Consumer Behavior toward Eco-Friendly Agricultural Products: An Analytical Survey of Households with Children

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***Abstract*—Recently, there have been movements promoting eco-friendly agriculture around the world. According to the Organic Research Center (ORC), improving agricultural productivity over the past decades has faced challenges such as soil degradation, biodiversity loss, water pollution, climate change, and ocean dead zones. The government and local authorities in Japan promote eco-friendly agriculture. However, according to The Research Institute of Organic Agriculture (FiBL) and International Federation of Organic Agriculture Movements Organics International (IFOAM), the proportion of organic farmland relative to total farmland is low in Japan. This situation is considered to be the result of the lack of widespread adoption of eco-friendly agricultural products. This study analyzes consumer behavior toward eco-friendly products using data from a questionnaire survey. The current situation and consumer behavior were researched. The results of the analysis showed that consumers prefer eco-friendly products not only because of environmental awareness and safety concerns, but also because of their good taste.**

***Keywords*—consumer behavior, eco-friendly agricultural products marketing, organic, reduced-pesticide use**

I. Introduction

This study defines agricultural products referred to as organic, pesticides-free, or reduced- pesticide as "eco-friendly agricultural products."

In recent years, a global trend towards promoting eco-friendly agriculture has emerged. According to the Organic Research Center (ORC), current agricultural practices necessitate addressing challenges such as soil degradation due to increased productivity, loss of biodiversity, water pollution, and climate change (Organic Research Center, 2019). Consequently, awareness of sustainable agriculture and environmentally conscious initiatives is also growing. Following this trend, the European Union (EU) has set a target to convert 25% of its farmland to organic by 2030 (Counsil of the European Union, 2021). Furthermore, organic agriculture is expanding beyond Europe and North America, beginning to take root in Asia. As of 2022, India ranked second, next to Australia, the country with the largest area of organic farmland (FiBL, 2024a). Furthermore, movements toward expanding organic agriculture, including increases in organic farmland area and the number of organic producers, are being reported worldwide. The area dedicated to organic farming increased by 26.6% in 2022 compared to 2021 (FiBL, 2024a).

As a result of these trends, among the top 10 countries with the highest percentage of organic farmland as a share of total agricultural land in 2022, 8 were European countries. Similarly, among the top 10 countries for per capita organic consumption, 8 were also European countries (Tables 1 and 2).

Table 1. Top 10 countries with the highest percentage of organic agricultural land as a share of total agricultural land in 2022 (FiBL, 2024b)

Ranking	Country	Organic share (%)
1	Liechtenstein	43.9
2	Austria	27.5
3	Estonia	23.4
4	Sao Tome and Principe	21.1
5	Sweden	19.9
6	Uruguay	19.6
7	Portugal	19.1
8	Italy	17.9
9	Switzerland	17.9
10	Greece	17.6

Table 2. Organic shares of total agricultural land and per capita consumption by country 2022 (FiBL, 2024b)

Country	Organic Share (%)	Organic Share Ranking	Per Capita Consumption €/person	Per Capita Consumption Ranking
Switzerland	17.9	9	437	1
Denmark	11.5	17	365	2
Austria	27.5	2	274	3
Luxembourg	6.2	31	259	4
Sweden	19.9	5	248	5
Germany	11.2	18	181	6
France	10	22	176	7
United States of America	0.5	101	176	7
Canada	2.7	50	147	9
Norway	4.7	36	85	10
…				
Japan	0.3	112	13	24

In Japan, the total pesticide uses per unit of farmland decreased by 24% between 1990 and 2022 (UN FAO. Our World in Data, 2024). However, the share of organic farmland in the total farmland area are still low at 0.3% (Table 2), and the government has outlined future strategies.

One key approach is the Ministry of Agriculture, Forestry and Fisheries' "MIDORI Strategy" (2022), which aims to increase organic farming land to 25% of total farmland, reduce chemical pesticide use by 50% (risk-adjusted), and cut chemical fertilizer use by 30% by 2050 (Ministry of Agriculture, Forestry and Fisheries).

