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Chapter 2

ECONOMIC ANALYSIS OF CONSUMER BEHAVIOR AND AGRICULTURAL PRODUCTS BASED ON BIODIVERSITY CONSERVATION VALUE

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ABSTRACT

Biodiversity conservation is one of the important aspects of the multi-functionality of agriculture. Therefore, some consumers might be willing to pay a higher price for agricultural commodities that are produced in a way that conserves biodiversity. If so, an important question would be whether market-oriented policies to promote adding the value of biodiversity to agricultural products can be used to conserve biodiversity. Our study focuses on consumer reactions to "life brand" products that improve biodiversity. We also analyze how the biodiversity impact of agricultural products affects market price. We present a case study of the Japanese brand of rice labelled "Stork-raising rice" (Stork rice). Farmers in Toyooka use special, environmentally friendly agricultural practices with fewer chemicals. These practices have improved the food supply and the habitat of storks, and have restored stork populations in the city. Using a choice experiment, we analyzed whether agricultural products that improve biodiversity can achieve higher market prices. We expected *a priori* Stork rice consumers to show more environmental awareness than general consumers. However, the results showed that many respondents placed a greater importance on their health than on stork conservation. They were also more aware of agricultural practices than any environmental conservation measures in Toyooka. We also found that willingness to pay increased as awareness of biodiversity conservation increased. However, our experiment also showed that consumers who bought Stork rice because of a preference for reduced-pesticide or organic food, without the knowledge that stork populations had been revived because of changes in agricultural practice, may not be willing to buy expensive agricultural

products that improve biodiversity conservation. The majority of agricultural product consumers in Japan are this type of consumer. This study showed that the promotion of biodiversity conservation by the production and sales of "life brand" agricultural products is difficult because of the non-excludability characteristic of their public goods. Therefore, government support and public activities are indispensable for biodiversity conservation.

Keywords: Life brand value, choice experiment, biodiversity

INTRODUCTION

The measures taken by the Ministry of Agriculture, Forestry and Fisheries (MAFF) on new high-added-value agricultural products produced and sold as the *life brand* have become a movement to promote the conservation of the rural and natural environment (MAFF, 2007, 2010). Moreover, according to Une's book series on living organisms (Institute of Agriculture and Nature, 2007) and the Biodiversity Agriculture Support Centre (2011) investigations of paddies in cooperation with the Japanese Agriculture National Federation, it can be said that those measures were intended to highlight and promote the need for prices of agricultural products to reflect the value of the surrounding biodiversity (e.g. rice price and paddy biodiversity value). Life brand environmental value can be divided into two types. The first type can be seen as a property of private goods where individuals can own the value related to the environment such as the positive image of agricultural products in terms of health, safety and being close to nature; symbols that can be used as a brand. These values might be available for use only for the consumers who purchase the products and not for others. Therefore, we can state that exclusive use could result in the possible enjoyment of private good services. In order to entrust the market to supply those services that involve the environment in sufficient quantities to meet demand, special considerations regarding willingness to pay (WTP) need to be taken into account. The second type of environmental value can be seen as a property of public goods where the value related to the environment is not only specific to some individuals but belongs to all citizens. Besides, it's necessary to keep those service benefits not only for our generation but also for future generations. Therefore, biodiversity value considered as public enjoyment needs to be preserved by the intervention of the government rather than paid for by the consumer because those services are not well identified by users as they do not own them personally. Of course, we do not suggest stopping personal donations but argue that society should bear the burden of preservation in this case.

In this article we review research efforts of the worldwide famous The Economics of Ecosystems and Biodiversity (TEEB) (2008) on economic aspects of biodiversity. Literature was evaluated following the Stated Preference Method such as the Contingent Valuation Method (CVM) and the Choice Experiment (CE) focusing on specific species to evaluate the economic value of biodiversity and the ecosystem. It appears that only limited literature on the multifunctional evaluation of agriculture and forestry exists in Japan. For example, Terawaki (1998), Kuriyama (1998) and the Japan Grassland Agriculture and Forge Seed Association (2008) constitute the main group of researchers working in this field.

Figure I. “Stork-raising rice”.

Their work focused mainly on assessing biodiversity value but they never applied their results to agricultural product value. Using the same methods, Aizaki’s (2005) research focused on environmental conservation of rice. Tanaka and Hayashi (2010) worked on general life brand studies. However in those previous studies, the differences between biodiversity as a market good and a public good have not always been well understood and so biodiversity value as a public good embodied in a market good has always been over-estimated. Thus, this study focuses on “Stork-raising rice” (Stork rice), which is organic rice or reduced pesticide rice and contributes to protect endangered storks, “Kounotori hagukumu okome" in Japanese, see Figure I). The Stork brand has a healthy and safe image to consumers who buy it. The price of Stork rice is substantially higher than other rice varieties and farmers want to sell the embedded biodiversity value as added-value products. However, if the rich natural environment to foster the storks is conserved, then all citizens can enjoy this environment as free riders. Therefore, assuming that consumers choose not to pay for biodiversity value embedded in market goods, we can wonder if farmers will accept the empirical eco-activity challenges. Consequently, focus should be directed at estimating how much biodiversity value can be added to the Stork rice price compared to private use value and more importantly, to know what kind of consumers will continue to pay this added value and how many consumers are willing to pay for it.

