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URBAN AGRICULTURE FOR SUSTAINABLE LIVELIHOOD OF LOW INCOME PEOPLE IN KHULNA CITY CORPORATION, SOUTHWEST BANGLADESH

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Abstract: The study elaborates the contribution of agriculture as the livelihood means of urban people. Three hundred and sixty one household heads from *Tutpara, Banorgati, Rupsha* and *Khalishpur* in Khulna City were surveyed to identify the livelihood outcome where the respondents are mostly employed in self-managed low paid jobs in the informal sectors like rickshaw pulling, day labor, factory work, agriculture, small-scale business. Vegetable cultivation, livestock rearing, aquaculture, crop cultivation and innovative gardening have been observed as agricultural activities. Index of Agriculture for Sustainable Livelihood (IASL) has been calculated and seven indicators such as income, food, health, education, clothing, interpersonal relations and fulfillment of market demand are considered. Landowners are involved in more sustainable activities. The level of sustainability increased by 0.218 units for changing 1 decimal amount of land which is statistically significant. Male respondents can contribute more in agricultural activities than the female respondents. The respondents whose main occupation is agriculture, especially involved in livestock, are more sustainable than those whose main occupation is not agriculture. Based on empirical result, it can be concluded that agriculture can contribute in fulfilling the basic need of the low income people in urban areas of Bangladesh. However, the respondents show enthusiasm for increasing potted plants in their neighbourhoods that help enhance self-sustenance.

Keywords: Urban agriculture, sustainability, livelihood, basic need, poverty

Introduction

Now a day urban agriculture practiced by the urban people attracts the attention of social scientists. It has been observed that it is mainly poor farmers from rural areas who have developed green areas in the vicinity of urban areas and largely contribute in sustainability of their livelihood. The dictionary meaning of livelihood is "a means of securing the necessities of life" (Oxford Dictionary, 2013). It means what we are getting as support from any organization, group, or any other means, that support our daily needs. "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base"

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(Carney, 1998). The livelihood outcomes according to Ellis (1998) include more income, improved food security, improved shelter, education and reduced vulnerability.

Globally, more people live in urban areas than in rural areas, with 54 per cent of the world's population residing in urban areas in 2014. In 1950, 30 per cent of the world's population was urban, and by 2050, 66 per cent of the world's population is projected to be urban" (United Nations, 2014). Urban agriculture is broadly defined as food production in urban areas, usually with an emphasis on livestock keeping and cultivation (Mougeot, 2000). It may be extended to include other types of production such as "forestry, parks, gardens, orchards, fuel wood plantations, aquaculture and related activities" (Gebre-Egziabher, 1996). Urban agriculture can be an important part of an urban livelihood strategy. Various studies have demonstrated that it can have impact on household food security, either by providing an additional income source, increasing dietary diversity, or helping to protect against seasonal unavailability in the food supply (Maxwell *et al*., 1998; Sustainable Development Solution Network, 2013). Typically urban agriculture applies intensive production methods, frequently using and reusing natural resources and urban wastes, to yield a diverse array of land, water, and air based fauna and flora, contributing to the food security, health, livelihood, and environment of the individual, household, and community (Smit *et al*., 2001). Urban agriculture is considered to be part of the informal sector because it shares the same characteristics, such as simple access, dependence on indigenous resources, labor intensive, lack of formal training and irregular markets. In the midst of concrete jungles, urban agriculture is perceived as a sign of hope, the ability to breath.

Several authors emphasize areas where the urban agriculture literature is commonly weak. Page (2002), conducted a study on urban agriculture in Cameroon and argues that the development of literature particularly, has a tendency to neglect the history of urban farming and its political implications. Urban agriculture is sprouting up in the empty spaces of post-industrial landscapes throughout the industrialized world in vacant lots, road medians, parks reminiscent of the patchwork of vegetable gardens and livestock enclosures that are a part of the urban streetscape in much of the Global South (McClintock, 2010). In the North, advocates argue that urban agriculture creates a more ecologically sound, resilient and productive landscape (Smit *et al*., 2001; Veenhuizen, 2006). Urban agriculture is a significant economic activity, central to the lives of tens of millions of people throughout the world (Brown & Carter, 2002).

