Will Consumers Support Green Innovation Products? A Study of Consumers' Choice Preference Towards Bio-Concentrated Liquid Fertilizers

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https://doi.org/10.5109/4772413

出版情報：九州大学大学院農学研究院紀要. 67 (1), pp.75-82, 2022. Faculty of Agriculture, Kyushu University
バージョン：
権利関係：

J. Fac. Agr., Kyushu Univ., **67** (1), 75–82 (2022)

Will Consumers Support Green Innovation Products? A Study of Consumers' Choice Preference Towards Bio–Concentrated Liquid Fertilizers

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(*Received October 7, 2021 and accepted November 5, 2021*)

Recently in Japan, under the context of increasing environmental concern, an increasing number of consumers are more likely to purchase green products. Bio–concentrated liquid fertilizer (Bio–CLF), an innovation derived from current methane fermentation liquid fertilizers, will help to produce a new kind of green product in the future. This study used conditional logistic regression to analyze Tokyo, Osaka and Fukuoka consumers' preferences for Bio–CLF rice. The results showed that when compared with ordinary organic fertilizer, although the rice cultivated by Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*) suffered a negative reputation among consumers, the marginal willingness to pay (MWTP) of the Bio–CLF rice is still higher than that of most chemical fertilizer–cultivated rice. Additionally, when considering consumers' income, knowledge of organic fertilizer raw materials, and green product purchase intention, the MWTP of the Bio–CLF rice will be much higher. This study will contribute to providing basic analysis data of Bio–CLF and help to popularize Bio–CLF, increase the utilization rate of methane fermentation digested liquid fertilizer, and eventually improve the environment.

Key words: Choice Experiment, Conditional logistic model, Consumer evaluation, Green innovation products, Methane fermentation digested liquid fertilizer

INTRODUCTION

When people's concern about the environment is increased, consumption behaviors would become more environmentally responsible, and they would shift their purchase patterns by buying green products (Kilbourne and Pickett, 2008). In recent years in Japan, in the context of increasing environmental concern, an increasing number of consumers are more likely to purchase green products[1].

According to Shrum *et al*. (1995), a green product is a product that is produced while concerned with the physical environment, such as air, water, and land. It constitutes at least one means of resolving problems related to waste, noise, and general detriment to ecology, and is an avenue for generating beneficial products and services (Lin and Huang, 2012). Based on this definition, rice cultivated by liquid fertilizer, which comes from methane fermentation, is considered a green product. Methane fermentation is a useful method for producing biogas as energy and digested liquid as fertilizer using local biomass resources such as animal waste, farm, and crop processing waste, kitchen food waste, slaughterhouse waste, and human excreta (Zackariah and Tanaka, 2019). The use of methane fermentation–digested liquid fertilizer can indirectly reduce greenhouse gas emissions (Zackariah and Tanaka, 2019).

This kind of liquid fertilizer has been used to produce green products in several areas in Japan, such as Yamaga, Kumamoto prefecture, Oki and Chikujo, Fukuoka prefecture, and so on (Hai *et al*., 2017). However, due to the reason that the area of most of the paddy fields in Japan is small which cause high cost and problems (such as handing, transportation (Haga *et al*., 1979)) to use it. Currently, the utilization rate and spreading efficiency of liquid fertilizers in Japan are still low. Additionally, adjusting the ingredients of the fertilizer is difficult. Ohdoi *et al*. (2013) highlighted that the liquid fertilizer contains a total nitrogen of only 0.2%–0.4%, and because the liquid fertilizer has to be applied to paddy fields at 2–4 kg/m^2; consequently, it has to be transported from the facility to a paddy field. Moreover, the number of transportation vacuum trucks in methane fermentation facilities is limited; hence, when a suitable period for fertilizer spread is coming, farmers have to wait for the spreader. These problems lead to a low utilization rate of digested liquid fertilizer, and methane fermentation facilities maintained by the local government have to pay a high cost for dealing with digested liquid to discharge it into the river.

Yabe (2019) developed an innovative technology based on liquid fertilizer derived from methane fermentation digested liquid, which is called bio–concentrated liquid fertilizer (Bio–CLF) to solve the problems above.

