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A choice experiment to compare preferences for rice in Thailand and Japan: The impact of origin, sustainability, and taste

Keiko Aoki [a],*, Kenju Akai [b], Kiyokazu Ujiie [c]

[a] Department of Research Promotion, Yokohama National University, 79-5 Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan
[b] Graduate School of Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan
[c] Faculty of Life and Environmental Sciences, University of Tsukuba, 1-1-1 Tennodai, Tsukuba-shi, Ibaraki 305-8572, Japan

ABSTRACT

Japan and Thailand have joined the Trans-Pacific Partnership, which introduces cheaper US-produced rice into the domestic markets of these countries. This study investigates consumers' preferences for cheaper US-produced rice in Japan and Thailand. To compare the willingness to pay for rice in these two countries, we employ a choice experiment that comprises five attributes: country of origin, fair trade label, cultivation method, taste ranking, and price. The random parameter logit model estimation results show that Japanese people prefer organic rice more than Thai people do and dislike US rice much more than Thai people do. Thai people prefer fair trade more than Japanese people do. The willingness to pay for taste ranking is identical across these countries. Taste ranking has the lowest and second lowest willingness to pay in Japan and Thailand, respectively. Further, gender is the most influential socioeconomic characteristic. Japanese women prefer premium rice with various attributes and dislike US-produced rice more than Thai women do. These results suggest that US-produced rice is unacceptable for Japanese people regardless of the price level, while it could be acceptable for Thai people if the price level is adequately low. Additionally, it is reasonable for Japanese rice producers to grow organic rice to compete in the market, while Thai rice suppliers prefer to enhance their fair trade labels.

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1. Introduction

Rice is one of the principal foods consumed worldwide. The global consumption of rice in 2014 was about 484 million tons and this is continually increasing worldwide. Similarly, global production in 2014 was 478 million tons and this is also increasing (USDA, 2015). Almost 90% of rice is produced in Asia and the top three exporters are Thailand, India, and Vietnam (USDA, 2015). However, rice is also produced outside Asia, especially in the United States and northern Africa. Rice exports from these countries account for over 30% of total exports worldwide (FAOSTAT, 2015). More than 50% of all importers of rice are outside Asia. The population in Asia constitutes over 60% of the world, which implies that more than half of the global population consumes rice. Thus, the Asian rice market is huge, and thus its production has a significant impact on the world market.

This Asian rice market is now at a major turning point because of the Trans-Pacific Partnership (TPP), which targets free trade in Asia–Pacific countries. With respect to agricultural products, the TPP requires releasing a tariff on rice. Traditionally, Asian countries set high tariff rates to protect domestic rice producers from the cheaper rice produced outside the region, especially in the United States. For instance, in Japan, the tariff on rice is over 700%. Therefore, the TPP agreement has been criticized for negatively affecting many domestic rice producers. Japan and Thailand have expressed interest in participating in the TPP. However, the related discussion is ongoing in Japan and is dividing public opinion. A similar scenario is observed in Thailand, and hence the new government has refused to participate in the TPP thus far. This does not apply to only these two countries, and there is still an open discussion on whether participating in the TPP to release the tariff on rice will improve the welfare of people living in Asian countries. This social background prompts us to investigate peoples' preferences for domestic and US-produced rice in Japan and Thailand.

In previous studies of the country of origin of rice, Yong Lee, Bong Han, Nayga, and Min Yoon (2014) conduct auction experiments to compare Korean, Chinese, and US rice for Korean people and find that these consumers place the highest premium on their own product. The present study builds on their findings by additionally examining the taste and sustainability of rice. Country of

origin affects the perception of product quality for consumers (Agrawal & Kamakura, 1999; Verlegh & Steenkamp, 1999). However, the results of the country of origin effect found in previous studies are conflicting (Samiee, 1994) because of the use of different methods (single-cue vs. multi-cue models) and information (descriptive vs. tangible; Peterson & Jolibert, 1995). Sharma, Shimp, and Shin (1995) imply that the consumer's ethnocentrism, which means his or her belief in purchasing imported products, is a factor of the country of origin effect (see also Shimp & Sharma, 1987). Klain, Lusk, Tonsor, and Schroeder (2014) show that the WTP for origin information of beef steak and pork chops from the direct estimation approach exhibits the higher value than that from the indirect approach by using the field experiments and the ethnocentrism induces the higher WTP. In social psychology, ethnocentrism describes the relation between in-groups and out-groups, called social identity theory (Tajfel, 1982). Schnettler, Ruiz, Sepúlveda, and Sepúlveda (2008) find that rice does not show a country of origin effect for consumers in Chile.

As the other attributes, first, we consider the effect of taste evaluation, which is the most important aspect of any food. After the TPP is introduced, consumers in both countries will be confronted with US rice. Since coming across US rice in the market in their daily lives is currently rare, it is difficult to judge their decision based on the taste experience. In such a situation, the evaluation or reputation of the taste of rice is too important to ignore. In particular, the taste of rice in Japan is evaluated by the Japan Grain Inspection Association (2015) in terms of the chemical (e.g., amylose content) and fiscal (e.g., viscoelasticity) qualities of each rice variety. This rank is then often used to advertise rice in the market. Our central question is thus whether the consumers in each country prefer domestic rice even though US rice has the same taste evaluation level. Previous studies of the quality or taste evaluated by authorities have been investigated by Lusk, Roosen, and Fox (2003), who include marbling and tenderness of beef evaluated by U.S. Department of Agriculture (USDA), Gunderson, Lusk, and Norwood (2009), who include USDA grade of stakes, and Lockshin, Jarvis, d'Hauteville, and Perrouty (2006) who include the award of wine.

Second, to examine the sustainability of food, we consider consumer preferences for organic and fair trade labels because these provide people with the satisfaction that they are supporting the long-term balance between ecology and the economy. For example, Vermeir and Verbeke (2006) suggest that sustainable food consumption raises the aspect of sustainability as a social norm. In addition, Lusk, Nilsson, and Foster (2007) suggest that altruistic people place a high weight on food with affiliated public good dimensions such as fair trade labels. Focusing on organic and fair trade labels to study sustainability is also important because organic rice is becoming more popular in Japan and Thailand despite having a higher price than conventional rice. On the other hand, fair trade is not so popular. Thailand is one of the big three exporter of rice but the exportation from Japan is much relatively low. Measuring the willingness to pay for protecting the rice farmer brings us a policy implication how to protect the domestic rice farmers after introducing TPP.

