

Non-farmers' Preference for Assisting with Farm Tasks as a Method of Health Promotion

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Abstract

Increasing attention has been focused on promoting the physical and psychological health of non-farmers through farm activities such as home gardening and allotment gardening. In addition to these two farm activities, another farm activity — assisting with farm tasks — has been recently observed among non-farmers. Assuming that certain activities promote the health of non-farmers, specifically assisting with farm tasks near the home, allotment gardening, home gardening, walking, hiking, light physical exercise, home training with gymnastic equipment, and bowling, the preference for assisting with farm tasks compared to other farm and non-farm activities for health promotion was assessed among non-farmers in Chiba prefecture, Japan. Based on the best-worst scaling approach, assisting with farm tasks and allotment gardening were found to be the least and second-least preferred activities, respectively, while home gardening was found to be more preferred than these two farm activities. According to our results, decreasing farm task difficulty, reducing the travel cost of visiting a farmer, and asking non-farmers to only assist with tasks that can be conducted at their own pace could increase the non-farmers' preference for assisting with farm tasks as a method of health promotion.

Discipline: Agricultural economics

Additional key words: best-worst scaling, gardening, ordered logit model, relative importance

Introduction

The key concept for evaluating agriculture is multifunctionality. While the principal role of agriculture is to produce food and non-food products, other roles include flood prevention, biodiversity, landscaping, and cultural heritage (OECD 2001, Aizaki et al. 2006, Renting et al. 2009). Recently, more attention has been focused on promoting the physical and psychological health of non-farmers through farm activities (Maas et al. 2006, Park et al. 2009, Sommerfeld et al. 2010, van den Berg et al. 2010, Hawkins et al. 2011, Onimaru et al. 2015). In one study, van den Berg et al. (2010) revealed that individuals with allotment gardens have better self-perceived health and well-being scores than their neighbors without an allotment garden. Previous studies regarding non-farmers' farm activity and their health mainly focused on daily farm activities, such as home gardening and/or allotment gardening. Those

engaging in home gardening may grow crops, flowers, and other plants in their home garden or in garden planters on the veranda of their home. They could also rent an allotment garden, usually from a farmer, near their home to grow crops, flowers, and other plants.

In addition to these two farm activities, which are also common in Japan, assisting with farm tasks is another farm activity that has been recently observed among non-farmers, especially in urban areas. Assisting with farm tasks is the activity of visiting a farmer near one's home to assist with farm tasks assigned by the farmer. Compared with home gardening and allotment gardening, assisting with farm tasks has a stronger connection with agriculture as conducted by farmers (see Ohe [2009] for details regarding the farm activities of non-farmers in urban areas and the related policies in Japan).

Several previous studies have examined the demand of Japanese non-farmers for daily farm activities. Among

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these studies, Aizaki (2005) estimated a demand function for allotment gardening in a local area of Japan using discrete choice experiments and a geographical information system, while Yagi (2013) estimated the demand of non-farmers for assisting with farm tasks in Tokyo. In a survey of elderly non-farmers in three major urban areas in Japan, Onimaru et al. (2015) revealed that their willingness and perceived ability affect their intention to assist with farm tasks near their home to promote health. Although valuable, these studies focused on a specific farm activity and did not consider non-farm activities, including the many sport and leisure activities that promote health. A comparison of preferences for farm and non-farm activities should be considered when analyzing the demand for farm activities for promoting health. If this comparison is neglected, the relative importance of each activity cannot be measured and the best means of raising awareness about assisting with farm tasks as a method of promoting health cannot be determined.

To fill this research gap, this study used the best-worst scaling (BWS) approach to examine how non-farmers evaluate the activity of assisting with farm tasks compared to other farm and non-farm activities for promoting health. Although the BWS approach is divided into three types, which include case 1 (object case) BWS, case 2 (profile case) BWS, and case 3 (multiprofile case) BWS (see Flynn [2010] and Flynn & Marley [2014] for a detailed descriptions of the three types of BWS), this study used case 1 BWS (hereafter, BWS refers to case 1 BWS). The use of BWS, which was developed by Finn & Louviere (1992) and is applied in various research disciplines, enables the relative importance of items to be estimated, and was therefore suitable for determining preferences for many health-promoting activities. This study also used an ordered logit model to explore the factors affecting non-farmers' evaluation of assisting with farm tasks to promote health.