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[1] Take organic food as an example, when compared with 2009, the percentage of consumers who is "almost all purchased foods are 'organic'" increased from 0.90% to 1.68% in 2017, and the purchase amount increased from 62.4 billion yen to 115.7 billion yen (Ministry of Agriculture, Forestry and Fishery, 2019).

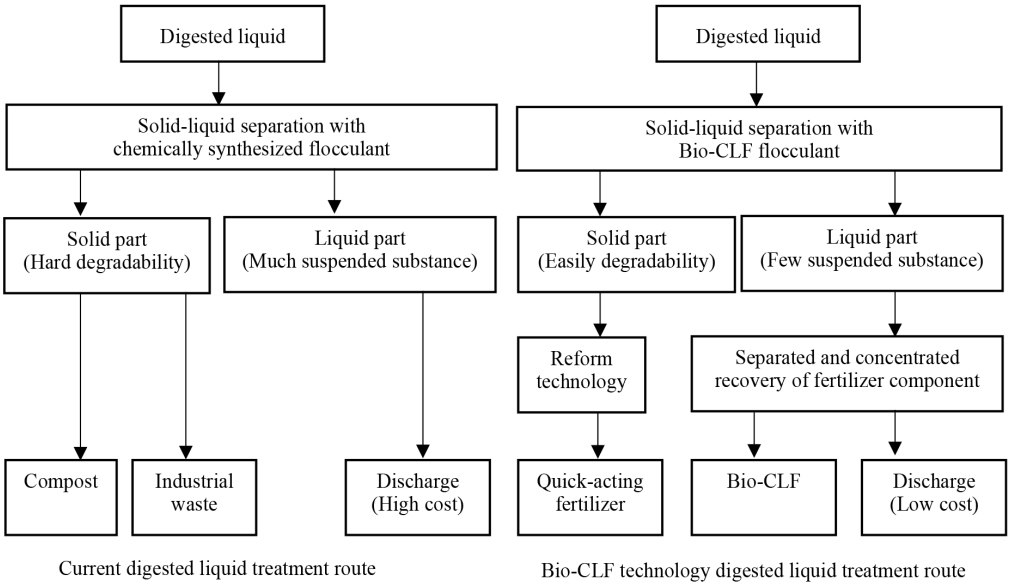

Fig. 1. Comparative of current and Bio–CLF technology digested liquid treatment route. Source: Yabe, (2019)

The difference between the current technology and Bio–CLF technology is shown in Figure 1.

Currently, under the laboratory level, Bio–CLF will help the farmer to save the spread cost by 2,000 yen/ton and as it is concentrated, it will easily be transported Yabe (2019). Additionally, Bio–CLF can also be spread in a horticultural facility and hydroponic soil cultivation where the liquid fertilizer cannot be spread before[2].

However, as (Jansson *et al.*, 2010) said, the development of less environmentally harmful products is not effective without consumers adopting greener technologies and lifestyles. Hence, it is important to determine whether the consumer will support the green innovation product that uses Bio–CLF, and what kind of consumer will purchase it is not clear now. Consequently, the objective of this study is to fill this gap. The results of this study will contribute to popularizing Bio–CLF, increase the utilization rate of methane fermentation digested liquid fertilizer, and eventually improve the environment.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

Income influences consumers' choice preferences towards green products. Moreover, this is positively correlated with environmental sensitivity (Finisterra do Paço and Raposo, 2010). Rawat (2015) found that an annual income increase correlates with increased environmental concern among the people. Additionally, Straughan and Roberts (1999) highlighted that individuals with higher income levels can bear the marginal cost increase associated with supporting green causes and favoring green product offerings. Most green products have higher prices than conventional products (Akehurst *et al.*, 2012). Consequently, we hypothesize the following:

H1: Consumers who have higher income will prefer Bio–CLF products.

