academicJournals

Vol. 9(12), pp. 373-380, December 2017
DOI: 10.5897/JDAE2017.0869
Article Number: BF6460866818
ISSN 2006-9774

http://www.academicjournals.org/JDAE

Journal of Development and Agricultural Economics

Full Length Research Paper

Who engages in urban and peri-urban agriculture in the condensed urban slums of Bangladesh?

Haruka Yamashita and Akira Ishida*

Graduate School of Agricultural Science, Kobe University, 1-1 Rokkodai-cho, Nada-ku, Kobe, 657-8501, Japan.

Received 24 August, 2017; Accepted 13 October, 2017

Urban and peri-urban agriculture (UPA) have been considered solutions for improving poor living conditions in undeveloped urban and peri-urban areas of developing countries. Therefore, this paper aims to identify the factors affecting UPA decision-making, with special attention to land constraints among poor urban slum dwellers in Bangladesh. A logit regression model was applied using secondary individual household data obtained from the International Food Policy Research Institute (IFPRI), and the predicted probabilities of engaging in UPA for each significant independent variable were estimated. In moderately populated Jessore, households that had more family members without children under five, had some savings, lived in their own house or lived there without paying rent, and had any water logging around the house 1 to 60 days per year were more likely to engage in UPA than other households. On the other hand, in densely populated Tongi, households that lived in their own house or lived there without paying rent, lived there for longer periods, had any water logging around the house less than four months per year, or could rely on neighbors through a difficult period were more likely to engage in UPA than other households. This finding suggests that constraint factors associated with engaging in UPA differ in various urban settings. Therefore, nonprofit/community organizations or local governments are required to plan carefully when promoting UPA, which is one of the coping strategies of poor urban dwellers wishing to enhance their resilience against food insecurity.

Key words: Urban and peri-urban agriculture, urban slum, Bangladesh.

INTRODUCTION

In the 15 years of the Millennium Development Goals (MDGs), the proportion of undernourished people in developing and transitional areas has been almost halved (UN, 2015), but eradication of pervasive food poverty is still one of the most difficult challenges the world is facing. The majority of the poverty-stricken population in developing countries, who are most likely to suffer from perpetual nutritional deprivation, are still cut off from access to sufficient basic food to meet their daily needs. Vulnerability to food insecurity inhibits the poor from

*Corresponding author. E-mail: akira_ishida@people.kobe-u.ac.jp.

engaging in stable income-generating activities, investing in human and physical capital, and thereby breaking the vicious circle of poverty. Therefore, mitigating their vulnerability has always been high on the agenda of poverty reduction programs.

The question is what remedies can reduce this vulnerability from the viewpoint of food poverty reduction in situations where urbanization has grown rapidly in developing countries. Seemingly old-fashioned but low-cost urban and peri-urban agriculture (UPA) offers an answer here. UPA is roughly defined as growing food crops (such as vegetables, root and tuber crops, staple grains, and fruits) and raising domestic animals (such as poultry, cattle, swine, and goats) within and around urban areas. Various empirical studies claim that UPA has been considered a solution for improving poor living conditions in undeveloped urban and peri-urban areas of developing countries, on the grounds of its effects on improving household food and nutrition intakes (Amrullah et al., 2017; Bhatta et al., 2008; Bukusuba et al., 2007; Dossa et al., 2011; Gallaher et al., 2013a; Lynch et al., 2013; Smart et al., 2015; Zezza and Tasciotti, 2010) and the physique of a child (Maxwell, 1995; Maxwell et al., 1998), increasing or diversifying household income (Amrullah et al., 2017; Ashebir et al., 2007; Maxwell, 1995; Smart et al., 2015; Zezza and Tasciotti, 2010), providing remunerative economic activities for women (Mudimu, 1996; Maxwell, 1995), empowering women through economic independence (Gororo and Kashangura, 2016; Masvaure, 2015; Simiyu and Foeken, 2014), and accumulating social capital (Gallaher et al., 2013a).