Data and Methods

1. Survey method

A web survey was conducted in February 2014. A total of 830 respondents were recruited from a survey panel maintained by MACROMILL, a major web survey company in Japan. The respondents were limited to non-farmers living in the Chiba prefecture of Japan, which is contiguous with Tokyo and a well-known agricultural region. To examine the effects of gender and age on the non-farmer's evaluation of the activities, 83 respondents were selected from each of the 10 categories constructed by combining the two main factors of gender (male and female; two categories) and age (20s, 30s, 40s, 50s, and 60s; five categories).

2. Activities for promoting health

The following eight activities were assumed to

promote the health of non-farmers: assisting with farm tasks near the home (assisting with farm tasks), allotment gardening, home gardening, walking, hiking, light physical exercise (exercise), home training with gymnastic equipment (training), and bowling. The farm activities evaluated were assisting with farm tasks, allotment gardening, and home gardening. Although non-farm activities (i.e., walking, hiking, exercise, training, and bowling) were selected based on responses to the 2011 Survey on Time Use and Leisure Activities (Ministry of Internal Affairs and Communications 2012), the original "walking or light physical exercise" category was divided into the two categories of "walking" and "light physical exercise" for the survey used in this study. This division was deemed necessary because walking is mainly an outdoor activity, while light physical exercise is mainly an indoor activity; therefore, non-farmers' preferences for walking and exercising may differ.

3. Best-worst scaling

BWS was used for measuring the relative importance of the eight activities for promoting health. A key feature of BWS is that it enables efficient measurement of the relative importance of a large number of items. If a paired comparison approach is used for measuring the relative importance of eight items, each respondent is required to answer a total of 28 paired comparison questions. If a total of eight items is evaluated, BWS would require each respondent to answer a total of 14 questions. The reason why each respondent would be required to answer 14 questions is that BWS requires a comparison of three or more items in each question and the construction of a combination of items in each question using an experimental design (for applications and detailed information regarding the BWS approach, refer to Flynn [2010], Louviere et al. [2013], Flynn & Marley [2014], and Aizaki et al. [2014]).

Figure 1 shows a sample of the BWS questions used in this study. Respondents were requested to select the most and least preferred activities for health promotion from a list of four activities. By changing the combination of activities presented to the respondents, the BWS questions were repeated 14 times for each respondent (i.e., 14 BWS questions per respondent). A balanced incomplete block design composed of eight items with 14 rows and four items per row (Cochran & Cox 1957) was used to create the 14 BWS questions.

Aggregated BWS scores were used for comparing the order of preference for activities among all respondents and/or among subgroups. Although various aggregated BWS scores have been proposed, we used the square root of the ratio of B_i to W_i ($\text{sqrt}BW_i$) for activity i :

$$\text{sqrt}BW_i = \sqrt{B_i / W_i}$$

and its standardized version:

$$\text{standardized (std.) sqrt}BW_i$$

$$= 100 \times \text{sqrt}BW_i / \text{maximum sqrt}BW_i,$$

where $B_i = \sum_n B_{in}$ and $W_i = \sum_n W_{in}$; B_{in} and W_{in} are the number of times individual n selected activity i as the most and least preferred activity in all presented BWS questions, respectively; std. sqrtBW_i is the relative importance of activity i among the eight activities; and the maximum sqrtBW_i is the maximum score among all activities. For example, if the std. sqrtBW for activity i and j is 20 and 40, respectively, activity j is twice (i.e., $40/20 = 2$) as important as activity i .

The individual level BWS score for assisting with farm tasks was examined to determine which factors affect non-farmers' evaluation of assisting with farm tasks as a method of health promotion. The BWS score of activity i was calculated as follows:

$$BW_{in} = B_{in} - W_{in}.$$

In this study, relative preference was indicated by ordered integer values ranging from -7 to 7 , which referred to the activities selected as the least and most preferred seven times, respectively. An ordered logit model (Greene & Hensher 2010) was used for the analysis.

