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Article

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RESEARCH

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Evaluating willingness to become a food education volunteer among urban residents in Japan: toward a participatory food policy

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Abstract

Food education has attracted growing concern focusing on appropriate dietary habits amid the deterioration of many aspects of health in this industrial society. For this purpose, a self-motivating type of food policy framework is expected to increase in significance. Under such a self-motivating policy framework that aims at inducing people to increase their food-conscious behaviour from the aspects of a healthy diet, food safety, reduction of food waste, and the local community, this paper investigated the awareness of food education by a survey of 3,000 inhabitants in a suburb of Tokyo and explored the factors determining the willingness to participate as a food education volunteer. We found the existence of a generation gap in terms of interest in and knowledge regarding food education, which suggests that there is room for working together to exert a complementary role between generations.

JEL classification: D62; D64; I18; Q18; Q58

Keywords: Food education; Volunteer education; Community awareness; Dietary behaviour; Educational externality; Environmental awareness; Health awareness

Background

The issue of food education has attracted growing concern regarding appropriate dietary habits in our industrial society. For that purpose, it is necessary to promote self-motivated behaviour to raise the awareness of various aspects of food-related behaviour. The policy framework that stimulates self-motivating behaviour will play an increasingly important role as civil society progresses toward a greater number self-motivated citizens. In this context, the Basic Law on Food Education was established in Japan to take advantage of this trend. After a long discussion of whether the state should intervene in personal life, the Basic Law on Food Education was enacted in 2005 in Japan and aims to enhance national awareness of matters related to food and nutrition and to eventually improve behaviours related to food and dietary aspects in daily life Maff (2010). Basically, although behaviours associated with food and health are personal matters in which the state should not intervene, it has been said that self-motivating measures that aim to enhance health awareness have been increasing in importance amid the deterioration of many aspects of health in every industrial society. This is a common issue facing these countries.

The focus of education on food differs from one country to another due to differences in issues of health, food security, and dietary heritage, including local foods and communal integrity because food has a connection with many aspects of life (McMichael 2000). Therefore, food education involves a wide range of generations, from children to the elderly, and also involves a wide range of concerns such as the awareness of various aspects of food, health, the environment, and the local community. In this regard, food education is not limited to education in schools, but includes the realm of adult education, which tries to transform the framework of behaviour of adults over time (Mezirow 1997; 2003). Nevertheless, in the arena of agricultural economics, food education issues have not been fully addressed despite intensive studies on food consumption and issues of food safety.

Education has externality because education of the public enhances economic efficiency, which benefits the whole society (Arai 1995). Food education has the same effect. This is because an increase in food awareness improves people's health and results in a reduction in medical costs and food waste, which eventually benefits the entire society through better resource allocation. A self-motivating policy framework, however, often ends up with merely setting goals without any concrete results. In this respect, to ensure the effectiveness of a self-motivating framework it is necessary to enlarge the domain of self-motivating behaviour. This is also necessary from the aspects of financial constraints that the public sector commonly faces and of the maturation of a civil society. Thus, the authors believe that it is necessary to explore the factors that determine the willingness of people to take part in volunteering to offer food education in connection with attainment of policy goals under a self-motivating policy framework. Although care should be taken not to expect too much from volunteers, in order to reduce administrative costs and promote the progress of a self-motivated civil society this point should be clarified. Although a simple questionnaire survey was conducted to better understand the national awareness of food education issues by central and prefectural governments at the time of enactment of the law (Cabinet Office 2007a; Kanagawa Prefecture 2007) and studies regarding specific food-related issues have been conducted in many countries, to our knowledge, there has been no full-scale research on the awareness of food education and willingness of individuals to volunteer to offer food education.

In this paper, those who volunteer are understood to be people who undertake economic behaviour that intentionally accompanies externality. We approach the issue by the following steps. First, based on a literature review, we present conceptual and empirical models for volunteer behaviour. Second, based on a questionnaire survey of 3,000 residents in Matsudo, an urban municipality that comprises an extended metropolitan area, we quantitatively explored what and how inhabitants' attitudes are connected with daily food-related behaviour and also estimated a willingness determinant model for participation as a food education volunteer taking into account the complementary role among generations. Finally, we give policy recommendations for a more participatory way of conducting a food education program.

Literature review

In reviewing the literature on food education topics that covered a wide range of aspects, we could find very few studies on food education and volunteering per se although food choices and food and nutrition policies have been widely examined from economic viewpoints (Evenson 1981; Blaylock et al. 1999; Kenkel and Manning 1999).

Studies that we reviewed dealt with aspects related to food education and consciousness of food itself, such as food safety, food and health, waste of food and environmental issues regarding food in relation to the community.

First, as for food education issues, Edwards and Hartwell (2002) examined primary school children's attitudes toward and knowledge of fruits and vegetables from the viewpoint of a balanced diet. Pivarnik et al. (2009) statistically examined knowledge of food safety and food safety education among high school teachers and supported the need for a food safety education program. Roe and Teisl (2007) investigated consumer reaction to labeling of genetically modified foods. Heslop et al. (2007) examined the behaviour of single working mothers in performing food-related household tasks. Scott et al. (2009) performed a statistical examination of outcomes of a safety education program for consumers on practices in using fresh produce and concluded that the food safety education program was effective in teaching consumers. von Normann (2009) described the increasing importance of food education at school based on results of an empirical examination of the impact on food patterns in German children based on lifestyle and knowledge of food. Lautenschlager and Smith (2007) examined the effects of community gardens on dietary behaviour of youth and found that garden programs had a positive impact on food choices, knowledge of nutrition and cooking skills among youth.