However, determinants or deterrents of urban and peri-urban agriculture in developing countries have rarely been examined in detail, with the few exceptions pointing out that the more members there are in a family (Dossa et al., 2011; Maxwell, 1995) and the longer their length of stay at their current residential address (Maxwell, 1995), the more likely a family is to engage in urban agriculture in cities in Africa. Additionally, previous studies regarding UPA have paid considerable attention to African countries only where severe food poverty has been pervasive, and UPA in Asian countries has rarely been discussed. However, it is well known that food poverty remains widespread and continues to be a challenging problem in South Asian countries, particularly in Bangladesh, which has a large poverty-stricken urban population. Hence, it is valuable to obtain insights into the factors affecting UPA engagement in the urban slums of Bangladesh, not only to bring us closer to understanding urban food production in the country, but also to map out strategies for mitigating vulnerabilities to food insecurity among poverty-stricken slum dwellers in Bangladesh and other South Asian countries, such as India, Pakistan, and Nepal. Therefore, this study identifies the factors affecting UPA decision-making, with special attention to land constraints among poor urban dwellers in Bangladesh. To accomplish this objective, a logit regression model was applied using secondary individual household data obtained from the International Food Policy Research Institute (IFPRI).

MATERIALS AND METHODS

Data and study areas

Slum household data were obtained from the Supporting Household Activities for Health, Assets, and Revenue (SHAHAR)[1] Project Baseline Survey, conducted by the International Food Policy Research Institute (IFPRI) and CARE-Bangladesh in the municipal areas of Tongi and Jessore during August and September 2000. Although the data set was not collected recently and most probably does not reflect the current situation of UPA in rapidly growing urban slums due to a massive inflow of job-seeking migrants from rural and suburban areas, it still seems that clarifying the factors affecting decision-making around UPA provides policy makers and practitioners with useful information on a situation where a reliable large sample microdata set including UPA practices in urban slums in Bangladesh is not available.

The SHAHAR Project was designed by utilizing an integrated Household Livelihood Security (HLS) framework, aimed to improve livelihood security for vulnerable urban households through infrastructure improvements, nutritional education, vocational and skills training, community mobilization, and institutional strengthening.

Jessore is mainly a peri-urban city located approximately 200 km southwest of Dhaka, the capital of Bangladesh. The Jessore district adjoins India on the west. Thus, the city is an important transit route to that neighboring country. According to the IFPRI's (2003) City Profiles, 40% of men and 33% of women in Jessore are undernourished; approximately one-fourth of women suffer from being underweight, and 34% of men and 48% of women over seven years old are illiterate. Tongi is located approximately 25 km north of Dhaka and is a center of the textile and rice-milling industries. Similarly to Jessore, 41% of men and 49% of women in Tongi are undernourished; approximately two-thirds of women suffer from being underweight due mainly to extreme poverty, and 44% of men and 56% of women over seven years old are illiterate.

CARE-Bangladesh (2001) estimated that there are 63 slums with a total population of 11,228 households (51,832 persons) in Jessore and 21 slums with 13,664 households (56,689 individuals) in Tongi. The IFPRI and CARE-Bangladesh randomly chose households from Jessore and Tongi, and a total of 1,120 households consisting of 5,265 individuals were interviewed: 563 households consisting of 2,581 persons from nine slums in Jessore and 557 households consisting of 2,684 individuals from six slums in Tongi. The IFPRI and CARE-Bangladesh prepared a list of questions covering a wide range of topics, such as household composition, employment earnings, transfers and other income, assets, savings, loans, hygiene, food consumption and security, health conditions, utilization of health care facilities, social networks, community participation, and anthropometry, on the basis of which trained staff interviewed household members. Of the 1,120 households interviewed by the IFPRI and CARE-Bangladesh, 1,058 were selected because they provided all the information necessary to carry out a quantitative analysis.

Approach

CARE-Bangladesh and IFPRI (2001) first asked the following question regarding UPA: "Does the household have access to any

[1] For detailed information on the SHAHAR project, see CARE-Bangladesh (2001).

