

The Gap Between Early Adopters and Early Majority in the Diffusion of Environmentally Friendly Farming

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Abstract

As an increasing number of people have become interested in healthy and environmentally friendly farm products, the diffusion process of sustainable farming has been widely discussed. However, few studies have empirically investigated the differences between early adopters and early majority in diffusion of environmentally friendly farming. The purpose of this study is to examine the existence of the gap between early adopters and the early majority in the diffusion of environmentally friendly certified farm production by focusing on the case in which a frequent buyers program (FBP) was introduced for locally certified crops in the farmers markets of Japan. Though there were no differences in the characteristics of the two groups, early adopters initiated such production through governmental information provision and expected more profit than the adopters that followed. It was also found that non-economic reasons and information on stable markets for the certified products were crucial for both adopter groups.

Keywords

Low-input farm products, diffusion process, frequent buyers program (FBP), farmers market

As issues related to food safety and environmental conservation in agriculture increase in importance, there is widespread interest in healthy and environmentally friendly farm products in both developed and developing countries.

There are many previous studies of conversion to sustainable farming, including organic and low-input farming from conventional farming. Most have investigated differences in farmer characteristics, farm structures, and motives at each stage of adoption within the framework of the diffusion of innovations theory by Rogers (1995), who identified differences between adopters at different stages of the distribution curve. He divided adopters into five adopter groups: innovators, early adopters, early majority, late majority, and laggards. In describing their

characteristics, he indicated that the proportions of each adopter group are 2.5%, 13.5%, 34%, 34%, and 16%, respectively. He also pointed out the existence of “critical mass”, referring to the point after which further diffusion becomes self-sustaining. In response to this theory, Moore (2014) found gaps between early adopters and the early majority in the case of high-tech products that require adopters to change their behavior. For further diffusion, he indicated that different markets are necessary for each adopter group

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because their purposes for adoption are completely different.

In terms of environmentally friendly farming, including organic farming, both consumers and producers need to change their behavior or their mind to adopt the resulting products. Therefore, it is assumed that differences between early adopters and the early majority exist and some strategies, such as creating new markets, are required for further diffusion of both consumption and production. It is true that previous studies on the diffusion of organic farming and participation to agri-environmental schemes demonstrated limited adoption and diffusion. For instance, Läßle (2012) investigated ex-organic farmers and reported that information availability is important for farmers' decisions to continue organic farming. In addition, most previous studies on adoption mentioned that the lack of a stable market in which value-added products command premium prices prevents farmers from adopting and expanding organic and low-input farming (Acs et al. 2009; Bellon and Lamine 2009; Läßle and Rensburg 2011; Hu 2001; Miyachi 2007). Other than this evidence, few studies have empirically investigated the adoption and diffusion of environmentally friendly farming, which supports the markets for such value-added products.

The objective of this study is to examine the gap between early adopters and the early majority in the diffusion of environmentally friendly farm production by focusing on the case in which a frequent buyers program (FBP) was introduced for certified crops in the farmers markets of Japan.

AGRICULTURAL POLICY FOR ENVIRONMENTALLY FRIENDLY FARMING IN JAPAN

In Japan, environmentally friendly farming was first discussed in 1994 by the National Committee for Promoting Environmentally Friendly Agricultural

Practices aiming to introduce it into national basic law, the Food, Agriculture and Rural Areas Basic Act which was enacted in 1999. During a period of rapid economic growth from 1955 to 1973, Japanese farming systems were industrialized for the purpose of increasing agricultural production by introducing mechanization and chemical inputs. This shift resulted in the damaged health of consumers and producers as well as soil degradation (Kada 1993). Consumers worried about chemical contamination of food because they did not get enough information on chemical inputs (Yasuda Shigeru 1974). To deal with this situation, the aforementioned national committee was founded in 1992 and it defined environmentally friendly agriculture as "sustainable agriculture which concerns both productivity and environmental damages by utilizing compost and reducing usage of chemical fertilizers and pesticides" or "sustainable agriculture which is comfortable for both human beings and nature".

