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Rice consumption in the Netherlands : perception, preference and use

Authors :

SCHIFFERSTEIN Hendrik N.J

MAKIMATTILA Mikko T.

BRASSER Alice C.

VAN TILBURG Aad

Wageningen Agricultural University - Hallandjeweg,1 - 16706 Km Wageningen - NETHERLANDS

Tel : +31- 317 48 3272

Fax:+ 31- 317 48 4361

Abstract

To satisfy future consumer needs and to increase competitive advantage, the European rice industry needs to improve rice quality and to diversify their products. To provide promising directions for product development and marketing strategies, the EURICE program investigates rice consumption patterns and consumer attitudes in several European countries. This paper discusses the differences between rice varieties perceived by Dutch consumers.

Eighty consumers tasted and evaluated six cooked rice samples and 160 respondents evaluated six raw rice samples. In addition, the 160 respondents participated in a conjoint measurement study in which the importances of price level, brand, country of origin, and physical appearance were assessed.

For the uncooked rice grains, the appearance of Thaï-Bonnet Camargue natural rice is preferred to all other rice varieties, with Basmati rice as the second most preferred variety. Dutch consumers are unfamiliar with parboiled rice and find its dark colour unappealing.

After cooking, Ariete Camargue and Thaï-Bonnet Camargue natural are liked significantly less than the other varieties. These two rice varieties are most likely to be used in desserts. For the other varieties, the degree of liking is related primarily to the suitability for incorporation in a main dish. Regression analysis suggests that consumers find deviations from 'common' important for appreciating rice. Healthiness or nutritional value are also important, whereas the ease with which rice is cooked and digested is somewhat less important.

In the conjoint analysis, the physical appearance of the raw rice samples was the most important determinant of individual buying intentions. Price was the second most important attribute. Brand name is probably more important than country of origin. From the different countries of origin, the European producer (Italy) was appreciated least. A product characteristic that respondents find very important, which was not included in the conjoint questionnaire, is cooking time.

Keywords

-  Rice, consumption, taste, attribute importance, conjoint measurement
-  the Netherlands

Introduction

In the future, the European rice market will be liberalized, implying that it will be opened to competitive imports of processed rice. New international trade agreements will probably increase the pressure on prices. From 1997, the price of rice imported in the European Union will drop below the price of rice produced in the European Community. In addition, the intervention price that serves to guarantee a minimum product price for European producers will decrease (Cambon, 1996). On rich markets, such as Europe, consumers have the possibility to select their most preferred product type. Therefore, the European rice industry needs to improve rice quality and to diversify their products in order to satisfy the needs of the different consumer segments and to increase competitive advantage.

Apart from physical product properties, consumers' buying decisions may be affected by information on the way a product is produced. Consumers are becoming more health and environmentally conscious and, therefore, want to know how their food is produced. This may be an advantage for European rice producers since agricultural production in the EC is tightly regulated and controlled with respect to cultivation methods and amounts of inputs (fertilisers and chemicals). Furthermore, rice production has an ecological function in many areas where it is produced (Guillot, 1996) and consumers may prefer products that are produced locally. Also, transportation distances in Europe are smaller compared to distances from main rice production areas like Thailand, Vietnam or the USA, probably resulting in less environmental pollution.

A short history of rice consumption in the Netherlands

Rice consumption in the Netherlands can be traced back to the 17th century. Rice was consumed primarily in the form of porridge with milk. In contrast to the potato, the introduction of rice did not result in radical changes of the regular Dutch diet. Rice was used as a supplement to the traditional diet (den Hartog, 1982a). Rice porridge flavoured with sugar and, occasionally, cinnamon continues to be used as a dessert.

For a long time, the Dutch have resisted to use rice as a staple food. In 1917, a time of food shortages, the poor population refused to eat meals composed of rice, meat and pulses provided by the low-class eating-houses. At that time, the diet consisted mainly of bread and potatoes, and many people were still relatively unfamiliar with rice. Substituting rice for potatoes resulted in riots in Amsterdam (den Hartog, 1982b).