Although the cultural and social aspects of food are too important to be ignored, there remains an open question about how many people spend money on food sustainability and whether developed or developing countries spend more. Apart from food-related aspects, one of the key answers to this question is derived from experimental economics. This field has tried to answer this question by using a dictator game, in which the first player (or the sender) decides the amount of money (provided by the experimenter) to be given to his or her counterpart (the second player or the recipient). Engel (2011) carries out a meta-analysis of the results of the dictator game by using over 100 experiments undertaken over 25 years and finds that subjects in developing countries are much less selfish than those in western countries. For social preferences, as proposed by Camerer (2003), culture thus has the most significant and robust effects.

Applying the question above to food preferences encourages us to investigate the effect of origin, sustainability, and taste in the daily eating behavior of developing and developed countries. To analyze these research questions, we employ a choice experiment (CE) with five attributes: country of origin (domestic vs. United States), cultivation method (organic vs. conventional), fair trade label (with fair trade vs. without fair trade), taste level (top 20% of good vs. normal), and price.

Before comparing the eating behavior of Japan and Thailand, we summarize the economic specification and rice consumption and production in these two countries. First, there is a large difference between the economies of these two countries. According to IMF (2015), GDP per capita (based on purchasing power parity, or PPP) is $37,390 and $14,354 in Japan and Thailand, respectively. Moreover, according to USDA (2015), the variety of rice used as the main food is *japonica* in Japan and *indica* in Thailand. Rice production is much higher in Thailand (20,500 t) than in Japan (7700 t), while rice exports from Thailand amount to 10,000 t, which is within the top three worldwide. By contrast, exports from Japan are 200 t, which is relatively low. Thus, Japan requires imported rice (700 t in 2014), whereas Thailand produces a sufficient amount to cover domestic consumption (i.e., imported rice is rare).

With respect to the combination of the attributes of interest in this study, the pioneers of CE were Onozaka and McFadden (2011), who examine apples and tomatoes in the United State and find that people prefer fair trade labels to carbon footprint and organic labels. Kimura et al. (2012) examine chocolate in Japan and find that the domestic attribute is preferable to fair trade. Jaeger and Rose (2008) analyze apples, bananas, kiwifruits, and oranges in New Zealand and find that the domestic attributes of apples, kiwifruits, and oranges are preferable to organic attributes. Pouta, Heikkilä, Forsman-Hugg, Isoniemi, and Mäkelä (2010) assess broilers in Finland and find that domestic attributes are more preferred to organic ones. Rousseau (2015) employs chocolates in Belgium and finds that the domestic and fair trade attributes are more preferred to the organic. Rousseau and Vranken (2013) employ apples in Belgium and find that the domestic is more preferable to the organic. Denver and Jensen (2014) employ apples in Denmark and find the domestic attribute to be more preferable to the organic. Comparing these studies, Rousseau (2015) is similar to Onozaka and McFadden (2011), except that the former includes flavor instead of carbon footprint used by the latter. Although our design is similar to Rousseau (2015), we employ the ranking of taste as the top 20% good taste among all varieties of rice.

Regarding the international comparison of our attributes of interest by using CEs, pioneering work was conducted by Tonsor, Schroeder, Pennings, and Mintert (2009), who compare beef in the United States, Canada, Mexico, and Japan and find that the domestic attribute has a significant positive effect. Janssen and Hamm (2012) compare apples and eggs in the Czech Republic, Denmark, Germany, Italy, Switzerland, and the United Kingdom, finding that people in the Czech Republic and Italy prefer organic apples and eggs to the non-organic varieties. These studies do not include the quality of taste or evaluation of taste. On the other hand, apart from our interest attributes, Lusk et al. (2003) focus on cattle feed and compare the values of ribeye steak in France, Germany, the United Kingdom, and the United States, finding that European consumers place a much higher value on beef from cattle that have not been fed genetically modified corn than US consumers. As variables of signal of taste quality, they use the marbling and tenderness evaluated by the USDA. However, apart

from their work, no international comparison has thus far used taste quality or evaluation in CEs. Thus, our study is the first to investigate the differences in preferences for country of origin, sustainability, and taste ranking between developed and developing countries in Asia.

The remainder of the paper is organized as follows. Section 2 presents the theoretical model. Section 3 describes the research methodology. Section 4 analyzes the results. Sections 5 and 6 discuss and summarize the conclusions, respectively.

2. Model

2.1. Random utility theory

The central idea behind CEs is random utility theory. The basic assumption underlying the random utility approach to choice modeling is that decision makers are utility maximizers, suggesting that in a given set of alternatives, decision makers select the alternative that maximizes their utility. The utility of an alternative for an individual (U) cannot be observed; however, it may be assumed to consist of a deterministic (observable) component (V) and a random error (unobservable) component (ε). Formally, individual q's utility of alternative i can be expressed as $U_{iq} = V_{iq} + \varepsilon_{iq}$. The random error component ε_{iqt} is assumed to follow a type I extreme value distribution and be independently and identically distributed. This is obtained from the conditional logit (CL) model (McFadden, 1974). However, the CL model is limited by its assumptions such that the preferences for all respondents are the properties of homogeneity and the independence of irrelevant alternatives (IIA). If the IIA property is violated, the results of the CL model will be biased.

2.2. Random parameter logit (RPL) model

This study employs the RPL model (Train, 1998; Train, 2009) previously used in the CE literature, which is a model to overcome the limitations of the CL model, because we cannot assume that the preferences in both Japan and Thailand are homogeneous. The RPL model relaxes the IIA assumption and assumes a heterogeneous preference for participants. This model thus enhances the accuracy and reliability of the estimated results. Formally, individual q's utility of alternative i in each of the t choice sets can be expressed as $U_{iqt} = V_{iqt} + \varepsilon_{iqt} = \beta_q' X_{iqt} + \varepsilon_{iqt}$. The density of β_q' is denoted by $f(\beta|\theta)$, where θ is a vector of the true parameters of the taste distribution, while X_{iqt} denotes the explanatory variables of V_{iqt} for alternative i, individual q, and choice set t.