In 1999, environmentally friendly agricultural systems became one of the main objects of agricultural policy declared in the Food, Agriculture and Rural Areas Basic Act. At the same time, the Act on Promotion of Introduction of Sustainable Agricultural Production Practices was introduced. This act aims to ensure that agricultural production remains in harmony with the environment by taking measures to promote the introduction of sustainable agricultural practices and thereby contribute to healthy development of agriculture. A system for certifying "eco-farmers" was established in 2002. This system allowed a prefectural government to provide eco-farmer certification to farmers who form future farming plans that involve using compost or organic matter and reducing chemical fertilizers and pesticides. One year before 2001, the national government implemented a guideline that regards crops produced by using 50% less chemical fertilizers and pesticides as "specially produced crops". These changes encouraged prefectural governments to set standards

for amounts and types of chemical inputs. In 2006, the Act on Promotion of Organic Agriculture was introduced at the national level. This act defines organic agriculture as a way of agricultural production that reduces environmental damage as much as possible without using any chemical inputs or genetic modification technology. Though the establishment of those act or certification systems, direct payment system for environmentally friendly farming was first introduced in 2011.

National institutions have led the way in the implementation of standards and guidelines for environmentally friendly agriculture. Following national standards, prefectural governments and municipalities have been setting their standards and certification systems for environmentally friendly products since 1988. Many of them use certification systems not only for environmental conservation and food safety but also for branding their regional crops and increasing farmers' incomes for rural development (Oshima, Hagimori, and Nagasaka 2004).

STUDY AREA

Farming in Higashiosaka City

Higashiosaka City is located in the eastern section of Japan's Osaka Prefecture, with a population of 507,404 in 2013. There are 231 hectares (ha) of farmland and 192 farm entities. This city has become urbanized during the economic development of Japan; therefore, many consumers now live near farms and fresh leaf vegetables and flowers are cultivated to supply the population. Because houses surround the farms and the scale of farming is small, most local farmers habitually use fewer chemical inputs than those in other areas of Japan.

Farmers in Higashiosaka tend to sell their crops primarily at morning fairs held by the local farmers' cooperatives (JA) (Japan Agricultural Cooperatives)

because there is not enough produce for whole sale distribution, owing to the small area of farmland. Higashiosaka currently has nine morning fairs and five farmer's markets, all managed by two local farmers' cooperatives—JA Green Osaka and JA Nakagawachi, and held at their branches.

"Farm-Mileage Program" Implementation

The Higashiosaka City Government introduced the Osaka Prefectural Certification System for promoting environmentally friendly farming in 2004. In Japan, most prefectural governments have their own certification systems for low-input farm products based on their regional conditions. Osaka Prefectural Government established the certification system in 2001 with the aims of supporting environmentally friendly farming and meeting consumers' demand for food safety. This system provides certification for farm crops and vegetables produced with 50% lower use of both chemical pesticides and fertilizers and without use of genetically modified seeds. Farm products meeting this standards are certified as "Osaka eco-crops" and can be sold with certification labels. Currently, 39 of 43 local governments within Osaka Prefecture utilize the certification system. The cost of certification is free for farmers, but the additional costs for introducing new technology and labels are borne by farmers. Therefore, some farmers do not use label in selling even though they get the certification.

In Higashiosaka City, three farmers gained prefectural certification in 2004, but the crucial challenge was the lack of a market and of consumers' consciousness for locally certified agricultural products. One of the three had a difficulty in selling certified products even though the farmer would like consumers to have tasty and safe vegetables and fruits, and asked an extension worker to give some advice. In this situation, the "farm-mileage program" was introduced in May 2009 by multi-stakeholders including municipality,

