consumers, so perception about the healthiness of the products will have a larger impact on preference than taste or exciting features, which usually was important in other food products

Linnemann *et al*. (1999) proposed future consumer prototypes according to their buying behaviour in relation to social, demographic, and economic characteristics into 7 groups (Table 3). For our research we added another prototype of consumer, namely with a traditional eating habit. Rice products were then grouped according to their preferences using Factor analysis. Three groups of products were clearly separated with its Eigenvalue greater than 1 (except the third factor was 0.9) (table 4). As each product carried with itself the concept, we then match food product preferences with consumer prototype (or product concepts) illustrated in Table 3. The three concepts altogether could explain 67.8% of total variance. These three concepts were convenience, varieties and traditional/natural concepts which accounted 33.9, 21.2, and 12.8 % of the total variance respectively.

(i) The convenience concept (33.9%):

Products belonging to this category were ready-to-eat or ready-to-heat rice products such as frozen or chilled rice dishes, microwavable dishes, canned/pouch cooked rice, and rice as a meal component of a ready-to-eat dish.

(ii) The grain variety concept (21.2%):

Products grouped in this category were all variations of rice that still took time to cook but had exciting or beneficial features as compared to traditional rice. The products belonging to this category were fortified rice, minute rice, and seasoned rice.

(iii) The traditional or natural concept (12.8%):

Various types of raw rice grain represented this concept, such as Jasmine rice, brown rice, Basmati rice, Risotto rice, wild rice etc.

Table 3 Future consumer prototypes, some key characteristics with respect to food preferences in general and to rice products in particular (adapted from Linnemann *et al*., 1999).

Consumer prototype to rice products	Characteristic food preferences	Characteristic preferences with respect to rice products
The environment-conscious consumer	Organic foods Unprocessed (fresh) foods Foods from short production chains	Organic rice
The nature and animal loving consumer	Foods without genetic modification Animal-friendly produced meat	Rice without genetic modification
The socially conscious consumer	Foods from fair trade	Fair-trade rice
The health-conscious consumer	Foods with health-protecting and health-promoting properties (e.g., low calorie, with extra vitamins minerals, and non-nutrients)	Fortified rice Brown rice
The convenience consumer	Ready-to-eat meals Fast food Take-out meals Restaurant food	Ready-to-eat rice (e.g., in pouches for the microwave, in cans)
The hedonic consumer	(Exotic) specialties, delicacies Foods of high sensory quality	Exclusive rice varieties
The price-conscious consumer	Homemade meals, with ingredients of a favourable price/ quality ratio (e.g., products from large-scale production)	Low-priced rice
The variety-seeking consumer	Seeks diversity in ingredients for meals New product introductions	New rice products and all sorts of combinations with rice, e.g., seasoned rice

Table 4 Rotated factor loadings of consumers' preferences for various rice products

Rice Products	Factor			Communality
	1	2	3*	
Convenience Concept				
Frozen / Chilled Rice Dish	**.865**	.099	.052	.761
Microwavable Rice Dish	**.808**	.212	.037	.699
Canned / Pouch Cooked Rice	**.799**	.146	.000	.660
Rice Grain + Ready to Eat Dish	**.707**	.345	-.030	.620
Grain Variety Concept				
Fortified Rice Grain	.113	**.770**	.207	.649
Minute Rice Grain	.161	**.752**	.039	.593
Seasoned Rice Grain	.362	**.576**	-.153	.486
Traditional/Natural Concept				
Rice Grain	.032	.092	**.974**	.958
% Variance in rotated solution	33.87	21.17	12.77	
% Cumulative Variance	33.87	55.04	67.81	

* The third factor Eigenvalue is 0.896

4.1.2. Product Concepts Preferences among Different Nationalities

In order to map each product concept with consumer's nationality, the rotated factor score of each observation obtained from previous factor analysis was averaged among consumers from different nationality. The averaged factor score of each concept within different nationalities was then plotted as presented in Figure 1. Result from factor score plot showed that convenience products were mostly preferred in higher income Asian countries, such as Japan/ Korea, North China/Taiwan, and most non-rice eating countries, namely the UK, USA/Canada. The Japanese/Korean consumers were the most fervent convenience seekers in this group. Less interested in convenience were the respondents from Australia/New Zealand, and other rice eating countries, namely Thailand, South and Southeast Asian. The variety concept was clearly more preferred by consumers from rice eating countries, *i.e*. consumers from South and Southeast Asia, Thailand and Australia/New Zealand, than by those in non-rice eating countries. The traditional/natural concept was strongly preferred by consumers from the major rice eating countries, which were Thailand, South and Southeast Asia. These results could be explained by our focus group study among French consumers. They did not consider traditional rice grain inconvenient as

long as the time used for cooking rice was not longer than boiling potato (which actually took even longer time). However, French consumers consider the cooking procedure of certain rice products (*e.g*. seasoned rice grain) inconvenient, since continuous stirring was needed. As a consequence, the preference for such rice products was lower in non-rice eating countries than rice eating countries where people usually spend a longer time in the kitchen (Table 5).

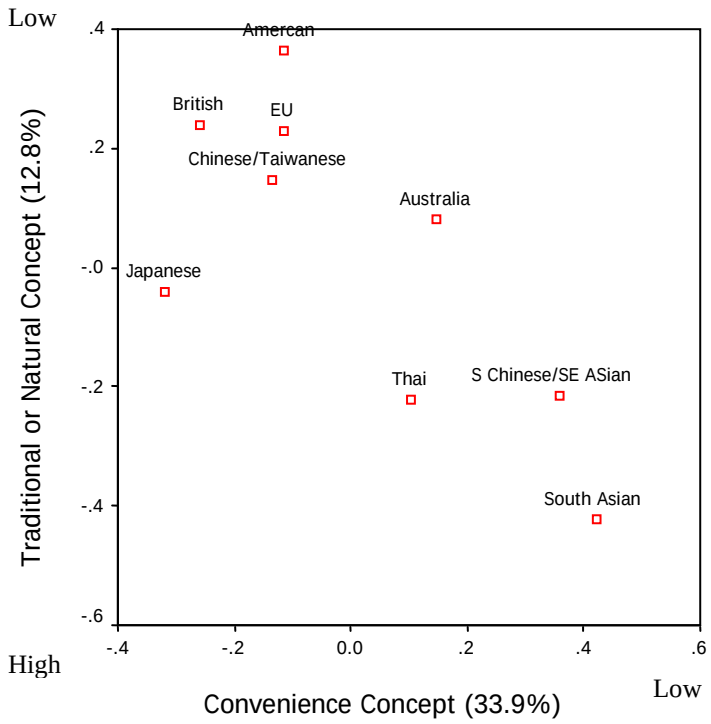
Respondents were grouped by countries into two groups followed their rice eating habit. The rice eating countries were those who eat rice as their main starchy food which were Thai, Chinese, Taiwanese, Japanese, Korean, Southeast Asian, South Asian and the Middle East. The non rice eating countries were those who eat rice occasionally which were British, Irish, American, Canadian, Australian, New Zealander and European. Analysis of variance was used to test the different in factor score means among these two groups. Resulted showed that convenience and traditional/natural rice product concepts were highly preferred and was not different among these two groups (Table 5). The variation concepts was significant differed (α=0.01), consumers from rice eating countries preferred more variation than non rice eating countries.

Table 5 Mean difference in preference for type of rice products between rice eating and non-rice eating countries

Rice product category	Product preference (Mean scores)	
	rice eating country	non-rice eating country
Convenience	-.018	.051
Variation**	-.186	.337
Tradition /natural	-.008	.017

** Significant at p = 0.01

Scale 1 = high preference 5 = low preference



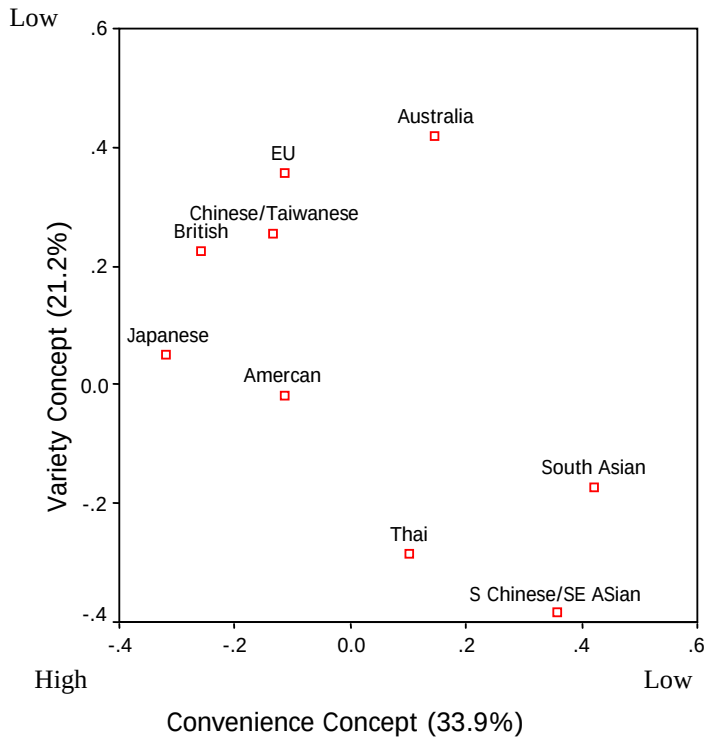


Figure 1 Rotated factor score plot of preferences for rice products among different nationalities

Preferences among consumers from the rice eating countries were related to income and new product exposure. Consumers in low income Asian countries, such as Thailand, South and Southeast Asia, kept a strong preference for traditional rice grain but moved towards more varieties of rice as mentioned above. However, we should keep in mind that the traditional rice grain still obtained the highest preference score in general (Table 2). New rice products should not go against their belief for healthiness in food products. The variation in rice products that these consumers appreciated was not an increase in convenience but the incorporation of new and exciting features. Other, higher income Asian counties, namely Japan/Korea and Taiwan, were comparatively more exposed to new rice products and quite ready to develop their preferences towards more processed, more convenient rice products. This result corroborated data from a market survey in a Japanese supermarket and at Food Expo 2002, which indicated various value-added rice products were more frequently found in Japan than in any other Asian countries.

4.1.3. Rice Products Preference and Consumer Health Concern

As starchy foods were generally perceived as nutritious and good for health (Moreira *et al.* 2005), a preference for healthy food should play a major role in preference for rice. The respondents were then divided into 3 groups according to their attitude towards the acceptance of processed food which were less, moderate and most health concerned consumers. The mean preference differed for all rice products except for the unprocessed rice grain (Table 6). Rice grain was preferred most among all groups, irrespective of their degree of acceptance of processed food. Subjects who had few and moderate concerns about processed foods preferred more of all rice products than the most concerned consumer. The latter was more conservative and strongly preferred natural rice grain. The less to moderate concerned consumers who accepted more of the processed rice products are 20-34 years old (53%) and 35-49 years old (30.3%), most were students (22%) and private company officers (20.8%), and nearly half of them (47.3%) were single.

Table 6 Means difference of the preferences for various rice products between groups of consumers who differ in their health consciousness

Rice products	Health perception of processed food		
	less [1)] (n=528)	moderate [2)] (n=315)	most [3)] (n=153)
Rice grain	2.01 ns	2.10 ns	2.03 ns
Rice grain fortified with vitamins	2.35 a	2.42 ab	2.60 b
Minute rice grain	2.15 a	2.22 a	2.63 b
Seasoned rice grain	3.14 a	3.19 a	3.44 b
Rice grain with ready to eat dish	2.99 a	3.25 b	3.72 c
Canned cooked rice	3.85 ab	3.73 a	4.05 b
Microwavable rice dish	3.06 a	3.23 a	3.75 b
Frozen/chilled rice dish	3.58 a	3.68 ab	3.83 b

Mean values within the same column followed by a different superscript letters were significantly different ($P<0.05$). ns = Not significant.

Question: I accept processed food as part of my meal (1=strongly agree 5=strongly disagree)

[1)] answers 1 and 2 [2)] answer 3 [3)] answers 4 and 5

Analysis of variance results showed that consumers from rice eating countries believe more strongly that rice was good for their health than consumers from non-rice eating countries (α=0.05). Dutch consumers expressed that they considered rice to be as healthy as meat but less healthy than lettuce and broccoli (Sijtsema *et al*., 2003). Moreover, the healthiness of food among the Dutch was related to a balanced diet, and food composition, such as fat or sugar content, rather than a specific food itself. Countries that have a long history of rice consumption, such as South Asia, Southeast Asia, and China, usually relate freshly-prepared to healthiness.

Nowadays, the desire for health-supporting foods is one of the most important criteria used in developing new products. Consumers, especially those from non-rice eating countries, need to be informed about the beneficial aspects of rice as compared to other staple foods. A major rice company in the Netherlands tried to educate their customers by giving information about different rice varieties, its nutritional value (especially low fat, non-gluten, high energy, good source of vitamin B, easy digestibility etc.), and various rice recipe on the package.

4.2. CONSUMERS' RICE EATING QUALITY

(Ref: Suwannaporn, P., A. Linnemann. *Rice Eating Quality Among Consumers In Different Rice Grain Preference Countries.* **J. of Sensory Studies** 2008; 23(1): 1-13.)

4.2.1. Rice Eating Quality among Consumers of Different Nationalities

Discrimination analysis was applied in our study to investigate differences in perception among consumers from target exported countries. Discrimination function plot could classify group centroids of those countries accordings to their eating preference into 5 groups. 1) long grain preference, consisting of Southeast Asian, and South Chinese, 2) short grain preference, namely Japanese/Korean, North Chinese/Taiwanese, 3) Basmati preference, comprised by South Asian/Middle East, 4) non-specific preference, namely American/ Canadian, European, Autralian/ Newzealander and other nationalities, and 5) Jasmine preference, Thai was the representative for this group (Figure 1). The group classification and its members agreed well with our previous knowledge in country's preference. The result confirmed that eating quality especially hardness, stickiness and aroma were the best discriminators for country's preference. Japanese/Korean, North Chinese/Taiwanese were much differred from South Asian/Middle East regarded to discrimination function 2 which stickiness was the highest load (discriminant loading 0.92),. Japanese/Korean, North Chinese/Taiwanese and American/Canadian, European, Autralian/ Newzealander were much differed from Thai by discrimination function 1 which aroma and hardness were the main effects (discriminant loading 0.71 and 0.68) (Figure 2, Table 7).

Table 7 Discriminant function coefficients and correlations of eating quality among consumer in target exported countries

Eating Quality	Discriminant function 1		Discriminant function 2	
	discriminant coefficients	discriminant loadings	discriminant coefficients	discriminant loadings
Hardness	.678	**.687**	-.301	-.029
Stickiness	-.279	-.020	.954	**.916**
Aroma	.707	**.747**	.303	.389

notes: significance of the discriminant function (from Wilks' Lambda) = 0.000;

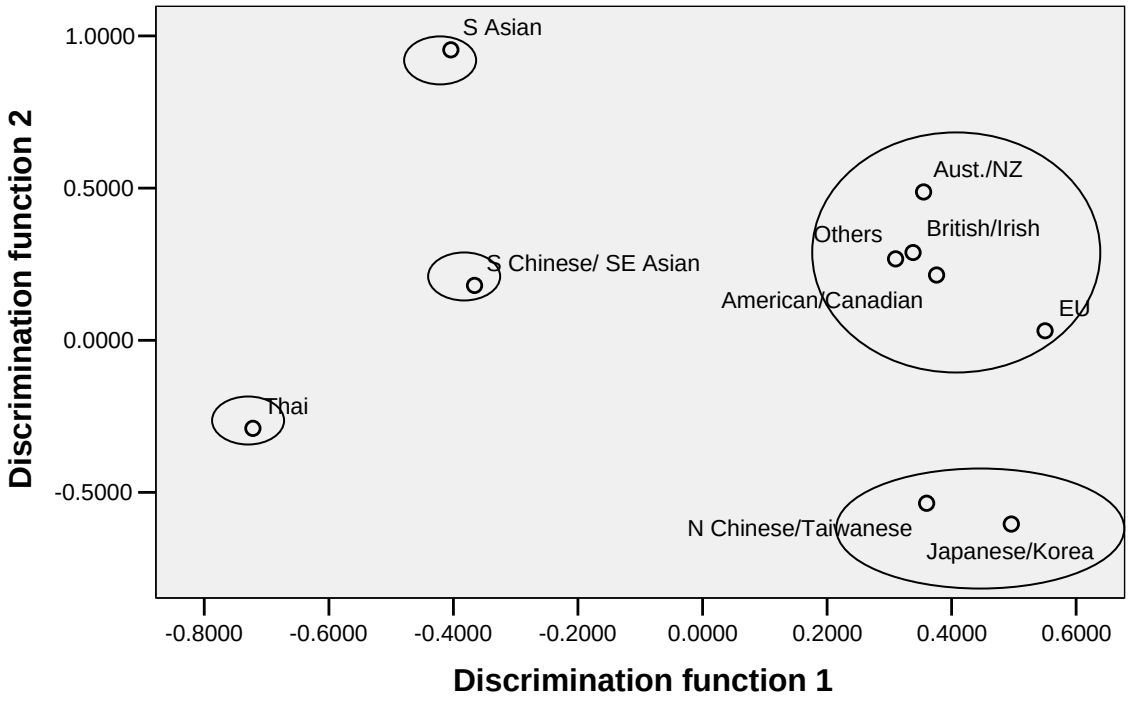


Figure 2 Discrimination function plot of group centroids among rice target exported countries

Eating quality was then compared with long grain preference consumers to evaluate differences in eating preference between countries. Results showed clear differences in eating quality perception among consumers from different grain type preference countries. Its prediction was corrected to 63%, 71%, and 81% for non-specific grain preference, short grain preference, and Basmati preference consumers, respectively (Table 8). Discrimination results showed that the best discriminator of the long grain from the short grain preference consumer was hardness (discriminant loading 0.88), from Basmati preference consumer were hardness and stickiness (discriminant loading 0.79 and 0.78). Stickiness was the best discriminator for the non specific grain preference but with negative correlation (discriminant loading -0.96). Color correlated with a value smaller than 0.3, which had no practical implication according to Hair *et al*. (1995). This information would be useful for rice breeders to manipulate rice grain quality in such a way as to suit each target group. For example, some varieties of long grain Thai rice had higher starch content, rendering it more sticky and suitable to Japanese taste preference (Janssen 1994).