The acceptance of rice as a staple food started after World War II, with the immigration of inhabitants from Dutch overseas colonies (Knegt and den Hartog, 1982). Immigrants from Indonesia started Chinese-Indonesian restaurants, that provided oriental dishes adapted to the taste of the European customer. These dishes continue to be popular : most of the white and brown rice used for a main dish, is used to prepare 'nasi goreng' or another Chinese-Indonesian dish (van Renselaar and van Tilburg, 1992). In the sixties and seventies, immigrants from Surinam and the Antilles introduced Indian (Hindu) rice dishes. In the same period, men from Mediterranean countries (Turkey, Morocco) were recruited as working force for the Dutch factories (Knegt and den Hartog, 1982). These immigrants and the families with which they were reunited later, supplemented the oriental rice dishes with Mediterranean dishes.

All these foreign influences have made rice a well-accepted staple food in the Netherlands. As stated above, 'nasi goreng' continues to be a very popular rice dish. The second most popular use of rice is as a potato substitute, mainly in chicken or fish dishes, but also in meat and vegetable dishes. Long grain, precooked white rice is the variety that is most preferred. However, the use of boil-in-bags white rice and of precooked brown rice is found to increase at the expense of precooked white rice (van Renselaar and van Tilburg, 1992). For a more extensive overview of the characteristics of the Dutch rice market, readers are referred to van Renselaar et al. (1991) and van Renselaar and van Tilburg (1992).

The present study

The research presented here is part of the EURICE program which is conducted in France, the United Kingdom, Spain, Greece, and the Netherlands, and is funded by the EC. In this program, rice consumption patterns and consumer attitudes are determined at the European level. One of the main objective of the program is to discover bases for market segmentation and to provide guidelines to develop rice products that will satisfy future consumer needs (d'Hauteville, 1996). The current paper presents parts of the results obtained in the Dutch survey. The current presentation of results focuses on the differences that Dutch consumers perceive between different rice varieties.

Method

Respondents

The consumer sample consisted of 160 paid volunteers, 72 men and 88 women. To reach potential respondents, 1600 letters were distributed throughout the city of Wageningen. In this letter, people were asked to call a contact person for an appointment if they were interested in participating in a study investigating rice consumption. The lower age limit was set at 18 years. The distribution over the respondents' ages was as follows : 38.4 % between 18 and 24, 20.4% between 25 and 35, 16.4% between 36 and 44, 20.1% between 45 and 60, and 4.4% was 61 years or older. Compared to the national age distribution, the number of respondents below 25 years of age is high (national : approximately 9%), whereas the number of respondents above 60 is low (national : approximately 18%).

Stimuli

Six different rice samples were used, provided by Rivoire & Carret Lustucru (RCL). These samples were selected to be representative of 6 different product segments after preliminary sensory evaluation of 26 rice varieties available in Europe. Three rice samples were natural and three were parboiled. Parboiled rice has been flash heated to stabilise starch on the surface, resulting in a reduced cooking time and a loose texture in the cooked grains. Parboiling gives the rice grain a yellow colour. Basmati rice is an aromatic rice with a distinctive smell. The samples are described in Table 1.

The rice samples for the cooked evaluation were packed in boil-in-bags. Samples were cooked in tap water without adding any salt. Cooking times varied from 10 to 17 minutes. The rice bags were put into the water in a particular order, so that they were ready to be served at the same time. Cooked rice samples were served in glass bowls with stickers indicating the rice's three digit code number. Raw samples were presented in the same glass bowls, but with different code numbers. All samples (cooked and uncooked) were presented to the respondents simultaneously.