The conditional probability of alternative i for individual q in choice set t is expressed as follows:

$$P_{iqt}(\beta_q') = \frac{exp\left(\beta_q' X_{iqt}\right)}{\sum_{j=1}^{J} exp\left(\beta_q' X_{jqt}\right)}, \quad (1)$$

In particular, the difference in the scale parameter in a choice model should be considered when different survey data (e.g., data generated in different countries) are compared (Tonsor, Schroeder, Fox, and Biere, 2005; Train, 2009). In this paper, by considering the difference in the scale parameter between Japanese and Thai consumers, the choice models of both countries are estimated individually and the marginal willingness-to-pay (WTP) values for the attributes are then compared. Marginal WTP is the ratio of the preference parameters; therefore, the scale parameters cancel out as in Carlsson and Martinsson (2008).

3. Methods

3.1. CE approach

The CE, a stated preference method (Louviere, Hensher, & Swait, 2000), can measure a consumer's preference. It is useful for overcoming certain biases compared with the contingent valuation method (another stated preference method) as well as for considering the important attributes (Van Ittersum, Pennings, Wansink, & van Trijp, 2007). Determining the importance of attributes is necessary for the valuation of attributes and provision of external information (Myers & Alpert, 1977). Attribute importance relates to the validity of a consumer's perception of a product. As Lagerkvist, Normann, and Åström (2015) imply, the model design must account for the goal attribute levels to which each attribute correspond as well as design the CE such that respondents can perceive the product based on its attribute and levels. To raise this perception, the present study employs information on the levels based on real conditions that consumers face in daily food markets.

In the CE, respondents make a decision by choice sets, which comprise four alternatives and five attributes as shown in Table 1. The present study employs non-labeled alternatives, termed Rice 1, 2, and 3, because of its focus on rice preferences based on each attribute (e.g., country of origin, taste, conventional method, fair trade label). Therefore, a generic design is preferred in this context. In addition, this study employs the opt-out alternative "neither," which means the no-purchase option. We ask respondents to choose this option if they do not want to buy any of the rice suggested in the choice set. Hence, our opt-out indicates the no-purchase option as in Onozaka and McFadden (2011). The need for an opt-out alternative is still an open discussion. Louviere et al. (2000) and Hensher (2010) note that an opt-out option does not force respondents to make a choice under certain conditions, which increases the realism of the choice task. On the contrary, Carlsson, Frykblom, and Lagerkvist (2007) imply that a design with an opt-out alternative, as the no purchase option, results in greater unobserved heterogeneity compared with that without it, although this does not affect marginal WTP.

As seen in Table 2, the levels of four attributes, except price, are identical in both Thailand and Japan—country of origin (domestic vs. US), fair trade label (with fair trade vs. without fair trade), cultivation method (organic vs. conventional), taste (top 20% good vs. normal).

The level of taste ranking refers to the result of the rice taste test conducted by the Japan Grain Inspection Association (1988). In total, 26% of rice was ranked as "Special A," that is the highest rank, every year from 2010 to 2014. Therefore, we use the level of top 20% good as the credible high rank for the taste evaluation for the consumers.

Note that the price levels are based on retail prices in Thailand (DIT, 2014) and Japan (Statistics Bureau, 2013), which are the real prices consumers face in daily life. Then, each level is based on the standard deviation of the average price, which is calculated by using retail prices. However, the cheapest price level is lower than the present retail price to investigate the impact of importing cheaper rice from the United States after the TPP releases the tariff. The amount of rice, 5 kg, is referred the most amount of purchasing it in Japan (Komenet, 2015) because consumers in both countries often purchase rice packaged under some amount. In Thailand, the amount of rice, 5 kg, is one of them (DIT, 2014).

The number of choice sets was decided as follows. The attributes and levels are four factors at two levels and one factor at four levels. According to a mixed-level orthogonal array, the study employs arrays with eight sets as MA8.2.4.4.1 (Sloane, 2015). Based on these arrays, the profile and choice set design follows

Table 1
An example of the choice set.

Alternative	Rice 1	Rice 2	Rice 3	Neither
Country of origin	USA	USA	USA	
Cultivation method	Conventional	Conventional	Organic	
Taste	Top 20%	Normal	Top 20%	
Fair trade	Non-Fair trade	Fair trade	Fair trade	
Price	100 baht	200baht	300 baht	
Which do you want to buy?		☑		

Table 2
Attributes and the levels.

Attributes	Levels	Thailand	Japan
Country of origin	2		Domestic, USA
Cultivation method	2		Conventional, organic
Taste	2		Normal, top 20%
Fair trade label	2		With Fair trade, without Fair trade
Price per 5 kg	4	140Baht, 170Baht, 200Baht, 230Baht	1300JPY, 1600JPY, 1900 JPY, 2200JPY

Table 3
Socioeconomic characteristics in Thailand and Japan.

	Definitions	Thailand (%)	Japan (%)
Female		62.4	49.9
Age	Less than 30 years old	46.2	19.7
	31–40 years old	31.1	18.7
	41–50 years old	13.7	19.3
	51–60 years old	6.8	14.2
	More than 61 years old	2.1	27.9
Education with University degree and above:		76.8	52
Income (Thai land)	Less than 360 thousand Baht	21.9	
	360–600 thousand Baht	24.2	
	600–840 thousand Baht	15.1	
	840–1200 thousand Baht	16.8	
	1200–1800 thousand Baht	11.5	
	More than 1800 thousand Baht	10.1	
Income (Japan)	Less than 3 million JPY		12.4
	3–5 million JPY		22.24
	5–7 million JPY		17.8
	7–10 million JPY		14.7
	More than 10 million JPY		9.5
	No answer		23
Frequent of eating rice: almost every day		93.3	71.8
Number of respondents		1073	1259

Table 4
Average ECCB scale in Thailand and Japan.