[2] In concrete terms, these spaces were open land on housing sites, rooftops, balconies, and areas where people could raise small livestock and/or cultivate

urban land[2] including a homestead that can be used to grow crops or raise animals?" If the answer was "Yes," they were further asked, "Does the household grow any fruits or vegetables on this land?" and "Does the household raise any animals on this land?" When households answered "Yes" to one or both questions, they were treated as "households engaged in UPA." The others were regarded as "households not engaged in UPA." Because the answers to these questions were either "Yes" or "No," a dichotomous logit model was applied, with *engagement in UPA* set as a bivariate dependent variable (Yes = 1, No = 0).

After confirming no multicollinearity among the independent variables, the independent variables was established as follows: The *highest number of years of schooling in the household* (years); the *age of the household head* (years); a dummy for the *gender of the household head* (male = 1, female = 0); the *number of household members* (individuals); a dummy for *infant* (a household with any children under five years old = 1, otherwise = 0); a dummy for *saving* (a household with at least one member having savings = 1, otherwise = 0); a dummy for a *stable occupation* (a household with at least one member employed as a salaried worker in the government and/or private sectors, working as a medical doctor, engineer, teacher, or medium/large trader whose annual revenue is above BDT 5,001 = 1, otherwise = 0); a dummy for *residence type* (rental [reference category], own, or live there without paying rent); the *length of residence* in Jessore or Tongi (in years); a cross-term of the dummy for *residence type* and the *length of residence*; a dummy for *the number of days of water-logging* per year (0 [reference category], 1-60, 61-120 and 121 days or more); a dummy for a *network of relatives* (households who can rely on any relatives through a difficult period = 1, otherwise = 0); and a dummy for a *network of neighbors* (households who can rely on any neighbors through a difficult period = 1, otherwise = 0). By using the logit regression model, the factors that affect households' engagement in UPA and the predicted probabilities of each significant independent variable were estimated.

For more detail, the well-known mathematical formula of the logit model was used to estimate parameters as follows:

$$P_r(Y = 1|X) = \frac{exp(X'\beta)}{1 + exp(X'\beta)}$$

$$\log\left(\frac{P_r}{1 - P_r}\right) = X'\beta$$

Where Y is a binary response variable (that is, *engagement in UPA* in this paper), X a vector of independent variables, and β a vector of unknown parameters to be estimated by the maximum likelihood logit model. The estimated values of β only show the direction of the effect of each independent variable on the probability of slum dwellers engaging in UPA and do not make much economic sense. To evaluate the extent to which each independent variable affects the probability of dwellers engaging in UPA, the predicted probability of a specific independent variable X_k was estimated, holding all other independent variables $\tilde{X}$ at observed values. In more detail, the formulas for calculating the predicted probability of each independent variable are as follows:

$P_r(Y = 1|\tilde{X}, X_k = 1)$ and $P_r(Y = 1|\tilde{X}, X_k = 0)$ if X_k is a dummy variable[3].

$P_r(Y = 1|\tilde{X}, X_k = \mu)$ and $P_r(Y = 1|\tilde{X}, X_k = \mu \pm \sigma)$ if X_k is a continuous variable.

RESULTS AND DISCUSSION

Before presenting the model estimation results, UPA engagement will be briefly explained. According to Table 1, 44.8% of households in Jessore and 14.4% in Tongi are engaged in UPA. In Jessore, which is moderately populated and where land for UPA can be acquired with comparative ease, 91.8% of households engage in UPA, and 41.1% of all households, including both UPA-engaged and non-engaged households, have livestock. The share of households planting vegetables or fruits to UPA-engaged households is 35.8%, indicating that raising livestock is more pervasively practiced than vegetable/fruit farming. More than 90% of households, or 202 of 243 households, having livestock raise poultry, followed by goats (18.4%, or 41 households), and cows (17.0% or 38 households). Conversely, the location of Tongi, which is densely populated in comparison with Jessore, prevents households from acquiring reasonably sized land or space suitable for raising livestock. Therefore, many households grow vegetables or other plants in vacant land or space. In Tongi, 59.5% of households engaged in UPA, or only 8.5% of all households have livestock. The share of households planting vegetables or fruits to UPA-engaged households is 71.6%, indicating vegetable/fruit farming is more pervasively practiced than raising livestock. As in the case of Jessore, poultry farming is the most widely practiced, with 93.2% of households, or 41 of 44 households, raising livestock. However, only five and three households raise goats and cows, respectively. The difference in land availability between Jessore and Tongi may affect these UPA characteristics. Dossa et al. (2011) revealed a negative relationship between population density and the prevalence of UPA in African urban cities. In an urban city with a high population density, such as Tongi, the nutritional and/or economic benefits of engaging in UPA appear to be confined to a small proportion of urban dwellers.