Moreover, knowledge influences consumers' choice preferences for green products. Knowledge gained from the previous purchase process influences consumers' next purchases (Young *et al.*, 2010). Additionally, as Rokicka (2002) highlighted, people with high ecological knowledge exhibit much better environmentally friendly behavior. However, various types of consumers may have diverse levels of environmental knowledge (Awad, 2011). Regarding green consumers, knowledge of green consumption positively affects consumers' green use behavior and attitude toward green products (Zhao *et al.*, 2014). Previous studies have confirmed the same relationship (Khan *et al.*, 2020; Kim *et al.*, 2016; Wulandari *et al.*, 2015).

In this study, we use consumers' knowledge of the raw materials of ordinary organic fertilizer[3] as a knowledge variable. The raw materials of Bio–CLF are food waste, sake brewing waste, and milk waste. Providing consumers a negative image of Bio–CLF, which may deteriorate consumers' reputation towards Bio–CLF, is simple. However, the raw materials of ordinary organic fertilizer are similar to those of Bio–CLF, which is a waste. Hence, we hypothesize the following:

[2] Ordinary liquid fertilizer contains suspended substance which may lead to horticultural facilities' pipe clogging problem. Hence, ordinary liquid fertilizer is main be used to spray the large–scale land–use crops.

[3] According to Japan Agricultural Standards, we defined the organic fertilizer raw materials as oil cake, livestock manure, bone meal, wood ash.

H2: Consumers who have knowledge of ordinary organic fertilizers prefer Bio–CLF products.

Previous purchase or use of experience is instrumental in consumers' choice preferences toward an innovative product. Jansson *et al.* (2010) mentioned that consumers' previous adoption was significantly associated with future willingness to adopt the same eco–innovation. Moreover, as Thøgersen *et al.* (2010) highlighted, past experience with using ecolabels influences people's adoption of a new ecolabel. Previous studies have demonstrated that prior experience with mobile ticketing services is one of the strongest predictors of the intention for adopting innovative mobile payment services (Mallat *et al.*, 2007). The relationship between previous purchase/use experience and consumers' adoption of innovative products has also been confirmed in many previous studies (Ashour and Al–Qirem, 2021; Cajita *et al.*, 2018; Mzembe *et al.*, 2021; Semenova and Rudakova, 2016).

In this study, we considered that the Bio–CLF product is a green product. Because there is no Bio–CLF product before, we use the purchase experience of other green products instead of Bio–CLF product purchasing experience[4].

Considering other green products, Japan has two levels of cultivation methods: "conventional cultivation," which uses chemically synthesized pesticides and is the traditional cultivation method, and "Reduced pesticide cultivation," which uses less than half the amount of chemically synthesized pests (Nishimura, 2021). Crops produced in the latter method called "specially cultivated agricultural products" are considered as kinds of green products, as it required producers to reduce chemical fertilizer (by amount) and pesticide (by frequency of application) use by 50% towards the conventional level of the region (Tyunina and Yamaji, 2017). Additionally, cultivated organic products strictly refer to the "Japanese agricultural standards" and are considered green products. This reduces pollution, conserves water, increases soil fertility, and uses less energy (Kumar *et al.*, 2014). Hence, we consider attendees who have purchased organic rice or specially cultivated agricultural rice to have purchase experience with green products. Based on the previous studies above, we hypothesize the following:

H3: Consumers who have prior purchase experience of green products prefer Bio–CLF products.

METHODOLOGY

Analysis Model

Conditional logistic regression is the standard tool for the analysis of matched case–control studies (Heinze and Puhr, 2010). Hence, this study determines consumers' preference for Bio–CLF, which consists of food, sake brewing, and milk wastes. Hence, each experiment attendee will face several choice sets as we have controlled for the characteristics of the attendees.