	Syntax	Thailand	Japan
E1	I have purchased a household appliance because it uses less electricity than other brands	3.26 (1.07)	3.11 (0.97)
E2	I have purchased light bulbs that are more expensive but that save energy	2.89 (1.11)	2.94 (1.15)
E3	I will not buy products that have excessive packaging	3.27 (1.11)	3 (1.08)
E4	If I understand the potential damage to the environment that some products can cause, I do not purchase these products	3.55 (1.2)	3.22 (1.09)
E5	I have switched products for ecological reasons	3.37 (1.1)	2.84 (1.03)
E6	I have convinced members of my family or friends not to buy some products that are harmful to the environment	3.27 (1.07)	2.2 (1.19)
E7	Whenever possible, I buy products packaged in reusable containers	3.06 (1.23)	2.82 (1.08)
E8	When I have a choice between two equal products, I always purchase the one that is less harmful to other people and the environment	3.2 (1.1)	3.03 (1.09)
E9	I will not buy a product if the company that sells it is ecologically irresponsible	3.04 (1.11)	3.09 (1.16)
E10	I do not buy household products that harm the environment	3.34 (1.13)	3.08 (1.17)
	Total score	32.28 (8.42)	29.38 (8.12)
	Cronbach's alpha	0.91	0.9

Notes: Standard deviations are in parentheses. Scoring scale: always agree = 5, mostly agree = 4, sometimes agree = 3, rarely agree = 2, and never agree = 1.

the mix-and-match method (Johnson, Kanninen, Bingham, & Özdemir, 2007) by using R (Aizaki, 2012) as in Ares, Mawad, Giménez, and Maiche (2014).[1] At the begging of the survey, the study employ cheap talk to be averse the hypothetical bias (Carlsson, Frykblom, & Lagerkvist, 2005; Lagerkvist, Carlsson, & Viske, 2006; Van Loo, Caputo, Nayga, & Verbeke, 2014). Thus, respondents read the cheap talk script and then choose one of the three types of rice and an opt-out alternative successively in eight choice sets with rice of different attributes. Thereafter, they answer questions on demographics and their environmental consciousness and attitudes, as discussed next.

3.2. Demographics and environmental consciousness and attitudes

After the eight choice sets are completed, the respondents answer the survey questions. The questions include those on socioeconomic characteristics such as gender, age, income, and the frequency of eating rice, as summarized in Table 3. Additionally, they

select answers on the environmental consciousness and attitudes (ECCB) scale. The ECCB scale is useful to understand respondents' environmental and psychological aspects. As shown in Table 4, the selected ECCB scale comprises 10 questions used in Johnston, Wessells, Donath, and Asche (2001) and Aoki and Akai (2013). These are part of the original ECCB scale developed by Roberts (1996), which comprised 30 items measuring socially responsible consumer behavior according to two dimensions: societal and ecological concerns. Respondents answer the questions on a five-point Likert-type scale ranging from 1 ("never agree") to 5 ("always agree").

4. Results

4.1. Samples

The surveys for Thailand and Japan were conducted online during December 2014 and March 2015, respectively. Respondents

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[1] The D-efficiency of the choice design matrix in this paper was 100% because the matrix was completely orthogonal and balanced (Kuhfeld, 2010).

were recruited by using social networks (Twitter, Facebook, etc.) and a survey company. The number of respondents was 1073 and 1259 in Thailand and Japan, respectively. Japanese respondents lived in Tokyo and the surrounding area and Thai respondents lived in Bangkok and the surrounding area. They received 100 Baht and 300 JPY in Thailand and Japan, respectively, as a reward for completing the survey. The samples in each country were representative of the corresponding population with respect to age and gender.

Table 3 shows the socioeconomic characteristics of Thailand and Japan. The female population is higher in Thailand than in Japan. Japanese respondents are older than the Thai people are. The education level in Thailand is higher than that in Japan. The average income in Thailand is roughly half of that of the Japanese, based on the Japanese yen. According to national statistics (Ministry of Health, Labor and Welfare in Japan, 2015; National Statistics of Thailand, 2015), average income per household is 550 million JPY and 300 thousand Baht in Japan and Thailand, respectively. Therefore, respondents in Thailand belong to the upper income level, while the Japanese are closer to the average income level. The frequency of rice consumption is almost the same for both countries.

Table 4 shows the average ECCB scales and total scores in both countries. Here, we show the credibility and validity of the psychological scale by using Cronbach's alpha, which was not calculated in the original studies by Johnston et al. (2001) and Aoki and Akai (2013). The Cronbach's alpha in both countries is more than 0.9; therefore, the ECCB scale has a high validity for revealing peoples' environmental attention in the study. The average scores in Thailand are higher than those in Japan, which implies that Thai people pay more attention to environmental aspects than Japanese do.

4.2. RPL model estimation for the main effect

Table 5 shows the RPL model estimation results for both countries by using LIMDEP 9.0 and NLOGIT 4.0. The result in the LR test rejects the null hypothesis of parameter equality between countries at the 1% level (LR = $-2(-17558.86 - (-8472.88 - 8065.18))$ = 2041.58, $p < 0.001$) so that we divide samples into two groups: Thailand and Japan.

First, the study considers the results for the main effect, which comprises the attributes. We assume the variable *PRICE* as the fixed parameter in the model because a price coefficient is known to be negative for every consumer (e.g., Lusk et al., 2003). However, since the other variables are not well known because of the presence of only a few related studies, they are assumed to be random parameters and specified as normally distributed (Carlsson, Frykblom, & Liljenstolpe, 2003; Revelt & Train, 1998; Train, 1998). The estimation results in the RPL model based on random utility theory are interpreted as follows: a positive sign means that respondents prefer the attribute, whereas a negative sign means that they do not. The results below follow this interpretation.

The variable *ASC* is the benchmark variable compared with opt-out, which indicates rice whose attributes are domestic, organic, normal taste, and without fair trade. *USA, ORGANIC, HIGH QUALITY,* and *FAIR TRADE* are dummy variables whose values are one if the attributes are the United States, organic, top 20% of good, and with fair trade. The estimates of *USA* and *PRICE* indicate significantly negative signs at the 1% levels in both countries. These results imply that all respondents in both countries prefer domestic and cheaper rice. Since the coefficient of *USA* is much higher than that of *PRICE*, people in both countries dislike US-produced rice.