ANALYTICAL METHOD

Conditional Logit Model (CLM)

We use CLM for the analysis of consumer preference of Stork rice. CLM is particularly appropriate in modelling choice behavior (Louviere, Hensher and Swait, 2000). Explanatory

variables include attributes of the choice alternatives (e.g. brands, pesticides and prices). The CLM used in this study is presented below. Because the choice experiment involves a selection of options from several alternatives on the basis of the random utility model (McFadden 1974; Ben-Akiva and Lerman 1989), it can be expressed in equations, as shown below: When the *i*-th respondent selects an alternative *j* from the set of alternatives, *C*, the utility u_{ij} can be defined by Equation (1):

$$u_{ij} = v_{ij} + \varepsilon_{ij} \tag{1}$$

Where v_{ij} denotes the observable portion of the utility and ε_{ij} indicates error term. When the *i*-th respondent selects the alternative *j*, the utility u_{ij} of the selected alternative *j* is higher than the utility u_{ik} of the other alternatives, and its probability can be defined by Equation (2):

$$\begin{aligned} \pi_{ij} &= \Pr(u_{ij} > u_{ik}; \forall k \in C) \\ &= \Pr(v_{ij} + \varepsilon_{ij} > v_{ik} + \varepsilon_{ik}; \forall k \in C) \\ &= \Pr(v_{ij} - v_{ik} > \varepsilon_{ik} - \varepsilon_{ij}; \forall k \in C) \end{aligned} \tag{2}$$

So long as the error term are independently and identically distributed (IID) and follows a Type I extreme value (or Gumbel) distribution, the probability of selecting alternative *j* can be expressed as follows:

$$\pi_{ij} = \frac{\exp(v_{ij})}{\sum_{j \in C} \exp(v_{ij})}$$

If a main effect model, confined to the vector x_{ij} specific to the alternative, is created for the observable utility function *v*, it can be defined by Equation (3):

$$\pi_{ij} = \frac{\exp(x_{ij}'\beta)}{\sum_{j \in C} \exp(x_{ij}'\beta)} \tag{3}$$

where β denotes a parameter vector, x_{ij}. In this case, the logarithmic likelihood function can be defined as follows:

$$LL(\beta) = \sum_i \sum_j (d_{ij} \ln \pi_{ij}) \tag{4}$$

If the alternative is selected, $d_{ij} = 1$. Otherwise, d_{ij} is equal to zero. If parameters can be estimated, the welfare measure of marginal willingness to pay (MWTP) can be calculated in the following way. That is, the indirect utility function *v* can be defined by Equation (5), if it is assumed to be a linear function involving the attribute x_k, the amount paid, *p*, and their parameters β_k and β_p:

$$v(x, p) = \sum_k \beta_k x_k + \beta_p p \tag{5}$$

If this equation is subjected to total differentiation, deeming the utility level unchanged (dv = 0) and fixing the attribute x_k (except attribute x_j) also at the initial level, the amount of WTP for one unit increase of attribute x_j can be defined as follows:

$$MWTP_{x_j} = \frac{dp}{dx_j} = -\left(\frac{\partial v}{\partial x_j}\right) \Big/ \left(\frac{\partial v}{\partial p}\right) = -\frac{\beta_j}{\beta_p} \tag{6}$$

In this way, MWTP following a change in the alternative level can be calculated. Further, the confidence interval of MWTP based on Hanemann and Kanninen (1999), can be calculated as follows:

$$Var\left(-\frac{\beta_j}{\beta_p}\right) = \frac{1}{\beta_p{}^2}\left[\left(\frac{\beta_j}{\beta_p}\right)^2 Var(\beta_p) + Var(\beta_j) - \left(\frac{\beta_j}{\beta_p}\right) Cov(\beta_j, \beta_p)\right]$$