Additionally, the Tokyo Metropolitan Government's "Basic Plan for Promoting Business Activities that Reduce Environmental Burden" (2023) promotes the "Tokyo Eco-Agricultural Products Certification System" to deliver safe and secure agricultural products to consumers and spread environmentally sustainable agriculture (Tokyo Metropolitan Government, 2023; Tokyo Metropolitan Government Bureau of Industrial and Labor Affairs). The certification is divided

into three tiers: a reduction of 25% or more, or 50% or more, in chemical pesticides and chemical fertilizers; and no use of chemical pesticides or chemical fertilizers (Tokyo Metropolitan Government Bureau of Industrial and Labor Affairs). This allows certification without requiring a 100% reduction rate, potentially reducing the burden on farmers.

However, expanding organic farmland is considered to require also consumer involvement, not only effort of the governments. As shown in Table 2, countries with higher per capita organic consumption tend to have larger areas of organic farmland. Therefore, Japan's low per capita consumption may be preventing the growth of organic agriculture. This study analyzes consumer behavior toward eco-friendly products using data from a questionnaire survey.

II. Related Work

According to Yagi, while farmers engaged in organic agriculture have diverse views on the practice, the majority consider it as the "Act on the Promotion of Organic Agriculture" (Yagi, 2022). Furthermore, he suggested that the primary reason Participatory Guarantee Systems (PGS), which are quality assurance systems for organic agricultural products focused on local communities, has not been widely adopted in Japan is likely due to consumers' lack of awareness about food production. Even if consumers are aware, there has been no mechanism for consumer involvement. Additionally, for farmers who have not achieved organic Japanese Agricultural Standards (JAS) certification, the question comes up that whether achieving a new certification motivate them sufficiently. It is crucial not only to reduce the effort and economic burden of achieving certification, but also to demonstrate the value of organic agriculture that is not expressed under the Organic JAS certification system (Yagi, 2022). This is also stated (Yagi, 2014).

According to Singh, S. *et al*., perceived behavioral control is one's self-efficacy or belief that they can perform a behavior. For example, in looking at organic food, external barriers such as higher prices, scarcity and unavailability, unawareness of certification, or distrust in organic labeling can undermine perceived control. While individuals may want to buy organic, these structural and informational constraints may limit their abilities to act (Singh *et al.,* 2025).

According to Cachero-Martínez, S., regarding the main reason for consuming organic products in Spain, 40% of surveyed consumers indicated that organic products are healthier than other products, 19.5% that organic products are tastier than other products, and 15.4% that their production does not harm the environment (Cachero-Martínez, 2020).

Based on these findings, this study investigated Japanese consumers' awareness about eco-friendly agricultural products, including perception of certification systems.

III. Consumer Survey Results

A. Research Methods

This study conducted an online survey, examining everyday shopping habits, preferences and choices about eco-friendly agricultural products, and systems related to such products. Since many of these questions were conceptual, they were formulated as multiple-choice questions with four options. The survey targeted households raising children in The Greater Tokyo area (parents of kindergarteners and children enrolled in extracurricular activities). The survey was conducted from August 6 to 22, 2025. A total of 78 responses were collected.

B. Factors Influencing Purchasing Decisions for Agricultural Products

Fig. 1 shows the factors consumers typically prioritize when selecting vegetables and fruits. All respondents prioritized "freshness," and over 90% prioritized "price." Additionally, over 70% prioritized "seasonality," "appearance," and "origin." Therefore, these five factors were shown to be key considerations for consumers during purchasing the vegetables and fruits.

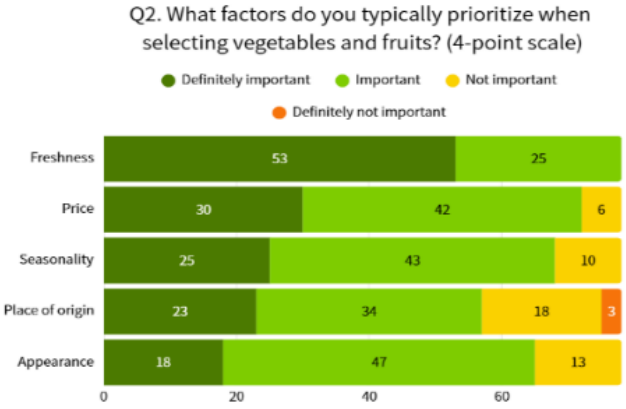

Fig. 1. Factors prioritized when purchasing agricultural products.

C. Consumer Behavior Toward Eco-Friendly Agricultural Products

About the frequency of purchasing eco-friendly agricultural products, 32.1% buy them often (once a week or more), 35.9% buy them occasionally (once a month or more), 26.9% rarely buy them (a few times a year), and 5.1% never buy them. This reveals that over two-thirds have opportunities to eat eco-friendly agricultural products in their daily lives (Fig. 2).