prefectural government, and JA, aiming to overcome the challenges imposed on environmentally friendly farmers by the limited number of distribution channels for their produce (Aoki 2013). The main activity of the program is that consumers are rewarded with produce costing approximately 300 yen (approximately \$3.00 USD) in the farmer's market and also received a letter of thanks for buying the value-added crops produced within the city, if they collect 48 labels from certified local crops costing 7,000 yen (approximately \$70.00 USD). Further, consumers wish to receive the award collect labels by consuming locally produced certified products and apply to a council that manages this program. They can claim a special award if they collect 10 letters. Individual labels are attached to each certified crop, showing the farmer's name and contact address. The price for one package of produce is 80-130 yen (approximately \$.80-1.30 USD), with a price 1.0-1.2 times higher than non-certified ones. Thus, this program can be similar to a FBP for locally produced, environmentally friendly crops. FBP is a system in which consumers earn, as part of a reward for shopping loyalty, points that can be redeemed for discounts on future purchases, free gifts, and other rewards.

Farm-Mileage Program Effects on Consumption and Production

Table 1 shows the transition to the consumption and production of locally produced, environmentally friendly, certified crops at farmers markets. Sales of certified and non-certified crops in three farmers markets participating in the farm-mileage program in Higashiosaka City are included. Prior to the start of the program, approximately 10%-30% of total sales were certified products, and there was slow growth in total local crop sales. After the program started in May 2009, the percentage of certified environmentally friendly crop sales increased to a peak of 63%, and total local crop sales also increased. From the

program's start through December 2013, 7,193 accumulated letters of thanks had been sent to consumers who collected 48 labels. It is evident that the program attracts consumers to locally produced environmentally friendly crops.

Production changes occurred alongside the increases in purchase of locally produced climate-friendly crops in the local markets. The transition of farmers engaging in cultivating crops for certification and the land area dedicated to sustainable farming. Prior to the program implementation, there was no increase in the land area used for certified crops (in fact, the area decreased in some years), but rapid growth occurred after the program was initiated. The number of farmers engaging in farming for certification also increased. It can be concluded that many farmers have started or converted to environmentally friendly farming, and that each one has enlarged the size of the land dedicated to producing crops for certification.

METHODOLOGY

Previous studies on the diffusion of organic farming and environmentally friendly farming have used various methodologies. Regarding characteristics of adopters, most previous studies discussed land size. Some concluded that farmers with more land tend to adopt sustainable farming practices (Damianos and Giannakopoulos 2002; Rigby, Young, and Burton 2001), whereas others did not find any association with farm size (Wynn, Crabtree, and Potts 2001). In terms of farmer characteristics, most studies showed that age is an important factor in a farmer's engagement with an agri-environmental scheme (Bonnieux, Rainelli, and Vermersch 1998; Wynn et al. 2001). However, overall results were not consistent, which means that farmers' characteristics differ case by case.

In terms of motives for engaging in sustainable farming, these have been discussed mostly with

respect to organic farming. Motives for conversion from conventional to organic farming are often divided into economic and non-economic motives. Padel (2001) and Flaten et al. (2006) reported that later adopters tend to be more profit-oriented than early adopters. In addition to economic perspectives, information on programs and markets is considered to be one of the things that inspires starting low-input farming. Defrancesco et al. (2008) demonstrated that market-oriented farmers are the most reluctant to participate in agri-environmental schemes. In addition to the importance of motives, Marra, Pannell, and Ghadim (2003) and L  pple (2012) pointed out the importance of information in initiating sustainable farming.

To examine differences in degree of expansion, characteristics, and motives for adoption among early adopters and the early majority in Higashiosaka, a face-to-face questionnaire survey was conducted from October 7 to November 5 in 2013, targeting 63 farmers who produced certified fruits and vegetables, sold their products in farmers markets during the period. For analysis, data of 63 farmers and from the government were jointly used.

Before the analysis, 63 respondents were divided into two groups: "former adopters" and "late adopters". The former consists of farmers who started engaging in environmentally friendly farming before initiation of the farm-mileage program, while the latter began to engage afterward. The number of adopters in each group is 24 and 39, respectively. Considering that the number of local farmers who were selling their products in farmers markets at that time was 151, former adopters accounted for approximately 15.9% of the total, which almost mirrors the proportions of "pioneers" and "early adopters" indicated by Rogers (1995) and Moore (2014). "Former adopters" in this study can be regarded as analogous to the "pioneers" and "early adopters" described in the diffusion of innovations theory.

