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PRESENT SCENARIO AND PROBLEM CONFRONTATION IN ROOF GARDENING OF KHULNA CITY, SOUTHWESTERN BANGLADESH

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Abstract: *The purposes of the study were to identify the present scenario and problem confrontation in roof gardening in Khulna City Corporation area, Khulna, Bangladesh. Data were collected from randomly selected 60 respondents of Nirala, Sonadanga and Khalishpur residential area of Khulna City Corporation during September, 2015 through personal interview using an interview schedule. Highest proportion (45%) of the respondents initiated roof gardening before 2004, Most of the respondents practiced roof gardening for vegetable production. Majority (51.7%) of respondents had medium sized roof area where almost all of the respondents (95%) had small to medium area potential for roof gardening. Considering the type of plants grown in roof garden, all of the respondents grew flower and vegetable. Average expenditure, total income and net income per unit area (m^2) were Tk. 28.21, 29.33 and 23.02, respectively. The most common and most severe problem of roof gardening were insects, pest and disease infestation while the least common and less severe problem was lack of sufficient area for roof gardening. Among 9 selected characteristics of the respondents, only organizational participation and cosmopoliteness showed a significant positive relationship with their problem confrontation.*

Key words*: Roof garden, Present scenario and Problem confrontation.*

Introduction

Roof garden is a garden on the roof of a building having decorative benefit. It may provide food, temperature control, hydrological benefits, architectural enhancement, habitats or corridor for wildlife, recreational opportunities, and in large scale it may even have ecological benefits. However, it's important to check out the structural capacity of the building before roof gardening in order to assess whether or not the roof is stable enough to support the additional weight of a rooftop garden. Roof garden helps to decrease the heat increase and minimize the cooling load for the mechanical air-conditioning; it is one of the primary focuses in the building energy policy. The value of green spaces to people living and working in towns and cities has increasingly been recognized by medical science. Bangladesh is an over populated country with limited land. Though the home yard of our villages have some space for gardening, but our urban areas lack enough space for gardening. In this respect roof gardening may be alternative of it. By establishing roof gardening people can get safe foods as the vegetable and fruit in our market are not always safe for our health. It can play a great role to our economy. On the other hand it can also play a great role to urban environment. At present time people of urban area of Bangladesh are also eager to roof gardening. People of all ages from teenage to old can start this work at their living home. It does not require a lot of investment but it returns us more. So it can be said that roof gardening can play an important role in our socio economic benefit. The present study thus assesses the present scenario and

problems of roof gardening in Khulna City Corporation (KCC), Southwestern Bangladesh.

Materials and Methods

The study was conducted in Khulna City Corporation (KCC). Data were collected from randomly selected 60 roof gardeners of Nirala, Sonadanga and Khalishpur of Khulna City Corporation during September, 2015. The present scenario of roof gardening was studied based on the following parameter-

Year of initiation of roof gardening
Needs and purpose of roof gardening
Area of roof gardening
- *Total roof area*
- *Potential area of roof gardening*
- *Actual area under roof gardening*

Types of plants grown in roof gardening
Intercultural operation
Total expenditure
Total income
Net income

Besides data were also collected on demographic characteristics of the respondents which were treated as independent variable viz. Age, Education, Family size, Experience in roof gardening, Organizational participation, Annual income, Extension contact, Cosmopoliteness and Knowledge in roof gardening. The problem confrontation of roof gardening was treated as dependent variable. To determine the severity of a problem, problem confrontation index (PCI) was calculated by using the following formula:

$$\mathbf{PCI = N_h \times 4 + Ns \times 3 + N_m \times 2 + N_l \times 1 + N_n \times 0}$$

When,

PCI = Problem Confrontation Index

$\mathbf{N_h}$ = Number of respondents rated the problem as highly severe

Ns = Number of respondents rated the problem as severe

$\mathbf{N_m}$ = Number of respondents rated the problem as moderately severe

$\mathbf{N_l}$ = Number of respondents rated the problem as less severe

$\mathbf{N_n}$ = Number of respondents rated the problem as not at all a problem

Necessary statistical measures such as percent, rank order, range, mean and standard deviation, Pearson's product correlation coefficient 'r' were used to interpret the data.