In relation to the aspect of environmental and community issues, Chappell and LaValle (2011) focused on the relationship between food security and biodiversity and argued that the two things are not mutually exclusive by using alternative agricultural practices. Griffin et al. (2009) estimated food waste across an entire local community. DeLind (2011) explored the effectiveness of contextual analysis of local food movements. Kerton and Sinclair (2010) focused on the significance of consumer participation in local organic agriculture and the learning experienced through that participation as a way of transformative learning advocated by Mezirow (1997, 2003). Hughner et al. (2007) pointed out that demographics and beliefs of organic food consumers were more heterogeneous than generally perceived. Kemp et al. (2010) examined the 'food miles' concept from the revealed preference survey of UK consumers and found that consumers respected this concept much less than expected. Iyer and Kashyap (2007) explored the positive conditions for consumer participatory recycling and noted that the provision of incentives and information was effective in increasing participation.

Now, turning to health issues, McGinnis and Meyers (1999) discussed nutrition and health policy by focusing on the Dietary Guidelines for Americans and drew on broad policy interventions. Robinson and Smith (2003) investigated the connection between health conscious consumers, body mass index (BMI), and attitudes about sustainably produced food and found that health conscious consumers were more likely to be female, older, more educated, earn a higher income, be more active, and have a healthier BMI than those who were not health conscious consumers. Cash et al. (2005) investigated possible health benefits of "thin subsidies", consumption subsidies for healthier foods, in the United States. Walsh and Nelson (2010) found the continuing influence of parents on adolescents' dietary behaviour by investigating the link between diet and health from a questionnaire survey of adolescents in Northern Ireland and recommended practical nutritional education for balanced dietary behaviour. Chang and Nayga (2011) highlighted the connection between mothers' nutritional label use and children's obesity and noted that mothers' nutritional label use leads to a lower probability of children becoming overweight. Visschers et al.

(2013) conducted a cluster analysis of nutrition information usage and health and nutrition interests and identified four segments with different demographics. Twiss et al. (2003) focused on the role of community gardens to enhance public health in improving the quality of life, which is supported by local leadership and volunteers. This topic is also connected with a community building effect.

Second, we could not find studies on volunteers who provide food education, so we reviewed studies on volunteers in general, which seem to be classified roughly into two categories: motives or recruitment issues and issues of effects. First, with respect to motives, Allison et al. (2002) statistically examined motives of volunteers in the community by comparison of two kinds of data sources and predicted the frequency of volunteering. Bussell and Forbes (2001) mentioned that those who are well educated, female and over the age of 50 are more likely to volunteer. Callow (2004) explored the motives for volunteering among retirees and found that the heterogeneous nature of senior citizens should be considered for volunteer recruitment. Thus, the profile of pro-volunteer citizens has been clarified, although, on the other hand, heterogeneity of the pool of volunteers should be borne in mind. Freeman (1997) revealed that the standard explanation of the labour supply for volunteering accounted for a minor part of volunteer behaviour and that volunteering is a 'conscience good,' which is something that people feel morally obligated to do when asked, but which they would just as soon let someone else do. Handy et al. (2000) developed the net-cost theory that hypothesized that the public perception of volunteering will be based on the perception of the net cost incurred by the individual and empirically verified this hypothesis from a cross-cultural perspective. This net-cost theory provided suggestions in building our conceptual framework below.

As to studies that evaluated the effects of volunteering, Brown (1999) assessed the dollar value of volunteer activity in the U.S and concluded that the overall value was understated when the gains accruing to volunteers themselves were included. Handy and Srinivasan (2004) evaluated the economic value of the net benefits of hospital volunteers and found a quite high value for every dollar spent. Hager and Brudney (2005) explored the measure of net benefit that takes into account both benefits and challenges of a volunteer program. Mook et al. (2005) examined an accounting paradigm that considers the value of volunteer contributions. Bowman (2009) applied microeconomic theory to the evaluation of volunteering and pointed out that the positive externalities that volunteers generate to society as a whole were not well calculated. In short, we can say that evaluation of the economic value of volunteers is worthwhile although an exact evaluation of the entire value of volunteering is difficult due to positive externalities.

With respect to food education in a Japanese context, Adachi (2008) urged the necessity for nutrition education from a holistic perspective on food and nutrition. Mah (2010) examined food education in Japan from the perspective of decentralized public health governance. Kimura (2011) discussed issues of food education in Japan from the viewpoint of privatized and gendered food knowledge. Ohe (2012) examined the educational function of agriculture. Earlier Ohe (2011) evaluated the educational function of dairy farming with an economic framework as a process of internalization of a positive externality.

To summarize, there is extensive literature mentioning that participatory and educational programs are effective tools to raise food-related consciousness among people. Nevertheless, it should be noted that no study dealt with the willingness to become a