Table 8 Discriminant function coefficients and correlations of eating quality between consumer in different rice grain preference countries as compared with consumers in long grain preference countries.

Eating Quality	Long grain VS Short grair preference [1)]		Long grain VS Non-specifi preference [2)]		Long grain VS Basmati preference [3)]	
	discriminant coefficients	discri. loadings	discriminant coefficients	discri. loadings	discriminant coefficients	discri. loadings
Hardness	1.012	**.884**	.568	.431	-.807	**.792**
Stickiness	-.424	-.157	.621	**-.962**	.268	**.779**
Aroma	-.243	-.154	-.309	.379	.248	-.218
Color	.031	.066	-.105	.267	.128	.079

notes: significance of the discriminant function (from Wilks' Lambda) = 0.000;

1) the function correctly predicts 72% of long grain preference consumer, and 68% of short grain preference consumer, for a combined rate of 70.6%.
2) the function correctly predicts 61.7% of long grain preference consumer, and 65% of non-specific grain preference consumer, for a combined rate of 63.3%.
3) the function correctly predicts 83.3% of long grain preference consumer, and 69.8% of Basmati preference consumer, for a combined rate of 81.2%.

Table 9 present the differences in the means of preferences for hardness and stickiness between short grain, Basmati grain, and non-specific grain preference consumer as compared to preferences for long grain. Consumers who prefer short grain, preferred rice which was a little bit harder than those prefer long grain. Consumers, who prefer Basmati, clearly preferred less sticky grain. Consumers with no specific grain preferences, preferred grain which was harder and less sticky. This result was consistent with results from interviews with French panels that preferred hard, fluffy, and separated rice. This preference might be partly attributed to the influence of the marketing of hard, fluffly and non-sticky American rice exported to the EU as quality rice under the pioneering "Uncle Ben" brand name. The non-stickiness of rice was reported to be one of the important quality attributes in France, the UK and Spain (d'Hauteville 1992). Their preferences differed greatly from the Thai and some Asian countries, which preferred soft, glossy and integrity grain which partly stick together.

Table 9 Sensory preferences for cooked rice among consumers with different preferences for grain type.

Eating quality	Means Preference			
	Long grain preference (n = 347)	Short grain preference (n = 181)	Basmati preference (n = 63)	No specific grain preference (n = 320)
Hardness	4.29 a	3.54 b	4.22 a	3.70 b
Stickiness	3.18 b	3.77 a	1.86 d	2.85 c
Aroma	3.99 a	3.30 b	3.53 b	2.82 c
Color	4.01 b	4.14 b	4.55 a	4.10 b

Significance different at α = 0.05

Question : Which cooked rice characteristics you prefer?

Hardness Scale: 1 = hard 5 = soft

Stickiness Scale: 1 = not sticky 5 = very sticky

Aroma Scale: 1 = weak 5 = strong

Color Scale: 1 = brown 3 = yellow 5 = white

4.2.2. Rice Eating Quality Preference among Consumers of Different Grain Preference

Respondents were grouped by grain type preference instead of by nationality to determine outstanding characteristics that consumers perceived in different types of grains. However, results showed lower prediction rate than grouping by nationality since their preferences were spread into many categories. Discrimination function can correctly predict 56%, 59%, 60%, and 64% of short grain, long grain, Basmati grain, and Jasmine rice preference respectively (Table 10). In real life, consumer could prefer more than one type of grain, especially those in non specific grain preference, so we allowed them to have more than one choices. Discriminant analysis separates groups by measuring the distance between group centroids. If the overlap in the distribution was large, the discrimination function can not separate the groups well (Hair *et al*. 1995). As a consequence, the overlapping was higher when grouping by preference than by nationality which we were specifically defined group for them as a one to one basis according to their nation's eating habit.

Table 10 Discriminant function coefficients and correlations of eating quality among consumer who prefer and not prefer in different rice grain variety

Eating quality	Long grain [1]		Short grain [2]		Basmati [3]		Jasmine [4]	
	discri. coeff.	discri. loadings	discri. coeff.	discri. loadings	discri. coeff.	discri. loadings	discri. coeff.	discri. loadings
Hardness	.925	**.883**	-.328	-.208	.311	.479	.635	**.784**
Stickiness	-.423	-.174	.944	**.794**	.896	**.953**	.522	**.675**
Aroma	.283	.386	-.474	-.383	-.018	.169	.302	.496

notes: significance of the discriminant function (from Wilks' Lambda) = 0.000;

1. the function correctly predicts 60.8% of consumer prefers long grain, and 57.1% of consumer not prefers long grain, for a combined rate of 59.1%.
2. the function correctly predicts 62.3% of consumer prefers short grain, and 54.6% of consumer not prefers short grain, for a combined rate of 56.4%.
3. the function correctly predicts 60.8% of consumer prefers Basmati, and 59.2% of consumer not prefers Basmati, for a combined rate of 59.6%.
4. the function correctly predicts 64.4% of consumer prefers Jasmine rice, and 62.8% of consumer not prefers Jasmine rice, for a combined rate of 63.9%.

Result showed that hardness was the main difference between consumers who preferred and those who did not prefer the long grain type. Stickiness was obviously the main difference for short grain rice and Basmati rice but in the opposite direction. Short grain preference consumers preferred stickier rice with decreased aroma. But Basmati preference consumers preferred less stickiness and harder rice. While jasmine rice was quite special with all characteristics (hardness, stickiness, and aroma) were different among consumers who preferred and those who did not prefer it. The result could imply that Jasmine rice had its unique quality, which was highly differentiated between people who prefer and not prefer (α = 0.00). Jasmine rice quality was integrated by these 3 qualities so it was not easy to substitute once it had been preferred. Jasmine rice preference consumer preferred softer (mean=4.21), more sticky (mean=3.40 similar to short grain), and stronger aroma (mean= 3.65). (Table 11). This agreed well with Suwansri *et al*. (2002) who stated that in the USA, the prefer Jasmine rice consumers (Asian American) preferred and were able to differentiate the imported Jasmine rice from the American's new breeding Jasmine-identical rice.

Table 11 Means differences of rice eating quality between consumers who prefer and not prefer different grain type

Eating quality	Means Preference (Prefer / Not prefer)			
	Long grain preference (n = 525)	Short grain preference (n = 231)	Basmati preference (n = 204)	Jasmine preference (n=421)
Hardness	*4.07 / 3.71	3.83 / 3.92	*3.64 / 3.97	*4.21 / 3.59
Stickiness	3.04 / 3.12	*3.42 / 2.97	*2.46 / 3.24	*3.40 / 2.73
Aroma	**3.45 / 3.26	**3.19 / 3.41	3.25 / 3.39	*3.65 / 3.16

* Significant difference between consumer who prefer and not prefer at α = 0.01

** Significant difference between consumer who prefer and not prefer at α = 0.05

Question : Which type of grain do you prefer? (can answer more than one)

Question : Which cooked rice characteristics you prefer?

Hardness Scale: 1 = hard 5 = soft

Stickiness Scale: 1 = not sticky 5 = very sticky

Aroma Scale: 1 = weak 5 = strong

4.3. CONSUMER PREFERENCES AND BUYING CRITERIA

(Ref: Suwannaporn, P., A. Linnemann. *Consumer Preferences and Buying Criteria for Jasmine Rice.* **Journal of Food Products Marketing**. (in press).)

4.3.1. Rice Grain Preferences

Consumers who prefer long grain rice were, in descending order, Southeast Asians/South Chinese (77.2%), Thai (72.3%), Australians/New Zealanders (65%), Americans/Canadians (54.2%), British/Irish (51.1%), Europeans (excl. British/Irish, 44.7%), North Chinese/Taiwanese (43.2%), and people from South Asia/Middle East (40.5%) (Table 12).

Table 12. Consumer preferences for different types of rice grain by nationality.

Nationality	Consumer preferences (%)					
	Long	Short	Basmati	Brown Rice	Parboil	Wild rice
Southeast Asian/South Chinese	77.2	17.2	12.3	15.8	2.6	9.6
Thai	72.3	13.6	1.7	55.0	6.3	0.8
Australians /New Zealanders	65.0	16.4	25.0	33.3	11.7	8.3
Americans/Canadians	54.2	31.6	19.8	26.0	8.3	21.9
British/Irish	51.1	10.1	43.6	18.1	4.3	10.6
Europeans (excl. British/Irish)	44.7	13.8	39.5	15.8	15.8	14.9
North Chinese/ Taiwanese	43.2	42.6	6.0	30.1	5.3	3.8
South Asians/Middle East	40.5	14.1	73.8	13.1	3.6	1.2
Japanese/Koreans	19.6	64.9	3.6	17.9	10.7	2.7
% Average	60.0	24.9	25.0	25.0	7.6	8.6

Long grain was least preferred by Japanese/Koreans (19.6%). Long grain rice was preferred over short grain rice by all nationalities in the survey, except for the Japanese/Koreans. Short rice grain was particularly preferred by Japanese/Koreans, while Chinese/Taiwanese equally preferred short and long grain. About one-third of the Americans/Canadians also preferred short grain. In the UK, long grain rice constituted the growth segment in the market. Increased consumption was dominated by parboiled white rice (with a 45% market share) and white rice (27%) (Hogg and Kalafatis, 1992).

Basmati rice was clearly preferred by most South Asians (73.8%) and quite noticeably among the British (43.6%) and other Europeans (39.5%). Brown rice was preferred mainly by Thai (55%), Australians/New Zealanders (33.3%), Chinese/Taiwanese (30.1%), and Americans /Canadians (26.0%). Brown rice was least preferred by people from South Asia and the Middle East. Other specialty rice grains, such as parboiled and wild rice, were preferred by few consumers and did not show distinct preferences among consumers in different countries. In the USA, the consumption of specialty rice, especially brown rice and parboiled rice, increased since it is perceived as nutritious, rich in vitamins and minerals, is an aid to good health, and a good source of fibers (Childs, 1993). In the UK the growth rates in the consumption of brown and Basmati rice decreased since the introduction of new types of rice, such as wild rice and organic rice (Hogg and Kalafatis, 1992).

4.3.2. Jasmine Rice Preference

The respondents who preferred Jasmine rice, were mostly consumers with a preference for long grain (59.6%). Jasmine rice was most preferred by Thai (79%) and for about 31-34.7% by Europeans, Americans/Canadians, Southeast Asians, South Asians/Middle Eastern people, Chinese/Taiwanese and British/Irish. Japanese/Koreans (16.2%) expressed the lowest preference for Jasmine rice (Table 13). Target export countries were grouped into traditionally rice eating countries and traditionally non-rice eating countries, i.e. all Asian countries on the one hand and the other countries on the other hand. Analysis of variance (ANOVA) results show that consumers from rice eating countries have a higher preference for Jasmine rice than those from non-rice eating countries (α=0.05). However, according to the data, Jasmine rice in general is not very popular, especially not among those consumers who already have developed a strong specific preference in rice, such as Japanese/Koreans. Japanese consumers complained that imported Thai rice smelled strange and did not cook in the same way as Japanese rice (Asian Business, 1994). Imported rice from Southeast Asia is struggling for Japanese acceptance, partly because it differs from the varieties grown in Japan (Economist, 1994). Due to these differences in rice preference, market penetration in Japan and Korea could be difficult and even more difficult than in countries that still have not developed such strong preferences, such as the traditionally non-rice eating countries.

Table 13. Preference for Jasmine rice over other types of rice in different countries.

Country	Means	Range	SD
Thailand	1.72 a	1.5-1.9	1.14
European Countries	2.63 b	2.4-2.8	1.05
USA / Canada	2.71 bc	2.5-2.9	1.04
Southeast Asia	2.72 bc	2.5-2.9	1.20
Australia / New Zealand	2.74 bc	2.5-3.0	0.93
South Asia / Middle East	2.84 bc	2.6-3.1	1.36
Chinese / Taiwanese	2.85 bc	2.7-3.0	1.07
UK / Ireland	2.88 bc	2.7-3.1	1.12
Japan / Korea	3.75 d	3.5-4.0	1.19
Others	3.02 c	2.7-3.3	0.95
Grand means	2.65	-	1.26

Means with a different letter (in the column) are different at $\alpha = 0.05$

Question to respondents: " I prefer Jasmine rice to other types of rice "

Scale: 1 = I strongly agree, 5 = I strongly disagree

North Chinese/Taiwanese preferences for short grain were not as strong as for the Japanese/Koreans. According to the focus group study, Northern Chinese and Taiwanese consumers usually eat and prefer short grain, but are willing to swift sometimes to change taste. Jasmine rice has its unique sticky texture, but is not as sticky as short grain, and still was accepted by most Chinese/Taiwanese. They perceived Jasmine rice from Thailand as expensive, quality rice. The Taiwanese said that eating Jasmine rice in a restaurant was perceived as something special. The South Chinese panel members said that to eat imported Jasmine rice was perceived to be more prestigious than having local rice.

South Asian/Middle Eastern consumers expressed a strong preference for Basmati rice. According to our data, the acceptance of Jasmine rice was still considerable among these consumers. South Asia can therefore be a potential export market for Jasmine rice, as well as those regions that cannot cultivate rice, such as the Middle East.

The USA/Canada and the European countries were found to be a high potential market for Jasmine rice. Here consumers had a high preference for long grain rice and Jasmine rice was also reasonably well preferred (Tables 12, 13). Aromatic rice in the US can be sold at prices that are 2 to 3 times higher than regular milled rice (Petrov *et al*., 1996). The total import in the year 2001/2 was 5 million ton. About 80% of the imported specialty rice was Jasmine rice, mainly from Thailand. The remainder was Basmati rice from India/Pakistan and Arborio rice from Italy (USDA, 2001). Imported Jasmine rice was mostly purchased by immigrants from Asia (Childs, 1993). In the EU, Indica rice accounted for 60% of the supply (Chataigner, 1992). This can be an opportunity and also a threat to Thailand's Jasmine rice export. Since the rice consumption is growing, US researchers are trying to develop domestic aromatic varieties that can compete with imported aromatic rice (Childs, 1993). Suwansri *et al*. (2002) have made preference maps for Thai Jasmine rice and American aromatic rice varieties, including the "Jasmine 85" variety that contains almost twice as much aromatic compounds as the other US aromatic varieties (Pinson, 1994). They found that color, flavor, aroma, stickiness, and hardness are, in descending order, the decisive quality factors for consumer preference. However, Asian-American consumers still preferred imported Jasmine rice to American, domestic aromatic rice (Suwansri *et al*., 2002).

4.3.3. Buying Decision Criteria

Lees and Yuen (1991) surveyed food consumption patterns of Chinese-speaking Asians living in Australia and found that they had not significantly changed their eating habits. Hu and Duval (2003) found that rice consumption of Chinese expatriates in the USA had not changed much during the time they stayed aboard. Rice eating habits are different for the traditionally non-rice eating consumers for whom rice was not their main staple food. They may occasionally eat rice just for a change of taste, trying a new thing or as part of a cooking hobby. Insight in the buying decision criteria of the two different groups is necessary to be able to adjust marketing strategies properly to these different markets.

Factor analysis results of consumer buying decision criteria yielded 4 factors, which were: marketing activities, quality, price and country of origin (Table 14). Discrimination analysis was performed to investigate differences in buying criteria between the traditionally rice eating and traditionally non-rice eating groups. The discrimination function was significant (at p=0.000), and correctly predicted consumers from rice eating and non-rice eating countries in about 70% of all

cases. Results show that country of origin, price, and marketing activities were the most important criteria in distinguishing the two groups. Quality was a poor discriminator (Table 15).

Table 14. Factor loadings of consumer buying decision criteria for rice.

	Component				Communality
	1	2	3	4	
Marketing Activities					
Advertisement	**.810**	-.060	-.016	-.069	.665
Promotion	**.689**	-.023	.392	-.046	.631
Cooking demonstration	**.667**	.179	.194	.104	.526
Attractive packaging	**.658**	-.071	.263	.181	.540
Brand name	**.585**	.122	-.162	.201	.424
Recommendation by friend / family	**.514**	.425	-.274	-.040	.521
Quality and specialty features					
High quality	-.040	**.734**	.034	.030	.543
Past experience	-.037	**.675**	-.101	.255	.533
Interesting feature/taste	.327	**.493**	.211	-.043	.396
Price					
As cheap as possible	.098	-.033	**.811**	.084	.676
Good value for money	.117	.499	**.548**	-.236	.619
Country of origin	.168	.129	.032	**.912**	.878
% Variance in rotated solution	26.77	12.95	10.50	7.71	
% Cumulative Variance	23.15	37.66	49.14	57.93	

Question: “How important are the following factors in your decision to purchase rice?”

Scale: 1 = very important 5 = not important at all

Notes: The Eigenvalue 4 = 0.926

Table 15: Discriminant function coefficients and correlations for consumer buying decision criteria for rice grain

Discriminating variables	discriminant function coefficients	pooled within groups correlations
Country of origin	.694	.626
Price	.594	.525
Marketing activities	.484	.415
Quality and specialty features	.249	.214

notes: significance of the discriminant function (from Wilke's Lambda) = 0.000;
the function correctly predicts 69.2% for respondents from rice eating countries, and 71.4% for non-rice eating countries, for a combined rate of 70.0%.

4.3.3.1. Quality

Eating quality was clearly the first priority for all consumers in their decision to buy rice (Table 6), although of course eating quality may have a different meaning for different groups of consumers across the countries. Quality may come from the grain itself, such as grain size, absence of impurity, homogeneity, food safety and sanitation. This aspect of quality can be controlled by grading such as USDA grade (Greenwalt, 1995). The main reasons for an increase in rice consumption in Europe was quality improvement, a change in consumers' attitude towards rice, advertising, culinary advise, and consumer education concerning various uses of rice (Chataigner, 1992). Consumers from both groups were rating quality by their past experience (table 16). Results from focus group studies and previous research indicated differences in criteria towards eating quality of rice grain among consumers from different countries, especially for countries with specific grain type preferences. Important characteristics are aroma, texture, and visual attributes of cooked rice (Suwansri *et al.*, 2002). Differences in the perception of quality, especially eating quality, among consumers in different countries are difficult to measure since rice is highly variable in eating quality depending on the variety used, the cultivation practices for its production, processing operations (especially the milling process), and storage time.