The estimates of the other variables, *ASC, ORGANIC, HIGH QUALITY,* and *FAIR TRADE*, have significantly positive signs at the 1% levels in both countries. The significance of a positive *ASC* is that consumers in both countries prefer rice whose attributes are

domestic, organic, normal taste, and without fair trade. The other variables imply that all respondents in both countries prefer organic to conventional methods, with fair trade to without fair trade, and top 20% of good to normal taste. Specifically, *ORGANIC* and *FAIR TRADE* have the highest efficiencies in Japan and Thailand, respectively. This result implies that the most important attributes are organic and fair trade for Japanese and Thai people, respectively. The standard deviation for all variables, except *PRICE*, shows significance at the 1% levels in both countries, which implies that the preference for the attributes differ among the respondents in each country.

4.3. RPL model estimation for the main effect with interactions

This subsection considers the interaction effect of attributes with the ECCB scale and socioeconomic characteristics. *HIGH ECCB* is a dummy variable that has a value of one if the total score of the ECCB scale is above average. In the socioeconomic characteristics, there are four dummy variables: *FEMALE, OLD, HIGH INCOME,* and *UNIVERSITY. OLD* and *HIGH INCOME* have a value of one if they are above average. *UNIVERSITY* has a value of one if the respondent is a university graduate.

By comparing the log likelihood between the Japanese model including only the main effect and that including the interaction effects, we find substantial differences. In the Japanese case, since about 20% of respondents did not answer the question about annual household income, we omitted those respondents from the estimation of the model with interactions. This fact could explain why the maximum log likelihood of the interaction model for Japanese consumers is greater than that in the main effect model for Japanese consumers. For both models, McFadden's R^2 is similar, as shown in Table 5. The improvement in McFadden's R^2 from the main effect model to the interaction model in Japan is similar to that in the Thai case. Therefore, adding the interaction term into this model does not lose robustness. The results of the attributes are the same as those in the main effect model. Adding the interaction variables has several significant impacts in both Thailand and Japan.

First, we check *ASC*. In Thailand, the interactions with *HIGH INCOME* and *FEMALE* are significantly negative and positive, which imply that people with low incomes and women prefer rice whose attributes are domestic, conventional, normal taste, and without fair trade. In Japan, the interaction with *HIGH ECCB* is significantly positive and those with *FEMALE* and *OLD* are significantly negative. These results imply that people with high environmental consciousness, men, and younger people prefer rice having the attributes of domestic, conventional, normal taste, and without fair trade.

Second, for *USA*, the interactions with *FEMALE, OLD,* and *UNIVERSITY* are significantly negative in Thailand, which implies that women, older people, and people with a high education perceive US-produced rice to have a lower value. In Japan, the interactions with *FEMALE* and *OLD* are significantly negative but that with *UNIVERSITY* is significantly positive. These results imply that women and older people place a lower value on US-produced rice but people with a high education do not.

Third, for *ORGANIC*, the interaction with *HIGH INCOME* is significantly positive in Thailand, which implies that people with a high income perceive a higher value for organic rice. In Japan, the interactions with *HIGH INCOME, FEMALE,* and *OLD* are significantly positive, which imply that people with a high income, women, and older people value organic rice more.

Fourth, for *HIGH QUALITY*, the interactions with *HIGH INCOME, HIGH ECCB,* and *FEMALE* are significantly positive in Thailand, which imply that people with a high income, people with a high environmental consciousness, and women place a higher value

Table 5
The random parameter logit regression results.

Variable	Main effect		Main effect with interaction	
	Thailand	Japan	Thailand	Japan
ASC	0.5***	3.19***	5.33***	3.53***
	(0.17)	(0.15)	(0.3)	(0.3)
USA[a]	−1.26***	−6.33***	−0.65***	−5.43***
	(0.06)	(0.18)	(0.17)	(0.33)
ORGANIC[a]	0.53***	0.93***	0.41***	0.47***
	(0.05)	(0.06)	(0.11)	(0.14)
HIGH QUALITY[a]	0.56***	0.5***	0.34***	0.2*
	(0.05)	(0.05)	(0.11)	(0.12)
FAIR TRADE[a]	1.26***	0.68***	0.89***	0.65***
	(0.04)	(0.05)	(0.12)	(0.11)
PRICE	−0.01***	−0.001***	−0.01***	−0.001***
	(0.00)	(0.00)	(0.00)	(0.00)
Standard deviation				
ASC	2.15***	3.47***	2.14***	3.17***
	(0.11)	(0.13)	(0.12)	(0.15)
USA	1.45***	4.15***	1.44***	3.82***
	(0.07)	(0.19)	(0.07)	(0.19)
ORGANIC	0.62***	0.92***	0.58***	0.94***
	(0.07)	(0.08)	(0.07)	(0.1)
HIGH QUALITY	0.7***	0.75***	0.69***	0.82***
	(0.05)	(0.08)	(0.05)	(0.08)
FAIR TRADE	1.1***	0.65***	1.09***	0.72***
	(0.1)	(0.07)	(0.11)	(0.08)
ASC*HIGH INCOME			−0.63***	0.3
			(0.2)	(0.23)
ASC*HIGH ECCB			−0.25	0.81***
			(0.2)	(0.24)
ASC*FEMALE			0.37*	−0.38*
			(0.19)	(0.23)
ASC*OLD			0.02	−1.38***
			(0.19)	(0.24)
ASC*UNIVERSITY			−0.21	0.08
			(0.19)	(0.23)
USA*HIGH INCOME			−0.16	−0.06
			(0.13)	(0.27)
USA*HIGH ECCB			−0.02	−0.07
			(0.13)	(0.28)
USA*FEMALE			−0.31**	−0.76***
			(0.12)	(0.26)
USA*OLD			−0.31**	−1.09***
			(0.13)	(0.28)
USA*UNIVERSITY			−0.32**	0.46*
			(0.12)	(0.26)
ORGANIC*HIGH INCOME			0.23**	0.23*
			(0.09)	(0.12)
ORGANIC*HIGH ECCB			0.13	−0.1
			(0.08)	(0.13)
ORGANIC*FEMALE			0.02	0.32**
			(0.08)	(0.13)
ORGANIC*OLD			−0.04	0.44**
			(0.08)	(0.13)
ORGANIC*UNIVERSITY			−0.05	−0.1
			(0.08)	(0.13)
HIGH QUALITY*HIGHI NCOME			1.83**	0.07
			(0.09)	(0.1)
HIGH QUALITY*HIGH ECCB			0.15*	0.00
			(0.83)	(0.1)
HIGH QUALITY*FEMALE			0.14*	0.19*
			(0.08)	(0.1)
HIGH QUALITY*OLD			−0.09	−0.16
			(0.08)	(0.1)
HIGH QUALITY*UNIVERSITY			0.08	0.36***
			(0.08)	(0.1)
FAIR TRADE*HIGH INCOME			0.3***	−0.1
			(0.09)	(0.09)
FAIR TRADE*HIGHECCB			0.1	0.04
			(0.09)	(0.09)
FAIR TRADE*FEMALE			0.28***	0.01
			(0.09)	(0.09)
FAIR TRADE*OLD			−0.12	0.02
			(0.09)	(0.09)
FAIR TRADE*UNIVERSITY			0.15*	0.2**
			(0.09)	(0.09)