Results and Discussions

Demographic Characteristics of the Respondents

Most (90%) of the respondents belonged to young to middle aged categories and only 10% respondents are in the old aged group. It is evident that young to medium aged people (90%) are more engaged in roof gardening. Majority (58.3%) of the respondents had graduation and above level of education followed by higher secondary level (25%), secondary level (11.7%). It is clear from the study (Table 1) that Most of the respondents who are involved in roof gardening were highly educated.

Table 1: Distribution of the respondents on the basis of selected demographic characteristics

Characteristics	Categories	Score	Respondent (N=60)		Range	Mean	Sd (±)
			Number	Percent (%)			
Age (Year)	Young	≤ 35	27.00	45.00	14-67	37.72	11.48
	Middle	36-50	27.00	45.00			
	Old	>50	6.00	10.00			
Education (Year of schooling)	Illiterate	0	0.00	0.00	1-16	12.6	3.19
	Primary	1-5	3.00	5.00			
	Secondary	6-10	7.00	11.70			
	Higher secondary	11-12	15.00	25.00			
	Graduate and above	>12	35.00	58.30			

Family size (No.)	Small	1-3	18.00	30.00	2-6	3.98	0.19
	Medium	4-5	39.00	65.00			
	Large	>5	3.00	5.00			
Experience in roof gardening (Year)	Low	≤10	34.00	56.70	2-40	12.5	9.20
	Medium	11-20	19.00	31.70			
	High	>20	7.00	11.70			
Organizational participation (Score)	Low	0-6	60.00	100.00	0-5	1.38	1.658
	Medium	7-12	0.00	0.00			
	High	13-18	0.00	0.00			
Annual income (in'000' Tk.)	Low	≤300	16.00	26.70	200-760	411.53	119.43
	Medium	301-600	42.00	70.00			
	High	>600	2.00	3.30			
Extension contact (Score)	No contact	0	0.00	0.00	2-10	5.23	1.943
	Low	1-6	46.00	76.70			
	Medium	7-12	14.00	23.30			
	High	13-18	0.00	0.00			
Cosmopoliteness (Score)	Low	≤4	0.00	0.00	5-9	7.03	1.04
	Medium	5-8	55.00	91.70			
	High	9-12	5.00	8.30			
Knowledge in roof gardening (Score)	Low	0-5	0.00	0.00	6-10	9.29	1.16
	Medium	5.1-7	7.00	11.70			
	High	7.1-10	53.00	88.30			

Source: Field Survey, 2015

The annual income of the respondents ranged from 200 ('000Tk) to 760 ('000'Tk) with a mean and standard deviation 411.53 and 119.43 respectively. Majority (70%) of the respondents were in medium income category followed by low income (26.7%) and high income (3.3%). Majority of the respondents (76.7%) had low scale extension media contact followed by medium scale extension media contact (23.3%) and none of respondents belonged to high and no contact categories. Most (91.7%) of the respondents had medium cosmopoliteness and (88.3%) had high knowledge on roof gardening.

Present Scenario of Roof Gardening

Year of initiation of roof gardening

Highest proportion of the respondents (45%) started roof gardening long ago (before 2004) among whom very few respondents started in 70s followed by 30% percent in recent time and 25% in very recent time (Table 2) i.e. after 2010.

Table 2: Distribution of respondents according to initiation (year) of roof gardening

Categories	Score (Year)	Respondent (N=60)		Range
		Number	Percent (%)	
Very recent	2010 to 2015	15.00	25.00	
Recent	2004 to 2009	18.00	30.00	1975-2014
Long ago	Before 2004	27.00	45.00	
Total		**60.00**	**100.00**	

Source: Field Survey, 2015

Needs and purpose of roof gardening

The respondents preferred roof gardening for different needs and purposes. Most of the respondents performed roof gardening for vegetable production (96.67%) followed by fruit production (95%) and hobby (95%), aesthetic need (93.33%), ecological balance (61.67%), income generation (53.33%) and others (4%), respectively (Table 3).