Table 16: Differences in buying decision criteria for consumers from traditionally rice eating countries and traditionally non-rice eating countries.

Buying decision criteria	Sig.	Means	
		Rice eating country	Non-rice eating country
Marketing Activities			
Advertisement	.000	3.10	3.41
Promotion	.000	2.81	3.42
Cooking demonstration	.000	2.94	3.54
Attractive packaging	.000	3.04	3.40
Brand name	.000	2.50	2.93
Recommended by family/friend	.013	2.40	2.58
Quality			
High quality	.000	1.48	1.69
Past experience	.407	1.72	1.77
Interesting feature/taste	.000	2.00	2.37
Price			
As cheap as possible	.000	2.80	3.51
Good value for money	.001	1.73	1.93
Country of origin	.000	2.36	3.27

Question: “How important are the following factors in your decision to purchase rice?”

Scale: 1 = very important 5 = not important at all

4.3.3.2. Price

Results show that consumers were not looking for the lowest possible price when buying rice (Table 16). Jones (1997) studied consumer demands for carbohydrate foods in the USA using supermarket scanner data and found that only rice and frozen potato had a positive expenditure elasticity, which suggested that it was not an inferior product but rather a normal good. Consumers had a strong preference for these products and the buying decisions were not influenced by price changes. Price insensitivity towards rice was partly because of the increase in its popularity. In the U.S., data on per capita consumption showed that rice consumption increased faster than consumption of pasta and potato, in which consumption was tripled over the past 20 years. In addition, it required a small enough proportion of consumers’ total budget so that price changes were not very noticeable (Jones, 1997). Consumer studies in France and Italy gave similar results, namely that consumers were not very sensitive to price

variation. Moreover, rice was substituted by other staple foods such as potato, pasta, or pulses in response to a change in price (Chataigner, 1992).

A low price for rice was found to be more important for consumers from the traditionally rice eating countries (Table 16), especially Japan, Korea, North China and Taiwan (Table 9), than for consumers from traditionally non-rice eating countries. Please note that a low price here does not even mean a very low price since price for rice in these countries is set by government intervention (USDA, 2001; Nashima, 1994; Business Korea, 1993). The retail price for rice in Japan, for example, was roughly 9 times the world market price (Economist, 1994). Similarly, the price for rice in Taiwan was 4-5 times higher than the world market price. Misunderstandings about consumers' perception of product price may tempt the rice exporting countries to focus on price rather than on quality. Continental Grain (Thailand) said that "Jasmine rice has great potential; the urban populations in affluent markets such as Hong Kong and Singapore demand high quality rice and are willing to pay for this. This is not a large volume business, but it is very profitable" (Janssen, 1994). Nowadays, major rice exporting countries mainly compete by price. The rise of cheaper, low-grade rice producers in Indochina, China, upset Thailand's rice industry (Janssen, 1994).

4.3.3.3. Country of Origin

Country of origin was frequently mentioned as an important criterion in buying rice in rice eating countries and was the most distinctive of all buying criteria between consumers from the 2 groups. Consumers from non-rice eating countries were not much concerned about the origin of the rice. They had little knowledge about rice varieties and did not even note where the rice came from. However, there were some links in preferences and countries of origin in certain grain types such as Jasmine rice with Thailand, Japonica (known as Japanese rice or Sushi rice) with Japan, Basmati with India/Pakistan, Risotto with Italy etc. Thailand, according to our data, has a strong reputation as a country of origin. Some 51.3% of the respondents preferred rice from Thailand (or 30.6% excluding Thai respondents). Other major rice producing countries, especially the USA, China and Vietnam, still have not developed such a reputation (Table 17). Nearly all Thai (96%) preferred rice from Thailand, followed by Southeast Asians (59.8%), Europeans (49%), British/Irish (43%), and Americans/Canadians (39%). The others (23%) did not know or attached no importance to the country of origin (Table 17).

Table 17 Consumer preferences for the countries of origin with respect to rice.

Country of origin	preference of respondents		Preference of respondents (exclude consumers within the same country of origin)	
	number	%	number	%
Thailand	579	51.3	345	30.6
India	200	17.7	125	11.1
USA	114	10.1	33	2.9
Vietnam	96	8.5	85	7.5
China	84	7.4	53	4.7
Pakistan	69	6.1	64	5.7
Not specified	255	22.6	-	-

Question : “When you buy rice, which country do you prefer as its origin?”

Cross tabulation was used to see the relationship between preferences for rice from Thailand in relation to countries with different grain type preferences. Results indicate that most consumers who prefer rice from Thailand come from countries with a preference for long grain, and this accounted for 86.0% of all consumers in these countries. Second in preference for rice from Thailand were the countries without a specific grain preference (42.9%). Rice from Thailand was least preferred in those countries that had already developed their own preferences, such as a preference for short grain and a preference for Basmati rice (Table 18).

Consequently, possibilities for successfully selling Jasmine rice seem most promising in countries with a preference for long grain. However, since these countries usually are rice producers themselves, product quality and price will play an important role. Moreover, there are trends towards an increased preference for long grain in the traditionally non-rice eating countries. Chataigner (1992) found that consumption of long grain Indica rice was increasing in Europe, with a share of 20% of production or 60% of supply. This indicates an opportunity for Jasmine rice in this market, especially the rice-eating expatriate target group such as Asian Americans or Asian-Europeans. The Asian Americans prefer imported Jasmine rice over domestic products (Suwansri *et al*. 2002). Building a reputation as a country of origin, especially in traditionally non-rice eating countries, should be a priority for Thailand. This is especially true since eating quality was the

most important buying criterion for all consumers. Building a reputation as a country of origin could be linked with quality and product reliability.

Table 18. Relationship between preference for rice from Thailand and grain type preference countries.

Grain Preference	Preference for rice from Thailand		Row total (row total %)
	No	Yes	
	Count Column %		
Long Grain Preference	50	307	357
	14.0%	86.0%	34.2%
Short Grain Preference	157	73	230
	68.3%	31.7%	22.0%
Basmati Preference	54	24	78
	69.2%	30.8%	7.5%
No Specific Grain Preference	217	163	380
	57.1%	42.9%	36.4%
Pearson Chi-square significance	.000		
Likelihood ratio significant	.000		

4.3.3.4. Marketing Activities

Traditionally rice eating consumers attached more importance to every aspect of the buying decision process, than non-rice eating consumers (Table 16). However, the differences were more pronounced for the marketing criteria than for quality criteria. Non-rice eating consumers were less concerned with brand name, country of origin, promotion, price, packaging, cooking demonstrations, and advertisements. Consumers from the USA/Canada had a stronger response to the buying criteria, especially quality, brand name, and packaging, than the Europeans and Australians (Table 19). Tomilson (1984) found that brand loyalty for most staple products and commodities such as rice in Canada was low since there was not much differentiation among brands. A branded commodity product should give a consumer a distinct reason to buy the brand that shows how it differs from other brands. Brand name can link with quality. The brand Tilda in the UK, for instance, targeted against cheaper, unbranded packed rice by warning consumers about adulterated rice (Hogg and Kalafatis, 1992).

Table 19. Means of factors influence buying decision criteria in different countries

	Rice Eating Country						Non-Rice Eating Country				
	Thai	S China/ SE Asia	N China /Taiwan	Japan/ Korea	South Asia	***Group Means***	USA / Canada	EU	UK	Australia / NZ	***Group Means***
High quality	1.30	1.30	1.80	1.82	1.35	***1.48***	1.71	1.72	1.72	1.63	***1.69***
Past experience	1.58	1.75	1.92	1.87	1.57	***1.72***	1.78	1.90	1.86	1.53	***1.77***
Good value for money	1.57	1.67	2.12	1.87	1.51	***1.73***	1.74	2.06	2.06	1.78	***1.93***
Interested feature/taste	1.66	2.01	2.69	2.14	1.57	***2.00***	2.08	2.52	2.26	2.80	***2.37***
Friend/family recommend	2.41	2.55	2.25	2.43	2.37	***2.40***	2.29	2.52	2.65	3.05	***2.58***
Brand name	2.77	2.64	2.26	2.24	2.49	***2.50***	2.39	3.05	3.15	3.14	***2.93***
Country of origin	2.45	2.49	2.37	2.01	2.40	***2.36***	3.15	3.18	3.43	3.15	***3.27***
Promotion	2.78	3.08	2.47	2.99	2.88	***2.81***	3.09	3.54	3.35	3.78	***3.42***
As cheap as possible	2.72	3.18	2.43	2.77	3.42	***2.80***	3.45	3.66	3.47	3.44	***3.51***
Attractive packaging	2.93	3.15	2.89	2.90	3.74	***3.04***	2.91	3.56	3.42	3.86	***3.40***
Cooking demonstration	2.90	3.11	2.71	2.98	3.25	***2.94***	3.35	3.59	3.51	3.76	***3.54***
Advertisement	3.27	3.22	2.69	3.00	3.29	***3.10***	3.08	3.46	3.43	3.78	***3.41***

Significant at p=0.01

Scale 1 = Very important 5= not al all important

Question "What important are the following factors encouraging you to make a purchase of rice grain"

Marketing activities apparently had less impact on consumer buying decision making. In the UK, the Masterfoods company spent more money on consumer education, aiming to raise the awareness of the heath benefits of rice (Hogg and Kalafatis, 1992). The USA, as a major rice exporting country, plays an important role in the promotion of rice consumption via vigorous advertising campaigns. Other rice producing countries in Asia or Europe have no permanent organization to promote their own rice yet. Most promotion is done by distributors in target countries rather than by the rice producers themselves.

The diffusion process will play an increasing role in customer preferences and perception of rice. Rice preference is usually spread by means of migration, colonization and ethnic cuisine. In the USA, rice consumption increased drastically because of increasing numbers of Asian Americans and other rice eating ethnic groups such as Hispanics (Childs, 1993). In the Netherlands, rice became popular as a food as a result of the colonization of Indonesia and Surinam and the increased contacts which followed. Another major diffusion process was due to the introduction of Asian cuisine by restaurants such as Chinese, Thai,

Indian, Vietnamese etc. Rice consumption in the US doubled in the past 10 years because of the increasing popularity of ethnic cuisine, its healthy image, neutral flavor, ease of preparation, menu versatility, and comparatively low prices (Weiss, 1993; Childs, 1993). Much of the growth in rice popularity in the US can be traced to restaurant use (Weiss, 1993; Childs, 1993; and Chataigner, 1992). Europeans and Americans wanted to try new exotic dishes with a different taste. Market strategies in these regions should therefore be developed through product differentiation (Chataigner, 1991). The introduction of rice into these countries should be done through a diffusion process. Market strategies could make use of the indirect channels such as restaurants, Asian grocery shops, supermarkets, cooking programs on TV or cooking recipe in magazines etc. This should be done in parallel to product differentiation, as in the case of Masterfoods company.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Consumer Preference of Rice and Rice Products

Consumers' rice preferences differed greatly among nationalities. Rice exporters have to understand these different preferences in order to offer the right products to their customers. Assuming consumer preferences to be comparable to one's own country's preference can cause new product failure. This research confirmed existing differences and presented details and backgrounds of these differences. Traditional rice grain was still among the most accepted and preferred products for all consumers. However, preferences in terms of eating quality and cooking method may not be similar and require further investigation. Product differentiation should focus on offering more diversity such as Aromatic rice, Basmati rice, wild rice, American rice etc., more convenient cooking methods and attractive packaging designs. Higher value-added rice products such as seasoned rice grain, which represented the grain variety concept, can be introduced to the variety seeking Asian consumers. Highly processed rice dishes which represented the convenience concept were more accepted by consumers in non-rice eating countries and the modernized Asian countries. Suitable target groups were young to middle aged singles, students and company officials. New rice product design should take consumers' eating and cooking habits and their perception of health into account.

5.2. Rice Eating Quality

Eating quality especially hardness, stickiness, and aroma were able to discriminate consumer preference in each country. Jasmine rice research in Thailand has focused on how

to increase or protect loss of aroma by means of breeding, grain coating, packaging, and storage control. Research funding has been used for improving the sensory quality attributes even though they may not be perceived as important by most consumers. According to our data, rice aroma was not a decisive quality attribute for consumers in general, and in particular not for consumer from the non-rice eating countries and countries in which short grain was preferred. However, it was found to be a desirable quality trait for those who specifically prefer Jasmine rice. The example of Japanese complained about the strange smell of Thai Jasmine rice supported this observation. Rice research should be diversified, according to different customer preferences towards rice. Research should focus more on the improvement of cooked rice's texture, to suit different target export countries. Moreover, rice processor or trader should offer various products that suit different preferences. Possibilities were promising since there were many long grain varieties in Thailand, which vary widely in eating quality.

For consumers in Thailand and some Asian countries, Jasmine rice's aroma was a unique characteristic and an important quality trait. Jasmine rice's uniqueness was not differentiated well enough in other countries. Differentiation strategy via diffusion process can make Jasmine rice indispensable in certain cuisine. Jasmine rice was related with Thai cuisine, similarly to Japanese rice with Sushi. As rice preference in the non-rice eating countries such as the EU were still in a transition state. Its preference could be developed by promotion via advertising campaigns, ethnic cuisine, menu versatility and cooking demonstration etc. Such activities need cooperation between the government and private sector to help promote Thai rice export market.

5.3. Consumer Buying Criteria

Proposed Strategic Model to Promote Jasmine Rice Export

Jasmine rice from Thailand has the potential to be a good export product. However, thorough understanding of its market and consumer behavior is needed to target potential consumers in the best possible way. We have divided the consumers in our study into 3 groups on the basis of their potential preference for Jasmine rice by combining our findings with past records on Thailand's Jasmine rice exports (Figure 1). The *low potential* group consists of consumers from rice eating countries who already have developed a strong preference for specific types of rice other than Jasmine rice. Those consumers are mainly from countries with a strong preference for short grain such as Japan, Korea, North China and Taiwan. This group is still in the diffusion stage; they occasionally eat Jasmine rice, for instance, in a specialty restaurant. The

consumption of Jasmine rice in this group of consumers could be promoted by focusing on product quality, the exciting taste, differentiation, and country of origin.

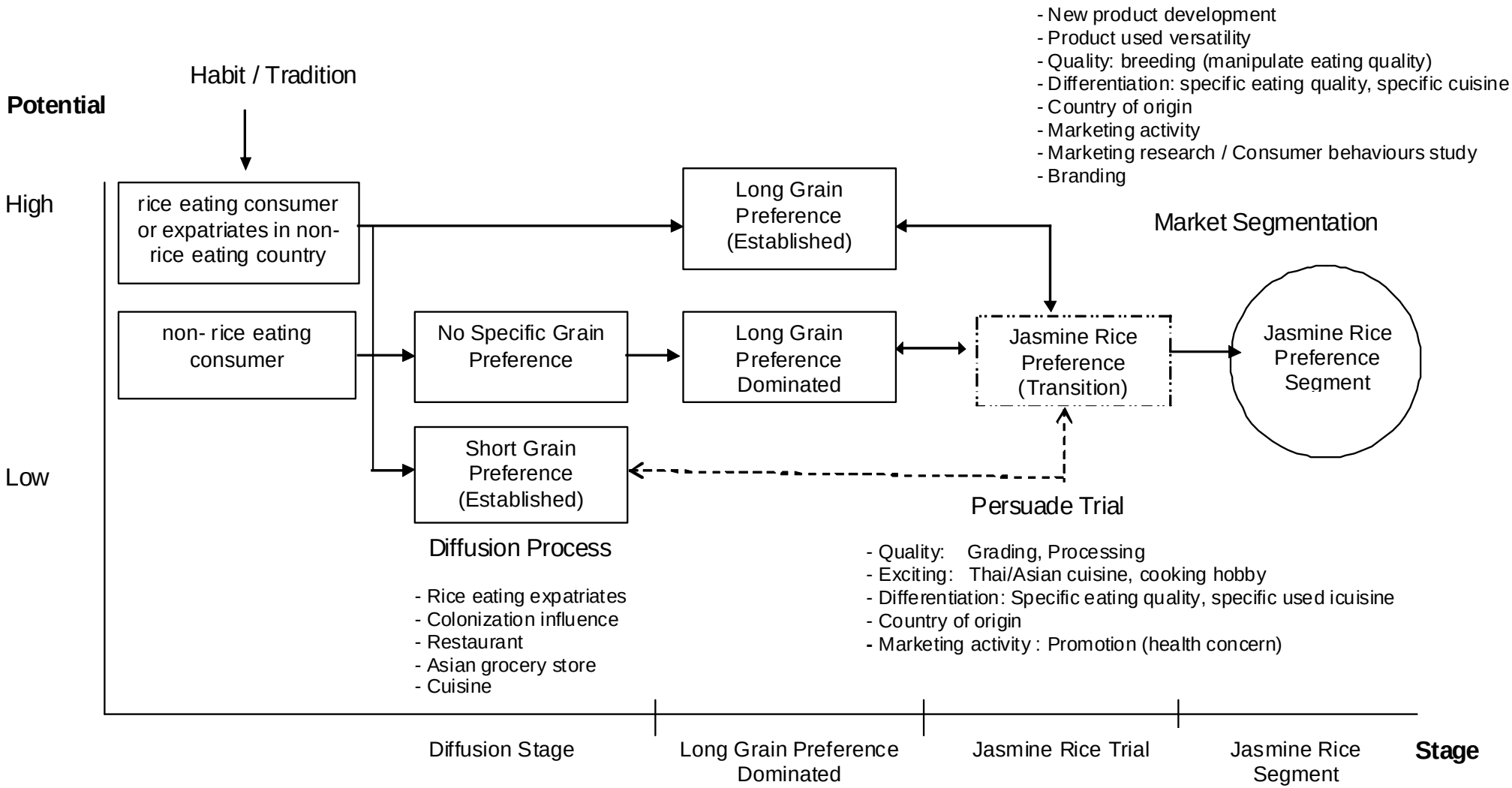
The traditionally non-rice eating consumers are mainly from the European Union countries, and the USA / Canada. They have a *moderate potential* consumers of Jasmine rice. Although a growing rice consumption and a preference for long grain are apparent in these countries, rice consumption is still low when compared to traditionally rice eating countries. Moreover, many rice varieties are offered on the market, which causes dispersion or dilution of preference. These consumers usually cannot differentiate among various grain types and tastes. Rice is consumed occasionally, mainly as a side dish, which does not stimulate the development for a strong preference towards a specific grain type. Quality has been reported to be the main reason of rice consumption in non-rice eating countries. Therefore quality should be controlled to avoid consumer disappointment. Sanitation quality must be high (i.e. complete absence of impurities such as dirt, stone, straw, and molded grains) and adulteration with low quality grains must be avoided. Exporting only Jasmine rice of a guaranteed quality will strengthen Thailand's export position and enable it to compete with other reliable sources, such as the USA, which already have reliable and consistent grading standards. Moreover, consumers in this group could be made familiar with Jasmine rice by introducing the Thai or Asian cuisine via cooking programs on TV, recipes in magazines and newspapers, and offering samples for tasting and testing in e.g. supermarkets. Differences with other types of rice should be emphasized by focusing on the uniqueness of Jasmine rice, such as its eating quality and aroma via specific dishes in which other types of rice grain can not compete.