The estimated results from the logit model are shown in Table 2. The null hypothesis that coefficients of all independent variables are equal to zero is rejected at the 1% level in both estimated results (test statistics are approximately distributed, as the chi-square distribution with 17 degrees of freedom is 138.702 for Jessore and 65.669 for Tongi). The percentages correctly predicted by the logit model are 71.8% for Jessore and 85.4% for Tongi. Additionally, the Hosmer-Lemeshow test shows there is no evidence for rejecting the null hypothesis (test statistics are approximately distributed, as chi-square distribution with eight degrees of freedom is 2.283 for Jessore and 6.110 for Tongi), suggesting that the fitted model is correct. Therefore, the estimation results of the logit model are reliable.

[2] In concrete terms, these spaces were open land on housing sites, rooftops, balconies, and areas where people could raise small livestock and/or cultivate vegetables or fruits.

[3] Note that the difference between $P_r(Y = 1|\tilde{X}, X_k = 1)$ and $P_r(Y = 1|\tilde{X}, X_k = 0)$ is equal to the average marginal effect.

Table 1. Urban and peri-urban agriculture (UPA) in Jessore and Tongi

	Jessore		Tongi	
Urban and peri-urban agriculture				
Yes	243	44.8	74	14.4
No	300	55.2	441	85.6
Total	543	100.0	515	100.0
Rearing livestock				
Yes	223	91.8	44	59.5
No	20	8.2	30	40.5
Planting vegetables/fruits				
Yes	87	35.8	53	71.6
No	156	64.2	21	28.4
Total	243	100.0	74	100.0

Source: Authors' calculation.

Table 2. Estimated result of the logit model

	Jessore					Tongi				
	Coeff.	**t-statics**		**Mean**	**SD**	**Coeff.**	**t-statics**		**Mean**	**SD**
Highest number of years of schooling in the household	-0.011	-0.393		6.105	4.132	0.077	1.725		4.429	3.610
Age of the household members	-0.017	-1.651		41.273	11.821	0.010	0.785		39.693	12.490
Gender of the household head	-0.117	-0.395		0.864		0.048	0.116		0.852	
Number of household members	0.175	2.874	**	4.783	1.939	0.047	0.635		4.619	2.045
Dummy for infant	-0.516	-2.297	*	0.488		0.128	0.416		0.499	
Dummy for saving	0.755	3.584	**	0.606		0.397	1.191		0.631	
Dummy for a stable occupation	0.431	1.915		0.378		0.113	0.384		0.464	
Dummy for residence type										
Own	1.291	3.541	**	0.505		2.836	3.709	**	0.536	
Live there without paying rent	2.301	3.399	**	0.074		3.936	4.014	**	0.070	
Length of residence	0.006	0.544		23.357	18.271	0.089	2.142	*	16.734	13.367
Residence type x length of residence										
Own	0.013	0.943				-0.093	-2.129	*		
Live there without paying rent	-0.026	-1.055				-0.138	-2.552	*		
Number of days of water-logging										
1-60 days	0.455	2.119	*	0.378		0.665	2.237	*	0.299	
61-120 days	-0.091	-0.229		0.070		1.064	2.254	*	0.072	
121days or more	0.457	0.735		0.024		0.310	0.259		0.017	
Dummy for a network of relatives	0.087	0.369		0.696		-0.097	-0.309		0.627	
Dummy for a network of neighbors	-0.022	-0.091		0.755		0.651	2.100	*	0.598	
Constant	-1.976	-3.413	**			-6.233	-6.215	**		
Log likelihood		-304.031					-179.142			
LR chi²(17)		138.702					65.669			
Hosmer-Lemeshow chi²(8)		2.283					6.110			
Correctly classified		0.718					0.854			
Pseudo R^2		0.186					0.155			
Sample size		543					515			