DATA ANALYSIS

Characteristics of Adopters

Table 2 shows the characteristics of each adopter group. The age differences in this survey are statistically significant at 5% level. Fifty percent of former adopters are aged between 70 and 79 years, 75% are more than 70 years old, while only 38.4% of late adopters are over 70 years of age. Looking at age when environmentally friendly farming was started, there are no differences, with farmers between 60 and 69 years of age being most likely to initiate such farming. This result might be because most farmers at those ages can receive pensions considered as off-farm income, which often makes them economically stable and able to initiate environmentally friendly farming. In terms of gender, most of the adopters are male and all three female were former adopters, but there is no difference statistically.

With regard to the distribution of total land, which includes owned and rented land, the proportion of former adopters who had .15-.3 ha is higher than that of late adopters, though a statistical difference is not seen. In addition, the number of adopters with less than .15 ha is higher in the latter group than the former. This means that smaller farmers tended to initiate environmentally friendly farming after program initiation. When asked about their level of familiarity with the farm-mileage program, 67% of farmers answered "I know it well" or "I know it in some way". Both groups have similar proportions for each category. However, 23% of respondents answered "I don't know the program", which shows that some farmers may not be aware that they are participating in the farm-mileage program.

Adoption and Expansion of Certified Products

Table 3 shows the averages of total sales amounts of locally produced vegetables and fruits and proportions of certified product sales to total sales amounts based

Table 1. Transition to Consumption and Production of Certified Low-Input Products

Year	Consumption in farmers market			Production		
	Total sales amount of local crops (1,000 yen)	Total sales amount of certified crops (1,000 yen)	The number of sent letter for thanks per year	The number of certified items	The number of farmers engaging in certification	Total land for certified products (ha)
2004				10	4	.86
2005				50	19	2.19
2006				98	37	2.83
2007				122	41	3.25
2008	54,621	10,087	0	121	42	6.58
2009	79,775	14,501	173	230	52	6.42
2010	77,849	28,426	944	391	78	10.58
2011	84,940	39,539	1,578	611	87	15.71
2012	90,512	42,427	1,956	775	90	20.76
2013	91,515	47,174	2,542	999	95	24.62

Notes: Since the farmers market opened in 2009, data of consumption are limited. Source: Data From JA Green Osaka and Higashiosaka City.

Table 2. Characteristics of Adopter Groups

	Former adopters		Late adopters		Total	
	N	%	N	%	N	%
Age**						
< 60	3	12.5	9	23.1	12	19.1
60-69	3	12.5	15	38.5	18	28.6
70-79	12	50.0	10	25.6	22	34.9
> 80	6	25.0	5	12.8	11	17.5
Age in starting environmentally friendly farming						
< 60	5	20.8	14	35.9	19	30.2
60-69	11	45.8	16	41.0	27	42.9
> 70	8	33.3	9	23.1	17	37.0
Gender						
Male	21	87.5	39	100.0	60	95.2
Female	3	12.5	0	.0	3	4.8
Farm land (ha)						
< .15 ha	4	16.7	13	33.3	17	27.0
.15 ha-.3 ha	10	41.7	9	23.1	19	30.2
.3 ha-.45 ha	3	12.5	9	23.1	12	19.1
> .45 ha	7	29.2	8	20.5	15	23.8
Knowledge of "farm-mileage program"						
I don't know	5	20.8	9	23.1	14	22.2
I've heard the program	1	4.2	4	10.3	5	7.9
I know it in some way	6	25.0	11	28.2	17	27.0
I know it well	12	50.0	15	38.5	27	42.9

Note: ** indicates significant difference at 5% level between the two groups on Fisher's exact test.