Conditional logistic regression is based on the random utility theory, which was derived from McFadden (1973). Referring to Bateman (2002), the functions of conditional logistic regression are described as follows:

Suppose that a consumer's preferences can be represented by the utility function U as follows:

$$U = U(X_1, \ldots, X_m) \tag{1}$$

The utility of this consumer depends on the level of the marketed goods and services consumed, X=1, …, m. This is because unobservable elements and those observed with error in X are present. The utility function is rewritten into two parts: one deterministic and observable, $V(\cdot)$, and an error part $e(\cdot)$ where the bold letters represent the vectors as follows:

$$U = U(X_1, \ldots, X_m) = V(\boldsymbol{X}) + e(\boldsymbol{X}) \tag{2}$$

In the choice experiment, attendee i is asked to choose one good among alternatives, which are assumed to be differentiated by attributes and levels. Considering that two alternatives exist, g and h, when attendee i selects alternative g, the utility when attendee selected g is then larger than that of h. As stated in Eq. (3) as follows:

$$U_{ig} > U_{ih} = (V_{ig} + e_{ig}) > (V_{ih} + e_{ih}) \tag{3}$$

Additionally, when consumers select products, considering the error term to consider unobservable factors (e.g., the effect of taste on a specific brand) is necessary. However, as shown in Eq. (3), the utility function has an error term (e), which makes comparing utility functions impossible. Therefore, the comparison of utility becomes a comparison of probability, which is expressed by Eq. (4) as follows:

$$P[(V_{ig} + e_{ig}) > (V_{ih} + e_{ih})] = P[(V_{ig} - V_{ih}) > (e_{ih} - e_{ig})] \tag{4}$$

Eq. (4) means that attendee i will choose alternative g over h if the difference in the deterministic parts (V_{ig}–V_{ih}) exceeds that in the error parts (e_{ih}–e_{ig}).

Typically, we assumed that the error term (e) was independently and identically distributed with the Gumbel distribution. Eq. (4) can then be expressed in terms of the logistic distribution in Eq. (5), where j represents all alternatives, and μ is a scale parameter that is typically equal to 1. This specification is known as a conditional logit model as follows:

[4] Strictly speaking, the purchase experience of ordinary liquid fertilizer product is properly way, however, unlike organic food or specially cultivated agricultural product. There is no specified criteria of ordinary liquid fertilizer product, consumers are unaware of whether the product is cultivated by ordinary liquid fertilizer or not. Hence, it is impossible to get the sample.

$$P(U_{ig} > U_{ih}) = \frac{\exp(\mu V_{ig})}{\sum_j \exp(\mu V_{ij})} \quad (5)$$

The log–likelihood function is shown below, where y_{ig} is an indicator variable that takes a value of 1 if attendee i chooses alternative g and zero if otherwise:

$$\log L = \sum_i \sum_g y_{ig} \log [\frac{\exp(V_{ig})}{\sum_j \exp(V_{ij})}] \quad (6)$$

Designing the Choice Experiment

In this study, we designed a choice experiment refers to (Louviere *et al*., 2000). The attributes and levels of the alternatives are presented in Table 1 as follows:

We refer to the study by Aizaki (2015) and use a mix–and–match design that completely designs 20 choice sets and divides them into four versions, each contains five choice sets. Choice set sample is shown in Fig. 2.

Data collection and sample characteristics

We collected data through an Internet survey administered in Japan through a market–research company, Cross Marketing Inc. The data collection period was from Jan 4 to Jan 6, 2021. The target respondent was aged 20 years or older. The sample was collected from an individual enrolled in Cross Marketing, Inc. Using random sampling, data from 1,000, 500 and 500 respondents in Tokyo, Osaka prefecture and Fukuoka prefecture, respectively, were finally stratified and extracted according to the age ratio of each local government.

To help respondents obtain an image of Bio–CLF, we present pictures to show the difference between the appearance of Bio–CLF and ordinary liquid fertilizer. Subsequently, we reveal the merits and demerits of Bio–CLF, and the materials of Bio–CLF.

We note the samples that did not reply to income. Finally, 781 attendees from Tokyo, 380 attendees from Osaka, and 385 attendees from Fukuoka were selected for analysis. The description of the sample characteristics is presented in Table 2.