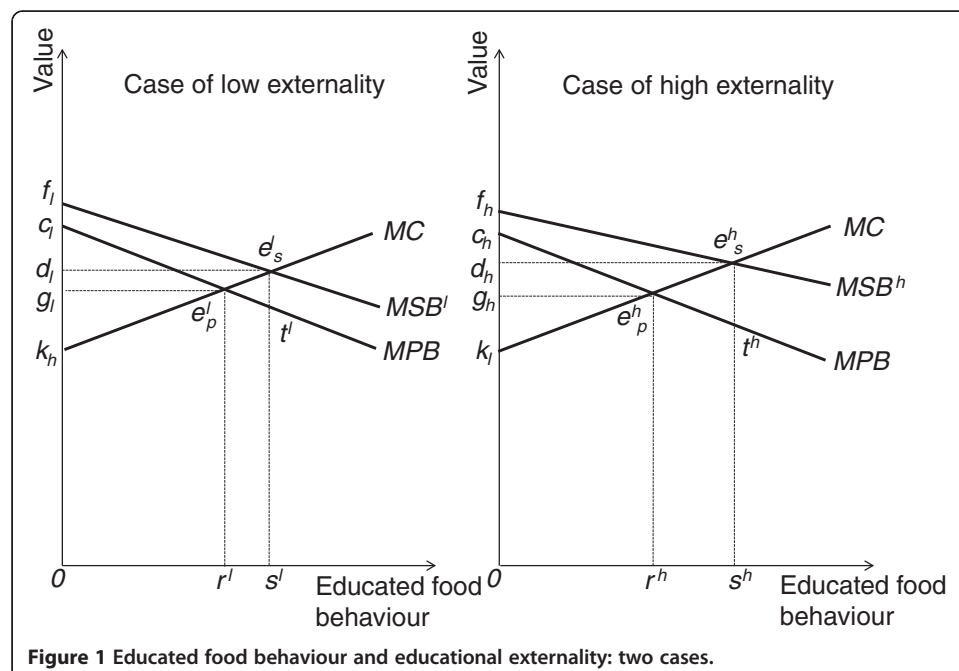
food education volunteer either at the conceptual or empirical level from an economic point of view.

Methods

Conceptual framework

Here, we set up an economic framework for the subsequent empirical investigation based on the net-cost theory that assumed that volunteers would incur the net cost of volunteering. Figure 1 illustrates two cases of a resident's subjective equilibrium on educated food behaviour, measuring value vertically and the level of educated food behaviour horizontally. The more rightward, the better food awareness behaviour is undertaken. The optimal level of food awareness behaviour is determined by the two curves: marginal benefit gained from that behaviour, *MB*, and marginal cost necessary for that behaviour, *MC*. We do not assume the social cost for that behaviour. As ordinarily expected, the *MB* curve decreases and the *MC* curve increases when the level of behaviour increases. With respect to the marginal benefit, there are two curves depicted in Figure 1 because food conscious behaviour exerts a positive educational externality on society. The upper marginal cost curve represents the social marginal benefit curve, *MSB*, while the lower curve represents the private marginal benefit curve, *MPB*, and the vertical gap between the two curves demonstrates the externality, which is the benefit to society due to diffusion of educated food behaviour.

If there is no externality at all, a resident's behaviour is determined at the private optimal point e_p where the *MPB* curve meets the *MC* curve. If externality exists, the optimal point e_s is determined where the *MSB* curve meets the *MC* curve, which is the social optimal point. Thus, the socially optimal level of educated food behaviour is conducted at os . In this case, attaining the social optimal externality should be internalized. Put differently, generators of externality should be compensated for the amount of externality. Otherwise, externality is not generated because it is rational



for residents to undertake educated food behaviour at the private optimal point e_p in the long run if they are not compensated.

Now, let us consider the case of residents who conduct volunteer work. Volunteers are considered those who do not internalize the externality by compensation from outside, but by bearing the opportunity cost by themselves at the social optimal point. Thus, we can say that volunteers are those who bear the opportunity cost of volunteering that generates externality, which is depicted as $e_s t$ in Figure 1. Here, to simplify the discussion, we assume no public subsidy and that volunteers bear all of the opportunity cost by themselves. Thus, generation of externality and enlargement of self-sustaining food education effects are expected through volunteering activity.

Whether volunteering is actually undertaken or not depends on the comparison between the expected utility from volunteering and the opportunity cost for volunteering. In this sense, the educational externality represents not only the opportunity cost for volunteering but also the expected benefit generated to society from volunteering. Thus, it is safe to say that the expected marginal benefit to society, $e_s t$, will be included in the expected marginal utility for volunteering.

Nevertheless, it becomes a burden for people to bear that opportunity cost on their own, so it is quite natural that the capability to assume that burden varies from one to another. It is most likely that if an individual is better able to bear that cost, the externality will be larger as depicted in the right case in Figure 1, while if that individual is not, the externality will be smaller as illustrated in the left case. Thus, in the case of high externality educated food behaviour is more highly achieved than that of low externality because $os^h > os^l$. Empirically, the question to be clarified is what factors in reality make these differences.

Analytical model

Here, based on the conceptual framework the researchers present an analytical model for the following empirical estimation of the determinant function of the willingness to participate as a food education volunteer. Generally, volunteer activity is different from ordinary economic activities from the aspect that an income gain is not the prime cause of action.

Since volunteer activity is not income earning behaviour, the volunteer activity needs to satisfy the following two conditions: Equation (1) and Equation (2). First, since the majority of the respondents were female, we take into account household production activity. To simplify the discussion here, we assume that an opportunity cost for participation in the labour market and for household production are identical, so that participation in the labour market and household production are indifferent in terms of utility level. Then an ordinary urbanite decides his or her own behaviour when a given wage level, W , exceeds the urbanite's subjective reservation wage, wr , after which the urbanite decides to take part in the labour market to gain income or undertaking household production (Equation (1)).

$$W(\text{wage level}) \text{ is greater than } wr(\text{subjective reservation wage}) \quad (1)$$

Second, it is considered that the expected utility of volunteer participation, $EU(vf)$, is lower than the utility level of the reservation wage, $U(wr)$, as indicated in Equation (2).

$$U(wr) \text{ (utility level of reservation wage) is greater than} \quad (2)$$

$$EU(vf) \text{ (expected utility of volunteer participation)}$$

This is because if the expected utility level of volunteer participation is greater than the reservation wage, then the resident can be better off by joining the labour market. We assume that these two conditions are satisfied.