Table 1. Evaluation of raw rice.

brand	type	No.	like	fast cooking	easy drying	does not stick	has taste and flavour	keeps firm	no idea
Ariete Camargue	natural	877	6.04	63.1	24.4	22.5	18.8	23.1	16.9
Thai-Bonnet Camargue	natural	538	6.91	58.1	36.9	39.4	25.0	35.6	14.4
Thai-Bonnet fast	parboiled	442	5.86	25.6	33.8	41.9	42.5	45.0	23.1
Thai-Bonnet standard	parboiled	369	5.78	25.6	40.0	46.3	45.6	46.9	16.9
Uncle Ben's	parboiled	457	6.03	23.1	46.3	48.8	48.8	50.0	16.9
Basmati	natural	397	6.61	60.6	45.6	38.8	25.6	36.9	15.0

Note : the fourth column gives the average rating on a 10 point numerical scale. The other columns gives the percentage of subjects that indicated that they associated these characteristics with this particular rice variety. In calculating these percentages, we assumed that all subjects (n=160) filled in the question.

Questionnaire

The questionnaire consisted of three parts referred to below as the 'cooked', the 'uncooked', and the 'conjoint' part. Most of the questions of the 'cooked' and the 'uncooked' parts were obtained from the EURICE questionnaire developed in co-operation with Kingston University, United Kingdom. The EURICE questionnaire is administered to 160 respondents in several European countries after translation into the local language. In addition, the participating researchers from each country are allowed to delete questions irrelevant for the local situation, and to add specific questions of interest.

In the 'cooked' questionnaire, six samples of cooked rice are evaluated. They are rated on degree of liking, perceived or inferred characteristics, and their suitability for use in several dishes and for several occasions. In addition, their positive and negative aspects are indicated by the respondents.

In the 'uncooked' questionnaire, six uncooked rice samples are evaluated. The samples are identical to those used for the 'cooked' questionnaire. In addition, the 'uncooked' questionnaire contains questions on the personal opinion on the act of cooking, personal interest in new foods, knowledge of cooking, and satisfaction with rice buying and rice consumption. Furthermore, it contains questions on using, cooking, and buying specific rice varieties or rice in general. At the end of the 'uncooked' part, respondents filled in socio-demographic characteristics. In the Dutch version of the questionnaire, we added questions on quality consciousness (Steenkamp, 1989), time pressure when shopping, and the importance of the

rice's country of origin.

The last part of the questionnaire consisted of a conjoint measurement study. In the 'conjoint' part, we tried to assess the relative importance of several product dimensions in determining a subject's overall evaluative judgement. The attributes used were price per 400 g, brand name, physical appearance of the uncooked rice, and country of origin. The last attribute was of particular interest in the present study, because one of the objectives of the EURICE project is to stimulate consumption of rice produced in Europe.

Five levels of each attribute were defined. For price, these were Dfl. 1.99, 2.29, 2.49, 2.79, and 2.99 per 400 g. These prices were realistic prices for the given brands in local stores. Brand names used were Uncle Ben's, Lassie, Silvo, Oryza, and Store brand. These brands are available in the local stores and together hold more than half of the retail market share in the Netherlands. The five uncooked rice samples were identical to the ones used for the evaluation of the uncooked samples described above (Table 1). Because only five levels were allowed by the research design and rice sample 369 looked very similar to rice 442 (both Thai-Bonnet parboiled), sample 369 was left out. The countries of origin in the conjoint measurement study were United States, Thailand, India, Surinam, and Italy. These countries were selected because they are rice producing countries from five different continents. In Europe, Italy was selected because it is the largest European producer of rice.

Two different versions of the 'conjoint' questionnaire were used. In one version, all five levels of price and country of origin were presented, whereas only three levels of brand name and physical appearance were used. In the other version, five levels of brand name and physical appearance were combined with three levels of price and country of origin. The specific levels used can be derived from Table 2. The questionnaire versions also differed with regard to the sequence of the individual attributes in the profile descriptions of the products. Each page contained two profile cards. The pages were randomized for each respondent.

To reduce the number of profiles each respondent had to judge, we used fractional factorial designs. These designs allowed us to estimate main effects only. Interactions between attributes were assumed to be negligible. In addition, we included 4 holdout profiles to assess the internal cross-validity of the conjoint model estimated. In total, every respondent evaluated 29 profiles (25 from a fractional factorial design, and 4 holdout profiles). Judgements were made on a nine-point scale with end points 'I will not buy for sure' and 'I will buy for sure'.