The *high potential* group consists of the consumers from the countries with a established preference for long grain, which are Southeast Asia, Southern China, the Middle Eastern countries, and their expatriates living elsewhere. Some consumers from this group, especially the Southeast Asians and expatriates from this region, already have a preference for Jasmine rice. Others are irregular consumers of Jasmine rice, and have high potential to permanently shift their preference and become a stable market segment for Jasmine rice. Our findings indicate that Jasmine rice should be positioned as a premium product that is sold at a higher price since its target consumers are not price sensitive. This group of consumers does not buy the cheapest rice but rather the rice that suits their preference. As a result, a high quality and product differentiation should secured.

New product development is an important means to promote rice versatility and the convenience of its use. Many companies report that the increase in rice sales is accounted for by new products and new taste sensations that the company offered, such as stir-fry, seasoning or an added sauce. Consumers from traditionally non-rice eating countries need more new products to stimulate their buying since they do not consume rice as a staple food but for its different and exciting taste.

In the long term breeding efforts can help to establish a preference for Jasmine rice among groups that at present have a low or moderate potential to become customers of Thai rice exporters. To that purpose the eating quality should be changed, targeting at different consumer groups' preferences. For example, a suitable eating quality for consumers with a preference for short grain is more sticky and with less aroma. In addition, less sticky and harder rice is required for consumers with a preference for Basmati rice and those from traditionally non-rice eating countries.

Figure 3. Proposed Strategy to Promote Jasmine Rice Export from Thailand



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7. FUTURE RESEARCH

Future research should focus on detailing different market segments to improve compliance to consumer needs. Development of value-added rice products also deserves attention to increase the value of Thai exports and sustain its export market in long term.

8. OUTPUT

1. ผลงานตีพิมพ์ในวารสารวิชาการนานาชาติ (ระบุชื่อผู้แต่ง ชื่อเรื่อง ชื่อวารสาร ปี เล่มที่ เลขที่ และหน้า) หรือผลงานตามที่คาดไว้ในสัญญาโครงการ

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2. การนำผลงานวิจัยไปใช้ประโยชน์

- เชิงพาณิชย์ (มีการนำไปผลิต/ขาย/ก่อให้เกิดรายได้ หรือมีการนำไปประยุกต์ใช้โดยภาคธุรกิจ บุคคลทั่วไป) ยังไม่มี
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- เชิงวิชาการ (มีการพัฒนาการเรียนการสอน/สร้างนักวิจัยใหม่) ยังไม่มี

3. อื่นๆ (เช่น ผลงานตีพิมพ์ในวารสารวิชาการในประเทศ การเสนอผลงานในที่ประชุมวิชาการ หนังสือ การจดสิทธิบัตร)
   ยังไม่มี

9. ภาคผนวก

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Consumer preference mapping for rice product concepts

Prisana Suwannaporn
Department of Food Science and Technology, Kasetsart University, Bangkok, Thailand

Anita Linnemann
Department of Agrotechnology and Food Sciences, Product Design and Quality Management Group, Wageningen University, Wageningen, The Netherlands, and

Ravipim Chaveesuk
Program in Agro-industry Technology Management, Kasetsart University, Bangkok, Thailand

Abstract

Purpose – Rice consumption per capita in many Asian countries is decreasing constantly, but American and European citizens are eating more rice nowadays. A preference study among consumers was carried out with the aim of determining new rice product characteristics in order to support export of Thai rice. This paper aims to report the results

Design/methodology/approach – The research was based on both secondary and primary data collection. The secondary data included exploratory surveys of rice and its products which were conducted in some of Thailand's potential rice export markets. Exploratory primary data were collected through qualitative focus group research. A quantitative questionnaire with 1,128 consumers of target nationalities was conducted to access consumer attitudes and preferences with respect to rice and rice products.

Findings – Rice products were grouped with factor analysis and could be characterized by convenience (explained variance 33.9 per cent), grain variety (21.2 per cent), and tradition/naturalness (12.8 per cent). Rotated factor score plot of the preference for rice products among different nationalities showed a similarity in the preference for the tradition/natural products. Convenient products were preferred in higher income Asian countries and the non-rice eating countries. These three product categories were correlated with consumers' ideas concerning the health-supporting character of processed food.

Originality/value – Consumers' rice preferences differed greatly among nationalities. Rice exporters have to understand these different preferences in order to offer the right products to their customers. Assuming consumer preferences to be comparable to one's own country's preference can cause new product failure. This paper confirms existing differences and presents details and backgrounds of these differences.

Keywords Rice, Product specification, Consumer behaviour, Thailand

Paper type Research paper

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Introduction

Rice consumption per capita in many Asian countries is decreasing steadily, amongst other reasons, due to changing dietary habits. Nowadays the new wealthy Chinese middle class, for example, eschews simple, traditional meals in favour of meat-laden Chinese and Western style food (Roberts, 1996). Rice consumption in Japan has declined from more than 100 kg per capita to about 70 kg in 1993 (*The Economist*, 1993) and 58 kg in 2001 (Kennedy *et al.*, 2002). Similar developments are taking place in South Korea and Taiwan, where a rise in income is accompanied by a decrease in per capita rice consumption (USDA, 2002); the demand for rice shrinks since western food became popular. The same situation can be observed in major rice eating countries such as Thailand and Indonesia (Chataigner, 1992). The contribution of rice to the energy intake of the consumers show a marked decrease and is replaced by wheat, beans, and other field crops (Inoue, 1996). As a consequence, rice farmers in major rice producing countries will face the problem of a decreasing demand in the near future.

By contrast, American and European citizens are eating more rice nowadays (Chataigner, 1992; Weiss, 1993; Suwansri *et al.*, 2002; USDA, 2005, Childs and Livezey, 2006). Moreover, rice consumption is expected to continue to increase. However, the annual consumption growth rate of 3 per cent in Europe is lower than that in the USA (5 per cent) (Chataigner, 1992). USA rice imports have risen sharply over the past 20 years and accounted for 15 per cent of total domestic disappearance compared to 4 per cent in 1985/1986 (Childs and Livezey, 2006). In the USA, rice is moving away from being merely a side dish to a proper meal component, because of the fast growing groups of Asian Americans and Hispanic Americans. Annual per capita rice consumption in the USA rises from 4.7 kg in 1980 to 12.3 kg in 2000 (USA Rice Federation, 2000); people belonging to the Asian ethnic groups consume ten times more rice than the average American consumer (Goodwin *et al.*, 1996; Childs, 1993). Within Europe, rice consumption increases most in the Northern European countries, such as the UK, Belgium, Germany and the Netherlands. The highest rice consumption per capita is in Portugal, Spain, Italy, and the Netherlands (Eurostat, 1990). The growing popularity of rice is attributed to several factors, e.g. its popularity in ethnic cuisine, healthy image due to the existence of gluten free products, appealing flavour, ease of preparation, menu versatility, the fact that it is relatively cheap, and many restaurants serve rice dishes (Weiss, 1993; Childs, 1993). In the UK, the growth of rice consumption is partly because consumers move away from the traditional meal to more exotic dishes such as Indian, Mexican, or Asian foods (Hogg and Kalafatis, 1992). In contrast, total carbohydrate foods remained stable for many years at around 45 per cent of total energy intake. Only 50 per cent of the UK respondents recognized the increased intake of complex carbohydrate such as bread, pasta and rice as general health guidelines to achieve dietary goal recommended by the UK Department of Health (Cannon, 1992; Goode *et al.*, 1995). Starchy foods are generally viewed as a "boring but filling" and do not help weight control (Stephen *et al.*, 1995). As a consequence, the overall perceptions to increase starchy food are low. Most consumers believed that starchy food intake has to reduce to achieve healthier diet. Stubenitsky and Mela (2000) studied the consumer attitudes toward starchy foods in the UK. Results showed that those who have positive attitudes toward increased starchy food diets thought that starchy food was good for health, nutritious, easy to prepare and cook, help control weight and not high in energy.

But the negative attitude consumers were less convinced in health and nutritious status, energy and weight control.

The increase in rice consumption mentioned above leads to new promising markets for Thailand. These can compensate for the decrease in demand of rice eating countries. This study investigated consumers' attitudes toward rice and rice products. It aimed to seek opportunities to substitute rice with their everyday starchy foods and increase background knowledge for future rice product development.

Research methodology

The research was based on both secondary and primary data collection. The secondary data included exploratory surveys of rice and its products which were conducted in some of Thailand's potential rice export markets, which were Taiwan, China, Japan, the USA, France, Italy and the Netherlands. Survey places were supermarkets, Asian grocery stores, and trade fairs, which were FOODEX JAPAN 2002 (Tokyo, 12-15 March 2002), IFT Annual Meeting and Food Expo 2002 (California, USA, 15-19 June 2002), Anuga 2005 (Cologne, Germany 8-12 October 2005). The market products' characteristics from the exploratory research was collected as a set of product attributes that represented various ideas such as features, utility, health/nutrition, taste etc.

Exploratory primary data were collected through qualitative focus group research. Focus group provided insights in consumer decision-making and attitude towards rice and rice products. Focus group studies were moderated following the focus group moderating training procedure of the Burke Institute (1993). Panels participated in this study were the natives of target rice export countries that we were able to access namely:

(1) Japanese housewives (ten persons age 28–40);

(2) Chinese students (ten persons age 27–32);

(3) Taiwanese students (ten persons age 27–32);

(4) two groups of French working people (six persons age 22-44 and 24-52); and

(5) one group of French elderly (eight persons age 62-68).

The participants in each focus group knew each other and were encouraged to give their opinions on selected topics, such as their everyday meal, how they prepared foods, types of rice they preferred, what they thought about Jasmine rice and about selected rice market samples etc. The purpose of this study was to collect a comprehensive view of eating and cooking behaviour and attitudes towards rice and rice products. Data from the focus group studies helped understanding rice-eating preference of each target country. And the product ideas from market survey were used to form product concepts that could represent their preferences and attitudes in rice. Both sets of information were then applied for developing a questionnaire to use in a larger follow-up study in a quantitative survey.

A quantitative questionnaire was designed to access consumer attitudes and preferences with respect to rice and rice products. Respondents were preliminary screened. Those who ever eat rice and rice products were selected using a quota sampling method with age and gender as quota control variables as shown in Table I.

Characteristics	Category	Number	%
1.1 Gender	Male	416	38.0
	Female	687	62.0
1.2 Age	< 20	23	2.0
	20-34	494	43.8
	35-49	322	28.5
	50-65	125	11.1
1.3 Nationality	Thai[a]	243	21.5
	North Chinese/Taiwanese[b]	151	13.4
	Japanese/Korean	113	10.0
	South Chinese/Southeast Asian[b]	102	9.0
	South Asian/Middle East	85	7.5
	British/Irish[c]	99	8.8
	American/Canadian	98	8.7
	Australian/New Zealander	61	5.4
	European	116	10.3
	Others	24	2.2
1.4 Married status	Single	497	44.1
	Married with at least one dependent child	280	24.8
	Married without children	125	11.1
	Married with adult children only	187	16.6
1.5 Occupation	Housewife	156	13.8
	Teacher	94	8.3
	Government officer	118	10.5
	Private sector	256	22.7
	Student	213	18.9
	Others	255	22.6

Notes: [a] Thai was excluded from Southeast Asian since there are many Thai respondents which may dominate the other Southeast Asian data. [b] Chinese was separated into southern and northern Chinese since their rice preferences are different. [c] British/Irish was separated from Europeans since it is one of our target study countries

Table I.
Characteristics of the consumers in the survey

The target age was between 20-50 years old and the proportion of women was comparatively higher since they were mostly responsible for the household food purchase. The questionnaire was translated into five languages by native speakers, which were Thai, Chinese, Japanese, English and Dutch (other nationalities were asked to use English version). After translation it was tested with people of the same nationality until the same perception was achieved. Questionnaires were distributed by means of person-to-person contact. Target persons were Thai, foreign expatriates living in Thailand, Asian expatriates living aboard, and consumers from target countries. Data were collected from target export countries (Taiwan, Japan, UK, USA) and within Thailand (Bangkok International Airport, International School in Bangkok for expatriates living in Thailand).

Questionnaires consisted of 23 questions using a five-point Likert scale. First, respondents were asked to indicate their cooking and rice eating frequency together with their attitudes towards natural/processed food. Second, attitudes and preference in all market products concepts were asked to rate according to their interest in those rice products. Purchase decision criteria for rice products were rated by their view of

importance. The questionnaire was pre-tested and modified before starting the field survey. Questionnaires were coded, data were analysed with SPSS version 10 (SPSS Inc., USA.) The analysis included comparison of means using analysis of variance and *t*-test. Since consumers usually think in more general evaluative dimension rather than specific items, factor analysis with Varimax rotation was then applied aiming for data reduction and concepts formation.

Filled-in questionnaires were obtained from 1,128 consumers. Consumers were then grouped into nine groups according to our previous study using consumers' sensory preference and habits in rice (Suwannaporn and Linnemann, 2008). These nine groups were Thai, North Chinese/Taiwanese, Japanese/Korean, Australian/New Zealander, British/Irish, American/ Canadian, South Chinese/Southeast Asian, South Asian/Middle East and European. Demographic details of the respondents were presented in Table I.

Results and discussion

Rice products concepts

The rice products obtained from the preliminary market survey were grouped by their processing characteristics into eight categories. The means of consumer preferences for these differently products were shown in Table II. Apparently, consumers' preferences decreased with degree of processing. Non-processed, natural rice grain was mostly preferred, followed by semi-processed products such as minute and fortified rice. The moderate preference consisted of rice products with added ingredients such as seasoned grain and further processed products like frozen/chilled rice dishes. According to focus group study, frozen food was perceived as good quality food, by the Europeans, since they consider that nutrients were preserved in such products. By contrast, these dishes were perceived as unhealthy food by Asians, because they were not freshly prepared. The least preferred rice products were the long lasting, and severely processed cooked (heat treatment) products such as canned cooked rice or microwavable rice dishes. In conclusion, the data in Table II showed that the preferences for the different rice products were related to the image that consumers had about the healthiness of the product, as deduced from the degree of processing and additives used. Rice was a staple food for many consumers, so perception about the

Rice products	Means[a]	SD
Rice grain	2.02	1.12
Minute rice grain	2.22	1.34
Fortified rice grain	2.40	1.27
Seasoned rice grain	3.18	1.31
Rice grain + ready to eat dish	3.18	1.40
Frozen/chilled rice dish	3.21	1.27
Microwavable rice dish	3.65	1.43
Canned/pouch cooked rice	3.85	1.32

Notes: [a] Question: "What type of rice product do you prefer?" Scale 1 = high preference 5 = low preference

Table II.
Means of consumer preferences for differently processed rice products

healthiness of the products will have a larger impact on preference than taste or exciting features, which usually was important in other food products.

Linnemann *et al.* (1999) proposed future consumer prototypes according to their buying behaviour in relation to social, demographic, and economic characteristics into seven groups (Table III). For our research we added another prototype of consumer, namely with a traditional eating habit. Rice products were then grouped according to their preferences using factor analysis. Three groups of products were clearly separated with its eigenvalue greater than one (except the third factor was 0.9) (Table IV). As each product carried with itself the concept, we then match food product preferences with consumer prototype (or product concepts) illustrated in Table III. The three concepts altogether could explain 67.8 per cent of total variance. These three concepts were convenience, varieties and traditional/natural concepts which accounted 33.9, 21.2, and 12.8 per cent of the total variance respectively.

(1) *The convenience concept (33.9 per cent).* Products belonging to this category were ready-to-eat or ready-to-heat rice products such as frozen or chilled rice dishes, microwavable dishes, canned/pouch cooked rice, and rice as a meal component of a ready-to-eat dish.

Consumer prototype to rice products	Characteristic food preferences	Characteristic preferences with respect to rice products
The environment-conscious consumer	Organic foods Unprocessed (fresh) foods Foods from short production chains	Organic rice
The nature and animal-loving consumer	Foods without genetic modification Animal-friendly produced meat	Rice without genetic modification
The socially conscious consumer	Foods from fair trade	Fair-trade rice
The health-conscious consumer	Foods with health-protecting and health-promoting properties (e.g. low calorie, with extra vitamins minerals, and non-nutrients)	Fortified rice Brown rice
The convenience consumer	Ready-to-eat meals Fast food Take-out meals Restaurant food	Ready-to-eat rice (e.g. in pouches for the microwave, in cans)
The hedonic consumer	(Exotic) specialties, delicacies Foods of high sensory quality	Exclusive rice varieties
The price-conscious consumer	Homemade meals, with ingredients of a favourable price/quality ratio (e.g. products from large-scale production)	Low-priced rice
The variety-seeking consumer	Seeks diversity in ingredients for meals New product introductions	New rice products and all sorts of combinations with rice, e.g. seasoned rice

Source: Adapted from Linnemann *et al.* (1999)

Table III.
Future consumer prototypes, some key characteristics with respect to food preferences in general and to rice products in particular

Rice products	Factor 1	2	3*	Communality
Convenience concept				
Frozen/chilled rice dish	0.865	0.099	0.052	0.761
Microwaveable rice dish	0.808	0.212	0.037	0.699
Canned/pouch cooked rice	0.799	0.146	0.000	0.660
Rice grain + ready to eat dish	0.707	0.345	−0.030	0.620
Grain variety concept				
Fortified rice grain	0.113	0.770	0.207	0.649
Minute rice grain	0.161	0.752	0.039	0.593
Seasoned rice grain	0.362	0.576	−0.153	0.486
Traditional/natural concept				
Rice grain	0.032	0.092	0.974	0.958
% variance in rotated solution	33.87	21.17	12.77	
% cumulative variance	33.87	55.04	67.81	

Notes: * The third factor eigenvalue is 0.896

Table IV. Rotated factor loadings of consumers' preferences for various rice products

(2) *The grain variety concept (21.2 per cent)*. Products grouped in this category were all variations of rice that still took time to cook but had exciting or beneficial features as compared to traditional rice. The products belonging to this category were fortified rice, minute rice, and seasoned rice.