Given these conditions, if an urbanite's expected utility level gained from the volunteer activity, $EU(vf)$, is greater than the opportunity cost of bearing the externality, $U(op)$, then the resident will take part in that volunteer activity (Equation (3)).

In contrast, if $EU(vf)$ is lower than $U(op)$, then a resident will not take part in the volunteer activity (Equation (4)).

$$EU(vf) \text{ (expected utility of volunteer activity) is equal to or greater than} \quad (3)$$

$$U(op) \text{ (opportunity cost of bearing externality)}$$

$$EU(vf) \text{ (expected utility of volunteer activity) is less than} \quad (4)$$

$$U(op) \text{ (opportunity cost of bearing externality)}$$

Given the analytical framework on participation in volunteer activity above, we set up an empirical model, indicated as Equation (5), to identify influential factors that determine the willingness to participate as a food education volunteer. Since the areas of food education extend widely, specifically we consider the vector of household attributes, vector of food awareness, vector of environmental awareness, vector of community awareness, and health awareness to test multiple aspects of life. If parameters of these factors are positive, these factors raise the subjective expected utility level of volunteer activity and vice versa.

$$V = G(\mathit{houshld}, \mathit{food}, \mathit{envrn}, \mathit{health}, \mathit{community}, \varepsilon) \quad (5)$$

Where, V = willingness to participate as a food education volunteer (yes = 1, no = 0)

houshld = vector of household attributes

food = vector of food awareness

envrn = vector of environmental awareness

health = vector of health awareness

community = vector of community awareness

ε = stochastic error term

Let us explain these variables. Explained variable V is the willingness to participate as a food education volunteer (yes = 1, no = 0). The explanatory variables are those that are supposed to raise the expected utility of volunteer participation based on the results of the literature review. ***houshld*** is the vector of household attributes, which determines the opportunity cost for participation as a volunteer from household aspects. For example, whether or not the existence of childcare work stipulates this opportunity cost. ***food*** is the vector of food awareness, and it is reasonable to assume that the higher this awareness, the higher the willingness to volunteer.

Likewise, with ***envrn***, i.e. the vector of environmental awareness, it is probable that the higher this awareness, the more positive the attitude toward becoming a food education volunteer from the instance that less trash emission is expected from a household with high environmental awareness. ***health*** is the vector of health awareness, and

it is safe to say that the higher the health awareness among urbanites, the more careful they are on a daily basis about development of metabolic syndrome. As a result, those urbanites with higher health awareness will also have a higher willingness to participate as a volunteer. *community* is the vector that represents the degree of awareness of how residents themselves are connected with the local community. People with high community awareness are expected to be willing to volunteer.

Given the above hypotheses on the variables, the sign conditions for food awareness, environmental awareness, health awareness, and community awareness are expected to be positive while those of household factors are variable dependent. If these hypotheses are verified, we can say that the promotion of food education among urbanites will be achieved through the improvement in awareness of these three factors in their lives. Actual variables are determined after the statistical tests described below.

Results and discussion

Outline of basic law on food education, study area and data collection

The Basic Law on Food Education was established in 2005 after a long discussion over whether the state should intervene in the personal lives of citizens amid mounting concerns over food-related behaviours of consumers and conditions in domestic agriculture. Of concern was the declining food self-sufficiency in Japan despite the large amount of food wasted at the same time; the increase in lifestyle diseases, even among the young, that continuously raises the nation's medical costs; food safety; and loss of the traditional healthy dietary habits and local food heritage. Three ministries were responsible for food education policy: Cabinet Office, Ministry of Education and Science, and Ministry of Agriculture, Forestry and Fisheries (Cabinet Office 2006; 2007b). They established the nation's basic plan to promote food education to tackle those issues described above. Then every prefectural government was asked to set up its own basic promotion plan and municipalities were required to make an effort to set up their own basic promotion plan at the municipal level. This law refers, in Article 22, to the importance of the partnership between volunteers for food education and local governments (Cabinet Office 2006, p.123).

Our study area, Matsudo, which is in Chiba prefecture, has 480 thousand inhabitants and is a suburb of Tokyo prefecture, with only a 20-minute train ride to downtown Tokyo. From this favourable location, the majority of Matsudo residents commute to the Tokyo metropolitan area. Data were collected by a surface mail questionnaire that we conducted for those residents living in Matsudo in collaboration with the municipality of Matsudo, which is one of the most ardent municipalities with regard to food education in Chiba because of the growing concerns over the fast-paced urban lifestyle that emphasizes convenience among residents. Matsudo inaugurated the city's own basic promotion plan in 2008, which mentions that volunteers are among those stakeholders who are supposed to play a crucial role in food education and help by connecting with people to attain three main goals: firstly, having healthy dietary habits taking into account the importance of food; secondly, knowing more about local foodstuffs and how they are produced and distributed; and, thirdly, balancing food intake and maintaining good oral health for mastication to attain a mentally and physically healthy life (Matsudo City 2008, pp. 9–10, p.25).