Design and Procedure

Eighty of the 160 respondents filled in all three parts of the questionnaire. These respondents were scheduled to participate in a group session, based on their personal time preferences. Sessions were performed during the day time and during the evening in a dining room or class room of the Agricultural University. Group size varied from 6 to 12 consumers. Respondents always received the different parts of the questionnaire in the same order : 'cooked', 'uncooked', 'conjoint'. At the beginning of the session, they received the 12 rice samples (6 cooked and 6 uncooked) and they filled in the questionnaire at their own pace. Respondents filled in the questionnaires individually. Communicating with other respondents was not allowed.

Table 2. Attribute levels used in the conjoint analysis and their estimated utilities (group averages).

Attribute	Level	Utility (3 levels)	Utility (5 levels)
Price/400 g	Dfl 1.99	0.85	0.94
	Dfl 2.29		0.37
	Dfl 2.49	-0.12	-0.13
	Dfl 2.79		-0.46
	Dfl 2.99	-0.73	-0.72
Brand name	Lassie	0.01	0.24
	Oryza		0.02
	Uncle Ben's	0.07	-0.01
	Store brand		-0.14
	Silvo	-0.08	-0.10
Rice sample	397	0.24	0.16
	538		0.38
	457	0.01	-0.04
	442		-0.30
	877	-0.25	-0.20
Country of origin	Thailand	0.09	0.07
	India		0.10
	USA	0.01	-0.08
	Surinam		0.08
	Italy	-0.10	-0.17

The other eighty respondents only filled in the 'uncooked' and the 'conjoint' questionnaire. Most of these respondents participated in a group session as described above, with the exception that only the six raw rice samples were presented. Some respondents filled in the questionnaire at home. These respondents received the raw rice samples in small plastic bags.

It took respondents approximately 1.5 hours to complete the three parts of the questionnaire. Completion of the latter two parts took approximately 1 hour. The survey was conducted in June 1997.

Results

Raw rice

First of all, we analysed the perceptions and preferences for the uncooked rice varieties. The group results are depicted in Table 1. The response distributions for all the hedonic judgements were unimodal. The differences in liking for the six rice varieties are significant in repeated measures ANOVA [$F(5,745)=9.6$, $p<0.001$]. The appearance of the Thai-Bonnet Camargue natural raw rice is preferred to all the other rice varieties [two-tailed t-test, $p<0.05$]. The Basmati rice is the second most preferred variety, and has obtained significantly higher ratings than the four remaining varieties [$p<0.05$]. The differences between the four other varieties are not significant [$p>0.05$]. The Thai-Bonnet raw rice thus becomes less appealing to consumers after parboiling. The parboiled rices, and the Thai-Bonnet parboiled rices in particular, all have a darker colour than the natural rices.

Table 3. Experience with specific rice characteristics.

characteristic	%
brown rice	97
fast cooking	96
long grain	74
ready-to-eat	49
boil-in-bag	45
round grain	44
coloured/mixed	40
savoury (e.g. Basmati)	34
parboiled	14

Table 1 also shows the characteristics that consumers ascribe to the different rice varieties. Consumers think that the parboiled rices will need a longer cooking time, do not stick, will have a more intense taste and smell, and will stay firm. These opinions suggest that the respondents are unfamiliar with parboiled rice, and that they associate the dark colour with brown rice. Table 3 shows respondents' experience with rices with specific characteristics. Respondents indicated which type of rice they had eaten at least once. Parboiled rice is, indeed, the least known characteristic.

We determined the relationship between the liking for a rice variety and the characteristics by dummy regression analysis. In the overall regression analysis, the variables 'easy drying', 'does not stick' and 'no idea' did not have a significant t-value [two-tailed test, $p > 0.05$] and were dropped from the analysis. The remaining variables were used in a second analysis, where the t-values were all significant [$p < 0.01$]. The standardized beta-weights were 0.28 for 'has taste and flavour', 0.13 for 'fast cooking', and 0.11 for 'keeps firm'.