** and * indicate significant at 1 and 5%, respectively.
Source: Authors' calculation.

The results in Jessore were first focused on. As shown in Table 2, some independent variables are statistically significant at the 1 or 5% levels as follows: The *number of household members*, *infant* dummy, *saving* dummy, *residence type* dummy (own or live there without paying rent), and *number of days of water-logging* per year dummy (1-60 days). Only the coefficient of the *infant* dummy is significantly negative, the other four variables being significantly positive. The following independent variables are not significant at the 5% level: The *highest number of years of schooling in the household*, *age of the household head*, *gender of the household head* dummy, *stable occupation* dummy, *length of residence*, cross-term of the dummy for *residence type* and the *length of residence*, *number of days of water-logging* per year dummy (61-120 and 121 days or more), *network of relatives* dummy, and *network of neighbors* dummy.

The results for Tongi also show that some independent variables are statistically significant at the 1 and 5% levels. The following coefficients are significant: The *residence type* dummy (own or live there without paying), *length of residence*, cross-term of the dummy for *residence type* and the *length of residence*, *number of days of water-logging* per year dummy (1-60 and 61-120 days), and *network of neighbors* dummy. The following independent variables are not significant at the 5% level: The *highest number of years of schooling in the household*, *age of the household head*, *gender of the household head* dummy, *number of household members*, *infant* dummy, *saving* dummy, *stable occupation* dummy, *number of days of water-logging* per year dummy (121 days or more), and *network of relatives* dummy.

Table 3 shows the predicted probabilities of engaging in UPA for significant variables, holding all other variables in the model at their means. In Jessore, the predicted probability of engaging in UPA is 33.8% for a household with the number of family members equal to the mean minus the standard deviation ($\mu - \sigma$), 41.7% at the mean (μ), and 50.1% at the mean plus the standard deviation ($\mu + \sigma$). As pointed out by Dossa et al. (2011) and Maxwell (1995) when examining the case of urban cities in Africa, the more members there are in a family, the more likely a family is to engage in urban agriculture in Jessore. The predicted probability for a household with more than one child under five years old to engage in UPA is 35.5%, which is 12.4% lower than that for a household without any children under five, indicating that having a young child under five is a deterrent for engaging in UPA in Jessore. Considering that the *number of household members* and the *infant* dummy are not significant in more condensed Tongi, where land is a scarce resource, not land but labor availability for UPA is an important factor affecting the probability of engaging in UPA in Jessore, which is moderately populated and where land for UPA can be acquired with comparative ease. As explained previously, Jessore is located in a peri-urban area, approximately 200 km from Dhaka.

Moreover, land availability is not strictly limited compared to Tongi. As such, it is not difficult to find land to cultivate. Consequently, the number of family members who can engage in UPA is important for those living in Jessore.

In Jessore, the predicted probability of a household with at least one member having savings to engage in UPA is 49.1%t, which is 17.9% larger than the probability (31.2%) of a household without savings. As pointed out by Dossa et al. (2011) in examining the relationship between participation rates in UPA and a household economic status in urban cities of Tanzania, Zimbabwe, Nigeria, and Cameroon, this result indicates that raising livestock is more common among households in the medium and upper income strata. Compared to vegetable or fruit farming, raising livestock, which is more pervasively practiced in Jessore than vegetable/fruit farming has more capital-intensive risks, and a larger loss could be suffered if all or part of the domestic animals are lost due to disease, theft, predation, or floods. Therefore, a household with savings can afford to take the risk of losing its livestock in order to obtain a significant source of animal protein and nutrition.