The Choice Experiment

In this experiment we focus on the brand image of Stork rice and the level of biodiversity conservation. In order to simplify the questionnaire and to reduce the respondent's workload we decided to use a simple profile. Since rice variety or taste were not the focus of the study we assumed a virtual situation where the proposed rice is polished, from the same variety and the same production area [(1)]. In our questionnaire, we proposed only the variety of "Koshihikari" grown in Hyogo Prefecture and its taste is assumed to be excellent. We prepared five attributes and their levels (Table 1) that consumers would potentially buy if the rice was sold in the shop. We also added the opt-out alternative so consumers could select the actual rice that they purchased at the time of the survey. The choice modelling technique requires consumers to choose only one alternative among three alternatives in each choice set (see Table 2). Consumers are requested to answer four choice sets using 2 x 3^2 x 6^2 orthogonal main effects design, which produced thirty-six choice sets, and then we prepared 9 versions of the choice experiment questionnaire. For the attributes of the choice experiment, two brands, Normal Koshihikari and Stork rice, are used to analyze whether consumers prefer the "Stork rice" brand. In reality, storks live around Toyooka and at the time of the investigation 29 individuals were recorded. In our virtual situation, we proposed numbers below and above the current state. The attribute on "Number of living organisms seen in rice fields" is set to ascertain consumer preference for higher levels of biodiversity conservation, where the current situation in Toyooka is the reference level. It is also good to notice that Stork rice is already a reduced pesticide (-75 percent) rice. That is why reduced pesticide (-30 percent) is the reference level of the "Quantity of pesticide" criteria for 75 percent reduction and 100 percent reduction as organic rice.

Table 1. Attributes and levels used in the choice experiment

Attribute	Level
Brand:	Normal Koshihikari, Stork rice
Number of storks inhabiting the rice production area:	2, 7, 15, 29, 60, 100
Number of living organisms seen in rice fields:	Same as Toyooka, Twice more than Toyooka, Three times more than Toyooka
Quantity of pesticide:	Reduced pesticide (-30%), Reduced pesticide (-75%), Organic (-100%)
Price (5kg):	2,000 Yens, 2,400 Yens, 2,800 Yens, 3,200 Yens, 3,600 Yens, 4,000 Yens

Table 2. Profile examples of choice set

Attribute	Alternative A	Alternative B	Alternative C
Brand	Stork rice	Normal Koshihikari	The rice you bought this time
Number of storks inhabiting the rice production area	100	15	
Number of living organisms seen in rice fields	Twice more than in Toyooka	Same as Toyooka	
Quantity of pesticide	Reduced pesticide (-30%)	Reduced pesticide (-75%)	
Price (5kg)	3,200 Yens	3,600 Yens	

Moreover at the time of the investigation, the average price of 5kg of rice without pesticide is 3,316 Yens for organic Stork rice and 2,892 Yens for 75 percent reduced pesticide rice.

SURVEY DESIGN AND DATA CHARACTERISTICS

The Questionnaire

The questionnaire addresses “Stork-raising rice” buyers through rice stores where “Stork-raising rice” is available. We excluded traders handling small quantities and major distributors such as supermarket chains due to the difficulty in distributing the questionnaire survey sheets. A total of 23 corporations were surveyed, among which eight are from the Kanto region and 15 are from the kansai region (two traders inside of Toyooka, one consumer cooperative organization). We asked rice stores to distribute the questionnaires, to collect and to send us all buyers’ answers after they bought “Stork-raising rice”. We also undertook a mailing method, where buyers could reply by returning the questionnaires in free-of-charge envelopes. This method was mainly used through trader companies, which usually sell rice by mail-order and cooperatives that take co-paid forms. Due to the time restriction [(2)], we provided traders with the same envelope in order for them to be able to send us filled

questionnaires they would collect in their store. The complete questionnaire set consisted of a mini pamphlet about "Stork-raising rice", a return envelope and a pen in an enclosed transparent envelope.

The pen was a gift for the consumers who took the time to fill in the questionnaire and the mini pamphlet aimed at giving basic information on "Stork-raising rice". A total of 2,200 questionnaires were sent to stores and traders, 768 in the Kansai region, 632 in the Kanto region and 800 at cooperatives. The method of distribution put priority on the major traders and was then distributed equally to other traders [(3)]. The questionnaire distribution period lasted for 40 days from the end of September to the end of October, 2008 when the new rice came on the market [(4)].

Questionnaire Response Rate

Of the total of 2,200 questionnaires, 1,859 were distributed, 641 in the Kansai region, 620 in the Kanto region and 598 for the cooperatives (Table 3). Only 709 informative questionnaires were returned and analyzed, 250 in the Kansai region, 81 in the Kanto region, and 378 for the cooperatives. The response rate using the number of questionnaires distributed as a denominator is respectively 39.0 percent in the Kansai region, 13.1 percent in the Kanto region and 63.2 percent for the cooperatives, representing a total response rate of 38.1 percent.

Consumer Profiles

On all returned questionnaires 85 percent were filled in by females, 12 percent by males, and the remaining 3 percent were either empty or incomplete returned questionnaires. Such a result represents the Japanese rice consumer-buyer. Indeed, in Japan it is mainly housewives who buy food, including rice. Moreover, 25 percent of answers were made by consumers in their forties, 22 percent were in their fifties, 19 percent in their thirties and 17 percent in their sixties. It is good to notice that cooperatives seem to have a larger influence on young customers compared to other distributors. An average Japanese family is composed of 2.56 people/family [(5)] and they consume 4.9kg of normal rice/person/month [(6)] representing 12.6kg of rice/family/month. In our investigation on Stork rice consumption, 38 percent of the respondents answered that they consumed 5kg/month and 38 percent consumed 10kg/month. The average consumption is 9.3kg of rice/family/month and 70 percent of the respondents bought less than 10kg of Stork rice/month, which appears to be lower than the average consumption of normal rice in Japan.