Bangladesh is highly vulnerable to natural hazards and the extreme effect of climate change added a new dimension to community risk and vulnerability (Disaster Management Bureau, 2010). Low income people living in the marginalized lands perusing nature dependent livelihoods are facing barriers and constraints earning wellbeing in the changing climate. Access to food, sanitation, pure drinking water, health care, education and social security are obviously inadequate in both urban and rural areas of Bangladesh (Nasreen, 2008). Khulna, located at the coastal zone and as an industrial city in Bangladesh, has been experiencing climate induced vulnerability, rapid urbanization and tremendous rise of population since 1950s. Sea level rise is a growing threat to the coastal region while Khulna is one of the 15 most vulnerable cities of the world (Dasgupta *et al*., 2009). Future climate projections

indicate that the increasing rate of sea level rise caused by global warming would lead to permanent inundation, drainage congestion, salinity intrusion and frequent storm surge inundation in the Southwestern coastal region including Khulna (Mohal *et al*., 2010). The climate threat can be tackled by enhancing social and ecological values at local level; urban agriculture can be a part of that solution (Viljoen, 2005). Urban agriculture contributes to preserving biodiversity, the amount of energy used to produce and distribute food. In this context urban agriculture can be an important tool in reducing urban poverty (Humpwaya *et al.,* 2009). Therefore the present study aims to identify the role of agriculture in fulfilling the basic needs of the low income people in Khulna city and ensuring their sustainable livelihood.

Materials and Methods

In this study following Denzin (2006) both qualitative (case study) and quantitative (survey) methods have been used. Data were collected through an interview schedule containing both open ended and close ended items. To understand the role of agriculture the respondents were selected as the household heads residing for at least 10 years at the locality and monthly household income is not more than 10000 BDT. The study has been conceded from June 2016 to February 2017 on four areas of Khulna city. After conducting a census 722 households were selected as study population who were involved in agricultural activities. From this population half (361) were selected through simple random sampling. Among them the survey was conducted on 353 respondents of *Banorgati* (56) *Rupsha* (129), *Tutpara* (91) and *Khalishpur* (77) of Khulna City and for in-depth study 08 (02 respondents from each area) case studies have been conducted to understand the role of agriculture in sustainable livelihood situation of the low income people. Moreover, to compare the role of agriculture for quantitative analysis especially by income and food another 353 respondents were purposively selected (because of large and unknown number of population) from those who were not involved in agriculture.

The study considers household as a group of people who pool resources or 'eat from the same pot' (Robertson, 2012). Following Deptford *et al*. (2013) a typical household was determined for this study and was judged to contain 4 individuals: a man, a woman and 2 children. According to Deptford *et al*. (2013) the lowest family for the urban livelihood zone of Khulna city was counted considering food expenditure (182 BDT per day) and non-food expenditure (119 BDT per day). In this context for the study area considering purchasing power parity 10000 BDT (190*30=5700 BDT per month for food expenditure and 125* 30=3750 BDT per month for non-food expenditure) was considered as the household income of the low income people.

To measure the poverty situation of the respondents the study considers income as the measuring tool. In 2015, the World Bank defines extreme poverty as living on less than US$1.90 (PPP) per day, and moderate poverty as less than $2 or $5 a day (but a person or family with access to subsistence resources, e.g., subsistence farmers, may have a low cash income without a correspondingly low standard of living – they are not living "on" their cash income but using it as a top up). As the conversion rate of US$ 1 was equivalent to almost 82 BDT during field survey the family income 4700 BDT or less per month has been

considered as absolutely poor (living on less than USD 1.90 per day) and the respondents whose monthly family income was more than 4700 BDT to 10000 BDT has been considered as moderately poor (US$3.8) in this study. The questionnaire was based upon the early observations and comments from cultivators and responses to the questionnaire. Data have been collected from two sources: Primary source: that is field survey and Secondary source: writings related to study, official documents and other research documents. Collected data are processed by SPSS program and analyzed and interpreted by different statistical techniques like Regression analysis with t-test and F- test, Mean and Standard Deviation.

The objective of this study was to understand the role of agriculture in fulfilling the basic needs of the respondents that will ensure the sustainability of their livelihood. As theoretical approach the study follows the basic need approach to assess the objective of this study. The 'basic needs' approach was introduced by the International Labour Organization's World Employment Conference in 1976. In 1976 ILO defined basic needs as, minimum requirements (for a family) for private consumption: adequate food, shelter and clothing, as well as certain household equipment and furniture. It also includes access to essential services provided by and for the community at large, such as safe drinking water, sanitation, public transport and health, educational and cultural facilities (Riddell, 2004). In this context following Ellis (1998) and Ara (2017) seven indicators are used to assess the contribution of agriculture in sustainability of urban livelihood. The indicators are income, food, health, education, clothing, interpersonal relations and market demand (Table 1).

