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Full Length Research Paper

Features of Homestead Agroforestry in Coastal Region of Bangladesh: Case of Selected Villages of Patuakhali District

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Abstract

The study was conducted in purposively selected two villages of each *upazila* namely Dumki and Bauphal of Patuakhali district in Bangladesh. The study was taken to observe the number of existing plant species in homestead and to explore their relationships with the selected characteristics of the respondents. Eighty respondents were selected randomly using multistage random sampling procedure. A structured personal interview schedule was used to determine some parameters. Pearson's Product Moment Correlation (r) was used for statistical analysis along with the usual descriptive statistical parameters. A total of 69 species in where categorically 12 timber species, 20 fruit species, 10 medicinal species, 8 ornamental plant species and 19 vegetable species were recorded. The overwhelming majority of (52.50%) respondents grew 11 to 14 plant species in their homestead areas. Among the selected characteristics of the respondents, education, family size, constraints, perception and support service showed no significant relationship with their diversified plant species. Farm size and knowledge showed a significant relationship with their number of plant species grows where farm size showed a negative relation. Plant growing habit in the homestead is highly related with knowledge which can enhance the vegetation coverage at homestead areas of coastal Bangladesh.

Keywords: Agroforestry, Bangladesh, coastal region, homestead, plant species.

INTRODUCTION

Bangladesh is one of the most densely populated countries in the world with a population of 164.6 million and with an annual growth rate of 1.37 (BBS, 2018), and therefore has very low per capita arable land of 0.06 ha (BBS, 2019). The overall poverty reached 21.8% in Bangladesh and over 87% of the poor people living in rural areas heavily depend on agroforestry systems for their daily living (Islam, 2015; BBS, 2019). Rural Bangladesh is full of homestead consisting some 32.07 million number of homesteads occupied almost 7% of the total cultivable land (8.4 million ha). Homestead of Bangladesh is highly productive and a kingdom of agroforestry species most of which belong to vegetables and fruits flora (BBS, 2005).

The homestead agroforestry system is very important in the economy of Bangladesh. Many woody species grown in the homesteads are a significant source of fuelwood; they also provide fodder, building materials and other forms of wood. In the context of the prevailing shortage of fuelwood and excessive deforestation in Bangladesh, this homestead agroforestry system needs to be strengthened

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(Foysal et al., 2013). Homestead garden is a traditional agroforestry system and an important component in the livelihoods of rural poor. It has significant contribution to the rural economy of the country. During the last 40–50 years, the relative importance has shifted from the traditional forestry to homestead forestry; in such a situation, homestead garden plays a vital role in providing firewood, fodder, medicine, fruit, and timber. It is estimated that about 70% of timber, 90% of firewood, 48% of sawn, veneer logs, and almost 90% of bamboo requirements are met from homestead forests (Uddin et al*.,* 2002).

The conservation of cultivated plants in homestead gardens of Bangladesh not only preserves a vital resource for humankind but plays an important role in household food security, as it is a sustainable source of food, fruits, and vegetables (Uddin et al., 2002). Bangladesh consists of 87,363 thousand villages (BBS, 2007) with each village encompassing many homesteads. They constitute the center of socioeconomic activities and traditional cultural heritage of village (Khan, 1977).

The coastal region of Bangladesh covers an area of about 47,201 km^2 extending along the Bay of Bengal. This region now covers 19 coastal districts facing, or in proximity to, the Bay of Bengal (Islam et al., 2006). The coastal and offshore areas include tidal, estuaries and river floodplains in the south along the Bay of Bengal. There are numerous old and new islands of varying size. The coastal zone constitutes 20% of the area and 28% of the population of Bangladesh (Islam, 2004). Agricultural laborers, small farmers, fishermen folk and the urban poor make up 71% of the 6.85 million households (Ahmad, 2004). As a result, homestead garden in the coastal region plays a vital role nowaday. Since the natural forest of Bangladesh is shrinking at an alarming rate due to unprecedented anthropogenic pressure, researchers from across the world have demonstrated a homestead gardens dynamic role in the conservation of biodiversity and provision of necessary daily needs to rural people by turn for urban people. Researchers from across the country and world have explored the quantitative status of homestead garden but not the driving factors which lead people to plant trees in their house premises.