Factors that affect non-farmers' evaluation of assisting with farm tasks were assumed to be gender, age, and willingness and ability to assist with farm tasks (Onimaru et al. 2015). To adjust for the possible effects of other individual characteristics on non-farmers' evaluation of assisting with farm tasks, the variables of having experience with farm management, having parents, close relatives, or friends who are farmers, and living near farmland were included and defined as shown in Table 1.

R (R Core Team 2015) along with the package support.BWS (Aizaki 2014, Aizaki et al. 2014) and the function `polr()` in the package MASS (Venables & Ripley 2002) was used to prepare the questionnaire and analyze the responses.

Results and Discussion

Table 2 lists the BWS scores for each activity among all respondents. Only three activities (i.e., walking, exercise, and home gardening) had sqrtBW scores > 1 , meaning that the B score was larger than the W score for activity i . The

sqrtBW scores of the other five activities (i.e., hiking, training, bowling, allotment gardening, and assisting with farm tasks) were < 1 . A remarkable finding was that walking and exercise are relatively strongly preferred, with the std. sqrtBW for the two activities 100 and 77.6, respectively, while that for the other six activities were less than 50. The order of activities from the most to least preferred for all respondents was (1) walking, (2) exercise, (3) home gardening, (4) hiking, (5) training, (6) bowling, (7) allotment gardening, and (8) assisting with farm tasks. The order of preference for these activities was nearly similar when the respondents were stratified according to male and female subgroups (Table 3) and age subgroups (Table 4).

Walking, exercise, and home gardening are activities that are conducted in or around home that impose no or little financial burden. The other five activities require travel from the home to a location where the activity can be conducted and/or impose a financial burden in the form(s) of travel costs, equipment costs, and/or activity fees. These results indicate that the features of activities, such as the need to travel to a different location and the need for a monetary outlay for participation, appear to affect preferences for activities (Franco et al. 2015).

An important finding was that assisting with farm tasks had the lowest sqrtBW score, indicating that it was the least preferred activity. The standardized scores for assisting with farm tasks was 18.9 for all respondents (Table 2), 19.8 and 15.7 for the male and female subgroups, respectively (Table 3), and 21.8, 23.7, 22.0, 13.0, and 14.4 for those in their 20s, 30s, 40s, 50s, and 60s, respectively (Table 4). Allotment gardening also had a low sqrtBW score. Conversely, home gardening was found to be the third-most preferred activity, meaning that it was more preferred than allotment gardening and assisting with farm tasks. The relatively greater preference for home gardening may be not only because it requires no travel and imposes no or few monetary costs, as explained previously, but also because it is easier for non-farmers to conduct than allotment gardening and assisting with farm tasks. Allotment gardening and assisting with farm tasks require various farm skills and

Please select the most and least preferred activities for promoting your health from the following four activities (select one activity for each).

	Most preferred	Least preferred
Assisting with farm tasks near the home	<input type="radio"/>	<input type="radio"/>
Allotment gardening	<input type="radio"/>	<input type="radio"/>
Home gardening	<input type="radio"/>	<input type="radio"/>
Walking	<input type="radio"/>	<input type="radio"/>