Table 1: Indicators of agricultural contribution in sustainable livelihood

Indicators	*Quantitative rank*	*Qualitative Rank*	*IASL Range 28-140*
Income	1 to 5	7	(1-5)7=7-35
Food	1 to 5	6	(1-5)6=6-30
Health	1 to 5	5	(1-5)5=5-25
Education	1 to 5	4	(1-5)4=4-20
Clothing	1 to 5	3	(1-5)3=3-15
Interpersonal relations	1 to 5	2	(1-5)2=2-10
Market demand	1 to 5	1	(1-5)1=1-5

Following Maxwell's cumulative food security index (1995) Index of Agriculture for Sustainable Livelihood (IASL) was constructed to make both quantitative and qualitative analysis regarding the contribution of urban agriculture on those who were involved in agriculture (361). Table 1 represents the way of constructing the Index of Agriculture for Sustainable Livelihood (IASL): Measurement of Explained (Dependent) Variables. The quantitative part correspond to five categories e.g., 1 = very low and 5 = very high. Each indicator assigned a quantitative rank from 1 to 5 according to the total score for contribution of agriculture based on the field survey. The qualitative dimension is formed to rank the key seven indicators from total scores assigned by the respondents. A five points Likert Scale (1 for least important, 5 for most important) has been used to weigh

the indicators following the method of Wyatt and Meyers (1987). The measurement of indicators is presented in Table 2.

Table 2: Measurement of indicators

Indicators	*Level of contribution*				
	Very low	*Low*	*Medium*	*High*	*Very high*
Income (BDT)	0 -2000	2001-4000	4001-6000	6001-8000	8001-10000
Food	Only for snacks	Having meal for one time in a day	Having meal for two times in a day	Having meal for three times in a day	Having meal for three times in a day with extra food
Health	No contributi on at all	As natural ingredients	Access to Quack	Access to Paramedic	Access to registered doctor
Education	No formal education	Completion of primary education	Completion of class eight	SSC pass	HSC pass and above
Clothing	For normal weather	In regular seasonal cloth	In access to winter cloth	In access to winter clothes and shoes	Provide cloths to help others
Interpersonal relations	Within family	With neighbors	With relatives	Within community	Outsiders of community
Market demand (BDT)	No contributi on at all	Not more than 2000	Earrn2001-4000	Earn 4001-6000	Earn 6001and above

Regression model: The multiple regression model for contribution of agriculture is:

$$IASL = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4b_5X_5\text{u}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where IASL = Index of Agriculture for Sustainable Livelihood; b_0 = Intercept term; b_1, b_2, b_3, b_4, b_5 = Regression co- efficient; X_1 = Ownership of house; X_2 = Community assistance; X_3 = Land; X_4 =Involvement in agricultural activities; X_5 =Sex; u = Stochastic disturbance term.

Moreover, Thunen's model has been chosen to explain the economic motivations for placing certain agricultural production close to urban centres. Thunen's model is a grounded theory that can explain several types of economic factors for agriculture at local level (Parr, 2013).

Results

Table 3 highlights the socioeconomic characteristics of the respondents.

Age structure of the respondents involved in agricultural activities varies noticeably only between 19-30 and 31-42 age groups (Table 3). Whereas more than 13 percent of respondents fall in the 55-66 years-old age group.

Table 3: Socio- economic and demographic status of the respondents

Tools	*Involved in agricultural activities (N-353)*	*Not involved in agricultural activities (N-353)*
Age (in Year)	%	%
19-30	32.4	30.5
31-42	33.2	36.6
43-54	13.6	21.1
55-66	13.6	5.0
67 and above (Minimum-19; Maximum-80)	7.2	6.8
Sex		
Male	83.3	91.7
Female	16.7	8.3
Main Occupation		
Van or rickshaw pulling	14.95	19.26
Small-scale business	18.01	14.73
Agriculture	15.79	0.0
Day labor	17.73	33.06
Labor in an industry	27.75	25.21
Others	5.5	7.6
Household Income (in BDT)		
0-2000	2.5	10.5
2001-4000	41.8	49.0
4001-6000	42.9	34.3
6001-8000	10.8	4.7
8001-10000	1.9	1.4
Amount of Land (in Decimal)		
0-2	44.19	57.79
3-4	25.21	21.53
5-6	16.71	12.75
7-8	6.52	3.40
9 and above	7.37	4.5
Ownership of House		
Rented	24.36	61.57
Owner	47.08	17.08
Gifted	28.56	21.35
Poverty Situation		
Absolutely poor	51.5	65.1
Moderately poor	48.5	34.9
Working Conditions		
Temporary	53.4	66.29
Seasonal	39.8	17.85
No work/ sometimes	6.8	15.9

Among the total respondents 83.3 percent of the household heads are male and 16.7 percent are female. The low income people were mostly employed in self-managed low paid jobs in the informal urban sectors like rickshaw pulling (14.9%), day labor (17.7%), factory work (27.7%), and small-scale business (18.0%). Though as urban residents only in 15.79 percent cases agriculture is the main source of occupation, half of the respondents are found to be involved in agriculture and in most cases their main occupation is small-scale business, day labor and industrial work. In access to land the amount of land of the respondents is not satisfactory. Only 7.37 percent respondents had the access to land of 9 or above decimal. The socioeconomic and demographic status of the respondents who were not involved in agriculture is also presented in the table 3.