Table 5 (*continued*)

Variable	Main effect		Main effect with interaction	
	Thailand	Japan	Thailand	Japan
Log likelihood	−8472.88	−8065.18	−8440.37	−6309.564
McFadden's R^2	0.28	0.42	0.29	0.41
Observations/# of participants	8584/1073	10,072/1259	8584/1073	7736/967

Notes: Standard errors are in parentheses.
[***], [**], and [*] denote that the parameters are different from zero at the 1%, 5%, 10% significance levels, respectively.
[a] Is dummy variable.

on the top 20% of good in terms of taste. In Japan, the interactions with *FEMALE* and *UNIVERSITY* are significantly positive, which imply that women and people with a high education place a higher value on such a taste ranking.

Finally, for *FAIR TRADE*, the interactions with *HIGH INCOME*, *FEMALE*, and *UNIVERSITY* are significantly positive in Thailand, which imply that people with a high income, women, and people with a high education value fair trade more. In Japan, the interaction with *UNIVERSITY* is significantly positive, which implies that people with a high education place a higher value on a fair trade label.

In summary, gender influences rice preferences in both countries. However, the other influenced variables differ by nation. Thailand people are influenced by income and Japanese by education.

4.4. International comparison of WTP

Fig. 1 shows the kernel density distributions of the means of the marginal WTP for each attribute. These are derived from the Krinsky and Robb methods and normalized by the US dollar currency based on PPP. PPP values are obtained for 2010–2014 from World Bank (2015). The means of marginal WTP for *ASC* and *FAIR TRADE* in Thailand are higher than those in Japan. In particular, Japanese people dislike US-produced rice much more than Thai people do. On the other hand, the mean of marginal WTP for *ORGANIC* in Thailand is less than that in Japan. The mean of marginal WTP for *HIGH QUALITY* is not that different, which means that the taste preference for rice in these countries seems to be identical.

Table 6 presents the differences in the means of marginal WTP based on the results of the complete combinatorial test (Poe, Giraud, & Loomis, 2005) between Thailand and Japan, which nonparametrically compares the differences in the WTPs in the two countries obtained by using the Krinsky and Robb methods (Carlsson, Frykblom, & Lagerkvist, 2007). In the main effect model, the means of marginal WTP for *ASC*, *USA*, *ORGANIC*, and *FAIR TRADE* are significantly different at the 5% level between countries. Therefore, Thai consumers place a higher premium on fair trade than Japanese consumers do, and the latter place a higher premium on organic than the former do. Additionally, the WTP for US rice in Japan is more than seven times that in Thailand. However, *HIGH QUALITY* does not exhibit any significant difference between these two countries, which means that their taste preferences are identical.
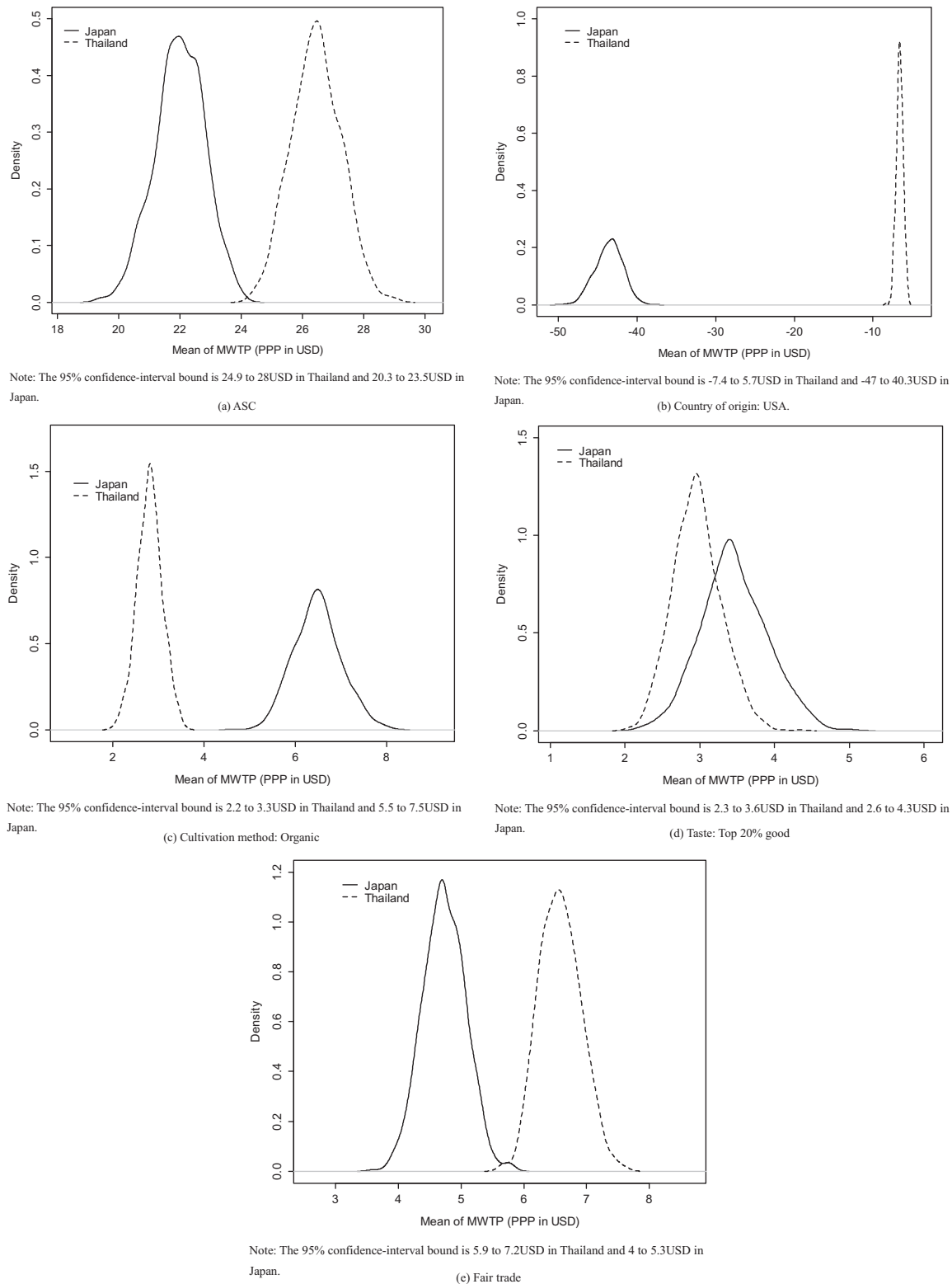
In the main effect with interactions model, the means of marginal WTP for *ASC*, *USA*, and *ORGANIC* remain significant at the 5% level; only *FAIR TRADE* loses significance. The robustness of the effect for *FAIR TRADE* remains controversial. Regarding the interaction variables, we focus on the significant interaction variables in both countries. *ASC*FEMALE* has a significant difference at the 5% level. Thai women thus prefer rice whose attributes are domestic, conventional, normal taste, and without fair trade. *USA*FEMALE* has a significant difference at the 1% level, implying that Japanese