Table 3. Questionnaire distribution and response rate

	Questionnaires Available	Undistributed questionnaires	Distributed questionnaires	Collected questionnaires	Response rate
Kansai region	768	127	641	250	39.0%
Kanto region	632	12	620	81	13.1%
Cooperatives	800	202	598	378	63.2%
Total	2,200	341	1,859	709	38.1%

Awareness on Stork Conservation and Agricultural Practices

Respectively, 41 percent and 47 percent of purchased rice was “Reduced pesticide rice” and “Organic rice”. Interestingly, though the organic rice price is higher, the number of consumers who selected reduced pesticide rice almost rivaled the number of organic rice consumers. Forty four percent of the consumers declared that they “always buy Stork rice”, 21 percent declared that they “buy it several times per year” and 34 percent declared that they “bought it for the first time at the time of the survey”. This result shows that Stork rice has acquired loyal consumers (Figure II). Those percentages coincide with the level of awareness in stork conservation efforts in Toyooka: 44 percent of previous awareness and 34 percent of little awareness (Figure III).

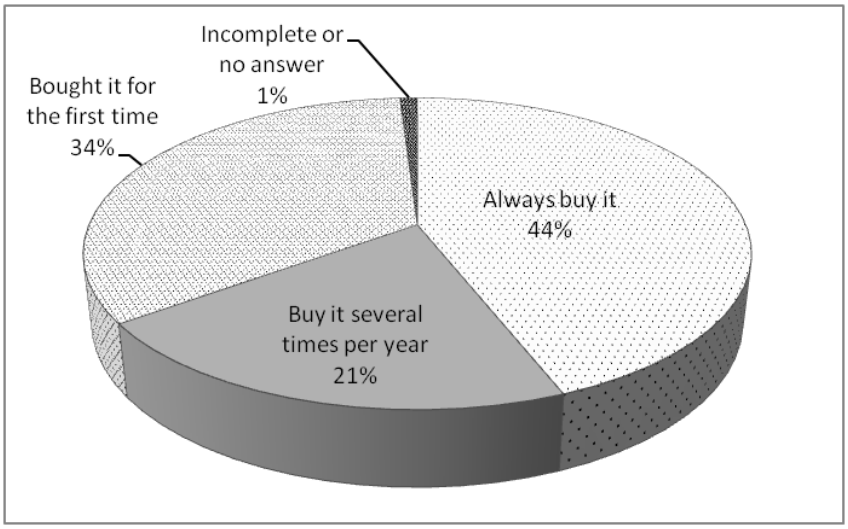

Figure II. Proportion of loyal customers for Stork rice.

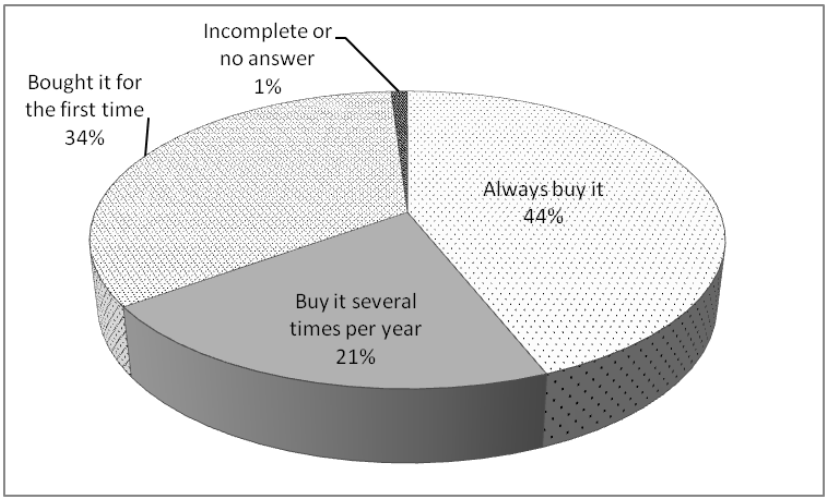

Figure III. Proportion of stork conservation awareness.