Among them 30.5 percent respondents were in age between 19-30 years and 36.6 percent were in 31-42 years-old age group. The respondents who were not involved in agriculture were mostly day laborer (33.06%) whereas 25.21 percent were workers of industry, 19.26 percent were rickshaw puller and 15.9 percent were workless.

Regarding poverty situation the respondents not involved in agriculture were more poor (65.1% were absolutely poor) than those who were involved in agricultural activities.

Agricultural activities: Urban agriculture includes greenbelts around cities, farming at the city's edge usually with emphasis on livestock keeping and cultivation, vegetable plots in community gardens, and food production in thousands of vacant inner-city lots (Brown, 2002; Mougeot, 2000). In the study area respondents were mainly involved in four types of agricultural activities: horticulture, aquaculture, livestock and poultry and agroforestry.

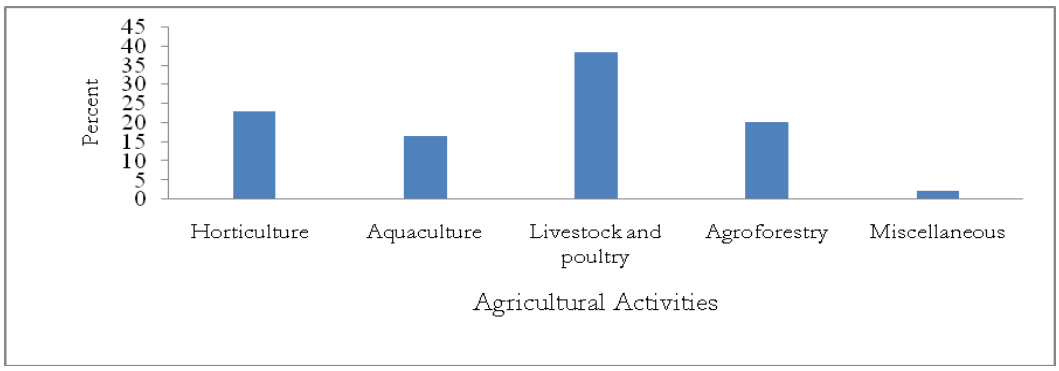

Fig. 1 Percentage distribution of the respondents Involved in Agricultural activities

Fig. 1 shows that 22.95 percent respondents were involved with horticultural activities mainly in producing vegetables and fruits. But in most cases the respondents were not the owner of farm but the sharecroppers (Table 3). The highest percent (38.2%) were involved in livestock rearing and 20.1 percent were engaged in homestead forestry. The common farming activities in the study area and the production places of these activities are presented in Table 4.

Table 4: Common farming activities in the study area

Farming systems	*Products*	*Fields/where and how*
Aquaculture	Fish, vegetables, seaweed, fodder	Ponds, river, cages, estuaries, sewage, lagoons, wetlands
Horticulture	Vegetables, fruit, compost	Home sites, parks, rights-of-way, rooftops, containers, wetlands, innermost belt outside the central marketplace
Livestock & Poultry	Milk, eggs, meat, manure, hides, fur	Zero-grazing, railways and roadsides, hillsides, peri- urban open spaces in the outer ring - cheap pasture land
Agroforestry	Fuel, fruit, nuts, compost, building and handicraft materials	Street trees, home sites, steep slopes, vineyards, greenbelts, wetlands, orchard, forests, parks, hedgerows
Miscellaneous	Houseplants, medicine, beverages, herbs, flowers, insecticides, mushrooms	Ornamental horticulture, rooftops, containers, sheds, beehives, cages, urban forests

Urban crops are generally perishable, high-valued or specialty crops, including culinary and medicinal herbs. Some special horticultural crops are presented in Table 5.

The most dominant plant encountered in the study area has grown for their fruits. The most common plants were papaya, banana, bitter gourd and betel plant. It is native to Khulna and highly usable in southern Bangladesh. Nearly one thirds of the respondents reported that tree population in the study area had medicinal properties. A large proportion of plants that have grown in *Khalishpur* and *Rupsha* are tomato and brinjal.