Table 3. Sales Amount in Farmers Market of Both Group of Adoption

	Former adopters				Late adopters			
	Total sales amount at farmers market (1,000 yen)		Proportion of certified crops		Total sales amount at farmers market (1,000 yen)		Proportion of certified crops	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
2007	569.3	562.6	5.8	8.2	125.2	221.5		
2008	922.9	926.4	38.9	35.1	232.9	372.5		
2009	1,326.9	1,371.9	49.6	31.6	354.5	558.6	.2	1.2
2010	1,362.1	1,391.1	58.8	29.9	414.1	610.8	15.7	25.3
2011	1,352.9	1,269.5	67.9	26.7	653.5	839.9	35.4	40.3

on data from farmers markets. The total sales amount of former adopters was about four times higher than that of late adopters in 2004. Though the gap between the two groups decreased in 2011, the amount of the former group was still twice as high that year. In terms of proportions of certified products, both adopter groups constantly increased their proportions but again that of the former was twice as high in 2011. For former adopters, total sales amounts changed slightly and the proportion of certified crops increased 1.3 times between 2009 and 2011. This evidence shows that both groups increased their sales of certified crops at farmers markets after 2008 but former adopters, who sold their products more actively, increased their proportion of sales of certified products after “farm-mileage program” implementation.

In terms of expanding land area for certified products, Table 4 shows the number of adopters and average area for certified products during each year for both adopter groups. Though farmers starting the production of certified low-input products formerly increased the land used for low-input crops from 2004 to 2005, they reduced their production in the next period and then increased it slightly from 2006 to 2008. However, after 2009, the average increased rapidly, reaching .347 ha in 2013, which indicates that some farmers rapidly expanded the land used for certified products. Farmers who started after the

initiation of the farm-mileage program tended to increase their land for the first two years and stably expanded the land without any reduction in the rate of increase.

This result shows that the farm-mileage program with local market strategies encouraged the former farmers who were more active to sell their product at local farmers markets to increase their environmentally friendly farming. Following the former adopters, late adopters gradually initiated certified crop production and expanded the land used for certified products.

Reasons for Adopting Certification for Environmentally Friendly Farming

In this section, differences of reasons for adopting certification between former adopters and late groups adopters are statistically examined. Since previous studies indicated that non-economic reasons, economic reasons, and information gains were important in diffusion, the following statements were included in the questionnaire and all statements were measured by four degrees: “Agree” = 4, “Partially agree” = 3, “Partially disagree” = 2, and “Disagree” = 1. Non-economic reasons included: “I would like to care about environmental problems in farming”, “I would like to protect my health from chemicals”, “I would like to protect soil from degradation”, and “I would like to sell low-input products making consumers feel

Table 4. Adoption and Expansion of Certified Products

	Former adopters			Late adopters		
	No. of adopters	Land for certified crops (1/100 ha)		No. of adopters	Land for certified crops (1/100 ha)	
		Mean	Std. Dev		Mean	Std. Dev
2004	4	3.08	14.47			
2005	13	8.55	16.05			
2006	18	8.23	12.44			
2007	22	9.40	13.63			
2008	24	9.31	13.13			
2009	24	14.25	15.65	5	1.37	5.87
2010	24	19.52	21.20	23	7.35	10.26
2011	24	26.88	24.08	29	14.83	21.35
2012	24	31.38	26.47	36	21.08	22.89
2013	24	34.71	24.56	39	27.49	22.96

safe". The economic reasons included: "I think certified products can be sold better than non-certified ones", "The price for selling certified products in the local market is less than that of whole sales or that of non-certified ones", and "I think certified products can be sold at higher prices than non-certified ones". Finally, statements on information included: "I got information on farmers markets for certified products", "I got information on certification from the local government", and "I got information on certification systems from neighboring farmers".

Table 5 shows both groups' means and standard deviations. To examine differences between the adopter groups, a one-tailed t-test was conducted. The null hypothesis is "means of former adopters \leq means of late adopters". Focusing on non-economic reasons, both groups had scores higher than 3.2 in all statements, but no statistical significance was seen. This means that all adopters initiated environmentally friendly farming due to concerns about the environment, health, soil protection, or safe food distribution. Particularly, given that the scores for "I would like to sell low-input products making consumers feel safe" are the highest in both groups, most farmers adopted certification as a guarantee of safety.