Table 3: Distribution of the respondents according to their needs and purpose of roof gardening

Categories	Citation	Percent (%)
Aesthetic	56.00	93.33
Vegetable production	58.00	96.67
Income generation	32.00	53.33
Ecological balance	37.00	61.67
Fruit production	57.00	95.00
Hobby	57.00	95.00
Others ((keeping busy himself, recreation etc)	4.00	6.67

Source: Field Survey, 2015

Area of roof gardening

The total roof area of the study area ranged from 56 m^2 to186 m^2 with mean and standard deviation of 120.7 and 34.91, respectively. Majority (51.7%) of the respondents had medium sized roof area followed by small sized roof area (31.7%) and large sized roof area (16.6%). The potential roof area of the study area ranged from 47 m^2 to 168 m^2 with a mean and standard deviation of 102.55 and 31.57, respectively. Half of the respondents (50%) had small sized roof area followed by medium sized roof area (45%) and large sized roof area (5%) potential for roof gardening. The actual area under roof garden in the study area ranged from 28 m^2 to 175 m^2 with a mean and standard deviation of 87.78 and 30.12, respectively. Majority (58.3%) of the respondents had medium area actually under roof gardening followed by large sized roof area (30%) and small sized roof area (11.7%)actually for roof gardening. It may be concluded that most (88.3%) of the respondents utilized their roof area for roof gardening (Table 4).

Table 4: Distribution of the respondents according to area under roof gardening

Characteristics	Categories	Score (m^2)	Respondents (N=60)		Range (m^2)	Mean (m^2)	Sd (±)
			Number	Percent			
Total roof area	Small	≤100	19.00	31.70	56-186	120.7	34.91
	Medium	100–150	31.00	51.70			
	Large	>150	10.00	16.60			
Potential area for roof gardening	Small	≤100	30.00	50.00	47-168	102.55	31.57
	Medium	100-150	27.00	45.00			
	Large	>150	3.00	5.00			
Actual area under roof gardening	Small	≤50	7.00	11.70	28-175	87.78	30.12
	Medium	50 – 100	35.00	58.30			
	Large	>100	18.00	30.00			

Source: Field Survey, 2015

Types of plants grown in roof garden

Types of plant grown in roof gardening of the respondents have been presented in Table 5. All of the respondents grew flower and vegetable plants while most of them also grew fruit and other plants. This result agrees with Islam (2002) findings

Table 5: Distribution of the respondents based on the types of plants grown in roof garden of the study area

Categories	Respondent (N=60)	
	Citation	Percent (%)
Flower	60.00	100.00
Vegetable	60.00	100.00
Fruit	59.00	98.33
Others	58.00	96.67

Source: Field Survey, 2015

Intercultural Operation

All of the respondents (100%) practiced irrigation and weeding followed by pruning (88.33%), pest and diseases control (66.67%), training (50%), thinning (47%), drainage (15%) and shading (5%) (Table 6).

Total Expenditure, Total Income and Net Income

The average expenditure for roof gardening of the respondents was Tk. 28.21 ranging from Tk. 13 to 64 with a standard deviation of 11.22. Expenditure of roof gardening for per unit (m^2) area ranged from Tk. 13-64 with a mean and standard deviation of 28.21 and 11.22, respectively. The average income from roof garden of the respondents was Tk. 68.21 ranging from Tk. 25 to 191 with a standard deviation of 29.33. Half of the respondents (50%) earned medium amount of money from roof garden followed by low income (31.7%) and only 5% respondents of them earned high amount of money from roof gardening.

Table 6: Distribution of the respondents according to their intercultural operations of roof gardening

Operations	Respondent (N=60)	
	Citation	Percent (%)
Irrigation	60.00	100.00
Weeding	60.00	100.00
Pruning	53.00	88.33
Thinning	47.00	78.33
Pest and diseases control	40.00	66.67
Training	30.00	50.00
Drainage	9.00	15.00
Shading	3.00	5.00

Source: Field Survey, 2015

The average net income of the respondents from roof garden was Tk. 39.86 ranging from Tk. 8 to 138 with a standard deviation of 23.02. Most of the respondents (85%) earned low amount of money from roof gardening followed by medium income (13.3%) and only 1.7% respondents of them earned high amount of money from roof garden (Table 7).