The cultivable areas in coastal districts are affected by varying problems. Besides, the majority of the farmers cultivate their homesteads by different fruit and timber species in an unplanned way. It is necessary to develop sound plans and procedure for planting more prevalent fruit, timber, medicinal and vegetable species in a scientific way. Since the population growth is increasing at a rate of 1.34, it requires more residential area and more food. For this, agricultural land is decreasing and at the same time forestland is also decreasing to get more homesteads and more agricultural land. So, the homestead is expected to recover the vegetation requirements of the country. Villages of Bangladesh have a long heritage of growing timber and fruit trees along with other perennial shrubs and herbs (Rahman et al*.,* 2009). Homestead is the most plant diversified ecosystem in Bangladesh. Plant diversity plays an important role for maintaining ecological balance as well as environmental stabilization. So plant diversified condition is desirable for a sound environment. In Bangladesh scope of agroforestry is vast. Homestead agroforestry is one of the most important venue for agroforestry practices.

In the coastal region, homestead agroforestry can be the best source of food, fuel, timber for the people. For improving the livelihood of the coastal region people, increase the productivity of land by introducing tree species by the association with crops and vegetable as homestead agroforestry practices are prime requirement. Though some studies being conducted to explore a different aspect of homestead in Bangladesh (Kalyan, 2006; Zico, 2011; Mahmuda, 2012), however, the results are not consistent and widely differ with site location, climate, soil type and perception of local people. Moreover, the research on the coastal homestead (Alam and Masum, 2005; Islam et al., 2013) is very limited which is not well organized. Thus this study aims to explore the features of existing homestead agroforestry in the coastal region of Bangladesh. The specific objectives of this study were: (i) To investigate the existing plant species in the homestead area; (ii) To find out the knowledge of respondents on homestead agroforestry and (iii) To explore the relationships among the selected characteristics of the respondent and the number of plant species in the homestead.

MATERIALS AND METHODS

Location of the study area: The study was conducted in two purposively selected villages of Dumki *upazilla* (Rajakhali & Sreerampur) and Bauphal *upazilla* (Rajnogor & Boga), respectively under Patuakhali district which is located in between 21°48' and 22°36' north latitudes and in between 90°08' and 90°41' east longitudes. It is bounded by Barisal district on the north, the Bay of Bengal on the south, Bhola district on the east and Barguna district on the west. The land of the district is composed of alluvial soil of the Meghna basin and of a number of small char lands.

Population and sampling procedure: Data has been collected from a sample rather than whole people involved considering the limitation of time, money, and energy. The homestead agroforestry practicing people of those study area constituted the populations for the study. A list of 800 households was prepared from those four villages as the population of the study with the help of extension agent of the respective block. From the population list, 10 percent was selected as the sample following a multistage random sampling procedure. Hence

the actual size of the sample was 80.

Preparation of survey schedule: In conformity with the set objectives of the study, a set of preliminary interview schedules was prepared for collection of data for the study. Simple questions and/or statements regarding their basic factors were included in the schedule. The draft schedule has been pre-tested by interviewing some sample respondents of Rajakhali, Sreerampur, Rajnogorand Boga by the researcher themselves. Thus, the final survey schedule was prepared in a simple manner maintaining logical sequences and necessary adjustments.

Measurement of independent variables: The following independent variables were including in the study: (a) Education (b) Family size (c) Farm size (d) Constraints faced in homestead gardening (e) Knowledge on homestead garden (f) Perception on homestead agroforestry and (g) Support services from the extension. Appropriate measurement techniques were used based on the nature of the variables (Table 1).