Fig. 1. A sample of best-worst scaling questions in this study

Table 1. Definitions of independent variables

Variable	Definition	Mean
FEMALE	Dummy variable set to 1 if the respondent is female, 0 otherwise	0.500
AGE30	Dummy variable set to 1 if the respondent is in their 30s, 0 otherwise	0.200
AGE40	Dummy variable set to 1 if the respondent is in their 40s, 0 otherwise	0.200
AGE50	Dummy variable set to 1 if the respondent is in their 50s, 0 otherwise	0.200
AGE60	Dummy variable set to 1 if the respondent is in their 60s, 0 otherwise	0.200
WILLING1	Dummy variable set to 1 if the respondent's answer to the question regarding willingness to assist with farm tasks is "I agree," 0 otherwise	0.061
WILLING2	Dummy variable set to 1 if the respondent's answer to the question regarding willingness to assist with farm tasks is "I rather agree," 0 otherwise	0.245
WILLING3	Dummy variable set to 1 if the respondent's answer to the question regarding willingness to assist with farm tasks is "Neutral," 0 otherwise	0.229
WILLING4	Dummy variable set to 1 if the respondent's answer to the question regarding willingness to assist with farm tasks is "I rather disagree," 0 otherwise	0.207
ABILITY1	Dummy variable set to 1 if the respondent's answer to the question regarding ability to assist with farm tasks is "I agree," 0 otherwise	0.055
ABILITY2	Dummy variable set to 1 if the respondent's answer to the question regarding ability to assist with farm tasks is "I rather agree," 0 otherwise	0.248
ABILITY3	Dummy variable set to 1 if the respondent's answer to the question regarding ability to assist with farm tasks is "Neutral," 0 otherwise	0.289
ABILITY4	Dummy variable set to 1 if the respondent's answer to the question regarding ability to assist with farm tasks is "I rather disagree," 0 otherwise	0.242
FARMER	Dummy variable set to 1 if the respondent was farmer, 0 otherwise	0.025
OTHER1	Dummy variable set to 1 if the respondent's parent(s) is a/are farmer(s), 0 otherwise	0.070
OTHER2	Dummy variable set to 1 if the respondent's close relative(s) is a/are farmer(s), 0 otherwise	0.206
OTHER3	Dummy variable set to 1 if the respondent's friend(s) is a/are farmer(s), 0 otherwise	0.095
FARMLAND1	Dummy variable set to 1 if a farmland is located near the respondent's home, 0 otherwise	0.371
FARMLAND2	Dummy variable set to 1 if a farmland is located in the respondent's daily life zone during weekdays, 0 otherwise	0.149
FARMLAND3	Dummy variable set to 1 if a farmland is located in the respondent's daily life zone during holidays, 0 otherwise	0.082

Note: The baseline categories were "20s" for AGE, "I disagree" for WILLING, "I disagree" for ABILITY, "I don't have parents, close relatives, and friends who are farmers" or "I don't know" for OTHER, and "farmland is not located near the respondent's home" or "I don't know" for FARMLAND.

equipment, long work hours, and a high workload. Thus, such tasks may cause anxiety among non-farmers regarding the dangers associated with using farm equipment and/or the physical fatigue associated with conducting farm tasks (Onimaru et al. 2015), which would result in the lower evaluation of assisting with farm tasks and/or allotment gardening.

Other reasons for the relatively greater preference for home gardening may be that it can be enjoyed independently, while assisting with farm tasks and allotment gardening require working collaboratively with others. Relatively more individuals may prefer conducting health-promoting activities at their own pace, which is not possible in allotment gardening or assisting with farm tasks. Furthermore,

Table 2. Aggregated best-worst scaling scores

Activity	B	W	sqrtBW	std. sqrtBW
Assisting with farm tasks	645	2,514	0.507	18.9 (8)
Allotment gardening	713	2,389	0.546	20.4 (7)
Home gardening	1,561	966	1.271	47.4 (3)
Walking	2,858	398	2.680	100.0 (1)
Hiking	1,237	1,259	0.991	37.0 (4)
Exercise	2,121	491	2.078	77.6 (2)
Training	1,292	1,669	0.880	32.8 (5)
Bowling	1,193	1,934	0.785	29.3 (6)

Notes: $n = 830$. B and W are the number of times all respondents selected each activity as the most and least preferred out of the 14 best-worst questions, respectively. sqrtBW and std. sqrtBW are the square root of the ratio of B to W for each activity and its standardized version, respectively. Values in parentheses denote the order of activities based on std. sqrtBW.

Table 3. Comparison of aggregated best-worst scaling scores for each activity according to gender

Activity	Male ($n = 415$)		Female ($n = 415$)	
	sqrtBW	std. sqrtBW	sqrtBW	std. sqrtBW
Assisting with farm tasks	0.519	19.8 (8)	0.494	15.7 (8)
Allotment gardening	0.596	22.7 (7)	0.499	15.9 (7)
Home gardening	1.105	42.1 (3)	1.469	46.7 (3)
Walking	2.625	100.0 (1)	2.738	87.1 (2)
Hiking	1.032	39.3 (4)	0.950	30.2 (4)
Exercise	1.542	58.8 (2)	3.144	100.0 (1)
Training	0.963	36.7 (5)	0.794	25.3 (5)
Bowling	0.883	33.6 (6)	0.691	22.0 (6)

Notes: sqrtBW and std. sqrtBW are the square root of the ratio of best score to worst score for each activity and its standardized version, respectively. Values in parentheses denote the order of activities based on std. sqrtBW.