Table 4. Evaluation of cooked rice.

brand	type	No.	like	starter	cooked pork	grilled fish	fish & sauce	meat & sauce	grilled meat	poultry	trad. meal	exotic	dessert	ordinary	special
Ariete Camargue	natural	801	4.70	23.8	21.3	25.0	36.3	38.8	26.3	33.8	23.8	22.5	56.3	4.88	3.89
Thai-Bonnet Camargue	natural	785	5.08	26.3	17.5	23.8	47.5	36.3	25.0	31.3	21.3	25.0	68.8	5.00	3.76
Thai-Bonnet fast	parboiled	586	5.92	45.0	35.0	35.0	42.5	57.5	51.3	50.0	65.0	56.3	10.0	6.41	6.22
Thai-Bonnet standard	parboiled	305	6.39	46.3	46.3	52.5	55.0	63.8	55.0	58.8	51.3	60.0	26.3	6.51	6.13
Uncle Ben's	parboiled	035	6.06	48.8	42.5	47.5	53.8	52.5	52.5	65.0	65.0	48.8	17.5	6.86	6.32
Basmati	natural	020	6.16	52.5	42.5	56.3	61.3	61.3	56.3	57.7	60.0	55.0	23.8	6.69	6.19

Note : the fourth column gives the average rating on a 10 point numerical scale. Columns 5 to 14 give the percentage of subjects that indicated that they would use this rice in combination with the specified ingredients in a meal. In calculating these percentages, we assumed that all subjects ($n=80$) filled in the question. The last two columns give the suitability of the rice variety for use in an ordinary meal or for a special occasion on a 10 point numerical scale. The higher the number, the more suitable.

Cooked rice

The average ratings for the six cooked rice varieties are given in Table 4. The differences in liking were significant in ANOVA [$F(5, 385) = 10.1$, $p < 0.001$]. It should be noted that the distribution of the hedonic ratings for the Thai-Bonnet Camargue natural deviates from the unimodal shape. The bimodal distribution of ratings has an antimode near 5 : 44.3% of the respondents gave a rating below 5 and 44.4% gave a rating above 5, but only 6% actually gave a 5. Paired comparisons show that the Ariete Camargue and the Thai-Bonnet Camargue natural are liked significantly less than the other four varieties [two-tailed t-tests, $p < 0.05$]. None of the other differences between products was significant [$p > 0.10$].

Table 4 shows that the preferred rice varieties will be used as a starter or as a component of any of the main dishes. The two rice varieties with the lowest liking ratings are more likely to be used as a dessert. Rice is more likely to be used in an ordinary meal than in a meal for a special occasion.

The suitability of using rice in dishes was highly correlated (Pearson $r > 0.5$) for all dishes, except for the desserts. Consequently, multiple dummy regression analyses for these data will be hampered by multicollinearity. Therefore, we first did an analysis in which we included all dummies. In this analysis, three variables had significant beta weights ($p < 0.10$). We used these 3 variables plus the 'dessert' variable in a subsequent analysis. This yielded significant beta weights for the three variables 'starter' ($=0.12$), 'cooked pork' ($=0.18$), and 'chicken' ($=0.24$), but not for 'dessert' ($=0.04$). This outcome suggests that liking for a rice variety is determined primarily by its suitability for incorporation in a main dish.

The average attribute ratings are given in Table 5. We performed a principal components analysis on these data to see whether these data could be represented by a limited number of underlying dimensions. We found three factors with eigenvalues larger than 1 (Table 6). The first factor, we called 'common', the second factor 'not healthy', and the third factor 'hard to handle'. The ratings of the six products on the three dimensions are given in the three columns on the right in Table 5. To determine the relative importance of these perceptual dimensions, we performed a regression analysis in which the liking rating was used as the dependent variable and the individual factor scores as the three independent variables. This preference regression yielded the following standardized regression coefficients : -0.43 for 'common', -0.30 for 'not healthy', and -0.16 for 'hard to handle'. The regression analysis suggests that consumers find it most important that rice deviates from 'common'. Healthiness or nutritional value are also important, but the ease with which rice is cooked and digested seems less important.