Measurement of dependent variable: Number of plant species observed in homestead agroforestry system was the main focus of the study. On the basis of this main aspect, the researcher gained knowledge by visiting the study area and discussing with respondents before collection of data. For homestead flora, plants are the important component. Plants (timber, fruits, medicinal and ornamental) along with saplings and young plants observed in the study area were calculated. It was expressed by a number.

Data collection and processing: Data for this study were collected through personal interviewing through face to face setting by the researcher themselves during 15 July to 30 September 2020 using the interview schedule prepared earlier. To get valid and pertinent information from the respondent, the researcher made all possible effort to explain the purpose of the study to the respondents and the respondent were assured that the study was purely an academic research which is not likely to make any adverse effect on them. Interviews were conducted with the respondents in their houses. The questions were explained and clarified whenever any respondent felt difficulty in understanding of the question. Co-operation has been obtained from respondents during data collection. Data collected from the respondents (samples) have been verified, complied, tabulated and analyze statistically according to the objectives of the study.

Analysis of data: Collected data were compiled, tabulated and analyzed statistically in accordance with objectives of the study. Local units of measurement were converted into standard units. Qualitative data has been converted into quantitative one by means of suitable scoring techniques wherever necessary. The analysis was performed using statistical treatment with SPSS computer package program. Descriptive statistics namely number, percentage, range, frequency, mean, standard deviation has been used in describing variables of the study. Pearson's product moment correlation co-efficiency (r) has been used in order to explore the relationship between the concern variables.

RESULTS

Selected characteristics of the respondents: The salient features of respondents selected characteristics have been presented in Table 1.

The education level of the respondents ranged from 0-16 with a mean of 7.65 and standard deviation of 4.78.The number of family members ranged from 2-13. However, most of the family was medium sized (6 members). The total land area of the dwellers ranged from 0.01-3.89 hectare with mean 0.641 hectare and standard deviation 0.640.This means that most of the household was small to medium sized farm holder. Constraints score of the respondents in homestead gardening ranged from 2-21 with the mean 7.34 and standard deviation 3.13. It indicates that farmers suffered from moderate type of constraints. The computed knowledge respondent ranged from 9-20. However, most of them possessed a medium level of knowledge. Perception of the respondent on homestead agroforestry scored a range from 23-36 with the mean 30.44 and standard deviation 2.55. The findings indicate that respondent had a very good perception about homestead agroforestry. The extension support service used by respondent on homestead agroforestry ranges from 13-24 with the mean 19.18 and standard deviation 2.23. This indicates that respondents were enjoyed very good extension services from different agencies.

Number of plant species in homestead agroforestry system: Scores of number of trees observed in homestead agroforestry system ranged from 6-19with an average 11.81 and standard deviation 3.01. Based on the observed scores, respondents were classified into three categories. The majority of the respondents (52.50 percent) were medium category who grew up 11 to 14 plant species, 32.50 percent were small category who grew up to 10 plant species and 15 percent of the respondents were high category who grew above 14 plant species (Table 2).

Plant species diversity in coastal area: A total of 69plant species were recorded in the studied areas presented in Table 3 where 50 plant species and 19 vegetable species were found of the homestead. Out of different categories, 12 timber species, 20 fruit species, 10 medicinal species, 8 ornamental plant species were recorded as plant species.

The relationship between selected characteristics of the respondents with their number of plant species observed in homestead agroforestry system: The section deals with the relationship between 7 selected characteristics of the farmers and their number of species observed in homestead agroforestry system. The variables

Table 1. Description of respondents characteristics treated as independent variables of the study (N = 80).

Characteristics	Measuring system	Observed range	Mean	Standard deviation
Education	Years of schooling	0-16	7.65	4.78
Family size	Numbers	2-13	5.99	2.14
Farm size	Hectare	0.01-3.89	0.42	0.64
Constraints	Rated score, 3 for “very serious”, 2 for “serious”, 1 for “less serious” and 0 for “not at all”	2-21	7.34	3.13
Knowledge on homestead garden	Rated score, 2 for the correct, 1 for the partial, 0 for the wrong answer	9-20	15.34	2.49
Perception of homestead agroforestry	5point scale, strongly agree (+4/0) to strongly disagree (-0/4)	23-36	30.44	2.55
Support service used	4 point scale, frequently (3), now and then (2), seldom (1), Not at all (0)	13-24	19.18	2.23

Table 2. Categorization of respondents according to their number of plant species.