women dislike US-produced rice more than Thai women do. For *USA*OLD*, there is a marginal significance at the 10% level. hence, older Japanese people dislike the rice produced in the United States. For *USA*UNIVERSITY*, there is a significant difference at the 1% level. Thus, Japanese people with a higher education can accept US-produced rice but their Thai counterparts cannot. For *ORGANIC*HIGH INCOME*, there is a marginal significant difference at the 10% level. Although the effect is weak, this finding implies that Thai people with a high income prefer organic rice than Japanese people with a high income do. For *HIGH QUALITY*FEMALE*, there is no significant difference, suggesting that the female effect in both countries is the same. For *FAIR TRADE*UNIVERSITY*, there is no significant difference; thus, a high education does not influence the difference in the preference for fair trade between these countries.

5. Discussion

The RPL model estimation results show that Japanese people prefer organic rice and have less preference for US-produced rice than Thai people do. On the other hand, Thai people prefer fair trade more than Japanese do. The WTP for taste is identical in both countries. The preference for domestic foods in Japan supports the findings of Kim (2008) and Tonsor et al. (2009). The former study finds that Japanese people prefer domestic products to those produced in the United States, while the latter finds that Japanese preferences are significant for domestic beef-steak, but insignificant for that produced in the United States. The preference for domestic food in Thailand is also supported by the results of Thaiyotin, Ujiie, and Shuto (2015), who find that Thai people prefer domestic oranges to Chinese ones. For both countries, domestic rice is preferable, which is consistent with Yong Lee et al. (2014), who finds that among the rice produced in the United States, China, and Korea, Koreans prefer their own domestic rice. This strong preference for domestic food over organic food is also supported by surveys in other countries, such as those carried out by Pouta et al. (2010), Rousseau and Vranken (2013) and Denver and Jensen (2014).

The result that Thailand, as a developing country, expresses higher altruism for fair trade than Japan, a developed nation, is consistent with the result of Engel (2011), who uses the dictator games to show that developing countries are more altruistic than developed nations. Throughout food consumption, Thai people consider agricultural producers' livelihoods and pay more for their sustenance than Japanese people do. On the other hand, the high attention to organic rice by Japanese people is inconsistent with the results of Onozaka and McFadden (2011), Kimura et al. (2012) and Rousseau (2015), who find that fair trade is preferred to organic in the United States, Japan, and Belgium. Specifically, the Japanese result in this study is inconsistent with Kimura et al. (2012). A possible explanation is that Kimura et al. (2012) employ younger Japanese respondents, while we recruited all ages. In this aspect, our result is more robust than that of Kimura et al. (2012). A possible explanation for the Japanese preference for organic over fair trade is that the Japanese government heavily

Note: The 95% confidence-interval bound is 24.9 to 28USD in Thailand and 20.3 to 23.5USD in Japan.

(a) ASC

Note: The 95% confidence-interval bound is -7.4 to 5.7USD in Thailand and -47 to 40.3USD in Japan.

(b) Country of origin: USA.

Note: The 95% confidence-interval bound is 2.2 to 3.3USD in Thailand and 5.5 to 7.5USD in Japan.

(c) Cultivation method: Organic

Note: The 95% confidence-interval bound is 2.3 to 3.6USD in Thailand and 2.6 to 4.3USD in Japan.

(d) Taste: Top 20% good

Note: The 95% confidence-interval bound is 5.9 to 7.2USD in Thailand and 4 to 5.3USD in Japan.

(e) Fair trade

Fig. 1. The mean of marginal WTP in Thailand and Japan.

supports agricultural producers, which disturbs the altruistic behaviors from Japanese consumers to agricultural farmers. Additionally, in Japan, the meaning of fair trade is often used to support agricultural producers in poor developing countries, especially coffee imported from Africa, which does not fit the image of Japanese agricultural famers.