Table 4. Comparison of aggregated best-worst scaling scores for each activity according to age categories

Activity	20s ($n = 166$)		30s ($n = 166$)		40s ($n = 166$)		50s ($n = 166$)		60s ($n = 166$)	
	sqrt-BW	std. sqrtBW	sqrt-BW	std. sqrtBW	sqrt-BW	std. sqrtBW	sqrt-BW	std. sqrtBW	sqrt-BW	std. sqrtBW
Assisting with farm tasks	0.509	21.8 (8)	0.577	23.7 (8)	0.528	22.0 (8)	0.410	13.0 (8)	0.512	14.4 (8)
Allotment gardening	0.562	24.0 (7)	0.592	24.3 (7)	0.562	23.4 (7)	0.452	14.3 (7)	0.565	15.9 (6)
Home gardening	1.141	48.8 (3)	1.109	45.5 (3)	1.143	47.6 (3)	1.241	39.2 (4)	1.818	51.1 (3)
Walking	2.336	100.0 (1)	2.356	96.7 (2)	2.400	100.0 (1)	3.165	100.0 (1)	3.556	100.0 (1)
Hiking	0.880	37.7 (6)	0.816	33.5 (5)	0.991	41.3 (4)	1.275	40.3 (3)	1.090	30.7 (4)
Exercise	1.824	78.1 (2)	2.437	100.0 (1)	1.995	83.2 (2)	1.959	61.9 (2)	2.313	65.0 (2)
Training	0.894	38.3 (5)	1.028	42.2 (4)	0.898	37.4 (6)	0.959	30.3 (5)	0.647	18.2 (5)
Bowling	1.115	47.7 (4)	0.685	28.1 (6)	0.904	37.7 (5)	0.743	23.5 (6)	0.537	15.1 (7)

Notes: sqrtBW and std. sqrtBW are the square root of the ratio of best score to worst score for each activity and its standardized version, respectively. Values in parentheses denote the order of activities based on std. sqrtBW.

without considering the health-promoting aspects of these activities, the demand for non-farmers to assist with farm tasks and/or allotment gardening appears to be extremely low. In a local area of Japan, the ratio of individuals who assisted with farm tasks to the total number of residents was forecast at < 1% (Yagi 2013). In another area, the ratio of allotment gardeners to the total number of residents was estimated at 1.5% to 7.6% (Aizaki 2005). Although conducted under specific conditions and with the data being collected in local areas, these forecasts suggest that the low demand may result in a lower evaluation of these activities for health promotion.

Figure 2 shows the distribution of individual BWS scores for assisting with farm tasks — the dependent variable used in the ordered logit model analysis. As expected according to Table 2, a majority of respondents (589; 71.0% of all respondents) had negative scores for assisting with farm tasks. Moreover, a relatively large number (132; 15.9% of all respondents) had the lowest score possible (-7) for assisting with farm tasks.

Table 5 shows the estimation results from the ordered logit model analysis. The gender and age dummy variables were not significant at the 10% level. In contrast, the dummy variables for willingness to assist with farm tasks (i.e., WILLING1 to WILLING4) were significant at the < 1% level, indicating that willingness to assist with farm tasks affects the likelihood that individuals would change their evaluation of assisting with farm tasks. Two dummy variables for the ability to assist with farm tasks (i.e., ABILITY1 and ABILITY2) were significant at the 10% and 1% levels, indicating that the ability to assist with farm tasks marginally affects the likelihood that individu-

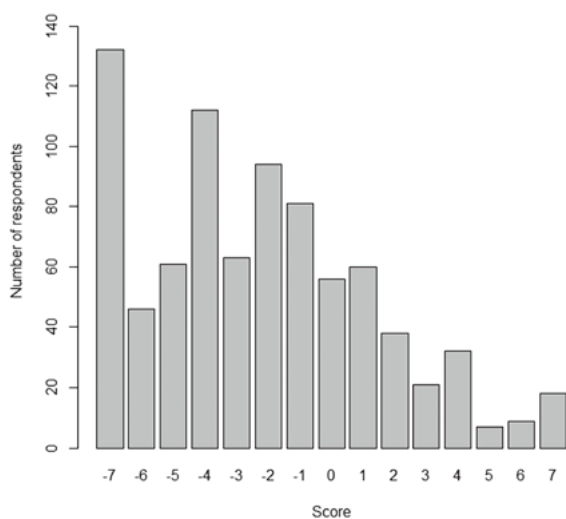


Fig. 2. Distribution of individual level best-worst scaling scores for assisting with farm tasks