Raw versus cooked rice

Half of our respondents evaluated both the cooked and the uncooked rice samples. We can determine to what extent the appearance of the raw rice predicts the quality of the cooked rice. When we compare the liking ratings in Tables 1 and 4, we see that the average ratings for the raw and the cooked samples do not agree : The parboiled rices are evaluated favourably when they are cooked. The Pearson correlation of the individual ratings for cooked and raw rice varieties was not higher than 0.19 ($p < 0.001$). The change in liking for the rice varieties when they are cooked is probably related to their change in appearance. Parboiled rice can be easily distinguished from natural rice when it is raw, due to its darker colour. This colour difference disappears during cooking.

Table 5. Perception of cooked rice.

brand	type	No.	attributes										dimensions		
			comm on	not nouris hing	exotic	artific ial	easy to cook	old-fashio ned	not sophistic ated	not healthy	difficult to digest	commo n	not healthy	hard to handle	
Ariete Camargue	natural	801	5.27	4.19	2.94	3.97	3.72	4.99	5.43	4.01	3.54	0.72	0.19	0.32	
Thai-Bonnet Camargue	natural	785	5.05	4.16	3.10	4.09	3.90	4.92	5.29	4.26	3.01	0.68	0.27	0.04	
Thai-Bonnet fast	parboiled	586	3.24	2.65	4.37	3.28	4.55	3.34	3.67	2.63	3.74	-0.56	-0.40	0.28	
Thai-Bonnet standard	parboiled	305	3.78	3.04	4.20	3.36	4.78	3.53	3.68	3.13	3.05	-0.32	-0.19	-0.18	
Uncle Ben's	parboiled	035	4.28	3.23	3.64	3.42	4.78	3.78	3.54	3.29	3.37	-0.14	-0.04	-0.08	
Basmati	natural	020	4.08	3.41	3.74	3.76	5.20	3.39	3.35	3.45	2.97	-0.38	0.17	-0.41	

Note : the average ratings are given on a 7 point category scale.

Table 6. Outcomes of principal components analysis of attribute ratings for cooked rice after varimax rotation.

attribute	factor 1	factor 2	factor 3
special - common	0.81	0.27	-0.11
modern - old fashioned	0.77	-0.07	0.16
not exotic - exotic	-0.70	-0.28	-0.05
sophisticated - not sophisticated	0.68	0.30	0.10
healthy - not healthy	0.27	0.81	0.13
natural - artificial	0.06	0.81	0.16
nourishing - not nourishing	0.33	0.77	-0.01
difficult to cook - easy to cook	-0.24	0.04	-0.80
very digestible - difficult to digest	-0.12	0.34	0.67
% variance explained	39	15	11

Conjoint analysis

The conjoint data were analysed using the Conjoint procedure in SPSS. This procedure uses ordinary least squares dummy regression estimation. The regression weights are used to obtain utility estimates. On an individual basis, we

calculated the range of utility estimates for each attribute which provides an estimate of the attribute's importance. We compared these estimates to subjective estimates of attribute importances on a 100 mm line scale with end anchors 'not important at all' and 'extremely important', respectively.

However, both these estimates may be biased by an individual's rating behaviour. The utility estimates depend on the standard deviation of an individual's response distribution on the buying intention scale. Subjects who distribute their responses over the scale will yield larger utility estimates than subjects who restrict their responses to a small part of the scale. In conjoint analysis, these individual differences are usually eliminated by calculating individual relative importance indices, implying that the utility range for a specific attribute is divided by the utility ranges for all attributes.

The direct subjective importance estimates depend primarily on the average rating respondents tend to give. Some may tend to give high importance estimates for each attribute, whereas others are more modest and tend to give low numbers. In this case, individual differences in rating behaviour cannot be eliminated by dividing an importance estimate by the sum of all attribute importance estimates, since importance has not been assessed on a ratio scale. Therefore, we have expressed each importance estimate as a standard normal deviate by subtracting the mean individual importance and dividing by the standard deviation of the four individual importance estimates. We performed this transformation both for the utility ranges (conjoint task) and the direct importance ratings. The results are shown in Table 7.