(3) *The traditional or natural concept (12.8 per cent)*. Various types of raw rice grain represented this concept, such as Jasmine rice, brown rice, Basmati rice, Risotto rice, wild rice etc.

Product concepts preferences among different nationalities

In order to map each product concept with consumer's nationality, the rotated factor score of each observation obtained from previous factor analysis was averaged among consumers from different nationality. The averaged factor score of each concept within different nationalities was then plotted as presented in Figure 1. Result from factor score plot showed that convenience products were mostly preferred in higher income Asian countries, such as Japan/Korea, North China/Taiwan, and most non-rice eating countries, namely the UK, USA/Canada. The Japanese/Korean consumers were the most fervent convenience seekers in this group. Less interested in convenience were the respondents from Australia/New Zealand, and other rice eating countries, namely Thailand, South and Southeast Asian. The variety concept was clearly more preferred by consumers from rice eating countries, i.e. consumers from South and Southeast Asia, Thailand and Australia/New Zealand, than by those in non-rice eating countries. The traditional/natural concept was strongly preferred by consumers from the major rice eating countries, which were Thailand, South and Southeast Asia. These results could be explained by our focus group study among French consumers. They did not consider traditional rice grain inconvenient as long as the time used for cooking rice was not longer than boiling potato (which actually took even longer time). However, French consumers consider the cooking procedure of certain rice products (e.g. seasoned rice grain) inconvenient, since continuous stirring was needed. As a

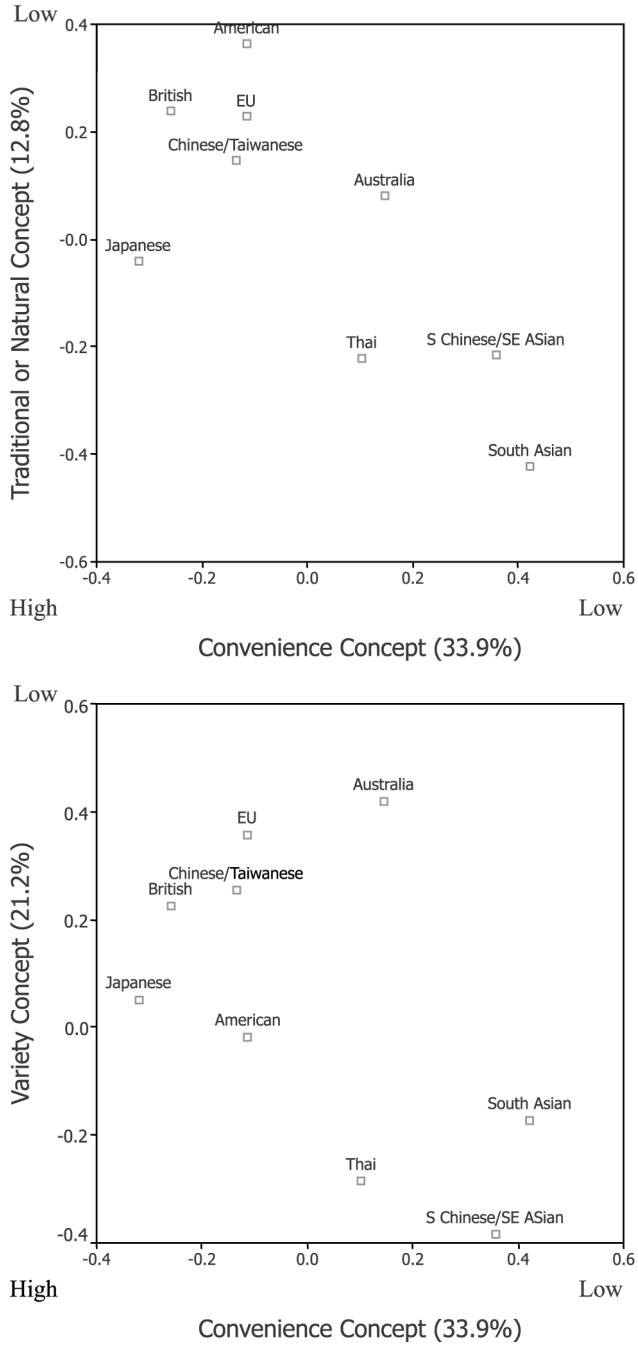

Figure 1.
Rotated factor score plot of preferences for rice products among different nationalities

consequence, the preference for such rice products was lower in non-rice eating countries than rice eating countries where people usually spend a longer time in the kitchen (Table V).

Respondents were grouped by countries into two groups followed their rice eating habit. The rice eating countries were those who eat rice as their main starchy food which were Thai, Chinese, Taiwanese, Japanese, Korean, Southeast Asian, South Asian and the Middle East. The non-rice eating countries were those who eat rice occasionally which were British, Irish, American, Canadian, Australian, New Zealander and European. Analysis of variance was used to test the different in factor score means between these two groups. Resulted showed that convenience and traditional/natural rice product concepts were highly preferred and was not different among these two groups (Table V). The variation concepts was significant differed ($\alpha = 0.01$), consumers from rice eating countries preferred more variation than non-rice eating countries.

Preferences among consumers from the rice eating countries were related to income and new product exposure. Consumers in low income Asian countries, such as Thailand, South and Southeast Asia, kept a strong preference for traditional rice grain but moved towards more varieties of rice as mentioned above. However, we should keep in mind that the traditional rice grain still obtained the highest preference score in general (Table II). New rice products should not go against their belief for healthiness in food products. The variation in rice products that these consumers appreciated was not an increase in convenience but the incorporation of new and exciting features. Other, higher income Asian counties, namely Japan/Korea and Taiwan, were comparatively more exposed to new rice products and quite ready to develop their preferences towards more processed, more convenient rice products. This result corroborated data from a market survey in a Japanese supermarket and at Food Expo 2002, which indicated various value-added rice products were more frequently found in Japan than in any other Asian countries.

Rice products preference and consumer health concern

As starchy foods were generally perceived as nutritious and good for health (Moreira *et al.*, 2005), a preference for healthy food should play a major role in preference for rice. The respondents were then divided into three groups according to their attitude towards the acceptance of processed food, which were less, moderate and most health concerned consumers. The mean preference differed for all rice products except for the unprocessed rice grain (Table VI). Rice grain was preferred most among all groups,

Rice product category	Product preference (Mean scores) Rice eating country	Non-rice eating country
Convenience	−0.018	0.051
Variation *	−0.186	0.337
Tradition/natural	−0.008	0.017

Notes: * Significant at $p = 0.01$; Scale 1 = high preference 5 = low preference

Table V. Mean difference in preference for type of rice products between rice eating and non-rice eating countries

Table VI.
Means difference of the preferences for various rice products between groups of consumers who differ in their health consciousness

Rice products	Health perception of processed food Less[1] ($n = 528$)	Moderate[2] ($n = 315$)	Most[3] ($n = 153$)
Rice grain	2.01 ns	2.10 ns	2.03 ns
Rice grain fortified with vitamins	2.35[a]	2.42[ab]	2.60[b]
Minute rice grain	2.15[a]	2.22[a]	2.63[b]
Seasoned rice grain	3.14[a]	3.19[a]	3.44[b]
Rice grain with ready to eat dish	2.99[a]	3.25[b]	3.72[c]
Canned cooked rice	3.85[ab]	3.73[a]	4.05[b]
Microwavable rice dish	3.06[a]	3.23[a]	3.75[b]
Frozen/chilled rice dish	3.58[a]	3.68[ab]	3.83[b]

Notes: Mean values within the same column followed by a different superscript letters were significantly different ($P < 0.05$); ns = Not significant. Question: I accept processed food as part of my meal (1 = strongly agree 5 = strongly disagree) [1]answers 1 and 2; [2]answer 3; [3]answers 4 and 5

irrespective of their degree of acceptance of processed food. Subjects who had few and moderate concerns about processed foods preferred more of all rice products than the most concerned consumer. The latter was more conservative and strongly preferred natural rice grain. The less to moderate concerned consumers who accepted more of the processed rice products are 20-34 years old (53 per cent) and 35-49 years old (30.3 per cent), most were students (22 per cent) and private company officers (20.8 per cent), and nearly half of them (47.3 per cent) were single.

Analysis of variance results showed that consumers from rice eating countries believe more strongly that rice was good for their health than consumers from non-rice eating countries ($\alpha = 0.05$). Dutch consumers expressed that they considered rice to be as healthy as meat but less healthy than lettuce and broccoli (Sijtsema, 2003). Moreover, the healthiness of food among the Dutch was related to a balanced diet, and food composition, such as fat or sugar content, rather than a specific food itself. Countries that have a long history of rice consumption, such as South Asia, Southeast Asia, and China, usually relate freshly prepared to healthiness.

Nowadays, the desire for health-supporting foods is one of the most important criteria used in developing new products. Consumers, especially those from non-rice eating countries, need to be informed about the beneficial aspects of rice as compared to other staple foods. A major rice company in The Netherlands tried to educate their customers by giving information about different rice varieties, its nutritional value (especially low fat, non-gluten, high energy, good source of vitamin B, easy digestibility etc.), and various rice recipes on the package.

Conclusions and recommendations

Consumers' rice preferences differed greatly among nationalities. Rice exporters have to understand these different preferences in order to offer the right products to their customers. Assuming consumer preferences to be comparable to one's own country's preference can cause new product failure. This research confirmed existing differences and presented details and backgrounds of these differences. Traditional rice grain was

still among the most accepted and preferred products for all consumers. However, preferences in terms of eating quality and cooking method may not be similar and require further investigation. Product differentiation should focus on offering more diversity such as Aromatic rice, Basmati rice, wild rice, American rice etc., more convenient cooking methods and attractive packaging designs. Higher value-added rice products such as seasoned rice grain, which represented the grain variety concept, can be introduced to the variety seeking Asian consumers. Highly processed rice dishes, which represented the convenience concept were more accepted by consumers in non-rice eating countries and the modernized Asian countries. Suitable target groups were young to middle aged singles, students and company officials. New rice product design should take consumers' eating and cooking habits and their perception of health into account.

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RICE-EATING QUALITY AMONG CONSUMERS IN DIFFERENT RICE GRAIN PREFERENCE COUNTRIES

PRISANA SUWANNAPORN[1,3] and ANITA LINNEMANN[2]

[1]*Department of Food Science and Technology*
Kasetsart University
Bangkok 10900, Thailand

[2]*Department of Agrotechnology and Food Sciences*
Product Design and Quality Management Group
Wageningen University
the Netherlands

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ABSTRACT

More rice is eaten nowadays in traditionally nonrice-eating countries. This study investigated consumer eating quality preferences among consumers in target rice export countries to identify opportunities and strategic implications. A quantitative study with 1,128 consumers of target nationalities was conducted in combination with focus group discussions. Discrimination analysis was performed to investigate differences in perception between consumers from countries which had different rice grain preference. Result showed that rice texture was the best discriminator. It could correctly predict consumers from nonspecific grain preference, short grain preference and Basmati preference at 63, 71 and 81%, respectively. Jasmine rice had its unique quality, which was highly differentiated between people who prefer and do not prefer it ($\alpha = 0.00$). Jasmine rice aroma was not a decisive quality attribute for consumers in general. However, it was a desirable quality trait for those who specifically prefer Jasmine rice. Consumers from the nonrice-eating countries preferred harder and less sticky rice that was a threat for Jasmine rice in this region. Thai exporters should offer various grain qualities that suit different taste preferences instead of focusing only on Jasmine rice.

PRACTICAL APPLICATIONS

This study found that rice aroma was not a decisive quality attribute for some consumer especially for those originating from nonrice-eating countries

[3] Corresponding author. TEL: +662-5625038; FAX: +662-5625021; EMAIL: prisana.s@ku.ac.th

and some Asians. So, Jasmine rice was not always preferred. Consumers from the rice-eating countries tended to prefer their country's traditional rice variety, which was not easy to change. However, differentiation strategy via diffusion process through Thai cuisine or Thai restaurant can make Jasmine rice an indispensable niche. Consumers from the nonrice-eating countries have started to develop a preference for long grain rice but with no specific preference among grain varieties. They obviously prefer harder and less sticky rice as the influence of the market pioneer, the American rice. Instead of focusing only on Jasmine rice, Thai rice exporters should offer various rice grain qualities that suit different taste preferences.

INTRODUCTION

Thailand is the world's largest rice-exporting country. Its export volume increased from 1 million tons in 2002 to around 7.6 million tons in 2005 (USDA 2005). Thailand competes with the U.S.A. in markets for high quality, long grain rice, primarily within the European Union (EU), the Middle East and South Africa. Thailand also competes with Vietnam, India, China and Pakistan in medium to low quality, long grain markets. Thailand exports mostly Indica rice, including parboiled rice and premium Jasmine rice. Aromatic rice, primarily Jasmine rice from Thailand and Basmati rice from India and Pakistan, accounted for 14% of global rice trade (Childs and Livezey 2006). Jasmine rice is Thailand's unique rice specialty, which sold at a higher price and with fewer competitors because of its unique flavor and texture. It is produced from Khao Dowk Mali 105 (KDML 105) and Kor Kho 15 (RD15) varieties. Jasmine rice has a niche market in certain Asian countries, especially in Thailand, some Southeast Asian countries and the Asian expatriates worldwide. Thailand would like to export more Jasmine rice on account of its relatively high price. The annual export quantities of aromatic rice were as high as 1.06–1.45 million tons and represented 20–27% of the total quantity export (Agricultural statistics of Thailand 2005; Childs and Livezey 2006). The U.S.A. was a major market of Jasmine rice with the yearly quantity of more than a million tons (USDA 2002). Aromatic rice accounted for about 90% of U.S. rice imports. However, Jasmine rice has struggled for acceptance among traditional nonusers, who were unfamiliar with its unique characteristics. Japanese consumers, for example, have complained about the strange smell and cooking method of Jasmine rice (Anon 1994a,b).

Rice consumption per capita in many Asian countries has recently decreased. In China, a new wealthy middle class replaced simple rice meals for meat-laden Chinese and western style food (Roberts 1996). South Korea's rice

consumption has declined from 1979 to 1980 through 1999 to 2000 because of a decrease in per capita consumption (USDA 2002). Rice consumption in Japan declined from more than 100 kg to about 70 kg per capita in 1993 (Anon 1993) and decreased further to 58.3 kg in 2001 (Kennedy *et al.* 2002). Similar to Japan, Taiwan has also experienced a decline in total and per capita rice consumption for decades, as a result of higher incomes (USDA 2002). Demand for rice was shrinking as western food was becoming more and more popular. The same trend has occurred in major rice-eating countries such as Thailand and Indonesia (Chataigner 1992). The contribution of rice to the energy intake has shown a marked decrease after having been replaced by wheat, beans and other field crops (Inoue 1996). As a consequence, rice producers in major rice-eating countries have faced decreasing demand.

By contrast, American and European citizens eat more rice nowadays (Chataigner 1992; Childs 1993; Weiss 1993; USDA 2001; Suwansri *et al.* 2002). The annual consumption growth rate in Europe (3%) was lower than the U.S.A. (5%) (Chataigner 1992). Rice consumption per capita increased mainly in northern European countries, such as the Netherlands (8.9 kg), France (7.4 kg), Finland (6.9 kg), Norway (6.5 kg), Belgium (5.8 kg), Germany (5.6 kg), Ireland (5.1 kg), Denmark (5.0 kg) and the U.K. (4.1 kg) (FAO 2002). In the U.K., increased rice consumption was partly because consumers move away from the traditional meal toward international cuisine such as Indian, Mexican and Asian foods (Hogg and Kalafatis 1992). European countries with the highest rice consumption per capita include Portugal, Spain, Italy and the Netherlands (Eurostat 1990). In the U.S.A., rice has moved away from being merely a side dish because of the fast-growing Asian-American and Hispanic-American population. Moreover, increased health awareness among American consumers in general, with the perception of rice as a healthy food, and a great number of restaurants serving rice dishes, has made rice more accepted by Americans (Childs 1993). These new promising markets have the potential to compensate for the loss in demand of major rice-producing countries, like Thailand.

Rice is grown in thousands of different varieties around the world. The commercial types were divided into long grain, medium grain and short grain. Long grain, Indica type, was Thailand's main rice variety. Aromatic rice varieties, such as Jasmine and Basmati rice, belong to the long grain category, but were usually mentioned separately because of their distinctiveness and commercial importance. When properly cooked, most long grain rice has dry, fluffy kernels (Scarpa 1992). Basmati rice has a distinctive odor; grains are double their length after cooking and remain separate. Basmati rice is preferred in India, Pakistan and the Middle East. Jasmine rice, which is preferred in some Asian countries, is soft, moist and clingy after cooking. The kernels of medium grain and short grain rice are moister and tend to stick together. Italian medium

grain rice is called Arborio rice, which gives the characteristic "*al dente*" texture to risotto. The waxy or sweet glutinous rice is short, plump, chalky white and opaque, which becomes sticky and shapeless after cooking (Scarpa 1992).

As Jasmine rice was one of the most important export commodities for Thailand, competition in terms of trade and technology such as the U.S. plant breeding program to develop rice varieties that was able to compete with aromatic rice put pressure for Thai to reevaluate its competition strategy. As a consequence, this study tried to investigate consumer preferences and attitudes towards rice, especially Jasmine rice, among consumers in some of Thailand's target rice-importing countries to identify opportunities and assess priorities for further research.