Fig. 2. Eco-friendly purchase frequency.

53 people, those who frequently buy eco-friendly products and those who buy it occasionally, revealed that "vegetables" were the most purchased items, followed by "fruit." (Fig. 3).

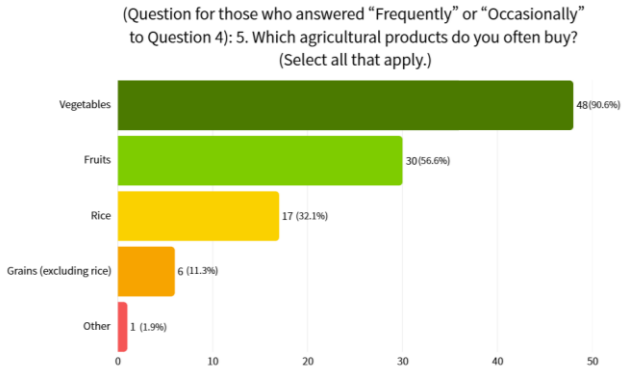

Fig. 3. Eco- friendly agricultural products selection.

Furthermore, a survey of 25 people who rarely or never buy eco-friendly agricultural products identified barriers to purchasing them. Among those who do not buy eco-friendly products, 75% cited "price" as a barrier, while 40% stated they "simply don't see them." (Fig. 4)

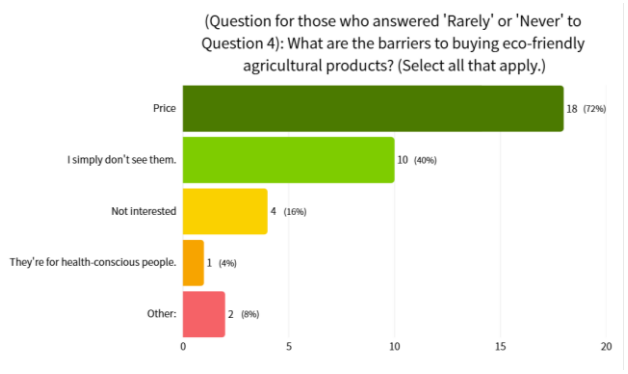

Fig. 4. Barriers of buying eco-friendly agricultural products.

D. Consumers' Perceptions of the Advantages and Disadvantages of Eco-Friendly Agricultural Products

The benefits of eco-friendly agricultural products were found to be more focused on personal health and well-being for oneself and one's family, such as "being able to eat with peace of mind" and "avoiding chemical intake," compared to environmental concerns like environmental issues. Furthermore, when collecting other potential benefits through open-ended responses, three answers related to health and safety systems were received, such as being able to eat vegetables with nutritious skins whole. Three answers related to the environment and sustainability were also obtained, such as being able to sell irregularly shaped products and reducing vegetable waste (Fig. 5).

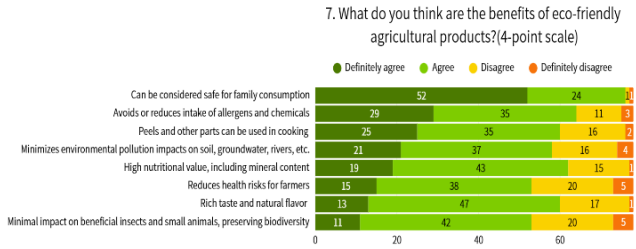

Fig. 5. Benefits of eco-friendly agricultural products.

About disadvantages, "price" was cited by about 90% of respondents, the most common concern, and this also tended to be higher for items personally relevant to them. Additionally, when collecting open-ended responses about other potential disadvantages, six responses mentioned supply and distribution issues like low production volume and difficulty obtaining products. Three responses highlighted quality and preservation issues, such as old products being displayed or organic vegetables received from acquaintances having bugs. This revealed that consumers also recognize the current limited distribution volume of eco-friendly agricultural products (Fig. 6).