After consideration of the results of two preceding questionnaire surveys on food education conducted by the state and Kanagawa prefecture (Cabinet Office 2007a;

Kanagawa Prefecture 2007), we asked 68 questions to elucidate the lifestyles and characteristics of the respondents such as basic knowledge regarding food education, food and related matters, perception toward environmental, health, and local community issues, and their attributes. These wide-ranging questions were presented because the area of food education includes not only dietary education itself, but also addresses issues related to the environment, health, and local community matters. Requests for information on income level, which would be a key indicator, and academic background were finally excluded as question items because of privacy considerations raised by city officials. The city officials worried about possible complaints from respondents claiming infringement of their privacy. After discussion with officials on the pros and cons, we finally dropped those questions to comply with the request from the officials. We established the survey sheet taking into account the opinions of the municipality officials and sent it to 3,000 residents over the age of 20 years who were randomly extracted from the basic resident registry. For households receiving the survey, we asked that those responding should be mainly those in charge of purchasing ingredients for meals and cooking. The survey period was from October 18th to October 31st, 2007. Of the 3,000 surveys, 1,262 were returned and 1,254 (41.8%) were used for examination after excluding questionnaires that did not provide information on the respondent's age, sex and willingness to be a food education volunteer.

Respondents' profile

Briefly, the profile of the respondents was as follows. First, the majority (81%) were female, which was not unexpected because we requested that responders be those mainly in charge of purchasing ingredients and cooking. Also, because of this, as to profession, full-time housewives or househusbands accounted for one third of the respondents, followed by company employees (24%) and part-time employees (21%); these three categories accounted for about 80% of respondents. Composition according to age group presented no large bias with 45% of responders being younger than 50 years of age and 55% of responders aged 50 or over. Nevertheless, only 14% were in their twenties, 36.8% were younger than 40 years of age, and 63.2% were 40 years old or over, which indicates that the majority of samples were middle-aged or past middle-age. Three fourths of respondents were married. Seventy percent had lived in Matsudo for more than ten years and over half (53%) had lived in this city for more than 20 years. Two-generation families, which are the typical nuclear family in modern society, accounted for 57% of respondents while traditional large families of three generations or more made up only about 6% of those responding; the remainder were married couples (29%) and those living alone (9%).

Statistical analysis of respondents' attributes with regard to food education

We employed statistical tests to identify the differences in awareness of food, food education, health, environmental issues, and involvement in local community issues.

Knowledge of and interest in food education

Firstly, Table 1 shows the results of survey items on food and food education issues. Health-related issues attracted the highest concern, followed by food safety and dietary habits while interest in food waste, the decline in the rate of food self-sufficiency and

Table 1 Concerns related to food issues and food education

Items Percentage of response (%)	Age group		Test results (sample size)	Sex		Test results (sample size)
	<40 years	≥40 years		Females	Males	
Healthy growth of mind and body	55.4	52.3	n(1254)	58.0	33.3	***(1254)
Lifestyle diseases	37.7	44.7	** (1254)	43.5	35.9	** (1254)
Food safety	33.6	45.6	*** (1254)	43.3	31.6	*** (1254)
Disorders of eating habits	40.5	33.6	** (1254)	37.3	30.7	* (1254)
Respect for food and nature	16.2	13.9	n(1254)	16.0	9.1	*** (1254)
Increase in obesity and underweight	15.8	12.5	+(1254)	14.2	11.7	n(1254)
Food waste	14.3	12.5	n(1254)	13.3	12.6	n(1254)
Decline in food self-sufficiency	7.6	11.6	** (1254)	9.2	14.3	** (1254)
Gastronomic and local heritage	10.6	8.0	+(1254)	8.4	11.3	+(1254)
Environmentally friendly food production	3.0	6.1	** (1254)	4.4	7.4	* (1254)
Building relationship with farmers	0.2	1.5	** (1254)	1.1	0.9	n(1254)

Note: Chi-square test was employed. ***, **, *, + show 1%, 5%, 10%, 20% (as reference) significance levels, respectively, and n shows no significance. For each item, yes = 1, no = 0; no answer also = 0.

local gastronomic culture and tradition were not high. Those aged 40 years or older showed interest in health issues such as lifestyle diseases, food safety, and disorders related to dietary habits. Female respondents had greater interest in mental and physical healthy growth of children and respect for food and nature while interest among males was greater in the rate of food self-sufficiency.

More than half of respondents answered that matters most important in food education for children were the reduction in food waste, respect for nature and food producers, and table manners (Table 2). Issues considered more or less important were food-related issues such as communication through eating, experiences in farming, forestry and fisheries, and succession of gastronomic heritage.

With respect to the site of food education, a significant difference in consensus was observed between age groups and sex, but respondents selected their home as the primary place for that purpose; more than half of those 40 years or older answered that their home was the preferred place while only a third of those who did so were under the age of 40 (Table 3). In contrast, the younger generation selected an equal role between home and school. A higher proportion of females than males responded that the home was the place for such education. In short, food awareness is higher among those 40 years old or older than among those under 40.

Eating habits and foodstuffs

Although the majority of respondents indicated that they ate breakfast every day, this ratio was higher in those 40 years old or older and in females with 1% significance (Table 4). 15.6% of male respondents said they rarely have breakfast every day. Thus, we can say that the younger generation and the male respondents eat breakfast less frequently.

That the yearly frequency of celebrations at home featuring traditional foods is low might be due to the loss of seasonality in urban life; this is in contrast to the results of the survey by the national government that covered not only urban areas, but also rural areas (Cabinet Office 2007a). We observed statistically significant differences between the two age groups examined; nearly 60% of those over 40 held celebrations featuring traditional foods more than 5 times each year in contrast to less than half under age

Table 2 Important items for food education of children

Item	Reduction in food waste	Respect for nature and food producers	Table manners	Better diet habits	Communication through food issues	Experience in farm, forestry and fisheries	Succession of gastronomic heritage
Important	76.6	75.1	68.5	59.9	44.1	22.9	22.1
More or less important	22.0	23.9	28.6	37.7	50.2	62.2	64.3
Less important	1.4	0.9	2.8	2.4	5.7	14.0	12.7
Not important	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size	214	213	213	212	211	214	213

Note: Total might not be 100% because each item is rounded off.