Table 7. Mean of the standardized importance estimates for the four product attributes in the conjoint task and for the direct importance ratings. During the conjoint task, each attribute was presented at 3 or 5 levels.

attribute	3 levels		5 levels		mean
	conjoint	rating	conjoint	rating	
price	0.15	0.24	0.42	0.44	0.31
brand	-0.69	-0.20	-0.21	-0.03	-0.28
country of origin	-0.67	-0.68	-0.16	-0.65	-0.54
physical appearance	0.43	0.39	0.73	0.47	0.51

The results show that the physical appearance of the raw rice samples seems to be the most important determinant of individuals' buying intentions. The importance estimate for this attribute is highest for all 4 conditions. In addition, price is consistently found to be the second most important attribute. The estimates of subjective importances for brand and country of origin do not show a consistent picture over conditions. The conjoint data suggest that these attributes are approximately equi-important, but the self-reported ratings suggest that brand is more important than country of origin. When the attribute range or the number of levels of an attribute is increased, the importance for that attribute usually increases (Wittink et al., 1982, 1989; Hair et al., 1995). We see this context effect consistently in Table 7 for each condition.

The discrepancy in importance for brand name in the two tasks might be due to the fact that most of the brands included in the conjoint analysis were A-brands, whereas stores may also sell a lot of unknown brands that are thought to offer lower quality. Table 8 shows the brands that respondents mentioned spontaneously when they were asked to indicate the brands they were familiar with or had heard of.

Table 8. Recall of rice brands

Brand	%
Lassie	76.9
Uncle Ben's	68.1
Oryza	43.8
Store brand	41.9
Silvo	21.9
Other	51.9

A third estimate of attribute importance was available from the 'uncooked' questionnaire. Consumers indicated the most important, the second most important and the third most important criterion for choosing a particular type of rice. Two consumption situations were distinguished : A usual meal at home and a special meal. We gave three points to the most important characteristic, two points to the second most important, and 1 point to the third most important. Then we calculated a total score. Table 9 shows that physical appearance and price seem to be the most important attributes, again. Physical appearance is most important for a special meal, whereas price is more important for a usual meal at home. Brand name is judged to be much more important than country of origin. Another characteristic that respondents find very important, which was not included in the conjoint questionnaire, is cooking time. Given these results, it is quite

surprising that a lot of the rice in the Netherlands is sold in cardboard packages, in which the uncooked rice is not visible to the consumer.

Table 9. Importance estimates derived from the three most important rice characteristics picked by respondents.

characteristic	usual meal	special meal	sum
physical appearance	104	176	280
price	172	95	267
cooking time	163	96	259
brand name	102	124	226
smell	38	100	138
familiar store	76	48	124
country of origin	13	22	35
pre-cooked	12	4	16

Since one of the EURICE objectives is to promote rice produced in Europe, note that the European country in the conjoint study (Italy) received the lowest average utility estimate (Table 2). Discussions with respondents revealed that the consumers were unfamiliar with the fact that rice was produced in Europe. Possibly, rice has an exotic image for Dutch consumers and European producers do not fit into that image.

Consumption situations

Table 10 indicates which type of foods are likely to be used, and which type of rice is likely to be used in a number of different situations. The left part of the table shows that the Dutch mainly use three types of staple foods : pasta, potatoes, and rice. These are mentioned most often and occur frequently at almost any occasion. In the Dutch diet, these staple foods are often supplemented with green vegetables.

Table 10. Use of specific foods and specific rice varieties for different occasions (percentages).