In terms of economic reasons, there seem to be some differences between the two groups. The mean differences of "I think certified products can be sold better than non-certified ones" and "I think certified products can be sold at higher prices than non-certified ones" are statistically significant at 10% level. This indicates that former adopters are more profit-oriented and expected economic advantages from the added value of certified environmentally friendly farm products. Among the three statements, the mean scores of "I think certified products can be sold better than non-certified ones" are the highest and former adopters expected better sales of certified products the most.

Finally, looking at statements on information, the mean difference is statistically significant at 5% level for "I got information on certification from the local government". It appears that former adopters are more likely to initiate the production of certified products after getting information from the local government, whereas late adopters do not rely on governmental information. Though there is no difference between groups, the mean scores for "I got information on farmers markets for certified products" are the second highest of all statements before and after program

Table 5. Reasons for Initiating Production of Certified Environmentally Friendly Crops

Statements of reasons for adopting certified products	Former adopters		Late adopters		P-value
	Mean	Std. Dev	Mean	Std. Dev	One-tailed test
I would like to care about environmental problems in farming	3.42	.83	3.26	.82	.228
I would like to protect my health from chemicals	3.38	.92	3.36	.78	.471
I would like to protect soil from degradation	3.25	.90	3.21	.86	.422
I would like to sell low-input products making consumers feel safe	3.75	.61	3.69	.66	.364
I think certified products can be sold better than non-certified ones	3.17	.82	2.82	.94	.071*
The price for selling certified products in the local market is less than that of whole sales or that of non-certified ones	2.79	.98	3.03	.90	.832
I think certified products can be sold at higher prices than non-certified ones	2.67	.76	2.36	.84	.075*
I got information on farmers market for certified products	3.67	.56	3.47	.76	.145
I got information on certification from local government	3.33	.87	2.82	.94	.017**
I got information on certification system from neighbor farmers	2.08	.93	2.21	1.00	.684

Notes: * and ** stand for significant differences at the 10% and 5% levels, respectively, between means of the two adopters groups based on one-tailed t-test.

initiation. This indicates that information on markets for certified products is crucial for all adopters initiating environmentally friendly farming.

CONCLUSIONS

This study examined the gap between early adopters and the early majority in the production of certified environmentally friendly vegetables and fruits by focusing on the diffusion of such production under the farm-mileage program with local market strategies held at farmers markets in Higashiosaka, Japan. The study categorized adopters into two groups on the basis of diffusion of innovation theory. The former adopters who initiated production before the initiation of the program, accounting for about 16% of total farmers selling in farmers markets, are analogous to “early adopters” in the diffusion of innovations theory, while “late adopters” can be considered as the “early majority”.

First, it was found that, though there were no

significant differences in farmers’ characteristics between the two groups in point of age, gender, and knowledge of the program, smaller farmers followed by relatively larger farmers tended to initiate certified crop production in this case. In addition, many farmers of both groups started such farming when they were between 60 and 70 years old, a period when they had stabilized their incomes through pensions.

Second, the findings revealed that former adopters initiated certified crop production before the farm-mileage program sold their products at local farmers market more than the late adopters and increased sales rate of certified products after the program implementation rapidly. This implies that the former adopters were more active to produce and sell their products including certified and non-certified ones at local farmers market.

Finally, in terms of reasons for initiating certified farm production, two differences were relevant. One was that former adopters were more likely to be

profit-oriented, expecting profit by selling more produce or at higher prices of certified vegetables and fruits, whereas late adopters were less concerned with profit. The other was that former adopters depended more on governmental information on certification systems for initiation, whereas late adopters did not. For both groups, non-economic reasons, especially the guarantee of safety, and information on markets for certified products were crucial reasons for adopting environmentally friendly certified farm production. In conclusion, the gaps in purposes and information sources exist between early adopters and the early majority in the diffusion of environmentally friendly certified production, indicating that some strategies, such as demand increases within local food supply chain, play an important role in crossing “critical mass” and driving the early majority to adopt.

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