Table 5: Horticultural products in the study area

Scientific Name	*Common Name*	*Percentage distribution of the respondents about the abundance of tree*	*Uses*	*Activities Observed (Non-Exhaustive)*
Carica papaya, Musa paradisiaca, PsidiumguajavaMomordicacharantia, Piper betle (Plant)	papaya banana, Guava tree and other fruit tree, bitter gourd, betel plant	46.3	Fruit	Fruit consumed Washing dishes
Azadirachtaindica, Gada, Epipremnumaureum, Rosa species and Jasminum species	Neem tree. Gada, money plant,rose and jasmine	28.8	Medicinal Flower	Occasion, sacred
Cocosnucifera, albiziasaman	Coconut, rain tree	24.9	Fruit, Shade	Ornamental, shade, fuel. Socializing, washing clothes

Plants with ornamental and medicinal uses were almost equal in proportion. Gada, money plant, rose and jasmine were the most common ornamental plants, present in more than 28 percent of the study area. The coconut and rain tree accounting for 24.9 percent of the sample which provides the vivid picture of the growth of agriculture. Thus, it is found that the majority of the trees found in the study areas have multiple uses, and are of high economic value.

Role of agriculture in sustainable urban livelihood: In the study area the respondents are benefited from urban agriculture. It contributes in income, food, improving health, enhancing education and developing interpersonal communication (Table 6).

Table 6: Contribution of agriculture in maintaining basic need of the household

Contribution	*Percentage distribution of the respondents regarding basic need*						
	Income	*Food*	*Health*	*Education*	*Clothing*	*Interpersonal relations*	*Market demand*
Very low sustainability (no contribution at all)	2.5	2.8	2.0	3.7	3.7	4.0	48.4
Low sustainability (low contribution)	42.5	37.1	37.1	22.9	36.5	26.1	41.1
Moderate sustainability (moderate contribution)	42.2	41.6	44.5	53.3	43.6	43.3	10.2
Sustainable enough (Good contribution)	10.8	15.0	12.2	15.0	13.3	20.1	0.3
Well sustainability (Very good contribution)	2.0	3.4	4.2	5.1	2.8	6.5	0.0
Total (N-361)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Income: Urban agriculture expands the economic base of the city through production, processing, packaging, and marketing of consumable products. This results in an increase in entrepreneurial activities and the creation of jobs, as well as reducing food costs and improving quality (Smit *et al*., 2001). Among the respondents 42.2 percent told about moderate contribution of agriculture in income that means they were in 40001-6000 income group and 10.8 percent were in 8001-10000 income group and mentioned about good contribution of agriculture in income. A comparative picture presented in the table 7 depicted that the respondents who are involved in agricultural activities earn more (average income 5039 BDT) than those (average income 4371 BDT) who were not involved in agriculture.

Food: Urban agriculture is associated with increased consumption of fruits and vegetables (Sheila, 2013*)* which decreases risk for disease and can be a cost-effective way to provide citizens with quality, fresh produce in urban settings. People are more likely to try new vegetables when they take an active role in the planting and cultivation of an urban garden. Daily intake of a variety of fruits and vegetables is linked to a decreased risk of chronic diseases including diabetes, heart disease and cancer.

Nearly 42 percent respondents responded that agriculture contribute to have two times meal in a day. Though, as noted by the respondents, fishing is not done at commercial quantity, but it does for meeting food needs. Many urban gardens reduce the strain on food banks and other emergency food providers by donating shares of their harvest and provide fresh produce in areas that otherwise might be food deserts. A comparative analysis has been presented regarding the role of agriculture in fulfilling the demand of income and food.

Table 7: Comparative analysis on the role of agriculture in food and income

Involvement in Agricultural activities	*Food security (Percentage distribution of the Respondents)*					*Income*	
	Very low security	*Less security*	*Moderate security*	*Secured enough*	*Well secured*	*Mean income (BDT)*	*Standard Deviation*
Not involved in agricultural activities (N- 353)	19.55	41.08	33.14	5.10	1.13	4371.06	2190.266
Involved in agricultural activities (N- 353)	2.83	37.11	41.64	15.01	3.40	5039.45	2296.585

From the Table 7 it is found that among the respondent who were involved in agriculture 41.64 percent respondents told about moderate food security that means they could receive food for two times in a day but it was 33.14 percent from those who were not involved in agricultural activities.

Health: When individuals come together around urban agriculture, physical activity levels have often increased (Kingsley *et al*., 2009). Through the case study a man, (Abdullah, 48) in *Rupsha* informed that "everything that is involved gardening, from turning the soil to digging holes, contributes to an individual's physical activity. He also stated that "working in agriculture is much more interesting and fulfilling than going to the gym. Households in Khulna city take advantage of vacant land and contribute not only to their household food needs but also the needs of their resident city". Regarding health 44.5 percent respondents argued that agricultural production has its moderate contribution and 12.2 percent respondents told about good contribution by providing food, fodder, and medicinal ingredients (Table 6).