40. Among families of two generations or more, 62.1% had such celebrations 5 times or more yearly while 42.7% of those living alone and married couples with no child did not.

In buying foodstuffs, food safety was the first concern of those age 40 or over followed in the order of nutrition, taste, and cost while those under 40 looked at costs due to the existence of children in the family. Likewise, those 40 years or older 'always' checked the origins of the food more than those under 40 (66.3% vs. 60.6% with 1% significance). These percentages were also higher for multi-generation families than for other types of families.

Understandably from the above differences, we observed differences in the level of knowledge of food safety between age groups and gender; the knowledge level was higher in those 40 years or older and in females compared with those under the age of 40 and males.

Health matters and environmental issues

As the first indicator of the degree of respondents' health awareness, we asked about self-awareness of metabolic syndrome, as was asked in the national survey. We found that those 40 years and older and male respondents indicated such awareness, with a significantly higher portion of those indicating that they had metabolic syndrome or had the potential to have it; 34.1% of those 40 years and over answered that they potentially had metabolic syndrome, as did 35.5% of the male respondents (Table 5).

Table 3 Site of food education

Place of food education	Age group		Sex	
	<40 years	≥40 years	Females	Males
Home	32.9	52.2	45.6	42.9
Somewhat home	30.5	22.4	26.8	19.1
Either home or school	34.2	21.3	25.2	29.9
Somewhat school	1.5	1.0	1.1	1.7
School	0.4	0.5	0.0	2.6
No answer	0.4	2.7	1.4	3.9
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)	***(1254)		***(1254)	

Note: Significance level is the same as in Table 1.

Table 4 Food awareness

Frequency of breakfast	Age group		Sex	
	<40 years	≥40 years	Females	Males
Everyday	74.9	89.4	86.8	72.9
Only on weekdays	5.8	1.8	3.1	3.9
2-3 times a week	9.1	4.3	5.5	8.7
Rarely	10.2	4.3	4.4	15.6
No answer	0.0	0.3	0.2	0.0
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)		***(1254)		***(1254)
Frequency of celebration at home with traditional foods	Age group		Family composition	
	<40 years	≥40 years	Married couple or single	Two generations or more
Five times or more	47.4	58.5	42.7	62.1
Test result (sample size)		***(1254)		***(1254)
Concern over food purchases	Age group		Sex	
	<40 years	≥40 years	Females	Males
Nutritional factors	18.2	19.2	19.5	16.0
Food safety	33.6	50.6	47.9	28.6
Taste and flavor	19.1	14.9	14.3	26.0
Cost	22.5	8.3	12.1	19.9
Preparation time	4.6	3.8	3.8	5.2
No answer	2.2	3.2	2.4	4.3
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)		***(1254)		***(1254)
Check origin of food at time of purchase	Age group		Sex	
	<40 years	≥40 years	Females	Males
Always	60.6	66.3	68.7	44.2
Occasionally	30.1	29.6	26.9	42.4
Never	8.9	3.7	4.0	12.6
No answer	0.4	0.5	0.4	0.9
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)		***(1254)		***(1254)
Having knowledge of food safety	Age group		Sex	
	<40 years	≥40 years	Females	Males
Yes	5.6	10.6	8.3	10.8
Some	29.9	47.9	41.7	39.0
Neither yes nor no	42.2	29.2	35.5	27.3
Little	18.2	10.0	12.3	16.0
No	3.7	2.0	1.9	6.1
No answer	0.4	0.4	0.3	0.9
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)		***(1254)		***(1254)

Note: Significance level is the same as in Table 1.

These differences in self-awareness of metabolic syndrome were reflected in differences in exercise habits; those 40 years and older indicated more frequent exercise as well as greater health awareness.

Table 5 Awareness of health and environment issues

Seeing yourself as having metabolic syndrome	Age group		Sex	
	<40 years	≥40 years	Females	Males
Yes	5.0	13.3	8.2	19.1
Potentially yes	24.0	34.1	29.2	35.5
No	62.8	48.2	56.7	39.8
Not sure	7.6	4.2	5.5	5.2
No answer	0.7	0.3	0.4	0.4
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)	***(1254)		***(1254)	
Regular exercise habit	Age group		Sex	
	<40 years	≥40 years	Females	Males
Everyday	6.9	14.7	10.8	16.5
Several times a week	19.7	26.8	24.6	22.1
Once a week	16.5	15.2	15.4	16.9
Rarely	56.3	42.9	48.7	44.2
No answer	0.7	0.5	0.6	0.4
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)	***(1254)		+(1254)	
Change in volume of household trash	Age group		Sex	
	<40 years	≥40 years	Females	Males
Increased	9.5	2.9	-	-
Somewhat increased	18.6	14.3	-	-
No change	54.8	45.3	-	-
Somewhat decreased	13.4	28.7	-	-
Decreased	3.0	8.1	-	-
No answer	0.7	0.8	-	-
Total (%)	100.0	100.0	-	-
Test result (sample size)	***(1254)		-	-
Carries own shopping bag	Age group		Sex	
	<40 years	≥40 years	Females	Males
Always	18.4	29.9	28.9	11.3
Occasionally	36.4	35.6	37.2	29.9
Not often	16.5	16.2	15.4	19.9
Rarely	28.8	17.8	18.1	38.5
No answer	0.0	0.5	0.3	0.4
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)	***(1254)		***(1254)	

Note: Significance level is the same as in Table 1.