Category	Respondent	Percent	Mean	Standard deviation
Small (up to 10)	26	32.50	11.81	3.01
Medium (11 to 14)	42	52.50		
High (above 14)	12	15.00		
Total	**80**	**100**		

were education, family size, farm size, constraints, knowledge, perception and support service. The relationship of the selected characteristics of the respondents with their number of species observed in homestead agroforestry system has been shown in Table4.

DISCUSSION

The findings indicate that education of the respondents had positive and no significant relationship with their diversified plant composition observed in homestead agroforestry system. The result is not consistent with the findings of Zico (2011), who found a positive and significant relationship with education and diversified plant species in the area of char Gobadia of Mymensingh district. Family size of the respondents had positive and no significant relationship with their diversified plant composition observed in homestead agroforestry system. The result has been comparable with the findings of Mahmuda (2012), who observed the negatively significant relationship between family size and diversified tree species in the area of Gopalpur *upazila* of Tangail district. Farm size of the respondents had a negatively significant relationship with a number of species observed in homestead agroforestry system. It means that big farm owner had fewer tendencies to plant trees in their homestead as they get sufficient utility from the wide area. On the other hand, the coastal small farmers had to get sufficient output from the limited land. Therefore, they were more eager to plant trees for food, shelter, fuel-wood and other necessary goods and services. The result is not consistent with the

Table 3. Existing plant species observed in the study area.

Species	Sl. No.	Common name	Scientific name
Timber species (12)	1	Mehogoni	*Swientonia mahogoni*
	2	Rain tree	*Albizia saman*
	3	Chambol	*Artocarpus chaplasha*
	4	Sadakoroi	*Albizia procera*
	5	Jackfruit	*Artocarpus heterophyllus*
	6	Neem	*Azadirachta indica*
	7	Akashmoni	*Acacia auriculiformis*
	8	Sissoo	*Dalbergia sissoo*
	9	Babla	*Acacia nilotica*
	10	Hijal	*Barigtonia acutangula*
	11	Kalokoroi	*Albizia lebbeck*
	12	Kat badam	*Treminalia catappa*
Fruit species(20)	13	Mango	*Mangifera indica*
	14	Jackfruit	*Artocarpus heterophyllus*
	15	Litchi	*Litchi chinensis*
	16	Guava	*Pisidium guajava*
	17	Coconut	*Cocos nucifera*
	18	Star fruit	*Averrhoa carambola*
	19	Jamrul	*Syzygium samarangese*
	20	Papaya	*Carica papaya*
	21	Supari	*Areca catechu*
	22	Gab	*Dospyros blancoi*
	23	Jambura	*Citrus grandis*
	24	Banana	*Musa spp.*
	25	Citrus	*Citrus sp.*
	26	Tal	*Borassus spp.*
	27	Kul	*Zizyphus jujube*
	28	Bel	*Aegle marmelos*
	29	Sofeda	*Manilkara sapota*
	30	Jolpai	*Elaeocarpus floribundus*
	31	Bilati gab	*Diospyros phillipensis*
	32	Amra	*Spondis pinnata*
Medicinal species(10)	33	Arjun	*Terminalia arjuna*
	34	Neem	*Azadirachta indica*
	35	Amla	*Phyllanthus emblica*
	36	Tulshi	*Ocimum tenuiflorum*
	37	Bokul	*Mimusops elengi*
	38	Olotkambol	*Abroma augusta*
	39	Basok	*Justicia adhatoda*
	40	Ashok	*Saraca asoca*
	41	Alovera	*Aloe vera*
	42	Bohera	*Terminalia bellirica*
Ornamental species (8)	43	Joba	*Hibiscus rosa-sinensis*
	44	Rongon	*Ixora coccinea*
	45	Sheuli	*Nycanthes arbor tristis*
	46	Baganbilash	*Bougainvillea spectabilis*
	47	Gondhoraj	*Gardenia jasminoides*
	48	Beli	*Jasminum sambac*
	49	Gada	*Tagetes erecta*
	50	Kodom	*Neolamarckia cadamba*
Vegetable species (19)	51	Chili	*Momordica charantia*
	52	Bottle gourd (Lau)	*Lagenaria ciceraria*
	53	Amaranth (data shak)	*Amaranthus lividus*