Education: Some community urban farms can be quite efficient and help women to find work, who in some cases are marginalized from finding employment in the formal economy. Through the case study Amena (55) in *Tutpara* acknowledged that "milk and egg directly provide nutrition diet that contributes in brain development and is the source of food which subsidizes their child education". From Table 6 it is found that 53.3 percent respondents reported that the agricultural production moderately contributes in their child education but 15 percent respondents told about the good contribution in this regard.

Social relations: Urban agriculture can have a large impact on the social and emotional well-being of individuals. Urban gardens are thought to be relaxing and calming, and offer a space of retreat in densely populated urban areas (Wakefield *et al*., 2007). The respondents in the study area were often seen gathering together in vegetable garden and communicating. Agricultural activities appeared to have an important utility function as physical entities, beyond their species-specific sacred, cultural or other properties. Women in the study areas were observed conducting domestic chores such as cooking (using fuel wood), washing clothes and dishes, and grooming (such as oiling each other's hair, combing and removal of lice) under tree canopies; while children were often found to be playing under the shade of trees. More than 43 percent respondents told about moderate contribution that is medium sustainability and 20.1 percent respondents informed that they could maintain good social relation as the contribution of agriculture.

Fulfilling market demand: Community and residential gardening, as well as small-scale farming, save household food costs. They promote nutrition and free cash for non-garden foods and other items. This allows families to generate larger incomes selling to local grocers or to local outdoor markets. Regarding the fulfillment of market demand the response of the respondents is not satisfactory where 41.1 percent respondents reported about the low contribution of agriculture in fulfilling market demand.

Table 8: Area wise percentage distribution of the respondents regarding food security

Location	*Food security (Percentage of the Respondents)*				
	Well secured	*Secured enough*	*Moderate security*	*Less security*	*Very low security*
Banorgati	3.6	32.1	37.0	25.0	2.3
Tutpara	16.5	36.2	33.1	12.1	2.1
Khalishpur	1.3	10.3	34.0	41.7	12.7
Rupsha	0.9	16.4	39.5	37.2	6.0

Table 8 shows that the respondents in Tutpara (16.5%) and Banorgati (3.6%) could maintain food security well than the respondents in Khalishpur (1.3%) and Rupsha (0.9%). The regression analysis provides a clear representation about the contribution of agriculture (Table 9).

Table 9: Regression coefficients

Independent variables	*Dependent variable: Index of Agriculture for Sustainable Livelihood (IASL)*			
	Coefficients	*t value*	*Standard Error*	*Significance level*
Constant	15.082	4.996	3.019	0.014
Ownership of house (X_1)	15.388	12.988	1.185	0.000
Community assistance (X_2)	4.661	14.732	0.316	0.000
Land (X_3)	0.218	3.125	0.070	0.002
Involvement in agricultural activities (X_4)	1.190	2.537	0.469	0.012
Sex (X_5)	0.059	1.985	2.796	0.048

N= 361; Adjusted R square = 0.710; F= 176.853 (Significance Level: 0.000)

The result of regression analysis is presented in the Table 9. These results hold up the proposition that agricultural sustainability depends on the aforesaid variables. It shows the positive and highly statistically significant effect on sustainability of agriculture. Household ownership is an important variable that is going to increase the level of agricultural sustainability. Table 9 demonstrates that the level of sustainability is increased by 15.388 units for having the ownership of house. The respondents who are the owners of house have the opportunity to contribute in their family income. Therefore they had greater control over agricultural resources and food security than those who are not owners of their house. The result shows that the level of sustainability is increased by 0.218 units for changing 1 decimal amount of land which is statistically significant. From the study it is found that male respondents can contribute more in agricultural activities than the female respondents. The study shows that the respondents whose main occupation is agriculture, especially involved in livestock, enjoy greater sustainability than those whose main occupation is not agriculture. Therefore, based on empirical result, it can be stated that agriculture can contribute in fulfilling the basic need of the low income people in urban areas of Bangladesh.

Discussion

The objective of the study was to identify the role of agriculture in fulfilling the basic needs to ensure the sustainability of the livelihood of the low income people in Khulna city. From the study it is found that urban agriculture has contributed positively towards food security for the dwellers a large especially in *Tutpara, Banorgati* and *Khalishpur* areas in Khulna city (Table 8). In *Khalishpur*, families involved in urban agriculture have been able to add an indirect income which is significant in relation to the household economies. Intensive production of vegetables and fruits (including market gardening or truck farming is the most common in the study area. Poorest dwellers generally growing tomatoes and

brinjals on some spaces like on riverbank in *Rupsha*, around the hut to large agribusinesses and beside the railways especially in *Khalishpur*.