The dummy for *residence type* is significant in both Jessore and Tongi. A household living in its own house or not paying rent is predicted to have a 58.1 or 60.8% probability to engage in UPA, respectively, in Jessore and a 18.2 or 24.1% probability, respectively, in Tongi. These estimations indicate that the household is 36.1 and 38.8%, respectively, more likely to engage in UPA compared to a household living in a rented house in Jessore and 12.4 and 18.3%, respectively in Tongi suggesting that households owning the house they live in or living there without paying rent can more easily secure suitable land or space for UPA in or around the house.

In densely populated Tongi, the predicted probability of engaging in UPA is 10.2% for a household living there for the length equal to the mean minus the standard deviation divided by two ($\mu - \sigma/2$)[4], 12.1% at the mean (μ), and 14.4% at the mean plus the standard deviation divided by two ($\mu + \sigma/2$). This result is consistent with Maxwell (1995), who pointed out that in the case of Kampala, the capital of Uganda, the longer the length of stay at the current residential address is, the more likely a family engages in urban agriculture. However, the *length of residence* is not significant in moderately populated Jessore, suggesting that whether a household with a longer-term residence is more likely to engage in UPA depends on the extent of competing land use among urban dwellers. It also should be noted that the cross-term of the dummy for *residence type* and the *length of residence* is significant in Tongi. Although the predicted

[4] As for the *length of residence*, since many data points lie far from the mean value, the standard deviation is large enough that the estimated probability at the mean plus/minus the standard deviation is likely to provide a low precision. Therefore, the points at the mean plus/minus the standard deviation divided by two was used.

Table 3. Predicted probability of engaging in UPA

	Jessore		Tongi	
	Probability	**Difference**	**Probability**	**Difference**
Number of household members				
Mean minus s.d. (2.843)	0.338		n.s.	
Mean (4.783)	0.417	0.079	n.s.	
Mean plus s.d. (6.722)	0.501	0.163	n.s.	
Dummy for infant				
No	0.479		n.s.	
Yes	0.355	-0.124	n.s.	
Dummy for saving				
no	0.312		n.s.	
yes	0.491	0.179	n.s.	
Dummy for residence type				
Rent a house (reference)	0.220		0.058	
Own	0.581	0.361	0.182	0.124
Live there without paying	0.608	0.388	0.241	0.183
Length of residence				
Mean minus s.d./2 (10.050)	n.s.		0.102	
Mean (16.734)	n.s.		0.121	0.020
Mean plus s.d./2 (23.418)	n.s.		0.144	0.043
Residence type x length of residence				
Rent a house				
x length of residence (10.050)	n.s.		0.033	
x length of residence (16.734)	n.s.		0.058	0.025
x length of residence (23.418)	n.s.		0.101	0.068
Own				
x length of residence (10.050)	n.s.		0.186	
x length of residence (16.734)	n.s.		0.182	-0.004
x length of residence (23.418)	n.s.		0.178	-0.008
Live there without paying				
x length of residence (10.050)	n.s.		0.305	
x length of residence (16.734)	n.s.		0.241	-0.064
x length of residence (23.418)	n.s.		0.187	-0.118
Number of days of water-logging				
0 day (reference)	0.375		0.094	
1-60 days	0.486	0.111	0.169	0.075
61-120 days	n.s.		0.232	0.138
dummy for a network of neighbors				
No	n.s.		0.085	
Yes	n.s.		0.152	0.067

Source: Authors' calculation.

probability to engage in UPA for a household renting its house tends to increase with the length of residence, that for a household living there without paying rent has a downward tendency to some extent. It seems that this antinomic relation is because the household living there without paying is more likely to face eviction with an increasing length of residence, due probably to a lack of legal land entitlement or valid lease agreement.

In Jessore, a household which has water-logging around its house for 1 to 60 days per year has a 48.6% probability of engaging in UPA, that is, 11.1% more than that for a household which does not experience water-logging through the year. In Tongi, a household which has water-logging around its house for 1-60 or 61-120 days per year has a 16.9 and 23.2% probability, respectively, of engaging in UPA, that is 7.5 and 13.8% larger, respectively, than that for a household which does not experience water-logging through the year. Land where water-logging sometimes occurs in the rainy season is generally unsuitable for residence. However, this situation may change significantly between the rainy and dry seasons in regions with 1 to 120 days of water-logging. Although water appears around homes in the rainy season, the land is suitable for cultivation or livestock farming in the dry season, when the water has withdrawn.