MATERIALS AND METHODS

Focus Group Studies

Focus group studies were conducted in target countries namely with (1) Japanese housewives (10 persons, age 28–40); (2) Chinese students (10 persons, age 27–32); (3) Taiwanese students (10 persons, age 27–32); (4) French employees in two groups (six persons, age 22–44 and 24–52); and (5) French elderly (eight persons, age 62–68). The participants in each focus group knew each other and were encouraged to give their opinions on selected topics, such as their every day meal, how they prepare food, what kinds of rice they prefer, what they think about Jasmine rice and about selected rice market samples. The purpose of this study was to collect a comprehensive view of eating and cooking behavior and attitudes about rice and rice products. Data from the focus group studies were used to develop a questionnaire for a larger follow-up study.

Quantitative Questionnaire

A quantitative questionnaire was designed to assess consumer preferences and buying criteria for rice. Questions were based on focus group studies. The questionnaire was translated into Thai, Chinese, Japanese, English and Dutch by native speakers. Translated questionnaires were tested with persons within the same nationality until the same perception was achieved. Questionnaires consisted of 23 questions using 1–5 Likert scale. Questionnaires were distributed by means of person-to-person contact. Convenience samples from both urban and metropolitan area were applied. Target persons were local Thai, foreign expatriates living in Thailand, Asian expatriates living aboard and consumers from target countries. Filled-in questionnaires were obtained from 1,128 consumers and grouped according to target

export regions and rice-eating habits into nine groups, namely Thai, North Chinese/Taiwanese, Japanese/Korean, Australian/New Zealander, British/Irish, American/Canadian, South Chinese/Southeast Asian, South Asian/Middle East and European. Data were collected from

(1) target export countries (Taiwan, Japan, U.K., U.S.A.); and
(2) Thailand (Bangkok International Airport: departure lounges, expatriates living in Thailand: Bangkok International School [students' parents], local Thai consumers: Bangkok and suburbs). 7

Demographic details of the respondents are presented in Table 1. Data were analyzed with SPSS version 10. 8

RESULTS AND DISCUSSION

Rice-eating Quality among Consumers of Different Nationalities

Discrimination analysis was applied in our study to investigate differences in perception among consumers from target export countries. Discrimination function plot could classify group centroids of those countries according to their eating preference into five groups: (1) long grain preference, consisting of Southeast Asian and South Chinese; (2) short grain preference, namely Japanese/Korean, North Chinese/Taiwanese; (3) Basmati preference, comprised by South Asian/Middle East; (4) nonspecific preference, namely American/Canadian, European, Australian/New Zealander and other nationalities; and (5) Jasmine preference, Thai was the representative for this group (Fig. 1). The group classification and its members agreed well with our previous knowledge in country's preference. The result confirmed that eating quality, especially hardness, stickiness and aroma, were the best discriminators for country's preference. Japanese/Korean, North Chinese/Taiwanese were much differred from South Asian/Middle East with regard to discrimination function 2, where stickiness was the highest load 9 (discriminant loading 0.92). Japanese/Korean, North Chinese/Taiwanese and American/Canadian, European and Australian/New Zealander were much differed from Thai by discrimination function 1, where aroma and hardness were the main effects (discriminant loading 0.71 and 0.68) (Fig. 1, Table 2).

Eating quality was then compared with long grain preference consumers to evaluate differences in eating preference between countries. Results showed clear differences in eating quality perception among consumers from different grain type preference countries. Its prediction was corrected to 63, 71 and 81% for nonspecific grain preference, short grain preference and Basmati preference consumers, respectively (Table 3). Discrimination results showed that the

TABLE 1.
DEMOGRAPHIC CHARACTERISTICS OF 1,128 RESPONDENTS FROM 55 COUNTRIES IN A QUANTITATIVE SURVEY ON PREFERENCES IN RICE

Characteristic	Category	Number	%
1.1 Gender	Male	416	38
	Female	687	62
1.2 Age (years)	<20	23	2.0
	20–34	494	43.8
	35–49	322	28.5
	50–65	125	11.1
1.3 Nationality	Thai*	243	21.5
	North Chinese/Taiwanese†	151	13.4
	Japanese/Korean	113	10.0
	South Chinese/Southeast Asian†	102	9.0
	South Asian/Middle East	85	7.5
	British/Irish‡	99	8.8
	American/Canadian	98	8.7
	Australian/New Zealander	61	5.4
	European	116	10.3
	Others	24	2.2
1.4 Marital status	Single	497	44.1
	Married with at least one dependent child	280	24.8
	Married without children	125	11.1
	Married with adult children only	187	16.6
1.5 Occupation	Housewife	156	13.8
	Teacher	94	8.3
	Government officer	118	10.5
	Private sector	256	22.7
	Student	213	18.9
	Other	255	22.6

* Thai respondents were separated from other Southeast Asians as the large number of Thai respondents could have masked differences between smaller sample sizes of respondents from other Southeast Asian countries.

† The Chinese were separated into southern and northern Chinese as their preferences in rice were different.

‡ The British were treated separately from the other Europeans as the U.K. was one of our target study countries.

best discriminator of the long grain from the short grain preference consumer was hardness (discriminant loading 0.88), and from Basmati preference consumer were hardness and stickiness (discriminant loading 0.79 and 0.78). Stickiness was the best discriminator for the nonspecific grain preference but with negative correlation (discriminant loading –0.96). Color correlated with a value smaller than 0.3, which had no practical implication according to Hair *et al.* (1995). This information would be useful for rice breeders to manipulate

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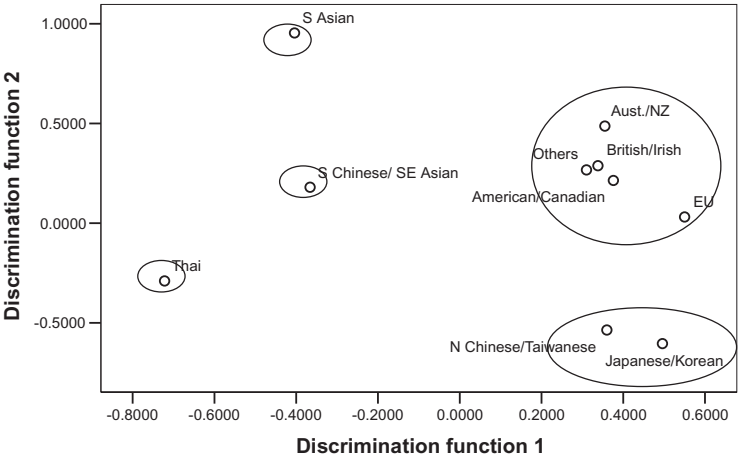

FIG. 1. DISCRIMINATION FUNCTION PLOT OF GROUP CENTROIDS AMONG RICE TARGET EXPORT COUNTRIES

S Asian, South Asian; S Chinese, South Chinese; SE Asian, Southeast Asian; Aust., Australian; NZ, New Zealander; EU, European Union; N Chinese, North Chinese.

TABLE 2.
DISCRIMINANT FUNCTION COEFFICIENTS AND CORRELATIONS OF EATING QUALITY AMONG CONSUMERS IN TARGET EXPORT COUNTRIES

Eating quality	Discriminant function 1		Discriminant function 2	
	Discriminant coefficients	Discriminant loadings	Discriminant coefficients	Discriminant loadings
Hardness	0.678	0.687	–0.301	–0.029
Stickiness	–0.279	–0.020	0.954	0.916
Aroma	0.707	0.747	0.303	0.389

Significance of the discriminant function (from Wilks' lambda) = 0.000.

rice grain quality in such a way as to suit each target group. For example, some varieties of long grain Thai rice had higher starch content, rendering it more sticky and suitable to Japanese taste preference (Janssen 1994).

Table 4 presents the differences in the means of preferences for hardness and stickiness between short grain, Basmati grain and nonspecific grain preference consumers as compared to preferences for long grain. Consumers who prefer short grain, preferred rice which was a little bit harder than those who prefer long grain. Consumers, who prefer Basmati, clearly preferred less sticky grain. Consumers with no specific grain preferences preferred grain which was

TABLE 3. 23
DISCRIMINANT FUNCTION COEFFICIENTS AND CORRELATIONS OF EATING QUALITY BETWEEN CONSUMERS IN DIFFERENT RICE GRAIN PREFERENCE COUNTRIES AS COMPARED WITH CONSUMERS IN LONG GRAIN PREFERENCE COUNTRIES

Eating quality	Long grain versus short grain preference*		Long grain versus nonspecific preference†		Long grain versus Basmati preference‡	
	Discriminant coefficients	Discriminant loadings	Discriminant coefficients	Discriminant loadings	Discriminant coefficients	Discriminant loadings
Hardness	1.012	0.884	0.568	0.431	–0.807	0.792
Stickiness	–0.424	–0.157	0.621	–0.962	0.268	0.779
Aroma	–0.243	–0.154	–0.309	0.379	0.248	–0.218
Color	0.031	0.066	–0.105	0.267	0.128	0.079

Significance of the discriminant function (from Wilks' lambda) = 0.000.
* The function correctly predicts 72% of long grain preference consumers, and 68% of short grain preference consumers, for a combined rate of 70.6%.
† The function correctly predicts 61.7% of long grain preference consumers, and 65% of nonspecific grain preference consumers, for a combined rate of 63.3%.
‡ The function correctly predicts 83.3% of long grain preference consumers, and 69.8% of Basmati preference consumers, for a combined rate of 81.2%.

TABLE 4. 24
SENSORY PREFERENCES FOR COOKED RICE AMONG CONSUMERS WITH DIFFERENT PREFERENCES FOR GRAIN TYPES

Eating quality	Means preference			
	Long grain preference (n = 347)	Short grain preference (n = 181)	Basmati preference (n = 63)	No specific grain preference (n = 320)
Hardness	4.29 a	3.54 b	4.22 a	3.70 b
Stickiness	3.18 b	3.77 a	1.86 d	2.85 c
Aroma	3.99 a	3.30 b	3.53 b	2.82 c
Color	4.01 b	4.14 b	4.55 a	4.10 b

Significance different at $\alpha = 0.05$.
Question: Which cooked rice characteristics you prefer?

Hardness	Scale: 1 = hard		5 = soft
Stickiness	Scale: 1 = not sticky		5 = very sticky
Aroma	Scale: 1 = weak		5 = strong
Color	Scale: 1 = brown	3 = yellow	5 = white

harder and less sticky. This result was consistent with results from interviews with French panels who preferred hard, fluffy and separated rice. This preference might be partly attributed to the influence of the marketing of hard, fluffy and nonsticky American rice exported to the EU as quality rice under the

pioneering "Uncle Ben" brand name. The nonstickiness of rice was reported to be one of the important quality attributes in France, the U.K. and Spain (d'Hauteville 1992). Their preferences differed greatly from the Thai and some Asian countries, which preferred soft, glossy and integrity grain that partly stick together.

Rice-eating Quality Preference among Consumers of Different Grain Preference

Respondents were grouped by grain type preference instead of by nationality to determine outstanding characteristics that consumers perceived in different types of grains. However, results showed lower prediction rate than grouping by nationality as their preferences were spread into many categories. Discrimination function can correctly predict 56, 59, 60 and 64% of short grain, long grain, Basmati grain and Jasmine rice preference, respectively (Table 5). In real life, consumer could prefer more than one type of grain, especially those in nonspecific grain preference, so we allowed them to have more than one choice. Discriminant analysis separates groups by measuring the distance between group centroids. If the overlap in the distribution was large, the discrimination function cannot separate the groups well (Hair *et al.* 1995). As a consequence, the overlapping was higher when grouping by preference than by nationality, which we were specifically defined group for them as a one-to-one basis according to their nation's eating habit. 10

Result showed that hardness was the main difference between consumers who preferred and those who did not prefer the long grain type. Stickiness was obviously the main difference for short grain rice and Basmati rice but in the opposite direction. Short grain preference consumers preferred stickier rice with decreased aroma. But Basmati preference consumers preferred less stickiness and harder rice. While Jasmine rice was quite special with all characteristics (hardness, stickiness and aroma) were different among consumers who preferred and those who did not prefer it. The result could imply that Jasmine rice has its unique quality, which was highly differentiated between people who prefer and do not prefer it ($\alpha = 0.00$). Jasmine rice quality was integrated by these three qualities, so it was not easy to substitute once it had been preferred. Jasmine rice preference consumers preferred softer (mean = 4.21), more sticky (mean = 3.40 similar to short grain) and stronger aroma (mean = 3.65) (Table 6). This agreed well with Suwansri *et al.* (2002) who stated that in the U.S.A., the Jasmine rice consumers (Asian-American) preferred and were able to differentiate the imported Jasmine rice from the American's new breeding Jasmine-identical rice. 11 12

TABLE 5.
DISCRIMINANT FUNCTION COEFFICIENTS AND CORRELATIONS OF EATING QUALITY AMONG CONSUMERS WHO PREFER AND DO NOT PREFER DIFFERENT RICE GRAIN VARIETIES

Eating quality	Long grain*		Short grain†		Basmati‡		Jasmine§	
	Discriminant coefficients	Discriminant loadings	Discriminant coefficients	Discriminant loadings	Discriminant coefficients	Discriminant loadings	Discriminant coefficients	Discriminant loadings
Hardness	0.925	0.883	–0.328	–0.208	0.311	0.479	0.635	0.784
Stickiness	–0.423	–0.174	0.944	0.794	0.896	0.953	0.522	0.675
Aroma	0.283	0.386	–0.474	–0.383	–0.018	0.169	0.302	0.496

Significance of the discriminant function (from Wilks' lambda) = 0.000.

* The function correctly predicts 60.8% of consumers who preferred long grain, and 57.1% of consumers who did not prefer long grain, for a combined rate of 59.1%.

† The function correctly predicts 62.3% of consumers who preferred short grain, and 54.6% of consumers who did not prefer short grain, for a combined rate of 56.4%.

‡ The function correctly predicts 60.8% of consumers who preferred Basmati, and 59.2% of consumers who did not prefer Basmati, for a combined rate of 59.6%.

§ The function correctly predicts 64.4% of consumer who preferred Jasmine rice, and 62.8% of consumers who did not prefer Jasmine rice, for a combined rate of 63.9%.

TABLE 6.
MEANS DIFFERENCES OF RICE-EATING QUALITY BETWEEN CONSUMERS WHO PREFER AND DO NOT PREFER DIFFERENT GRAIN TYPES

Eating quality	Means preference (prefer/not prefer)			
	Long grain preference ($n = 525$)	Short grain preference ($n = 231$)	Basmati preference ($n = 204$)	Jasmine preference ($n = 421$)
Hardness	*4.07/3.71	3.83/3.92	*3.64/3.97	*4.21/3.59
Stickiness	3.04/3.12	*3.42/2.97	*2.46/3.24	*3.40/2.73
Aroma	**3.45/3.26	**3.19/3.41	3.25/3.39	*3.65/3.16

Question: Which type of grain do you prefer? (can answer more than one)
Question: Which cooked rice characteristics you prefer?

Hardness	Scale: 1 = hard	5 = soft
Stickiness	Scale: 1 = not sticky	5 = very sticky
Aroma	Scale: 1 = weak	5 = strong

* Significant difference between consumers who prefer and did not prefer different grain types at $\alpha = 0.01$.

** Significant difference between consumers who prefer and did not prefer different grain types at $\alpha = 0.05$.

CONCLUSION AND RECOMMENDATION

Eating quality, especially hardness, stickiness and aroma, were able to discriminate consumer preference in each country. Jasmine rice research in Thailand has focused on how to increase or protect loss of aroma by means of breeding, grain coating, packaging and storage control. Research funding has been used for improving the sensory quality attributes even though they may not be perceived as important by most consumers. According to our data, rice aroma was not a decisive quality attribute for consumers in general, and in particular not for consumers from the nonrice-eating countries and countries in which short grain was preferred. However, it was found to be a desirable quality trait for those who specifically prefer Jasmine rice. The example of the Japanese complaints about the strange smell of Thai Jasmine rice supported this observation. Rice research should be diversified, according to different customer preferences towards rice. Research should focus more on the improvement of cooked rice's texture, to suit different target export countries. Moreover, rice processors or traders should offer various products that suit different preferences. Possibilities were promising as there were many long grain varieties in Thailand, which vary widely in eating quality.

For consumers in Thailand and some Asian countries, Jasmine rice's aroma was a unique characteristic and an important quality trait. Jasmine rice's uniqueness was not differentiated well enough in other countries.

Differentiation strategy via diffusion process can make Jasmine rice indispensable in certain cuisine. Jasmine rice was related with Thai cuisine, similarly to Japanese rice with sushi. As rice preference in the nonrice-eating countries such as the EU is still on a transition state, its preference could be developed by promotion via advertising campaigns, ethnic cuisine, menu versatility and cooking demonstration, etc. Such activities need cooperation between the government and the private sector to help promote Thai rice export market.

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q25	Au: Table 5: The table legend " . . . CONSUMERS WHO PREFER AND NOT PREFER IN DIFFERENT RICE GRAIN VARIETY" has been changed to " . . . WHO PREFER AND DO NOT PREFER DIFFERENT RICE GRAIN VARIETIES." Is this OK? In the table footnote, " . . . consumer prefers long grain, and 57.1% of consumer not prefer long grain . . . " has been changed to " . . . consumers who preferred long grain, and 57.1% of consumers who did not prefer long grain . . . " Is this correct? Pleas note that these changes have also been applied to other footnotes in this table.	
q26	Au: Table 6: In the table footnote, " . . . who prefer and not prefer at $\alpha = 0.01$" has been changed to " . . . who prefer and did not prefer different grain types at $\alpha = 0.01$." Is this correct? Please note that this change has also been applied to another footnote in this table.	