The most important contribution of this study relates to the findings on the taste attribute. Marginal WTP does not show significant differences between the two countries. In Japan, the WTP for high quality is the lowest among all attributes, while, in Thailand, it is the second lowest. Kimura et al. (2012) show that fair trade and country of origin are more important than flavor, while

Table 6
The difference of mean of marginal WTP.

	Main effect		p-Value	Main effect with interaction		p-Value
	Thailand	Japan		Thailand	Japan	
ASC	26.45	21.99	0.00	27.80	31.34	0.06
USA	−6.60	−43.60	0.00	−3.45	−37.55	0.00
ORGANIC	2.81	6.48	0.00	2.18	4.30	0.03
HIGH QUALITY	2.96	3.46	0.18	1.76	1.20	0.28
FAIR TRADE	6.58	4.73	0.00	4.67	4.16	0.30
ASC*HIGHINCOME				−3.28	−2.61	0.35
ASC*HIGHECCB				−1.28	−5.82	0.01
ASC*FEMALE				1.98	−1.82	0.01
ASC*OLD				0.14	−8.20	0.00
ASC*UNIVERSITY				−1.12	−2.19	0.27
USA*HIGHINCOME				−0.84	−2.32	0.21
USA*HIGHECCB				−0.14	−1.25	0.29
USA*FEMALE				−1.60	−8.21	0.00
USA*OLD				−1.69	−4.54	0.06
USA*UNIVERSITY				−1.67	4.74	0.00
ORGANIC*HIGHINCOME				1.21	−0.09	0.08
ORGANIC*HIGHECCB				0.72	−0.41	0.10
ORGANIC*FEMALE				0.17	2.29	0.01
ORGANIC*OLD				−0.25	1.73	0.01
ORGANIC*UNIVERSITY				−0.31	−0.06	0.39
HIGH QUALITY*HIGHINCOME				0.95	0.86	0.46
HIGH QUALITY*HIGHECCB				0.80	0.15	0.20
HIGH QUALITY*FEMALE				0.75	1.20	0.28
HIGH QUALITY*OLD				−0.47	−0.49	0.49
HIGH QUALITY*UNIVERSITY				0.44	2.45	0.00
FAIR TRADE*HIGHINCOME				1.59	−0.63	0.00
FAIR TRADE*HIGHECCB				0.57	−0.71	0.04
FAIR TRADE*FEMALE				1.48	0.01	0.03
FAIR TRADE*OLD				−0.62	0.50	0.07
FAIR TRADE*UNIVERSITY				0.80	1.57	0.15

Rousseau (2015) shows that flavor has a higher WTP than the organic and country of origin attributes. The Japanese result of Kimura et al. (2012) is thus consistent with our result in the Japanese case. Similarly, Lusk and Briggeman (2009) and Lusk (2011) show that the value of taste is lower than that of safety and nutrition but higher than that of price, natural environment, and fairness. This finding is inconsistent with the results of the present study for both countries, namely that the priority of taste evaluated by others is less for consumers in both countries compared with sustainable factors. A possible future research avenue here would be to investigate whether consumers trust subjective tasting or external evaluations such as Michelin guidebooks to a larger degree. Additionally, Lusk and Briggeman (2009) and Lusk (2011) do not target specific food (they just use the term "food" in their survey). Therefore, the types of food that have a high value for taste and which type of taste information leads to such a high value remain unclear. Our study is the first step to comparing taste preferences and other attributes by using the CE method.

With respect to the socioeconomic characteristics, the most influential variable is gender. The female effect is significant in the benchmark of ASC, rice produced in the United States, and the top 20% of good in both countries. Specifically, among these attributes, Japanese women dislike US-produced rice more than Thai women do and have a lower preference for rice with a benchmark of ASC. This result implies that Japanese women prefer premium rice than Thai women do. To obtain robust results for the other socioeconomic characteristics, however, we must gather more data.

These results are important when considering the production and consumption of rice in each country after the TPP is introduced. First, Japanese consumers do not accept rice produced in the United States regardless of price, while Thai consumers may accept it if the price level is adequately low. Second, Japanese rice producers face a challenge in addressing the growing organic rice

category, while Thai rice suppliers focus more on fair trade when they trade with producers. Specifically, for fair trade in Thailand, since income and environmental consciousness are considered to be influential in this study, this attribute becomes more important for the consumption of Thai rice along with the growing of the Thai economy.

6. Conclusion

This study employs the CE approach to compare the attributes of rice between Japan and Thailand, considering the impact of country of origin, sustainability, and taste. The RPL model estimation results show that Japanese people prefer organic rice more and Thai people prefer fair trade more in their rice-related choices. US-produced rice is less preferable in both countries, but the WTP for avoiding this rice for Japan is much higher than that for Thailand. Both countries have identical preferences regarding taste. These results suggest that Japanese consumers do not accept US-produced rice regardless of price, while Thai consumers tend to do so if the price level is adequately low. Further, fair trade has a much higher WTP than taste for Thai consumers and organic a much higher WTP than taste for Japanese consumers. Finally, for both countries, the WTP for taste evaluation for a staple food such as rice is a lowest priority, which is new finding presented by this study.

One limitation of this study is that, for the results of the main effect with interactions, the difference in the WTP for fair trade between the two countries was not significant. This result suggests that in order to compare the difference between the two countries, we must pay more attention to the difference in socioeconomic characteristics. This fact is consistent with Camerer (2003), who suggests analyzing the impact of culture when assessing altruistic behaviors. Future research should thus aim to include cultural and religious consciousness into its models.

Another limitation concerns the design of the CE, where the attributes and levels were based on those used in previous studies and market price. Further, the study used the RPL model to compare preferences in Thailand and Japan. However, further research should consider the scale effects and the assumption of preference heterogeneity.

While our study offers an intra-national comparison, further research could expand the body of knowledge by presenting an international comparison. For example, researchers could consider how the rice produced in Asian developing countries could be accepted by other rich countries such as Japan and Singapore. Moreover, how Japan makes a reasonable premium on its rice to compete with the cheaper rice in the world market and still be accepted by developed regions is another research avenue.

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