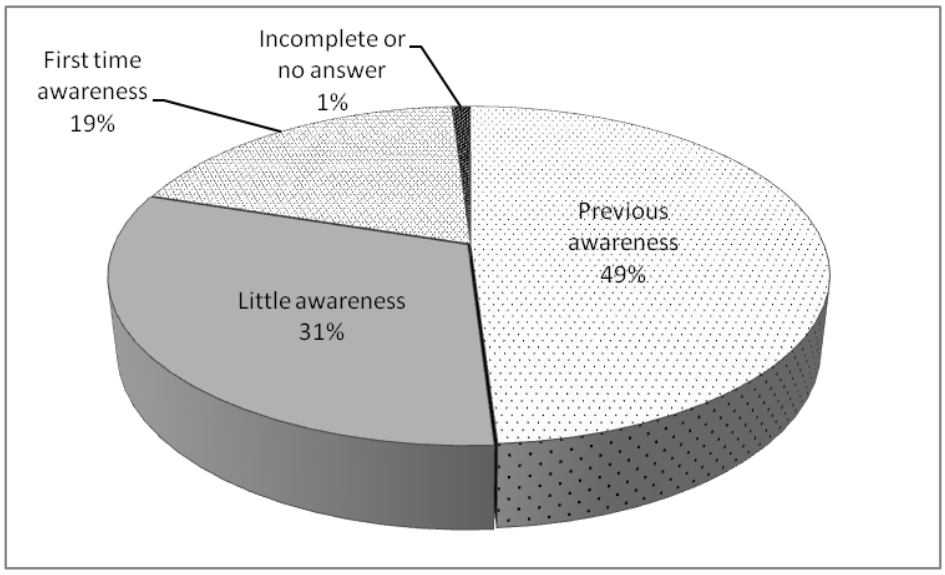

Figure IV. Proportion of agricultural practice awareness.

Surprisingly, awareness of agricultural practices in Toyooka reached 49 percent; a proportion higher than the 44 percent of consumers aware of stork conservation efforts in the region (Figure IV). There is a difference between the awareness of agriculture practices of Toyooka for consumers who buy Stork rice at usual shop (45 percent) and that of cooperative consumers (55 percent).

This difference might come from the difference in information accessed by the two groups. Indeed, cooperatives often promote activities to give their members the opportunity to visit the production area. It is during those pedagogic visits that explanations on stork conservation and agricultural practices are usually provided to citizens.

Purchasing Decision

The first characteristics leading consumer decisions to purchase Stork rice are effect on health (48 percent), and taste (23 percent) in Figure V. The influence of "environmental impacts" on consumer choice is however very low (4 percent) and highlights the fact that most of the consumers buying rice do not attach great importance to the environment, but rather to their own personal benefits. Figure VI shows the answers to the question: which of the two effects on Stork-raising rice is given priority for 1) living organism habitat conservation and 2) healthy food?

The figure shows that even the neutral response of "Both were valued" was half the total response. Those respondents who answered that they valued the individual health benefits were approximately three times the number who answered that they valued habitat protection. This result shows a tendency among the survey respondents to value health benefits for the consumer as a more important decision criterion than the more universal biodiversity conservation concept.

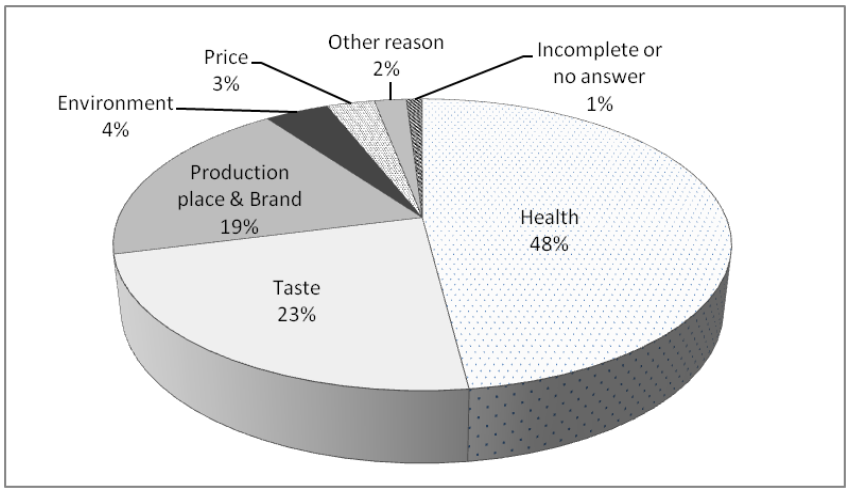

Figure V. Reasons for purchasing Stork rice.

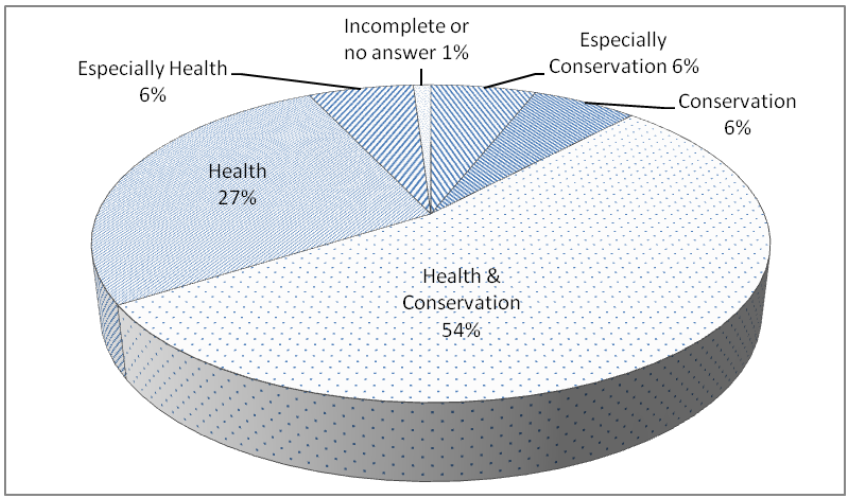

Figure VI. Importance of habitat conservation and individual health.