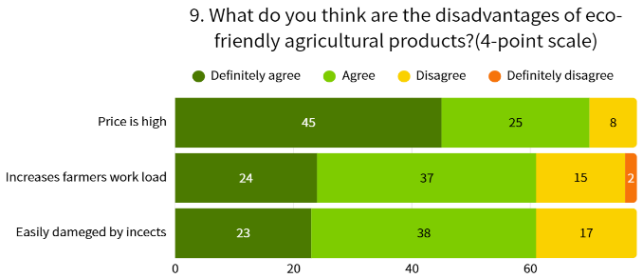

Fig. 6. Disadvantages of eco-friendly agricultural products.

E. Identifying Purchase Factors through Regression Analysis

Next, the reasons why people purchase eco-friendly agricultural products are analyzed.

Using data analysis tool of Microsoft Excel, a regression analysis was analyzed with the frequency of purchasing eco-friendly agricultural products as the dependent variable (y) and the benefits of eco-friendly agricultural products as the independent variable (x). The results showed that "can be considered safe for family consumption," "rich taste and natural flavor," and "minimizes environmental pollution impacts on soil, groundwater, rivers, etc." had a significant positive impact.

Table 3. Benefits of eco-friendly agricultural products

	Channels	Coef.	Std. Err.	T Stat	*p*-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
(a) Can be considered safe for family consumption (Q7-1)	Intercept	1.494	0.625	2.392	0.019	0.250	2.738	0.250	2.738
	X Variable	0.401	0.170	2.359	0.021	0.062	0.740	0.062	0.740
(b) Rich taste and natural flavor (Q7-2)	Intercept	1.843	0.448	4.113	9.8E−05	0.950	2.735	0.950	2.735
	X Variable	0.378	0.150	2.531	0.013	0.081	0.676	0.081	0.676
(c)Minimizes environmental pollution impacts on soil, groundwater, rivers, etc. (Q7-6)	Intercept	2.229	0.371	6.003	6.2E−08	1.490	2.969	1.490	2.969
	X Variable	0.243	0.121	2.010	0.048	0.002	0.484	0.002	0.484

Coef.: Coefficient, Std. Err: Standard Error.

Next, a regression analysis was analyzed with the frequency of purchasing eco-friendly agricultural products as the dependent variable (y) and the factor typically important to selecting vegetables and fruit as the independent variable (x). Analysis revealed that both Price (Q2-1) and Place of origin (Q2-3) have significant effects. However, since price

has a negative coefficient, it indicates a negative impact, while grown locally (Place of origin) has a positive effect.

Table 4. Relationship between purchase frequency and awareness. consumer purchase decision criteria

	Channels	Coef.	Std. Err.	T Stat	*p*-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
(a) Price (Q2-1)	Intercept	4.425	0.540	8.193	4.7E−12	3.349	5.500	3.349	5.500
	X Variable	−0.446	0.161	−2.778	0.007	−0.766	−0.126	−0.766	−0.126
(b) Place of origin (Q2-3)	Intercept	2.162	0.372	5.808	1.39E−07	1.421	2.909	1.421	2.904
	X Variable	0.263	0.120	2.191	0.032	0.024	0.503	0.024	0.503

Coef.: Coefficient, Std. Err: Standard Error

F. Display of Eco-Friendly Agricultural Products

Consumers were asked to list up to two places where they most frequently purchase or obtain vegetables and fruits. Supermarkets ranked first at 93.6%, followed by home delivery at 30.8%.

Next, the analysis investigated how eco-friendly products are displayed at the stores where consumers usually buy vegetables and fruits. While 47.4% (37 out of 78) reported that "eco-friendly products is grouped together in a dedicated section," over a quarter answered "don't know" or "don't pay attention," revealing a gap in awareness.

Table 5. Display of eco-friendly products

Display Method	Ratio (%)
Displayed together in the eco-friendly products section	47.4
Eco-friendly agriculture products are also displayed in the sections organized by vegetable type.	26.9
I don't really understand / I don't care	25.6

G. Awareness of Certification Systems

Awareness of Japan's main eco-friendly agricultural product certification systems was analyzed. While 83% knew about or had heard of Organic JAS, 74% responded that they were completely unaware of the Tokyo Metropolitan Eco-Friendly Agricultural Products Certification (Fig. 7).