als would change their evaluation of assisting with farm tasks. Dummy variables of having experience with farm management, having parents, close relatives, or friends who are farmers, and living near farmland (i.e., FARMER to FARMLAND3) were not significant at the 10% level. As in the results of Onimaru et al. (2015), these estimation results suggest that the willingness and ability of non-farmers to assist with farm tasks affect their intention to assist with

Table 5. Results from the ordered logit model analysis

Variable	Coefficient	t-value
FEMALE	0.075	0.605
AGE30	0.290	1.473
AGE40	0.072	0.369
AGE50	-0.127	-0.646
AGE60	0.130	0.655
WILLING1	3.790	11.661
WILLING2	2.866	12.497
WILLING3	1.341	6.269
WILLING4	0.674	3.243
ABILITY1	0.563	1.720
ABILITY2	0.568	2.386
ABILITY3	-0.004	-0.017
ABILITY4	-0.051	-0.230
FARMER	0.378	0.927
OTHER1	-0.072	-0.285
OTHER2	0.138	0.874
OTHER3	0.200	0.975
FARMLAND1	-0.154	-1.052
FARMLAND2	-0.018	-0.096
FARMLAND3	0.383	1.569
μ_1	-0.548	-2.450
μ_2	-0.127	-0.577
μ_3	0.344	1.569
μ_4	1.119	5.007
μ_5	1.548	6.806
μ_6	2.222	9.448
μ_7	2.869	11.789
μ_8	3.374	13.495
μ_9	4.029	15.469
μ_{10}	4.553	16.810
μ_{11}	4.913	17.549
μ_{12}	5.701	18.485
μ_{13}	5.959	18.544
μ_{14}	6.403	18.298

Note: μ_1 -14 indicate threshold parameters.

farm tasks, and that ability has a lower impact on intention than willingness.

Conclusion

This study evaluated the preference for assisting with farm tasks, allotment gardening, home gardening, and five non-farm activities for promoting the health of non-farmers. The results revealed that assisting with farm tasks and allotment gardening were the least and second least preferred activities, while home gardening was more preferred than these two farm activities. According to our findings, difficulties in assisting with farm tasks, the travel cost of visiting a farmer, and the need to work collaboratively with others may be responsible for the low preference for assisting with farm tasks. Therefore, we concluded that the following activities could increase the preference for assisting with farm tasks among non-farmers:

- (1) Fractionalize farm tasks according to the skills required to conduct the tasks, and then request non-farmers to assist with only unskilled tasks that are easy for them to do.
- (2) Develop agricultural machinery and/or equipment that reduce the difficulty of skilled tasks, which could subsequently increase the number of (unskilled) tasks for non-farmers.
- (3) Provide a free chauffeur service for non-farmers to reduce the travel cost of visiting a farmer in cooperation with local community organizations that are interested in farm activities. Such cooperation would also reduce the farmers' cost of recruiting (e.g., advertising) non-farmers to assist with farm tasks.
- (4) Ask non-farmers to only assist with tasks that can be conducted at their own pace to avoid the need to work collaboratively with others.

This study faced two limitations that may have affected the results. First, the population was limited to non-farmers in one prefecture of Japan. A survey targeting a larger population (i.e., the entire population of Japan) is necessary to formulate a general conclusion. Second, the survey collected limited, specific information regarding home gardening, allotment gardening, and assisting with farm tasks. Within- or between-subject experiments should be conducted to examine more ways of raising awareness about assisting with farm tasks as a method of health promotion. While this study assumed that the farmers providing the farm tasks lived near the respondents in urban areas, farmers living in rural areas further away from non-farmers could also provide the tasks. Non-farmers could enjoy this farming/agricultural leisure activity on a non-daily basis, which might change how they evaluate assisting with farm tasks as a method of health promotion.

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