Interestingly, to the questions on how much a consumer is willing to pay for 5kg of Stork rice, two thirds of the consumers answered 3,000 to 3,500 Yens (Figure VII), a price that almost corresponds to the average actual market price, which indicates that consumers' answers might be biased because their price limit is reflected in the present price.

ESTIMATED RESULTS

Estimated Results by Pooled Data

Table 4 shows the explanatory variable in the conditional logit model and the estimated result when all the samples are used as pooled data.

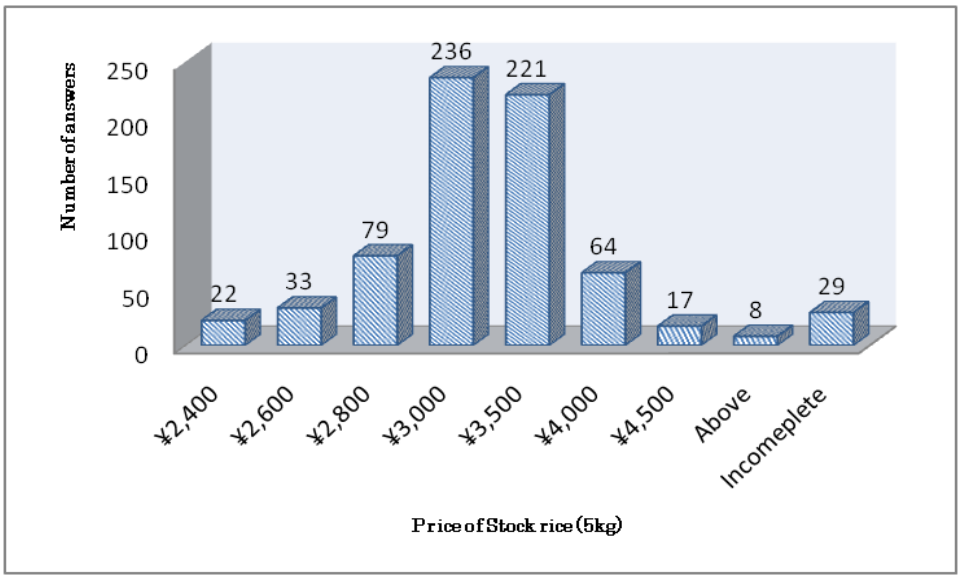

Figure VII. Distribution of prices customers are willing to pay for 5kg of Stork rice.

If those 701 people had answered all four sets of choice experiment questions, the number of available samples would have been 2,804. Since there were also some people who did not answer all four questions, the number of available samples that could actually be used became 2,706.

On average each respondent answered 3.8 questions. The Alternative Specific Constant, ASC, estimates the effect of preference between rice purchased at the time of the survey and the other attributes of virtual rice which were not used for this survey. Taking into account the attributes of rice, which were not presented in this study, the estimated ASC is negative and has a difference from zero at the level of 1 percent significance, and then we can get that the respondent prefers their voluntarily selected rice to virtual rice. There is a significant difference at the 1 percent level in terms of customer choice between the two proposed brands, Stork rice and Normal Koshihikari, which emphasizes the importance of the brand or name of a product.

For the stork population, the naturalized logarithm is taken. We can see that the respondents exhibit a high valuation on rice when the number of living storks increases in the rice producing areas though the estimated coefficient was positive and significant at the 1 percent level. For the reduction of pesticide, we used two dummy variables. These were compared with reduced pesticide -30 percent as the reference level. These dummy variables are “Reduced Pesticide -75 percent” and “Organic”. Reduced pesticides -75 percent and organic both have significant differences when the estimated coefficient is at the 1 percent level, and which match the expected positive sign condition. The estimated coefficient of organic was larger than the reduced pesticide -75 percent. For biodiversity, two dummy variables were also used. Toyooka was set as zero. “Twice biodiversity” was assumed to be twice the amount of living things in the rice field and was set as 1, and “Three times biodiversity” was assumed to be three times the amount of living things in the rice field and was also set as 1.