Although regular physical exercise was not common among respondents and only a minority selected daily exercise as a response, we observed significant differences with regard to sex and age group. More than half of those responders under the age of 40 rarely exercised while about 40% of those 40 years and older exercised once or several times a week. Although more male than female respondents exercised daily, the difference was just barely significant. Thus, those 40 years or older are definitely health conscious.

Table 6 Participation in community work and willingness to be a food education volunteer

Participation in community work	Age group		Sex	
	<40 years	≥ 40 years	Females	Males
Positively	0.9	4.2	2.4	5.2
Somewhat positively	10.0	16.7	14.7	12.1
Passively	26.0	30.3	29.6	24.7
No	63.0	47.5	52.4	56.7
No answer	0.2	1.4	0.9	1.3
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)		***(1254)		*(1254)
Experience & willingness to be a food education volunteer	Age group		Sex	
	<40 years	≥40 years	Females	Males
Having experience	0.9	3.4	2.3	3.5
Yes, if chances are available	56.7	59.3	61.1	46.3
No	41.8	31.9	33.1	46.3
No answer	0.7	5.3	3.5	3.9
Total (%)	100.0	100.0	100.0	100.0
Test result (sample size)		***(1254)		***(1254)

Note: Significance level is the same as in Table 1.

As an aspect of environmental awareness, although most respondents answered that there was no change in the volume of household trash, a sharp contrast between age groups was observed; the portion of those indicating a decrease in volume was 36.8% of those aged 40 years and over while only 16.4% of those of under 40 years of age indicated a decrease. Conversely, the portion of those indicating an increase was 28.1% among respondents under 40 years of age but was only 17.2% in those 40 years of age or older. It is assumed that these differences came from the family life cycle and environmental awareness.

With regard to using one's own shopping bags instead of plastic bags provided by the store, there was no large difference between age groups in the category of only occasionally using personal shopping bags. There were, however, differences in the category of always using and rarely using such bags. Of those 40 years or older, 29.9% always used personal shopping bags whereas 28.9% of those of under 40 rarely used such bags. Further, nearly 40% of the males answered that they rarely carried their own bags. To summarize, environmental awareness was notably different between age groups and gender.

Local community work, and food education volunteering

Generally, participation in local community work was not frequent (Table 6). Even in the proactive 40 and over age group, only half participated and positive participation, including the "somewhat positively" response, was only 20.9%. Still, relatively speaking, those 40 and over were more actively involved than those under 40 (1% statistical significance).

As for experiences in participation as a food education volunteer and willingness to participate, whereas only a small percentage of respondents had such experiences, those 40 and over and the female respondents expressed a higher intention to participate than those under 40 and who were male (Table 6). In particular, nearly 50% of male respondents expressed no interest in this type of volunteer work. In short, although the middle-aged male respondents were interested in their own health issues,

they were not enthusiastic about engaging in food education, probably because of being busy with daily duties.

The willingness to participate as a food education volunteer in relation to various areas of interest is shown in Table 7. The areas of interest differed from one age group to another; those 40 and over preferred cooking class for a healthy diet and also food safety issues while those under 40 selected a succession of food culture, agriculture, forestry and fishery experiences, and international exchange of food cultures. To summarize, it is safe to say that those 40 and over have higher awareness of food, health, the environment, and the local community than those under 40.

Estimation of determinant factor of the willingness to participate as a food education volunteer

Given the analytical model and results of the statistical test, we set up an estimation model.

$$V = \alpha_0 + \alpha_1 \text{houshld}_1 + \alpha_2 \text{houshld}_2 + \alpha_3 \text{food}_1 + \alpha_4 \text{food}_2 + \alpha_5 \text{envrn} + \alpha_6 \text{health} + \alpha_7 \text{community} + \mu \tag{6}$$

Where, α_0 = constant, α_i = parameters to be estimated, ($i = 1, \dots, 7$)

μ = stochastic error

Specifically, the explained variable that demonstrates the willingness to volunteer is based on binary data; unity is given if respondents have such an intention or have volunteer experience whereas zero is given if respondents have no intention. As for explanatory variables, two variables are used as household attributes; first, we considered the variable of sex because the opportunity cost for volunteer work is supposed to be lower in females than in males. Second, those households that have children 13 years of age or older (junior high school age and older) get unity while zero is given for those with children under 13 years old. This is because parents will have more leisure time due to a decrease in childcare work when children reach junior high school age. This variable also can be interpreted as a proxy variable representing the inter-generation differences at around the age of 40 years to avoid multicollinearity due to the correlation between the age of children and parents. Also there is a high correlation between the generation variable at 40 years old and other variables related to life stage. These household variables will reduce the opportunity cost, so that we can expect positive sign conditions.

We considered two variables for food awareness. The first variable is the frequency of celebrations involving serving traditional foods at home, which represents the degree of food awareness. The second is the degree of checking areas of origin of purchased food

Table 7 Areas of interest as a food education volunteer

Items	Age group		Test results (sample size)	Sex		Test results (sample size)
	<40 years	≥40 years		Females	Males	
Percentage of responses						
Cooking class for healthy diet	26.0	35.7	***(1254)	34.3	22.5	***(1254)
Improvement in eating habits	23.6	24.2	n(1254)	25.4	17.8	** (1254)
Food culture succession activity	23.6	19.8	+(1254)	22.4	16.0	** (1254)
Food safety and appropriate labeling	14.5	25.1	*** (1254)	22.3	16.5	* (1254)
Food waste and recycling	13.9	12.1	n(1254)	12.6	13.4	n(1254)
Agriculture, forestry & fishery experiences	13.4	8.8	** (1254)	10.4	11.3	n(1254)
International exchange of food cultures	9.5	6.2	** (1254)	7.9	5.2	+(1254)

Note: Significance level is the same as in Table 1.