findings of Mahmuda (2012), who found significant positive relationship between farm size and diversified tree species in the area of Gopalpur *upazila* of Tangail district. There was no significant relationship between constraints of the respondents and the number of plant species in homestead agroforestry system. Knowledge on homestead agroforestry of the respondents had positive significant relationship with the number of species observed in homestead agroforestry system. The findings are consistent with the findings of Zahid (2006), who also found significant positive relationship with the socio-economic condition. It revealed that the knowledgeable dwellers planted more trees as compared to the ignorant.

Table 3. Cont.

54	Red Amaranth (Lalshak)	*Amaranthus mangostanus*
55	Ash gourd (Chalkumra)	*Cucurbita moschata*
56	Bean	*Lablab niger*
57	Sweet gourd	*Cucurbita maxima*
58	Brinjal	*Solanum melongena*
59	Snake Gourd	*Trichosanthes cucumerina*
60	Ridge gourd	*Luffa acutangula*
61	Yard long bean	*Vigna unguiculata*
62	Spinach	*Spinacia oleracea*
63	Indian Spinach	*Basella alba*
64	Aroids (Mukhikachu)	*Colocasia esculenta*
65	Squash	*Cucurbita maxima*
66	Ladies finger	*Abelmoschus esculentus*
67	Sponge gourd	*Luffa aegyptiaca*
68	Teasel gourd	*Momordica dioica*
69	Green banana	*Musa spp.*

Table 4. Computed co-efficient of correlation (r) between respondent's number of plant species in homestead agroforestry selected characteristics (N = 80).

Respondent's characteristics	Values of 'r' with df. 78
Education	0.153^{NS}
Family size	0.187^{NS}
Farm size	-0.278*
Constraints on homestead	-0.206^{NS}
Knowledge of homestead	0.428**
Perception of homestead	-0.002^{NS}
Support service	-0.064^{NS}

** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level; NS = Non significant.

The findings indicate that perception of the respondents had no significant relationship with the number of species observed in homestead agroforesty system. Support service of the respondents also had no significant relationship with the number of species observed in homestead agroforestry system. So, it is clear that plant growing habit in the homestead is highly related with knowledge and need of the people.

CONCLUSION

It can be conclude that education of the respondent was satisfactory as most of them had secondary level education. However, they had relatively big size family (6 person) as compared to the other parts of the country. Dwellers had medium size land holding. They had good knowledge and perception on agroforestry as they got sufficient support services from different extension agencies. On an average each homestead hold 12 plant species. Most of the household grew 11 to 14 plant species in their homestead. Characteristics of the respondents such as education, family size, constraints, perception and support service had no significant relationship with their number of tree species observed in homestead. Only farm size showed negative significant relationship with their number of tree species observed in homestead. Knowledge of respondent on homestead agroforestry and number of plant species grown was positively related. It can be concluded that plant growing habit in homestead is highly related with knowledge and need of the people. Therefore, it can be recommend that large farm and homestead holders should be motivated to intensify their land with appropriate tree species for increasing the achieving required national vegetation coverage (25%). Moreover, an intensive program should be taken by different agencies including NGOs, government forest department and department of agricultural extension to increase the knowledge of coastal people on agroforesty.

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