Table 4. Estimated result of conditional logit model

Variable	Definition	Estimated coefficient		MWTP (Yens)
ASC	Alternative Specific Constant	-0.684	***	-839
		(-9.156)	a)	[-1002, -677] b)
Brand	Stork rice = 1	0.220	***	269
	Normal Koshihikari = 0	(-3.195)		[131, 408]
Stork's population	ln (Bird number)	0.249	***	306
		(8.889)		[246, 366]
Reduced Pesticide	Pesticide -75% = 1	1.098	***	1347
-75%	Pesticide -30% = 0	(11.156)		[1109, 1585]
Organic	Organic = 1	1.816	***	2230
	Pesticide -30% = 0	(18.775)		[1952, 2507]
Biodiversity twice	Organisms in paddies, Toyooka × 2 = 1	0.149	*	183
	Same as in Toyooka = 0	(1.756)		[12, 354]
Biodiversity three	Organisms in paddies, Toyooka × 3 = 1	0.162	*	199
times	Same as Toyooka = 0	(1.829)		[22, 376]
Price	Unit : 1,000 Yens	-0.815	***	
		(-15.589)		
Number		2706		
Log likelihood		-2333.96		

Note: a) the number between ( ) indicates t value

b) the number between [ ] indicates 95% confidence interval of MWTP

Both estimated coefficients have the expected positive sign at the 10 percent level of significance and the estimated coefficient of "Three times biodiversity" is larger than that of "Twice Biodiversity." However, these results indicate that there is statistically no significant difference between two or three times biodiversity because the estimated MWTP of "Twice Biodiversity" falls in the 95 percent confidence interval of MWTP for "Three times biodiversity", and vice versa. The estimated coefficient of price has the expected negative sign at the 1 percent significant level. This means that people indicate a higher price results in lower utility. The amount respondents are willing to pay is 165 Yens when biodiversity is twice as much as Toyooka biodiversity and 179 Yens when biodiversity is three times more than Toyooka biodiversity. However, according to Kontoleon and Yabe (2006), the use of these analytical results based on average consumers is not always the best way to capture the whole picture of consumers.

Impact of Environment-Related Awareness on the Amount Customers are willing to Pay for Biodiversity Conservation

Next we compared the estimated results of two groups (Table 5), namely, A) "the aware group" which comprised 1,214 consumers who knew about stork conservation history and activities in Toyooka and B) "the unaware group" which comprised 1,468 consumers who knew a little about it or learned of it for the first time at the time of the survey, or who did not answer or gave incomplete answers. Both ASCs are significant at the 1 percent level and became negative, and observed without substantial change from pooled data case. Moreover, the stork population also exhibits the expected positive sign at the statistically significant 1 percent level. It is an expected positive sign similar to the estimated coefficient of reduced pesticide -75 percent and organic rice, and the estimated coefficient of organic rice became bigger than the reduced pesticide -75 percent at the 1 percent significance level. The estimated coefficient of the price also meets the expected negative sign at the 1 percent significance level.

Table 5. Comparison of estimated results when grouped by the presence of environmental knowledge

Variable	Estimated coefficient		MWTP (Yen)	Estimated coefficient		MWTP (Yen)
ASC	-0.77	***	-1057	-0.652	***	-722
	(-6.713)		[1354, 760]	(-6.580)		[-911, -532]
Brand	0.336	***	460	0.14		-
	(3.184)		[217, 704]	(1.524)		
Stork's population	0.302	***	414	0.217	***	240
	(6.989)		[305, 524]	(5.793)		[170, 311]
Reduced pesticide -75%	1.169	***	1604	1.049	***	1161
	(7.584)		[1165, 2044]	(8.088)		[888, 1435]
Organic	2.017	***	2767	1.682	***	1863
	(13.327)		[2220, 3315]	(13.209)		[1560, 2167]
Biodiversity twice	0.388	***	532	-0.034		-
	(2.981)		[233, 830]	(-0.300)		
Biodiversity three times	0.251	*	344	0.110		-
	(1.824)		[37, 651]	(0.932)		
Price	-0.729	***		-0.903	***	
	(-9.162)			(-12.745)		
Number	1214			1478		
Log likelihood	-1011.14			-1289.13		

The MWTP tends to be larger for the aware group than for the unaware group. Indeed, when the stork population changes from 2 to 29 individuals, group A respondents are willing to pay 1,107 Yens/5kg for Stork rice(7) while group B respondents are willing to pay 642

Yens/5kg for Stork rice. In the same way when the pesticide quantity changes from -30 percent to -75 percent, group A respondents are willing to pay 1,604 Yens while in group B respondents are willing to pay 1,161 Yens. When the pesticide quantity changes from -30 percent to -100 percent (organic), group A respondents are willing to pay 2,767 Yens while in group B respondents are willing to pay 1,863 Yens. Through this result we understand that the group aware of stork conservation in the region is willing to pay more for conservation activities than the group that is not aware or a little bit aware of the situation. Secondly, let's compare the statistically different sign condition when it is pooled data and when it is divided in two.