(always = 1, not always = 0). As the variable for environmental awareness, the degree of reduction in household trash emission (decreased = 1, not decreased = 0) was used. As for the variable of health awareness, we used the frequency of regular physical exercise (daily = 1, not daily = 0). These variables are expected to have positive signs. It is supposed from the statistical analysis above that those with positive participation in community work will be expected to be positive in participation in volunteer work as well (positive = 1, not positive = 0).

For estimation, we used a binary logit model because of the binary nature of the explained variable. Binary logit models have been quite widely used for evaluation of binary qualitative choices of behaviours due to their simplicity although this model is not capable of dealing with cases of multiple choices. The estimation results are shown in Table 8. Although we tried an ordered logit model by using a three-category explained variable (having experience of food education volunteer = 3, having willingness to volunteer = 2, no willingness = 0), the result was not good enough to adopt. Thus, we took the results of the binary logit model. As a reference, we showed the robust estimate of variance in addition to the standard estimate of variance. There was no distinctive difference between the standard and robust estimates in terms of parameters and significance levels.

Not every parameter was inconsistent with sign conditions, which means that these variables raise the willingness for volunteer activity by reducing the opportunity cost for that work. Among the estimated parameters, the community oriented attitude had the highest odds ratio, that is, 2.40, which means that this attitude is the most influential factor for willingness to volunteer. Then, being female, being middle aged, and having health awareness followed. Factors related to food awareness had positive effects on willingness to volunteer, but were not highly influential. The environmental factor was a barely influential factor because the parameter showed 20% significance, which is only used for reference. In short, those urbanites who are community oriented, female, middle aged, and having health awareness can comprise a potential volunteer group supportive of food education. The result here is not inconsistent with the previous study on volunteering as mentioned in the literature review (Bussell and Forbes 2001).

Conclusions

Food education aims at establishment of self-motivating behaviour leading to healthy dietary habits. This paper investigated the awareness of food education by a questionnaire survey mailed to 3,000 inhabitants in Matsudo and explored the factors determining the willingness to participate as a food education volunteer.

From conceptual considerations, we stipulated that educated food behaviour accompanied by volunteer behaviour exerts externalities to society by self-imposing internalization of the opportunity cost of conducting volunteer work, which set the empirical framework below.

First, from results of the questionnaire survey, the awareness of food education greatly differs with statistical significance between age groups and between males and females. Specifically, the age group under 40 years old has lower awareness and knowledge about food than does the older group. Although males are self-conscious regarding health issues to some extent, they are not highly conscious of food education. Thus,

Table 8 Estimation result of willingness to participate as a food education volunteer (binary logit model)

Factor	Explanatory variable	Parameter		Odds ratio
		Ordinary std. err.	Robust std. err.	
Respondent/household attribute 1	Respondent sex (female = 1, male = 0)	0.4409*** (2.79)	0.4409*** (2.84)	1.55
Respondent/household attribute 2	Having child ≥ 13 years (yes = 1, no = 0)	0.3546** (1.99)	0.3546** (2.03)	1.43
Food awareness 1	Frequency of celebrations at home with traditional foods	0.1713*** (3.31)	0.1713*** (3.34)	1.19
Food awareness 2	Checking origin of food at time of purchase (always = 1, not always = 0)	0.2270* (1.77)	0.2270* (1.79)	1.25
Environment awareness	Change in emission of household garbage (decreased = 1, not decreased = 0)	0.2083+ (1.53)	0.2083+ (1.52)	1.23
Health awareness	Practice of regular exercise (daily = 1, not daily = 0)	0.3577*** (2.95)	0.3577*** (2.97)	1.43
Community awareness	Participation in community activities (positive = 1, not positive = 0)	0.8746*** (4.79)	0.8746*** (4.74)	2.40
-	Constant	-1.3451*** (-4.80)	-1.3451*** (-4.87)	-
Number of samples		1254		1.254
Log likelihood		-796.7120		-796.7124
LR Chi-square test		85.52***		73.75***

Note: Note: Significance level is the same as in Table 1. Figure in () is Z value.

females and those 40 years or older have positive attitudes toward food education and knowledge of food education.

Second, from the estimation result of the determinant function of willingness to participate as a food education volunteer, those inhabitants who had positive attitudes toward health and community issues expressed their willingness to volunteer. In short, our study results support the necessity and effectiveness of promoting food education to enhance not only food aspects, but also multiple aspects of daily life such as health and community awareness.

Consequently, it is necessary to enhance the awareness of food education among those under 40 years old who are busy raising children and working at jobs. On the other hand, the existence of generation gaps in terms of interest in and knowledge regarding food education suggests a complementary role between generations. For instance, those of the middle-aged generation and who are highly conscious of community issues can play a complementary role by supporting as food education volunteers the busy younger generation that is involved in raising children. Further research is necessary on effective measures for food education and evaluation of these educational results. Also, a civic-participatory food policy framework should be more closely scrutinized in the long run.

Competing interests

The author declares that there is no any competing interest among people and organizations concerned.

Authors' contributions

The first author mainly conducted a data analyses while the second author was mainly in charge of design of the survey in this study and the third author was mainly in charge of implementation of the survey. We shared the research results. All authors read and approved the final manuscript.

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