RESULTS

The results are shown in Table 3. When compared with ordinary organic fertilizer rice, rice cultivated by Bio–CLF raw materials (*food waste*, *sake brewing waste*, and *milk waste*) received a negative reputation from consumers in three areas (Tokyo, Osaka and Fukuoka). The marginal willingness to pay (MWTP) of *Food waste* from three areas ranges from –378.7 to –997.1. This means that when compared with ordinary organic rice, consumers are willing to pay a lower price range at 378.7 to 997.1 for Bio–CLF (*Food waste*) rice. Similarly, the MWTP of Bio–CLF (*sake brewing waste*) rice from three areas ranges from –503.7 to –964.2. The MWTP of Bio–CLF (*milk waste*) rice from three areas ranges from –441.9 to –1507.8.

In conditional logit regression, evaluating consumers' personal characteristic variables by multiplying them with attribute variables[5] and putting the cross term into the model is possible (Aizaki and Nishimura, 2007).

Table 1. The attributes and levels of Bio–CLF used in the choice experiment study

Attribute	Levels	Description
1. Types of spray fertilizer	4	Ordinary organic fertilizer; Bio–CLF (Food waste); Bio–CLF (Sake brewing waste); Bio–CLF (Milk waste)
2. Source of raw materials	2	Local area; Else area
3. Price (yen/5 kg)	6	2,000; 2,200; 2,500; 2,800; 3,100; 3,500.

Note: Local area means the municipality area where the attendee belongs to.
Source: Author

If there is a kind of rice grown by Bio-CLF which without using chemical fertilizer is sold in the market where you always used, or in Internet shop as shown below. Which one will you choose? One thing should be noticed is that the variety and taste of the rice below are the same.

	Option A	Option B	I don't buy either
Types of spray fertilizer	Ordinary organic fertilizer	Bio-CLF (Sake brewing waste)	—
Source of raw materials	Else area	Local area	—
Price (yen/5kg)	3,100 yen	2,800 yen	—
Option	□1	□2	□3

Fig. 2. Example of a Bio–CLF rice choice set.

[5] In this study, attribute variables are *Food waste*, *Sake brewing waste*, and *Milk waste*.

Table 2. The description of sample characteristics.

Variable	Definition	Tokyo		Osaka		Fukuoka	
		Mean	SD	Mean	SD	Mean	SD
Sex	0 = Female, 1 = Male	0.55	0.50	0.54	0.50	0.53	0.50
Age	Year	45.30	14.10	45.87	14.45	45.42	14.68
Marriage	0 = Unmarried, 1 = married	0.54	0.50	0.63	0.48	0.61	0.49
Family	Family members	2.32	1.27	2.54	1.17	2.60	1.32
Image	The image of the word "Organic".	0.42	0.49	0.36	0.48	0.34	0.47
	0 = else, 1 = I know						
Knowledge	The knowledge of organic fertilizer material.	0.32	0.47	0.20	0.40	0.28	0.45
	0 = else, 1 = I know						
WillBuy	The will of buying organic rice or specially cultivated rice.	0.50	0.50	0.46	0.50	0.47	0.50
	0 = else, 1 = I want to buy						
Income	Family totally Income.	3.68	1.86	3.31	1.57	3.01	1.49
	1 = under 2 million yen,						
	2 = above 2 million, under 4 million yen,						
	3 = above 4 million, under 6 million yen,						
	4 = above 6 million, under 8 million yen,						
	5 = above 8 million, under 10 million yen,						
	6 = above 10 million, under 12 million yen,						
	7 = above 12 million yen.						
Observation		11715		5700		5775	

Source: Author

Table 3. The results of consumers' choice preference towards Bio–CLF raw materials