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Consumer Preferences and Buying Criteria in Rice: A Study to Identify Market Strategy for Thailand Jasmine Rice Export

Prisana Suwannaporn
Anita Linnemann

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Q6: Au: Please double-check title. Should this be "Stars and stripes sushi"?
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ABSTRACT. Rice consumption per capita in many Asian countries decreased, but it is consumed more in non-rice-eating countries. This study aimed to investigate consumer preferences and attitudes toward Jasmine rice among consumers in target rice export countries to identify opportunities and strategic implications. A quantitative study with 1,128 consumers of target nationalities was conducted in combination with focus group discussions. Factor analysis of consumers' buying decision criteria yielded four factors: marketing activities (explained variance 26.8%), quality (13%), price (10.5%), and country of origin (7.7%). Discrimination analysis was performed to investigate differences in buying criteria between traditional rice-eating and non-rice-eating countries ($p = 0.000$).

Prisana Suwannaporn, PhD, is an associate professor at the Department of Food Science and Technology, Kasetsart University, Bangkok 10900, Thailand.

Anita Linnemann, PhD, is an assistant professor at the Department of Agrotechnology and Food Sciences, Product Design and Quality Management Group, Wageningen University, The Netherlands. (E-mail: anita.linnemann@wur.nl).

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Address correspondence to: Prisana Suwannaporn, PhD, Department of Food Science and Technology, Kasetsart University, Bankok 10900, Thailand. (E-mail: prisana.s@ku.ac.th).

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Marketing activities, price, and country of origin were the best discriminators, whereas quality was a poor discriminator. Rice was not a substitute to other staple foods due to price change. Product quality, differentiation, and price play an important role. Building a reputation by using a clear statement on the country of origin should be a priority for Thailand. On the basis of their preference, consumers were segmented into three groups and marketing strategies were proposed.

KEYWORDS. Jasmine rice, consumer preference, buying criteria, strategy, Thailand

INTRODUCTION

Thailand's rice export volume increased from 1 million tons in 2002 to around 7.5 million tons in 2003 (USDA, 2002). Jasmine rice is Thailand's unique rice specialty, which can be sold at a higher price and with fewer competitors due to its unique flavor and texture. However, Jasmine rice is struggling for acceptance by traditional nonusers, who are not familiar with its characteristics. Japanese consumers, for example, complained about the strange smell and cooking method of Jasmine rice (*Asian Business*, 1994; *The Economist*, 1994). Rice consumption per capita in many Asian countries decreased. In China, a new wealthy middle class replaced simple rice meals for meat-laden Chinese and Western style food (Roberts, 1996). South Korea's rice consumption declined from 1979–1980 through 1999–2000 because of a decrease in per capita consumption (USDA, 2002). Rice consumption in Japan declined from more than 100 kg to about 70 kg per capita in 1993 (*The Economist,* 1993) and decreased further to 58.3 kg in 2001 (Kennedy, Burlingame, & Nguyen, 2002). As with Japan, Taiwan experienced a decline in total and per capita rice consumption for decades as a result of higher incomes (USDA, 2002). Demand for rice is shrinking since Western food is becoming more and more popular. The same occurred in major rice-eating countries such as Thailand and Indonesia (Chataigner, 1992). The contribution of rice to the energy intake showed a marked decrease; wheat, beans, and other field crops replaced rice (Inoue, 1996). Consequently, rice producers in major rice-eating countries are facing a decreasing demand.

By contrast, American and European citizens eat more rice nowadays (Childs, 1993; Suwansri, Meullenet, Hankins, & Griffin, 2002; Weiss,

1993; USDA, 2001; Chataigner, 1992). The annual consumption growth rate in Europe (3%) was lower than that of the United States (5%) (Chataigner, 1992). United States' rice imports have risen sharply over the past 20 years accounting for 15% of the total domestic disappearance, compared to 4% in 19851986 (Childs & Livezey, 2006). Rice consumption per capita increased mainly in northern European countries, such as the Netherlands (8.9 kg), France (7.4 kg), Finland (6.9 kg), Norway (6.5 kg), Belgium (5.8 kg), Germany (5.6 kg), Ireland (5.1 kg), Denmark (5.0 kg), and the United Kingdom (4.1 kg) (FAO, 2002). In the United Kingdom rice consumption increased partly because consumers moved away from the traditional meal to more international cuisine such as Indian, Mexican, or Asian foods (Hogg & Kalafatis, 1992). The highest rice consumption per capita in Europe was in Portugal, Spain, Italy, and the Netherlands (Eurostat, 1990). In the United States, rice was moving away from merely a side dish because of the fastgrowing Asian American and Hispanic American populations. Moreover, an increased health awareness among American consumers in general, with the perception of rice as a healthy food, and a great number of restaurants serving rice dishes, make rice more accepted by Americans (Childs, 1993). In contrast, total carbohydrate foods remain stable for many years at around 45% of total energy intake. Only 50% of the United Kingdom respondents recognize the increased intake of complex carbohydrates such as bread, pasta, and rice as general health guidelines to achieve the dietary goal recommended by the U. K. Department of Health (Cannon, 1992; Goode, Beadsworth, Haslam, Keil, & Sherratt, 1995). Starchy foods are generally viewed as a "boring but filling" and do not help weight control (Stephen, Sieber, Gerster, & Morgan, 1995).

The increase in rice consumption mentioned above leads to new promising markets for Thailand. These can compensate for the decrease in demand of rice-eating countries. This study aims to investigate consumer preferences, attitudes, and buying criteria toward rice, with a focus on Jasmine rice, among consumers in some of Thailand's target riceimporting countries to identify export opportunities and assess priorities for further research.

METHODOLOGY

Exploratory primary data was collected through qualitative focus group research. The focus group provided insights in consumer decision making and attitude toward rice and rice products. Focus group studies

were moderated following the focus group moderating training procedure of the Burke Institute (1993). Panel members participating in this study were the natives of some target rice export countries that we were able to access namely with (1) Japanese housewives (ten persons age 28–40), (2) Chinese students (ten persons age 27–32), (3) Taiwanese students (ten persons age 27–32), (4) two groups of French working people (six persons age 22–44 and 24–52) and (5) one group of French elderly (eight persons age 62–68). The participants in each focus group knew one another and were encouraged to give their opinions on selected topics, such as their everyday meal, how they prepared foods, types of rice they preferred, what they thought about Jasmine rice, etc. The purpose of this study was to collect a comprehensive view of eating and cooking behaviour and attitudes toward rice. Data from the focus group study helped understand rice-eating preferences of each of the target countries, which aided questionnaire development to use in a larger follow-up study in a quantitative survey.

A quantitative questionnaire was designed to access consumer attitudes and preferences with respect to rice. Respondants were screened preliminarily. Those ever eat rice and rice products were selected using a quota sampling method with age and gender as quota control variables as shown in Table 1. The target age was between 20–50 years old with more women than men represented because they were mostly responsible for household food purchases. The questionnaire was translated into five languages by native speakers: Thai, Chinese, Japanese, English, and Dutch (other nationalities were asked to use the English version). After translation, it was tested with a person of the same nationality until the same perception was achieved. Questionnaires were distributed by mean of person-to-person contact. Target persons were Thai, foreign expatriates living in Thailand, Asian expatriates living abroard, and consumers from target countries. Data were collected from target export countries (Taiwan, Japan, United Kingdom, United States) and within Thailand (Bangkok International Airport, International School in Bangkok, and Local Thai consumers).

Questionnaires consisted of 23 questions using a 1–5 Likert scale. Respondants were asked to indicate their cooking and rice- frequency. Purchase decision criteria for rice products were asked to be rated by their view of importance. Questionnaires were pretested and modified before starting the field survey. Questionnaires were then coded, data was analyzed with SPSS version 10. The analysis included comparison of means using analysis of variance. Data reduction and buying factors were created using factor analysis, enter method with varimax rotation.

TABLE 1. Demographic characteristics of 1128 respondents from 55 countries in a quantitative survey on preferences in rice and rice products

Characteristic	Category	No.	%
1.1 Gender	Male	416	38
	Female	687	62
1.2 Age (years)	<20	23	2.0
	20–34	494	43.8
	35–49	322	28.5
	50–65	125	11.1
1.3 Nationality	Thai[1)]	243	21.5
	North Chinese / Taiwanese[2)]	151	13.4
	Japanese / Korean	113	10.0
	South Chinese / Southeast Asian[2)]	102	9.0
	South Asian / Middle East	85	7.5
	British / Irish[3)]	99	8.8
	American / Canadian	98	8.7
	Australian / New Zealander	61	5.4
	European	116	10.3
	Others	24	2.2
1.4 Marital ttatus	Single	497	44.1
	Married with at least 1 dependent child	280	24.8
	Married without children	125	11.1
	Married with adult children only	187	16.6
1.5 Occupation	Housewife	156	13.8
	Teacher	94	8.3
	Government officer	118	10.5
	Private sector	256	22.7
	Student	213	18.9
	Other	255	22.6

Note: [1)]Thai were separated from other Southeast Asians since there were many Thai respondents, who could have dominated the over the other Southeast Asians.
[2)]Chinese were separated into southern and northern Chinese since their preferences in rice were different.
[3)]British were treated separately from the other Europeans, since the UK was one of our target study countries.

Discriminant analysis was performed to find buying factors that were the best discriminators between rice-eating and non-rice-eating consumers. Cross- tabulation was applied to investigate the relationship between rice from Thailand and consumers with various preferences.

Completed questionnaires were obtained from 1,128 consumers. Consumers were then placed into nine groups according to our previous study that grouped consumers using their sensory preference and habits toward rice (Suwannaporn & Linnemann, 2007). The nine groups were Thai; North Chinese/Taiwanese; Japanese/Korean; Australian/New Zealander; British/Irish; American/Canadian; South Chinese/Southeast Asian; South Asian/Middle East; and European. Demographic details of the respondents are presented in Table 1.

RESULTS AND DISCUSSION

Rice Grain Preferences

Consumers who preferred long grain rice were, in descending order, Southeast Asians/South Chinese (77.2%); Thai (72.3%); Australians/New Zealanders (65%); Americans/Canadians (54.2%); British/Irish (51.1%); Europeans (excl. British/Irish, 44.7%); North Chinese/Taiwanese (43.2%); and people from South Asia/Middle East (40.5%) (Table 2). Long grain was least preferred by Japanese/Koreans (19.6%). Long grain rice was preferred over short grain rice by all nationalities in the survey, except for the Japanese/Koreans. Short rice grain was particularly preferred by Japanese/Koreans, while Chinese/Taiwanese equally preferred short and long grain. About one-third of the Americans/Canadians also

TABLE 2. Consumer preferences for different types of rice grain by nationality

Nationality	Consumer preferences (%)					
	Long	Short	Basmati	Brown Rice	Parboil	Wild rice
Southeast Asian/South Chinese	77.2	17.2	12.3	15.8	2.6	9.6
Thai	72.3	13.6	1.7	55.0	6.3	0.8
Australians/New Zealanders	65.0	16.4	25.0	33.3	11.7	8.3
Americans/Canadians	54.2	31.6	19.8	26.0	8.3	21.9
British/Irish	51.1	10.1	43.6	18.1	4.3	10.6
Europeans (excl. British/Irish)	44.7	13.8	39.5	15.8	15.8	14.9
North Chinese/Taiwanese	43.2	42.6	6.0	30.1	5.3	3.8
South Asians/Middle East	40.5	14.1	73.8	13.1	3.6	1.2
Japanese/Koreans	19.6	64.9	3.6	17.9	10.7	2.7
% Average	60.0	24.9	25.0	25.0	7.6	8.6

preferred short grain. In the United Kingdom, long grain rice constituted the growth segment in the market. Increased consumption was dominated by parboiled white rice (with a 45% market share) and white rice (27%) (Hogg & Kalafatis, 1992).

Basmati rice was clearly preferred by most South Asians (73.8%), and quite noticeably among the British (43.6%) and other Europeans (39.5%). Brown rice was preferred mainly by Thai (55%); Australians/ New Zealanders (33.3%); Chinese/Taiwanese (30.1%); and Americans/ Canadians (26.0%). Brown rice was least preferred by people from South Asia and the Middle East. Other specialty rice grains, such as parboiled and wild rice were preferred by few consumers and did not show distinct preferences among consumers in different countries. In the United States, the consumption of specialty rice, especially brown rice and parboiled rice, increased since it is perceived as nutritious, rich in vitamins and minerals, is an aid to good health, and a good source of fibers (Childs, 1993). In the United Kingdom the growth rates in the consumption of brown and Basmati rice decreased since the introduction of new types of rice, such as wild rice and organic rice (Hogg & Kalafatis, 1992).

Jasmine Rice Preference

The respondents who preferred Jasmine rice were mostly consumers with a preference for long grain (59.6%). Jasmine rice was most preferred by Thai (79%) and for about 31–34.7% by Europeans, Americans/Canadians, Southeast Asians, South Asians/Middle Eastern people, Chinese/Taiwanese, and British/Irish. Japanese/Koreans (16.2%) expressed the lowest preference for Jasmine rice (Table 3).

Target export countries were grouped into traditional rice- countries and traditional non-rice-eating countries, i.e., all Asian countries in one group and the other countries in another group. Analysis of variance (ANOVA) results show that consumers from rice-eating countries have a higher preference for Jasmine rice than those from non-rice-eating countries ($\alpha = 0.05$). However, according to the data, Jasmine rice in general is not very popular, especially not among those consumers who already have developed a strong specific preference in rice, such as Japanese/Koreans. Japanese consumers complained that imported Thai rice smelled strange and did not cook in the same way as Japanese rice (*Asian Business,* 1994). Imported rice from Southeast Asia is struggling for Japanese acceptance, partly because it differs from the varieties grown in Japan (*The Economist,* 1994). Due to these differences in rice preference,

TABLE 3. Preference for jasmine rice over other types of rice in different countries

Country	Means	Range	SD
Thailand	1.72 a	1.5–1.9	1.14
European Countries	2.63 b	2.4–2.8	1.05
USA / Canada	2.71 bc	2.5–2.9	1.04
Southeast Asia	2.72 bc	2.5–2.9	1.20
Australia / New Zealand	2.74 bc	2.5–3.0	0.93
South Asia / Middle East	2.84 bc	2.6–3.1	1.36
Chinese / Taiwanese	2.85 bc	2.7–3.0	1.07
UK / Ireland	2.88 bc	2.7–3.1	1.12
Japan / Korea	3.75 d	3.5–4.0	1.19
Others	3.02 c	2.7–3.3	0.95
Grand means	2.65	–	1.26

Means with a different letter (in the column) are different at $\alpha = 0.05$.
Question to respondents: "I prefer Jasmine rice to other types of rice".
Scale: 1 = I strongly agree, 5 = I strongly disagree.

market penetration in Japan and Korea could be difficult and even more difficult than in countries that still have not developed such strong preferences, such as the traditional nonrice-eating countries.

North Chinese/Taiwanese preferences for short grain were not as strong as for the Japanese/Koreans. According to the focus group study, Northern Chinese and Taiwanese consumers usually eat and prefer short grain, but are willing to switch sometimes to change taste. Jasmine rice has its unique sticky texture, but is not as sticky as short grain, and still was accepted by most Chinese/Taiwanese. They perceived Jasmine rice from Thailand as expensive, quality rice. The Taiwanese said that eating Jasmine rice in a restaurant was perceived as something special. The South Chinese panel members said that to eat imported Jasmine rice was perceived as more prestigious than eating local rice.

South Asian/Middle Eastern consumers expressed a strong preference for Basmati rice. According to our data, the acceptance of Jasmine rice was still considerable among these consumers. South Asia can therefore be a potential export market for Jasmine rice, as well as those regions that cannot cultivate rice, such as the Middle East.

The United States/Canada and the European countries were found to be a high potential market for Jasmine rice. Here consumers had a high

preference for long grain rice and Jasmine rice was also reasonably well preferred (Tables 2, 3). Aromatic rice in the United States can be sold at prices that are two to three times higher than regular milled rice (Petrov, Danzart, Giampaoli, Faure, & Richard, 1996). The total import in the year 2001–2002 was 5 million tons. About 80% of the imported specialty rice was Jasmine rice, mainly from Thailand. The remainder was Basmati rice from India/Pakistan and Arborio rice from Italy (USDA, 2001). Imported Jasmine rice was mostly purchased by immigrants from Asia (Childs, 1993). In the European Union (EU), Indica rice accounted for 60% of the supply (Chataigner, 1992). This can be an opportunity and also a threat to Thailand's Jasmine rice export. Because the rice consumption is growing, U.S. researchers are trying to develop domestic aromatic varieties that can compete with imported aromatic rice (Childs, 1993). Suwansri et al. (2002) have made preference maps for Thai Jasmine rice and American aromatic rice varieties, including the "Jasmine 85" variety that contains almost twice as much aromatic compounds as the other U. S. aromatic varieties (Pinson, 1994). They found that color, flavor, aroma, stickiness, and hardness are, in descending order, the decisive quality factors for consumer preference. However, Asian-American consumers still preferred imported Jasmine rice to American domestic aromatic rice (Suwansri et al., 2002).

Buying Decision Criteria

Lees and Yuen (1991) surveyed food consumption patterns of Chinese-speaking Asians living in Australia and found that they had not significantly changed their eating habits. Hu and Duval (2003) found that rice consumption of Chinese expatriates in the United States had not changed much during the time they stayed aboard. Rice-eating habits are different for the traditional non-rice-eating consumers for whom rice was not their main staple food. They may occasionally eat rice just for a change of taste, trying a new thing, or as part of a cooking hobby. Insight in the buying decision criteria of the two different groups is necessary to be able to adjust marketing strategies properly to these different markets.

Factor analysis results of consumer buying decision criteria yielded four factors: marketing activities, quality, price, and country of origin (Table 4). Discrimination analysis was performed to investigate differences in buying criteria between the traditional rice- and traditional non-rice-eating groups. The discrimination function was significant (at $p = 0.000$), and correctly predicted consumers from rice-eating and non-rice-eating countries in about 70% of all cases. Results show that country of origin,

TABLE 4. Factor loadings of consumer buying decision criteria for rice

	Component				Communality
	1	2	3	4	
Marketing Activities					
Advertisement	.810	−.060	−.016	−.069	.665
Promotion	.689	−.023	.392	−.046	.631
Cooking demonstration	.667	.179	.194	.104	.526
Attractive packaging	.658	−.071	.263	.181	.540
Brand name	.585	.122	−.162	.201	.424
Recommendation by friend / family	.514	.425	−.274	−.040	.521
Quality and specialty features					
High quality	−.040	.734	.034	.030	.543
Past experience	−.037	.675	−.101	.255	.533
Interesting feature/taste	.327	.493	.211	−.043	.396
Price					
As cheap as possible	.098	−.033	.811	.084	.676
Good value for money	.117	.499	.548	−.236	.619
Country of origin	.168	.129	.032	.912	.878
% Variance in rotated solution	26.77	12.95	10.50	7.71	
% Cumulative Variance	23.15	37.66	49.14	57.93	

Question: "How important are the following factors in your decision to purchase rice?"
Scale: 1 = very important 5 = not important at all.
Notes: The Eigenvalue 4 = 0.926.

price, and marketing activities were the most important criteria in distinguishing the two groups. Quality was a poor discriminator (Table 5).