Table 7: Distribution of the respondents according to expenditure, total and net income from roof gardening

Characteristics	Categories	Score (TK)	Respondents (N=60)		Range (TK)	Mean (TK)	Sd (±)
			Number	Percent (%)			
Expenditure for roof gardening (Tk/m^2)	Low	≤20	17.00	28.30	13-64	28.21	11.22
	Medium	21-40	34.00	56.70			
	High	>40	9.00	15.00			
Total income from roof gardening (Tk/m^2)	Low	≤80	46.00	76.70	25-191	68.21	29.33
	Medium	81-120	11.00	18.30			
	High	>120	3.00	5.00			
Net income from roof gardening (Tk/m^2)	Low	≤60	51.00	85.00	8-138	39.86	23.02
	Medium	61-100	8.00	13.30			
	High	>100	1.00	1.70			

Source: Field Survey, 2015

Problem Confrontation

The respondents of the study area confronted more or less 11 problems related to roof gardening with different extent of severity. The most common and most severe problem in roof gardening in the study area was insect, pest and disease infestation while the least common and less severe problem was lack of sufficient area for roof gardening (Table 8).

Table 8: Commonness and severity of the problem related to roof gardening in the study area

SI. no	Problems	No. of respondent faced the problem	*PCI	Rank order	
				*Commonness	Severity
1	Lack of sufficient area	11	13	10	9
2	Lack of proper management	31	35	4	4
3	Insect, pest and disease infestation	48	57	1	1
4	Lack of proper sunlight and shade	26	27	7	7
5	Disturbance by child, pet animals and thieves	36	42	2	3
6	Transportation problem	25	28	8	6
7	Lack of proper marketing facilities	29	32	5	5
8	Influence of middle man	14	17	9	8
9	Lack of proper training, skill and experience	32	46	3	2
10	Lack of proper nourishment	31	42	4	3
11	Lack of suitable planting materials	27	35	6	4

[*commonness means the number of respondents faced the problem] [* PCI= Problem Confrontation Index]

Source: Field Survey, 2015

Relationship between the Selected Characteristics of the Respondents and Their Problem Confrontation in Roof Gardening

The selected characteristics did not show any significant relationships with their problem confrontation. Similar findings were obtained by Rahman (1995) in Pineapple cultivation in case of age. Karim (1996) in his study found that education of the farmers had negative significant relationship with their problem confrontation. Haque (1995) found that there was no significant relationship between family size and problem confrontation. Rashid (2003) found that farm size of the rural youth had no relationship with problem confrontation in selected agricultural production activities. Raha (1989) found that income of the farmers had no significant relationship on their irrigation problem confrontation.

Table 9: Computed coefficient of correlation (r) between the selected characteristics of the respondents and their problem confrontation

Characteristics (Independent variable)	Dependent variable	Correlation coefficient
Age	Problem confrontation	0.116^{NS}
Education		-0.054^{NS}
Family member		-0.041^{NS}
Experience in roof gardening		0.244^{NS}
Organization participation		0.633**
Annual income		0.035^{NS}
Extension contact		0.090^{NS}
Cosmopoliteness		0.332**
Knowledge		-0.211^{NS}

NS= Non-significant, **Correlation highly significant at 1% level of probability

Source: Field Survey, 2015

Conclusion

Based on result and its logical interpretation the following conclusion may be drawn, Majority (90%) of the respondents were young to middle aged had graduation and above level of educational qualification, medium sized family, low experienced in roof gardening, low organization participation, medium annual income, low extension media contact, medium cosmopoliteness and high knowledge on roof gardening. Flower and vegetable production is the main purpose of roof gardening. Total area, potential area and actual area under roof gardening ranged from 56-186 (m^2), 47-168 (m^2) and 28-175 (m^2). All of the respondents grew flower and vegetable plants in their roof garden. Most of the respondents spent and earned medium amount of money from roof gardening and practiced irrigation and weeding operations. Insect, pest and disease infestation is the common and severe problem in roof garden. Only organization participation and cosmopoliteness indicated a significant positive relationship with their problem confrontation.

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