	Tokyo			Osaka			Fukuoka		
	Coef.	SE	MWTP	Coef.	SE	MWTP	Coef.	SE	MWTP
ASC	2.435***	0.175		2.740***	0.262		2.211***	0.256	
Price	–0.001***	0.000		–0.001***	0.000		–0.001***	0.000	
Material area	–0.177	0.132	*–158.1*	–0.017	0.200	*–12.9*	0.086	0.199	*75.2*
Food waste	–1.079***	0.156	–964.6	–0.504**	0.235	–378.7	–1.138***	0.234	–997.1
Sake brewing waste	–1.074***	0.171	–960.2	–0.671***	0.258	–503.7	–1.101***	0.249	–964.2
Milk waste	–0.846***	0.170	–756.6	–0.589**	0.270	–441.9	–1.721***	0.272	–1507.8
*Income*Area*	0.048*	0.028	42.7	0.012	0.049	*8.7*	0.009	0.052	*8.0*
*Income*Food*	0.059*	0.031	52.5	–0.048	0.052	*–36.0*	0.154***	0.056	135.1
*Income*Sake*	–0.006	0.035	*–5.4*	–0.057	0.060	*–42.9*	0.145**	0.059	126.8
*Income*Milk*	0.022	0.035	*20.0*	–0.003	0.062	*–2.3*	0.288***	0.066	252.1
*Knowledge*Area*	–0.099	0.115	*–88.6*	0.258	0.193	*193.8*	0.045	0.177	*39.2*
*Knowledge*Food*	0.436***	0.122	390.0	0.526**	0.207	394.6	–0.300	0.196	*–262.9*
*Knowledge*Sake*	0.480***	0.140	428.9	0.552**	0.245	414.0	0.111	0.220	*97.2*
*Knowledge*Milk*	0.345**	0.144	308.0	0.133	0.238	*100.1*	0.167	0.218	*146.4*
*Willbuy*Area*	0.321***	0.112	286.6	0.226	0.164	*169.4*	0.384**	0.164	336.4
*Willbuy*Food*	0.907***	0.119	810.7	0.815***	0.174	612.1	1.254***	0.179	1098.4
*Willbuy*Sake*	1.251***	0.136	1118.0	1.160***	0.196	870.7	0.993***	0.196	870.1
*Willbuy*Milk*	0.916***	0.139	818.5	0.758***	0.202	569.0	1.426***	0.202	1248.9
Observations		11715			5700			5775	
Log–Likelihood		–3642.75			–1707.50			–1722.61	
Adjusted McFadden's R–squared		0.15			0.17			0.18	

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

If the coefficients are not significant, the marginal willingness to pay (MWTP) is unreliable and italics are used to show the MWTP.

Source: Author

Consequently, consumers' personal characteristics are variable. We find that *Income*Food* received positive reputation from Tokyo consumers and *Income*Food*, *Income*Sake*, and *Income*Milk* received a positive reputation from Fukuoka consumers. When *income* increases by one unit, MWTP of Tokyo consumers towards Bio–CLF (*Food*) rice increase 52.5 yen/5 kg. The MWTP of Fukuoka consumers towards Bio–CLF (*Food, Sake*, *Milk*) rice are 135.1 yen/5 kg, 126.8 yen/5 kg, and 252.1 yen/5 kg, respectively.

Additionally, *Knowledge*Food*, *Knowledge*Sake*, and *Knowledge*Milk* received a positive reputation from Tokyo consumers, and *Knowledge*Food* and *Knowledge*Sake* received a positive reputation from Osaka consumers. Hence, when compared with those consumers with no knowledge regarding organic fertilizer material, consumers who have the knowledge will pay more for Bio–CLF (*Food*, *Sake*, *Milk*) rice at 390.0 yen/5 kg, 428.9 yen/5 kg, and 308.0 yen/5 kg in Tokyo. Moreover, they will pay more for Bio–CLF (*Food, Sake*) rice at 394.6 yen/5 kg and 414.0 yen/5 kg in Osaka.

Moreover, we should highlight that *Willbuy*Food*, *Willbuy*Sake*, and *Willbuy*Milk* received a positive reputation from three areas, supporting H3. This means that in three areas, consumers who have green rice purchase experience pay more for Bio–CLF (*Food*, *Sake*, *Milk*) rice compared to consumers who do not have green rice purchase experience.