Quality

Eating quality was clearly the first priority for all consumers in their decision to buy rice (Table 6), although of course eating quality may have a different meaning for different groups of consumers across the countries. Quality may come from the grain itself, such as grain size, absence of impurity, homogeneity, food safety, and sanitation. This aspect of quality can be controlled by grading such as USDA grade (Greenwalt, 1995). The main reasons for an increase in rice consumption in Europe were quality improvement, a change in consumers' attitudes toward rice, advertising, culinary advice, and consumer education concerning various uses of rice (Chataigner, 1992). Consumers from both groups rated quality by their past experience (Table 6). Results from focus group studies

TABLE 5. Discriminant function coefficients and correlations for consumer buying decision criteria for rice grain

Discriminating variables	discriminant function coefficients	pooled within groups correlations
Country of origin	.694	.626
Price	.594	.525
Marketing activities	.484	.415
Quality and specialty features	.249	.214

notes: significance of the discriminant function (from Wilke's Lambda) = 0.000; the function correctly predicts 69.2% for respondents from rice eating countries, and 71.4% for non-rice eating countries, for a combined rate of 70.0%.

TABLE 6. Differences in buying decision criteria for consumers from traditional rice-eating-countries and traditional non-rice-eating countries

Buying decision criteria	Sig.	Means	
		Rice eating country	Non-rice eating country
Marketing Activities			
Advertisement	.000	3.10	3.41
Promotion	.000	2.81	3.42
Cooking demonstration	.000	2.94	3.54
Attractive packaging	.000	3.04	3.40
Brand name	.000	2.50	2.93
Recommended by family/friend	.013	2.40	2.58
Quality			
High quality	.000	1.48	1.69
Past experience	.407	1.72	1.77
Interesting feature/taste	.000	2.00	2.37
Price			
As cheap as possible	.000	2.80	3.51
Good value for money	.001	1.73	1.93
Country of origin	.000	2.36	3.27

Question: "How important are the following factors in your decision to purchase rice?"

Scale: 1 = very important 5 = not important at all.

and previous research indicated differences in criteria toward eating quality of rice grain among consumers from different countries, especially for countries with specific grain type preferences. Important characteristics are aroma, texture, and visual attributes of cooked rice (Suwansri et al., 2002). Differences in the perception of quality, especially eating quality, among consumers in different countries are difficult to measure because rice is highly variable in eating quality depending on the variety used, the cultivation practices for its production, processing operations (especially the milling process), and storage time.

Price

Results show that consumers were not looking for the lowest possible price when buying rice (Table 6). Jones (1997) studied consumer demands for carbohydrate foods in the United States using supermarket scanner data and found that only rice and frozen potatoes had a positive expenditure elasticity, which suggested that they were not inferior products but rather normal foods. Consumers had a strong preference for these products and the buying decisions were not influenced by price changes. Price insensitivity toward rice was partly due to the increase in its popularity. In the United States, data on per capita consumption showed that rice consumption increased faster than consumption of pasta and potatoes, in which consumption was tripled over the past 20 years. In addition, it required a small enough proportion of consumers' total budget so that price changes were not very noticeable (Jones, 1997). Consumer studies in France and Italy gave similar results, namely that consumers were not very sensitive to price variation. Moreover, rice was substituted by other staple foods such as potatoes, pasta, or pulses in response to a change in price (Chataigner, 1992).

A low price for rice was found to be more important for consumers from the traditional rice-eating countries (Table 6), especially Japan, Korea, North China, and Taiwan, than for consumers from traditional non-rice-eating countries. Please note that a low price here does not indicate a very low price since price for rice in these countries is set by government intervention (USDA, 2001; Nashima, 1994; *Business Korea,* 1993). The retail price for rice in Japan, for example, was roughly nine times the world market price (*The Economist,* 1994). Similarly, the price for rice in Taiwan was four to five times higher than the world market price. Misunderstandings about consumers' perception of product price may tempt the rice-exporting countries to focus on price rather than on

quality. Continental Grain (Thailand) said that "Jasmine rice has great potential; the urban populations in affluent markets such as Hong Kong and Singapore demand high-quality rice and are willing to pay for this. This is not a large volume business, but it is very profitable" (Janssen, 1994). Nowadays, major rice-exporting countries mainly compete by price. The rise of cheaper, low-grade rice producers in Indochina and China have upset Thailand's rice industry (Janssen, 1994).

Country of Origin

Country of origin was frequently mentioned as an important criterion in buying rice in rice-eating countries and was the most distinctive of all buying criteria between consumers from the two groups. Consumers from non-rice-eating countries were not very concerned about the origin of the rice. They had little knowledge about rice varieties and did not even note where the rice came from. However, there were some links in preferences and countries of origin in certain grain types such as Jasmine rice with Thailand, Japonica (known as Japanese rice or Sushi rice) with Japan, Basmati with India/Pakistan, Risotto with Italy, etc. Thailand, according to our data, has a strong reputation as a country of origin. Some 51.3% of the respondents preferred rice from Thailand (or 30.6% excluding Thai respondents). Other major rice-producing countries, especially the United States, China, and Vietnam, still have not developed such a reputation (Table 7). Nearly all Thais (96%) preferred rice from Thailand, followed by Southeast Asians (59.8%), Europeans (49%), British/Irish (43%), and Americans/Canadians (39%). The others (23%) did not know or attached no importance to the country of origin (Table 7).

Cross-tabulation was used to see the relationship between preferences for rice from Thailand in relation to countries with different grain type preferences. Results indicate that most consumers who prefer rice from Thailand come from countries with a preference for long grain, and this accounted for 86.0% of all consumers in these countries. Second in preference for rice from Thailand were the countries without a specific grain preference (42.9%). Rice from Thailand was least preferred in those countries that had already developed their own preferences, such as a preference for short grain and a preference for Basmati rice (Table 8).

Consequently, possibilities for successfully selling Jasmine rice seem most promising in countries with a preference for long grain. However, as these countries usually are rice producers themselves, product quality and price will play an important role. Moreover, there are trends toward an

TABLE 7. Consumer preferences for the countries of origin with respect to rice

Country of origin	preference of respondents		Preference of respondents (exclude consumers within the same country of origin)	
	number	%	number	%
Thailand	579	51.3	345	30.6
India	200	17.7	125	11.1
USA	114	10.1	33	2.9
Vietnam	96	8.5	85	7.5
China	84	7.4	53	4.7
Pakistan	69	6.1	64	5.7
Not specified	255	22.6	–	–

Question: "When you buy rice, which country do you prefer as its origin?" (more than one answer possible).

TABLE 8. Relationship between preference for rice from Thailand and grain type preference countries

Grain Preference	Preference for rice from Thailand		Row total (row total %)
	No	Yes	
	Count Column %		
Long Grain Preference	50	307	357
	14.0%	86.0%	34.2%
Short Grain Preference	157	73	230
	68.3%	31.7%	22.0%
Basmati Preference	54	24	78
	69.2%	30.8%	7.5%
No Specific Grain Preference	217	163	380
	57.1%	42.9%	36.4%
Pearson Chi-square significance	.000		
Likelihood ratio significant	.000		

increased preference for long grain in the traditional non-rice-eating countries. Chataigner (1992) found that consumption of long grain Indica rice was increasing in Europe, with a share of 20% of production or 60% of supply. This indicates an opportunity for Jasmine rice in this market,

especially the rice-eating expatriate target group such as Asian Americans or Asian-Europeans. The Asian Americans prefer imported Jasmine rice to domestic products (Suwansri et al., 2002). Building a reputation as a country of origin, especially in traditional non-rice-eating countries, should be a priority for Thailand. This is especially true since eating quality was the most important buying criterion for all consumers. Building a reputation as a country of origin could be linked with quality and product reliability.

Marketing Activities

Traditional rice-eating consumers attached more importance to every aspect of the buying decision process, than did non-rice-eating consumers (Table 6). However, the differences were more pronounced for the marketing criteria than for quality criteria. Non-rice-eating consumers were less concerned with brand name, country of origin, promotion, price, packaging, cooking demonstrations, and advertisements. Consumers from the United States/Canada had a stronger response to the buying criteria, especially quality, brand name, and packaging, than the Europeans and Australians (Table 9). Tomlinson (1984) found that brand loyalty for most staple products and commodities such as rice in Canada was low since there was not much differentiation among brands. A branded commodity product should give a consumer a distinct reason to buy the brand that shows how it differs from other brands. Brand name can link with quality. The brand Tilda in the United Kingdom, for instance, targeted against cheaper, unbranded packed rice by warning consumers about adulterated rice (Hogg & Kalafatis, 1992).

Marketing activities apparently had less impact on consumer buying decision making. In the United Kingdom, the Masterfoods company spent more money on consumer education, aiming to raise the awareness of the heath benefits of rice (Hogg & Kalafatis, 1992). The United States, as a major rice-exporting country, plays an important role in the promotion of rice consumption via vigorous advertising campaigns. Other rice-producing countries in Asia or Europe have no permanent organization to promote their own rice yet. Most promotion is done by distributors in target countries rather than by the rice producers themselves.

The diffusion process will play an increasing role in customer preferences and perception of rice. Rice preference is usually spread by means of migration, colonization, and ethnic cuisine. In the United States, rice consumption increased drastically because of increasing numbers of

TABLE 9. Means of factors influencing buying decision criteria in different countries

	Rice Eating Country						Non-Rice Eating Country				
	Thai	S China/ SE Asia	N China/ Taiwan	Japan/ Korea	South Asia	*Group Means*	USA/ Canada	EU	UK	Australia/ NZ	*Group Means*
High quality	1.30	1.30	1.80	1.82	1.35	*1.48*	1.71	1.72	1.72	1.63	*1.69*
Past experience	1.58	1.75	1.92	1.87	1.57	*1.72*	1.78	1.90	1.86	1.53	*1.77*
Good value for money	1.57	1.67	2.12	1.87	1.51	*1.73*	1.74	2.06	2.06	1.78	*1.93*
Interested feature/taste	1.66	2.01	2.69	2.14	1.57	*2.00*	2.08	2.52	2.26	2.80	*2.37*
Friend/family recommend	2.41	2.55	2.25	2.43	2.37	*2.40*	2.29	2.52	2.65	3.05	*2.58*
Brand name	2.77	2.64	2.26	2.24	2.49	*2.50*	2.39	3.05	3.15	3.14	*2.93*
Country of origin	2.45	2.49	2.37	2.01	2.40	*2.36*	3.15	3.18	3.43	3.15	*3.27*
Promotion	2.78	3.08	2.47	2.99	2.88	*2.81*	3.09	3.54	3.35	3.78	*3.42*
As cheap as possible	2.72	3.18	2.43	2.77	3.42	*2.80*	3.45	3.66	3.47	3.44	*3.51*
Attractive packaging	2.93	3.15	2.89	2.90	3.74	*3.04*	2.91	3.56	3.42	3.86	*3.40*
Cooking demonstration	2.90	3.11	2.71	2.98	3.25	*2.94*	3.35	3.59	3.51	3.76	*3.54*
Advertisement	3.27	3.22	2.69	3.00	3.29	*3.10*	3.08	3.46	3.43	3.78	*3.41*

Significant at p = 0.01.
Scale 1 = Very important 5 = not at all important.
Question “What important are the following factors encouraging you to make a purchase of rice grain.

Asian Americans and other rice-eating ethnic groups such as Hispanics (Childs, 1993). In the Netherlands, rice became a popular food as a result of the colonization of Indonesia and Surinam and the increased contacts that followed. Another major diffusion process was due to the introduction of Asian cuisine by restaurants including Chinese, Thai, Indian, Vietnamese, etc. Rice consumption in the United States doubled in the past ten years because of the increasing popularity of ethnic cuisine, its healthy image, neutral flavor, ease of preparation, menu versatility, and comparatively low prices (Weiss, 1993; Childs, 1993). Much of the growth in rice popularity in the US can be traced to restaurant use (Weiss, 1993; Childs, 1993; and Chataigner, 1992). Europeans and Americans wanted to try new exotic dishes with a different taste. Market strategies in these regions should therefore be developed through product differentiation (Chataigner, 1991). The introduction of rice into these countries should be done through a diffusion process. Market strategies could make use of the indirect channels such as restaurants, Asian grocery shops, supermarkets, cooking programs on TV, or recipes in magazines, etc. This should be done in parallel to product differentiation, as in the case of Masterfoods company.

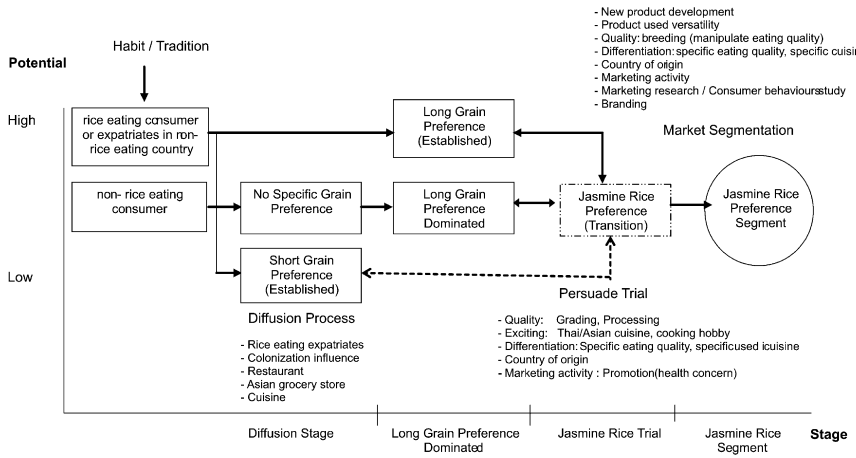
CONCLUSION AND RECOMMENDATIONS

Proposed Strategic Model to Promote Jasmine Rice Export

Jasmine rice from Thailand has the potential to be a good export product. However, thorough understanding of its market and consumer behavior is needed to target potential consumers in the best possible way. Future research should focus on detailing different market segments to improve compliance to consumer needs. Development of value-added rice products also deserves attention to increase the value of Thai exports and sustain its long-term export market.

We have divided the consumers in our study into three groups on the basis of their potential preference for Jasmine rice by combining our findings with past records on Thailand's Jasmine rice exports (Figure 1). The *low potential* group consists of consumers from rice-eating countries who already have developed a strong preference for specific types of rice other than Jasmine rice. Those consumers are mainly from countries with a strong preference for short grain such as Japan, Korea, North China, and Taiwan. This group is still in the diffusion stage; they occasionally eat

FIGURE 1. Proposed Strategy to Promote Jasmine Rice Export from Thailand.



Jasmine rice, for instance, in a specialty restaurant. The consumption of Jasmine rice in this group of consumers could be promoted by focusing on product quality, the exciting taste, differentiation, and country of origin.

The traditional non-rice-eating consumers are mainly from the European Union countries, and the United States/Canada. They have *moderate potential* consumers of Jasmine rice. Although a growing rice consumption and a preference for long grain are apparent in these countries, rice consumption is still low when compared to traditional rice-eating countries. Moreover, many rice varieties are offered on the market, which causes dispersion or dilution of preference. These consumers usually cannot differentiate among various grain types and tastes. Rice is consumed occasionally, mainly as a side dish, which does not stimulate the development for a strong preference toward a specific grain type. Quality has been reported to be the main reason of rice consumption in non-rice-eating countries. Therefore, quality should be controlled to avoid consumer disappointment. Sanitation quality must be high (i.e., complete absence of impurities such as dirt, stone, straw, and molded grains) and adulteration with low-quality grains must be avoided. Exporting only Jasmine rice of a guaranteed quality will strengthen Thailand's export position and enable it to compete with other reliable sources, such as the United States, which already have reliable and consistent grading standards. Moreover, consumers in this

group could be made familiar with Jasmine rice by introducing the Thai or Asian cuisine via cooking programs on TV, recipes in magazines and newspapers, and offering samples for tasting and testing in supermarkets. Differences with other types of rice should be emphasized by focusing on the uniqueness of Jasmine rice, such as its eating quality and aroma in specific dishes in which other types of rice grain cannot compete.

The *high potential* group consists of consumers from the countries with an established preference for long grain: Southeast Asia, Southern China, the Middle Eastern countries, and their expatriates living elsewhere. Some consumers from this group, especially the Southeast Asians and expatriates from this region, already prefer for Jasmine rice. Others are irregular consumers of Jasmine rice, and have high potential to permanently shift their preference and become a stable market segment for Jasmine rice. Our findings indicate that Jasmine rice should be positioned as a premium product that is sold at a higher price since its target consumers are not price sensitive. This group of consumers does not buy the cheapest rice but rather the rice that suits their preference. As a result, high quality and product differentiation should be ensured.

New product development is an important means to promote rice versatility and the convenience of its use. Many companies report that the increase in rice sales is accounted for by new products and new taste sensations that the company offered, such as stir-fry, seasoning, or an added sauce. Consumers from traditional non-rice-eating countries need more new products to stimulate their buying since they do not consume rice as a staple food but rather for its different and exciting taste.

In the long term, breeding efforts can help to establish a preference for Jasmine rice among groups that at present have a low or moderate potential to become customers of Thai rice exporters. For that reason, the eating quality should be changed, targeting at different consumer groups' preferences. For example, a suitable eating quality for consumers with a preference for short grain is stickier consistncy and less aroma. In addition, less sticky and harder rice is required for consumers with a preference for Basmati rice and those from traditional non-rice-eating countries.

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