In Tongi, a household that can rely on neighbors through a difficult period is expected to engage in UPA at a 15.2% probability and is 6.7% more likely to do so compare to a household who cannot rely on anyone. Tongi is located near Dhaka and is densely populated. Therefore, people have difficulty obtaining land that is suitable for UPA. To avoid trouble with neighbors over land utilization, it is important for residents to maintain good relations.

CONCLUSION AND POLICY IMPLICATIONS

This study identifies the factors affecting UPA decision-making, with special attention to land constraints among poor urban dwellers in Bangladesh. To accomplish this objective, a dichotomous logit regression model was applied using secondary slum household data obtained from the SHAHAR Project Baseline Survey, conducted by the IFPRI and CARE-Bangladesh in Tongi and Jessore.

The results show that in moderately populated Jessore, households that have more family members without children under five, have some savings, live in their own house or live there without paying rent, and have any water-logging around the house 1 to 60 days per year are more likely to engage in UPA than other households. On the other hand, in densely populated Tongi, households that live in their own house or live there without paying rent, live there for longer periods, have any water-logging around the house less than four months per year, and can rely on neighbors through a difficult period are more likely to engage in UPA than other households.

In Jessore, where households are often able to acquire land for planting food crops or raising livestock, the number of family members available for engaging in UPA is an important factor in UPA engagement. In Tongi, where it is difficult to obtain land, good relationships with neighbors help households avoid some of the problems of land utilization. This finding suggests that constraint factors associated with engagement in UPA differ in various urban settings.

Although it is difficult to raise domestic animals or plant vegetables or fruits on a large scale in highly competitive situations for vacant land suitable for UPA (which is decreasing along with rapid urbanization in developing and transitioning countries), the Food and Agriculture Organization[5] insists that urban agriculture on just one square meter can provide 20 kg of food per year. In densely populated urban cities in Africa and Asia, many poor dwellers, particularly women, grow vegetables in pots and/or sacks that can be put in front of the house or a narrow vacant space, such as a roadside, rooftop, or balcony. UPA is one of the coping strategies for poor urban dwellers to enhance their resilience to food insecurity. Therefore, it is suggested that more people should understand the merit of UPA and start running recommended and systematic UPA programs[6]. For example, female group farming or livestock rearing, which is reported to result in strengthening social networks among participants at the community level and then lessening the risk of tension over who utilizes a vacant space or land suitable for UPA (Gallaher et al., 2013a), should be promoted in situations where a massive inflow of people from rural to urban areas is expected to continue, as in many developing countries like Bangladesh.

However, UPA has many benefits but is not free from faults. For example, some researchers worried about the accumulation of heavy metals by using contaminated irrigation water and soil (Antwi-Agyei et al., 2016; Gallaher, 2013b; Nyantakyi-Frimpong et al., 2016) and livestock excrements. Pest issues and diseases, which lead to a production failure and lower return, are also pointed out as detrimental factors in preventing urban dwellers from engaging in UPA (Amrullah et al., 2017). Although UPA engagement can be expected to have many positive effects, it also has negative effects or effects that do not match expectations. Thus, it is important for us to promote UPA engagement with great care. A majority of urban slum dwellers do not have enough knowledge of either the health risks of consuming vegetables contaminated by hazardous viruses or toxic materials, such as heavy metals, or growing vegetables and/or rearing livestock properly. Therefore, technical support and basic training programs should be provided by agricultural extension or NPO officers to attain more efficient and safe food production in densely populated urban cities.

CONFLICTS OF INTERESTS

The authors have not declared any conflict of interests.

[5] http://www.fao.org/urban-agriculture/en/ (last accessed on February 21, 2017).