Vegetable cultivation and innovative gardening also help in enhancing the self-sustenance that ultimately has improved livelihood especially in *Tutpara*, *Banorgati* and *Rupsha*. Particularly in *Tutpara*, *Banorgati* and *Khalishpur* areas, trees offer the poorest urban residents a means of generating income. Activities include collecting nuts; recovering fallen trees for use as fuel wood, construction material, or wood for handicrafts; and gathering fodder, herbs, or shrubbery. Bees are essential for both agricultural and natural ecosystems, and worm production is essential for composting especially for shrimp cultivation. Moreover, beverage crops including grapes, palm, medicinal crops, cactus, flowers and other ornamentals are highly perishable in the study area.

The range of livestock raised in the study areas includes chicken, cows, goats, ducks, geese, pigeons and worms. Animal husbandry generally has a main product (meat) and a number of useful by-products, including milk, eggs, fur, hides, feathers, and dung. In poor families elsewhere, some of these by-products are more important than the meat. The animals are often treated by the poorest as insurance they can be sold in an emergency as a source of quick cash. Urban poultry production has an important role to play in the future food supply in Khulna city.

In this study aquaculture includes many vegetable crops as well as fish crops of all types. It takes place in man-made tanks or in ponds, lakes, rivers, estuaries. Fish and water vegetables raised in wastewater are sometimes purified less completely than that needed for direct human consumption. In many cases, the process of raising these crops purifies the wastewater to a cleaner state than some current sources of potable water.

The result shows that the agriculture has its enormous contribution to fulfill the basic need of the respondents. As women have reproductive roles they predominate in backyard gardening. Shirin (56), a woman in *Banorgati* told that "men can control larger portions of land and tend to produce cereal crops, whereas women have small plots that they work more intensively to produce vegetables. In terms of livestock and poultry production generally women are involved through which they can contribute in family income, food, health and children's education, though women are more likely to enter into collective poultry production than their husbands are".

Urban agriculture improves the quality of the urban environment through greening and results in a reduction in pollution. Through urban agriculture local resources can be utilized and urban agriculture makes cities more energy efficient (Humpwaya *et al*, 2009). It also makes of the city a healthier place to live by improving the quality of the environment. It has the potential to become a dynamic economic sector that quickly adapts to changing urban conditions and demands, intensifying its productivity and diversifying its functions.

Thus the constraints and limitation of urban agriculture should be removed. Rahim (65) in *Tutpara* told that "space is at a premium in cities and is accordingly expensive and difficult to secure. In some cases farms are built on vacant land that offers little security in terms of long-term land access". Community gardens are typically established on vacant or abandoned land, and the farmers/gardeners often do not own the land they tend. Therefore

public and private land management, authorize leasing agreements with private landowners, purification of contaminated land and authorize use of municipal land can play a vital role for the development of agriculture in Khulna city. Agricultural training can help to ensure greater farming success in this regard.

Conclusion

In this study agriculture is clearly reported as the most important income source for producers in the four study areas of Khulna city. However, the majority of agricultural production is for self-consumption, with surpluses being sold in the market and contributing in family food consumption, medicinal ingredients, education, developing interpersonal relations and green building. In the study area urban cultivators face many similar challenges when starting or expanding an urban farm like, lack of land security. But the major constraint is that the municipal governments are restrictive with renting out urban land. It makes difficult for urban farmers to expand their business or to start up a new business. In this regard a plan for long term financial sustainability is vital for ensuring both long-term success and other funding opportunities. Governmental policy should create the proper framework conditions for optimal development of the social, economic and ecological benefits of urban agriculture to make cities sustainable and resilient. Increased interest among the public can increase the interest for urban agriculture among municipal governments. A way to give space for urban agriculture and strengthen the urban rural relationship is to create green corridors throughout Khulna city.

References

Ara, M.R. (2017). *Urban Environment and Sustainable Livelihood: The Case of Khulna City, Bangladesh* (Doctoral Dissertation). Dhaka: University of Dhaka.

Brown, K.B. & Carter, A. 2002. *Urban agriculture and community food security in the United States: Farming from the city center to the urban fringe*. Portland: Urban Agriculture Committee of the Community Food Security Coalition (CFSC), pp.4.

Carney, D. (1998). *Sustainable rural livelihoods: What contribution can we make?* London: Department for International Development (DFID), pp.213.

Dasgupta, S., Laplante, B., Murray, S., & Wheeler, D. (2009). Climate Change and the Future Impacts of Storm-Surge Disasters in Developing Countries. Washington, D. C., United States of America: Center for Global Devlopment, pp. 17-19.

Denzin, N. (2006). *Sociological Methods: A Sourcebook*. Chicago, United States of America, Aldine Transaction, pp. 1-600.