The result concerning the brand's estimated coefficient was greatly different in this case. Group A, the aware group with the knowledge that stork populations had been revived because of changes in agricultural practice, shows a positive sign though the estimated coefficient of the brand is statistically significant at the 1 percent level. The estimated coefficient for group B, the unaware group without the knowledge, shows no statistically significant preference even at a 10 percent level. In other words, it shows that group A acknowledges Stork rice brand has additional value while group B does not. Moreover, the estimated coefficient of twice biodiversity had statistical significance at the 1 percent level and the estimated coefficient of three times biodiversity had statistical significance at the 10 percent level in group A with knowledge; and the sign was positive. Moreover, though the estimated coefficient for twice biodiversity is bigger than that for three times biodiversity, the coefficients of these two shows no statistically significant difference because each MWTP is in the other 95 percent confident interval of MWTP. The situation in the twice and three times biodiversity situations could not be clearly explained. So future study is necessary as the result that has been evaluated only shows that biodiversity is preferred over the current state. On the other hand, group B without knowledge did not indicate a significant difference either at the 10 percent level by the estimated coefficient of the twice and three times biodiversity. This value of increasing biodiversity was detected in group A with knowledge but not in group B without knowledge.

DISCUSSION

It can be assumed that the respondents who knew about stork conservation in Toyooka had greater interest in environmental preservation and were not only valuing the positive health aspects but also including the aspect of natural environment-related conservation in the value of the Stork rice. On the other hand, the concern of the respondents who did not know or knew only a little about environmental preservation was relatively low. Even though the value of Stork rice as a means of conservation to increase the number of living storks was acknowledged, the WTP for biodiversity that is the basis of stork conservation through the Stork rice price was not so high, especially for the average consumer. Actually, a part of the revenue from Stork rice sales is contributed to the Toyooka stork fund, and used to prepare the habitat by constructing storks' feeding station etc. The group "with knowledge" was expected to express positive approval of such activity and buy the Stork rice for biodiversity conservation even at a high price. On the other hand, the group "without knowledge" was expected to make no positive contribution to the fund as they had little interest in general

ecosystem conservation, although they were interested in the increase of the stork population. Considering the circumstances mentioned above, the value of biodiversity as a public good was clarified, and the consumer who paid extra for biodiversity conservation was limited despite their high interest in buying Stork rice.

CONCLUSION

In this study on Stork rice, we focused on analyzing whether agricultural products can command higher prices by granting the product a life brand, and whether it is possible to add the value of public good such as biodiversity to agricultural product prices. *A priori*, Stork rice consumers were expected to show more environmental awareness than general consumers but the replies of many respondents attached greater importance to their health than to stork conservation in Toyooka. Similarly, they were more aware of agricultural practices than environmental conservation measures in Toyooka. We also found that the willingness to pay increases with the level of awareness of agricultural practices and on biodiversity conservation. On the other hand, research shows that consumers who bought Stock rice for reasons of reduced pesticides or because it is organically grown, without knowing that the stork population had revived as a result of these initiatives, were reticent to buy expensive agricultural products for the purpose of biodiversity conservation. As such, they are able to become free riders. Such a consumer would actually be a majority purchaser of Japanese agricultural products. Thus, this study clarified that to promote biodiversity conservation as one of the important aspects on multi-functionality of agriculture by producing and selling life brand agricultural products is difficult, as theoretically foreseen due to the characteristics of public good. Therefore, governmental supports are indispensable for biodiversity conservation. Although life brand advertises biodiversity conservation in rural regions, the additional value placed on these products by the average consumer appears to be centered only on the health and safety of the individual consumer. The limitation of this research is that we focused only on Stork rice consumers. To improve our analysis and get a better overview on willingness to pay, more general consumers of different classes need to be questioned.

- Note

1) As to the research that applies the focus to this study, for instance, see the reference such as Yoshida and Peterson (2003).
2) The questionnaire is 3 pages long and needs 10 minutes to answer when people read it slowly. Therefore collecting the questionnaire in the store is the general rule but it can also be collected by mail for the convenience of respondents and traders.
3) Originally, the number of questionnaires distributed to each trader was efficiently proportional to the amount of rice handled. However, such a method was adopted from the viewpoint of hidden data because it connected the number of distributions while clarifying the amount each trader was handling.

4) The questionnaire isn't limited only to the 2008 buyer of "Stork-rising rice" but also to the 2007 buyer and their annual outputs.. The rice is respected and well known in the trade.
5) The value in 2005 was quoted from National Institute of Population and Social Security Research (2010) regarding the average number of household members.
6) 59kg/year (the roughly estimated value in 2008) was quoted from the Ministry of Agriculture, Forestry and Fisheries "Food supply and demand figures", this was divided by 12 months, and the rice consumption of per month and per person was thereby estimated.
7) (ln(29)-ln(2))×414=(3.367-0.693)×414=1107

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