[6]The findings are based on a case study of two slums in Bangladesh using cross-sectional household data. Therefore, it should be noted that the results may not be applicable or generalizable to urban cities in other Asian countries.

REFERENCES

Amrullah ER, Pullaila A, Ishida A, Yamashita H (2017). Effects of sustainable home-yard food garden (KRPL) program: A case of banten in Indonesia. Asian Soc. Sci. 13(7):1-9.

Antwi-Agyei P, Biran A, Peasey A, Bruce J, Ensink J (2016). A faecal exposure assessment of farm workers in Accra, Ghana: A cross sectional study. BMC Public Health 16:587.

Ashebir D, Pasquini M, Bihon W (2007). Urban agriculture in Mekelle, Tigray State, Ethiopia: Principal characteristics, opportunities and constraints for further research and development. Cities 24(3):218-228.

Bhatta KP, Ishida A, Taniguchi K (2008). Does kitchen garden and backyard livestock farming help combat food insecurity: An example of Nepalese households. J. Rural Econ. Spec. Issue pp. 376-383.

Bukusuba J, Kikafunda JK, Whitehead RG (2007). Food security status in households of people living with HIV/AIDS (PLWHA) in a Ugandan urban setting. Br. J. Nutr. 98(1):211-217.

CARE-Bangladesh, International Food Policy Research Institute (IFPRI) (2001). Baseline survey report: livelihood security analysis of vulnerable urban households, Jessore and Tongi Pourashavas. Dhaka: CARE-Bangladesh.

Dossa LH, Buerkert A, Schlecht E (2011). Cross-location analysis of the impact of household socioeconomic status on participation in urban and peri-urban agriculture in West Africa. Hum. Ecol. 39(5):569-581.

Gallaher CM, Kerr JM, Njenga M, Karanja NK, WinklerPrin AMGA (2013a). Urban agriculture, social capital, and food security in the Kibera Slums of Nairobi, Kenya. Agr. Hum. Values 30(3):389-404.

Gallaher CM, Mwaniki D, Njenga M, Karanja NK, WinklerPrins AMGA (2013b). Real or perceived: the environmental health risks of urban sack gardening in Kibera Slums of Nairobi, Kenya. EcoHealth 10(1):9-20.

Gororo E, Kashangura MT (2016). Broiler production in an urban and peri-urban area of Zimbabwe. Dev. S. Afr. 33(1):99-112.

International Food Policy Research Institute (IFPRI) (2003). IFPRI city profiles: Jessore and Tongi, urban livelihoods in the slums. Washington, DC: IFPRI.

Lynch K, Maconachie R, Binns T, Tengbe P, Bangura K (2013). Meeting the urban challenge? Urban agriculture and food security in post-conflict Freetown, Sierra Leone. Appl. Geogr. 36:31-39.

Masvaure S (2015). Coping with food poverty in cities: The case of urban agriculture in Glen Norah Township in Harare. Renew. Agric. Food Syst. 31(3):202-213.

Maxwell D (1995). Alternative food security strategy: A household analysis of urban agriculture in Kampala. World Dev. 23(10):1669-1681.

Maxwell D, Levin C, Csete J (1998). Does urban agriculture help prevent malnutrition? Evidence from Kampala. Food Pol. 23(5):411-424.

Mudimu GD (1996). Urban agricultural activities and women's strategies in sustaining family livelihoods in Harare, Zimbabwe. Singapore J. Trop. Geogr. 17(2):179-194.

Nyantakyi-Frimpong H, Arku G, Inkoom DKB (2016). Urban agriculture and political ecology of health in municipal Ashaiman, Ghana. Geoforum 72:38-48.

Simiyu R, Foeken DWJ (2014). Urban crop production and poverty alleviation in Eldoret, Kenya: Implications for policy and gender planning. Urban Stud. 51(12):2613–262.

Smart J, Nel E, Binns T (2015). Economic crisis and food security in Africa: Exploring the significance of urban agriculture in Zambia's copperbelt province. Geoforum 65:37-45.

Zezza A, Tasciotti L (2010). Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. Food Pol. 35(4):265-273.