Deptford, A., Louis, C., & Hall, A. (2013). *A Cost of the Diet Analysis in Khulna District of Bangladesh*. Dhaka: Save the Children.

Disaster Management Breau. (2010). *National Plan for Disaster Management 2010-2015*. Dhaka, Bangladesh: Disaster Management and Relief Division, Ministry of Disaster Management and Relief, pp. 2.

Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies, 35*(1), 1-38. doi: <10.1080/002>

Gebre-Egziabher, A. 1996. Understanding urban survival strategies: Urban agriculture, the ultimate stage in household survival. *Habitat Debate*, *2*(2): 21-22.

Hampwaye, G.,Nel, E., & Ingombe, L (2009). The Role of Urban Agriculture in Addressing Household Poverty and Food Security: The Case of Zambia. Food, Agriculture and Natural Resources Policy Analysis Network.

Kingsley, J. Y., Townsend, M., & Henderson-Wilson, C. (2009). Cultivating health and wellbing: Members' perceptions of the health benefits of a port Melbourne community garden. *Leisure Studies, 28*(2), 207-219. doi: <10.1080/02614360902769894>

Maxwell, D., Levin, C. & Csete, J. (1998). Does urban agriculture help prevent malnutrition? Evidence from Kampala. *Food Policy*, *23*(5): 411-424. doi: <10.1016/S0306-9192(98)00047-5>

McClintock, N. (2010). Why farm the city? Theorizing urban agriculture through a lens of metabolic rift. *Cambridge Journal of Regions, Economy and Society*, *3*(2), 191–207. doi:1<10.1093/cjres/rsq005>

Mohal, N., Khan, Z. H., & Rahman, N. (2010). Impact of Sea Level Rise on Coastal Rivers of Bangladesh. Dhaka, Bangladesh: Institute of Water Modelling, pp. 1-9.

Mougeot, L. J. A. (2000). *Urban agriculture: Definition, presence, potentials and risks, and policy challenges*. Ottawa: International Development Research Centre (IDRC).

Nasreen, M. (2008).*Violence Aganist Women During Flood and Post-Flood Situations in Bangladesh.* Dhaka, Bangladesh: Women's Rights & Gender Equality Sector, pp. 1.

Oxford Dictionary (2013). Livelihood. Retrieved from http://oxforddictionaries.com/definition/english/livelihood.

Page, B. (2002). Urban agriculture in Cameroon: An anti-politics machine in the making? *Geoforum, 33*(1), 41-54. doi: <10.1016/S0016-7185(01)00022-7>

Parr, J. B. (2013). Exploring the urban system of von Thünen's isolated state. *Papers in Regional Science*, *94*(1), 161-175. doi: <10.1111/pirs.12057>

Robertson, C. C. (2012). *Sharing the Same Bowl: A Socio-Economic History of Women and Class in Accra, Ghana.* New York, United States of America: ACLS Humanities E Book, pp. 1-4.

Riddell, R. (2004). *Approaches to poverty: A note from the "development" perspective*. Geneva: International Council on Human Rights Policy (ICHRP).

Sustainable Development Solution Network. (2013). *Solutions for sustainable agriculture and food systems: Technical report for the post-2015 development agenda*. New York: Sustainable Development Solution Network (SDSN).

Sheila, G. (2013). *Urban agriculture impacts: social, health, and economic: A literature review. Sustainable agriculture research and education program*. California: Urban Agriculture Impacts Literature Review Agricultural Sustainability Institute at University of California Davis, pp. 4-15.

Smit, J., Nasr, J., & Ratta, A. (2001). *Urban agriculture: Food, jobs and sustainable cities*. New York: United Nations Development Programme (UNDP).

United Nations. (2014). *World urbanization prospects*. New York: United Nations (UN).

Veenhuizen, R. V. (ed.). (2006) *Cities Farming for the Future: Urban Agriculture for Green and Productive Cities*. Ottawa: International Development Research Centre (IDRC).

Viljoen, A. (2005). Continuous productive urban landscapes: Designing urban agriculture for sustainable cities. Oxford: Elsevier.

Wakefield, S., Yeudall, F., Taron, C., Reynolds, J., & Skinner, A. (2007). Growing urban health: Community gardening in south-east Toronto. *Health Promotion International, 22*(2), 92-101. doi: <10.1093/heapro/dam001>

World Bank. (2015). World Bank Forecasts Global Poverty. Washington D.C., United States of America: The World Bank Retrieved from <www.worldbank.org/.../news/press-release/.../10/.../world-bank-forecasts-global-pover...>

Wyatt, R. C., & Meyers, L. S. (1987). Psychometric properties of four 5-point Likert type response scales. *Educational and Psychological Measurement, 47*(1), 27-35. doi: <10.1177/0013164487471003>