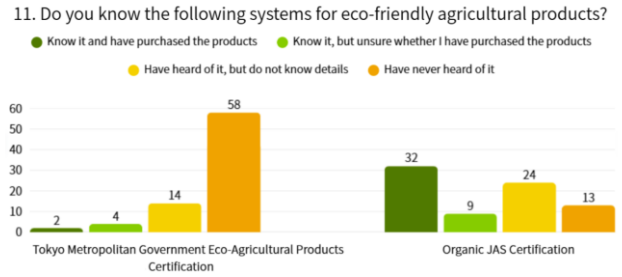

Fig. 7. Awareness of eco-friendly agricultural product certification systems.

IV. Discussion

Almost 70% of respondents purchase eco-friendly agricultural products at least once a month (3-C), suggesting these items are becoming relatively accessible. Vegetables and fruits, in particular, are agricultural products purchased frequently on a daily basis regardless of whether they are eco-friendly, making them likely easier to buy. Furthermore, high demand likely means there are many producers and a large volume in circulation.

Furthermore, among those who purchase eco-friendly products less frequently, some stated they simply don't see it or don't know where to find it. This suggests potential issues with how eco-friendly products is displayed. As shown in 3-F, Japanese consumers surveyed tend to be highly aware of dedicated sections for eco-friendly products. In contrast, when investigating storefronts in Australia at Fresh St Market IGA Atherton and Coles Spencer St, dedicated marks indicating eco-friendly products or "BIO" labels were clearly displayed on in-store signage. In Japan, signage often makes it difficult to discern organic status, requiring consumers to check packaging. This may contribute to eco-friendly products being less visible.

About who purchases eco-friendly products (3-D), in the section on benefits, "rich taste and natural flavor" ranked 6th in average score. However, the regression analysis in 3-E showed that factors like safety, richer taste, and reduced environmental impact positively influenced purchase frequency. This indicates that people who actually purchase eco-friendly products tend to do so because of the vegetables' inherent flavor. Therefore, we believe it is crucial for consumers to understand that eco-friendly products not only benefits the environment and is safe but also allows them to enjoy the true deliciousness of vegetables. This approach is also likely effective against the price disadvantage mentioned in 3-D. Currently, the limited distribution volume of eco-friendly products and higher production cost likely contributes to its higher price, making it important to increase awareness of its appeal.

Considering these points, to promote eco-friendly agricultural products, we can suggest displaying the Tokyo Eco-Friendly Agricultural Products Certification System in a, noticeable way and using eco-friendly products in cooking classes as an opportunity for people including children to experience the strong, authentic taste of vegetables.

First, while Organic JAS is the national certification system in Japan, the Tokyo Metropolitan Eco-Friendly Agricultural Products Certification System grants certification even with lower reduction rates of chemical pesticides and fertilizers, provided producers implement the required practices. Making producers' efforts clearly visible would increase consumer awareness of the system and make eco-friendly products easier to recognize on store shelves.

According to Uenishi (2022), highlighting high sugar content on in-store POP displays and packaging is effective based on consumer taste surveys and preference studies about strawberries. Findings from this study (our study) also suggest that highlighting the "rich taste and natural flavor" will be effective (Uenishi *et al.,* 2022).

Furthermore, cooking classes in schools allow students to learn about agricultural products using their five senses. Since eco-friendly agricultural products are also touched upon in Japanese home economics textbooks, introducing them during cooking classes could lead to an increase in consumers

purchasing eco-friendly agricultural products in the future.

Therefore, we consider that implementing what we proposed in this study could increase the number of consumers purchasing eco-friendly agricultural products, potentially leading to a further reduction in pesticide usage.

V. Conclusion

In this study, we analyzed consumer behavior toward eco-friendly agricultural products by conducting a survey of consumers in the household raising children. The results showed that nearly two-thirds of respondents regularly purchase eco-friendly agricultural products. Furthermore, the frequency of purchasing eco-friendly agricultural products was related to taste, safety, environmental consideration, and place of origin while price had a negative impact. It was also found that among those who rarely purchase eco-friendly products, some cited reasons like not knowing where to find them, indicating potential for consumer behavior, but also revealing that sales methods for eco-friendly agricultural products may not fully match consumer needs. Therefore, we believe it is crucial for consumers to recognize the inherent value of eco-friendly products such as rich taste and natural flavor.

This time, we conducted a survey among households raising children. For the future research, we aim to investigate differences based on other age groups, household circumstances, and whether respondents reside in urban areas where many shop by train or on foot, or in suburban areas where car shopping is more common. Furthermore, while this survey focused primarily on purchasing behavior, we plan to consider including detailed profiles in future surveys to enable deeper analysis.

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