Situation	Food product							Rice characteristics						sum
	pasta	potatoes	dry vegetables (e.g. beans)	couscous	rice	corn	green vegetable	long grain	round grain	brown	savoury	parboiled	fast cooking	
main meal at home	82	92	74	20	83	24	85	33	18	69	17	4	64	665
special meal at home	66	59	39	33	71	35	58	36	10	41	39	4	30	521
with friends or family at home	76	70	58	25	78	34	62	38	16	44	31	4	39	575
with friends or family in restaurant	54	54	41	31	72	27	48	39	15	17	41	8	12	459
meal or lunch with many guests	68	33	44	12	80	18	31	26	11	24	16	4	51	418
when I am on my own	74	60	46	9	68	18	52	16	9	36	9	3	59	459
dinner with unexpected friends	71	41	41	7	75	13	31	19	9	24	8	4	59	402
for a picnic	27	20	10	6	33	25	8	11	4	10	6	3	19	182
when I am engaged in sports activities	57	33	26	5	49	8	31	13	5	27	4	3	29	290
when I feel a little sick	16	27	17	3	58	6	26	9	15	11	5	3	37	233
when I do not have much time to cook	76	19	27	6	66	9	19	13	4	10	3	5	78	335
a (birthday) party with children	48	33	12	2	26	8	12	13	11	10	4	1	29	209
sum	715	541	435	159	759	225	463	266	127	323	183	46	506	4748

The rice properties that are mentioned most often are : fast cooking, brown, and long-grain. These appear to be the most popular rice characteristics : The self-reported consumption data show that fast-cooking rice, whole bran rice, and long-grain rice are consumed most often by the group of respondents (Table 3). The brown rice is especially popular for main meals at home. Fast cooking rice may be used for main meals at home, but also when one does not have much time to cook, e.g. when many guests are coming for dinner or when they arrive unexpectedly, or when preparing a meal for one person only.

Discussion

Dutch consumers are unfamiliar with parboiled rices. This lack of familiarity might explain why the uncooked parboiled rices receive low ratings for liking. In judging the uncooked parboiled rice, respondents are probably misled by the colour of the product. The pattern of responses suggest they think it is a kind of brown rice. This type of reaction may be specific for Dutch consumers and will probably not appear in European countries where parboiled rices are common.

The Ariete Camargue and the Thai-Bonnet Camargue natural rices received low liking ratings. These varieties probably yield wet, sticky white rice grains. These characteristics are not appreciated for use in a main course. Similar rice varieties are used to make sweet desserts in traditional Dutch cuisine (rice porridge).

In the present study, we found that 'brown', 'fast cooking', and 'long grain' are well-known rice characteristics (Table 3). Rice varieties with these properties are used for many different dishes at many different occasions (Table 10). In van Renselaar and van Tilburg's (1992) study, long grain, precooked white rice was the variety that was most preferred. At the time their study was conducted, fast cooking brown rice was a relatively new product on the Dutch market, which was becoming increasingly popular. Unfortunately, the present data do not allow us to determine, whether brown rice is now appreciated more or consumed more than white rice in the Netherlands.

Van Renselaar et al. (1991) performed a conjoint analysis of preferences for different types of rice in the Netherlands. They incorporated five attributes in their study : variety (white/brown), type (long grain, round grain, broken), cooking time (precooked/not precooked), ease of use (sachet/loose), and flavoured (yes/no). The average relative importance estimates for the entire group were variety (32%), type (20%), cooking time (19%), ease of use (17%), and flavoured (12%). Similar to the present study, the most important attributes are those concerned with the physical appearance of the rice. The other attributes cannot be compared, since they are different from the ones used in the present study. Van Renselaar et al. (1991) used the individual utility estimates from the conjoint analysis as input for a cluster analysis. This analysis yielded three different consumer segments. The type of rice variety was most important for two segments. The largest segment (44%) preferred white rice, whereas the other segment (24%) preferred brown rice. In the third segment (32%), cooking time, type of grain, and ease of use were the most important attributes.

The finding that Italy is least appreciated as a rice producing country, suggests that the claim 'produced in Europe' will not appeal to Dutch rice consumers. At present, the consumers are unfamiliar with the fact that rice is produced in Europe. A European producer could disrupt their exotic image of rice. Therefore, a European rice promotion strategy would first have to educate the Dutch consumers, and change their attitudes towards European rice.

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