DISCUSSION

The rice cultivated by raw materials of Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*) received a negative reputation from consumers in the three areas. It should be emphasized that the benchmark was ordinary organic rice. We estimate that the cheapest ordinary organic rice is around 3,500 yen/5 kg[6]. In contrast, the average price of chemical fertilizer–cultivated rice is around 2,000 yen/5 kg[6]. Hence, based on the MWTP of Bio–CLF rice from Table 3, consumers are considered willing to pay for Bio–CLF (*food waste*) rice between a price range from 2,503 yen/5 kg to 3,121 yen/5 kg. For Bio–CLF (*sake brewing waste*) rice, price ranges from 2,536 yen/5 kg to 2,996 yen/5 kg. For Bio–CLF (*milk waste*) rice price ranges from 1,992 yen/5 kg to 3,058 yen/5 kg. Finally, consumers are pay for Bio–CLF rice between a price range from 1,992 yen/5 kg to 3,121 yen/5 kg, wherein price is higher than most chemical fertilizer–cultivated rice.

Additionally, when compared with ordinary consumers, green consumers are shown to have a favorable position in relation to environmental aspects, such as environmentally friendly buying behavior, recycling, and resource–saving (Finisterra do Paço and Raposo, 2010). These green behaviors are generally associated with green consumption, which is defined as consumer goods that neither cause pollution nor damage the natural environment and those that encourage consumers to act with a sense of social awareness and social responsibility (Paço *et al*., 2019). Hence, these conclusions are presented in Table 3. According to Table 3, we can clarify that when considering consumers' knowledge of organic fertilizer and consumers' green purchase intention, consumers' willingness to pay for Bio–CLF rice is much higher.

Simulated price presented sufficient incentive for conventional cultivate farmers to use Bio–CLF. Moreover, to expand the market of the Bio–CLF product in the future and eventually improve the agricultural environment, we provide some advice for Bio–CLF product sellers: First, showing and explaining the details of the raw materials of Bio–CLF and allowing consumers to comprehend Bio–CLF is necessary. Second, since green consumers showed much more interest compared to ordinary consumers toward Bio–CLF products, combining Bio–CLF products together with other green products can promote Bio–CLF products. Third, consumers with higher income showed greater utility toward Bio–CLF products than lower–income consumers and sold Bio–CLF products in the senior market.

However, this study has some limitations. First, the samples originate from Japan's main cities (Tokyo, Osaka and Fukuoka), which may not represent all Japanese consumers. Second, this study uses an extremely strict restraint wherein we hypothesize that all consumers have the same personal attributes. Finally, in future studies, models considering consumers' personal attributes, such as the mixed logit model and latent class model, are suggested to analyze consumers' choice preferences for the raw materials of Bio–CLF rice.

CONCLUSION

Recently in Japan, in the context of increasing environmental concern, an increasing number of consumers are more likely to purchase green products. Bio–CLF, as an innovation of current methane fermentation liquid fertilizer, will help to produce new kinds of green products in the future. However, consumers' preference for Bio–CLF have not been clarified. In this study, we used conditional logistic regression to determine answers.

Comparing consumers from three main cities (Tokyo, Osaka and Fukuoka), we found that when compared with ordinary organic fertilizer, and although the rice cultivated by Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*) suffered a negative reputation among consumers, the MWTP of the Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*) rice remains higher than most of the chemical fertilizer–cultivated rice. Additionally, when considering consumers' income, knowledge of organic fertilizer raw materials, and green product purchase intention, the MWTP of Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*) rice will be much higher. Particularly, consumers' green product purchase intention shows a significant

[6] According to amazon.co.jp.

positive influence on the MWTP of the Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*) in three research areas, which constitutes a significant policy implication for Bio–CLF product sellers.

This study found that consumers' preference for Bio–CLF (*food waste*, *sake brewing waste*, and *milk waste*), which contributes to providing basic analysis data of Bio–CLF and help to popularize Bio–CLF, increase utilization rate of methane fermentation digested liquid fertilizer, and, eventually, improve the environment.

AUTHOR CONTRIBUTIONS

Y. Takahashi and Z. Wu designed the study. Z. Wu analyzed the data and wrote the manuscript. M. Yabe participated in the study design and supervised the study. Y. Takahashi assisted in editing the manuscript and approved the final version.

ACKNOWLEDGEMENTS

This work was supported by JSPS KAKENHI (grant number 19K12445). And we would like to thank Editage (www.editage.com) for English language editing.

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