

## Species composition and its diversity in the homesteads of Kalaroa and Tala upazila of Satkhira district of Bangladesh

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**Abstract:** The study was conducted in Kalaroa and Tala upazilas under Satkhira district to observe tree diversity present in homestead agroforestry systems, and to explore their relationships with the selected characteristics of the farmers of the study area. One hundred farmers were selected randomly from 20 villages of the two upazillas. A structured personal interview schedule with simple technique and visual observation was used to determine the selected parameters. The respondents were selected randomly and used for collecting data during the period from 01 October to 15 November, 2010. Pearson's product moment correlation co-efficient ( $r$ ) was used for statistical analysis along with the usual descriptive statistical parameters. A total of 69 tree species were identified in the homestead of the study area. The overwhelming majority (68%) of the medium farmers head 30 to 40 trees in their homestead area. Among the nine selected characteristics of the farmers, education, homestead size, pond size, number of trees in homestead, number of trees around the pond, annual income and knowledge on homestead agroforestry showed significant positive relationships with diversified tree species, while, no such relationship was observed with age and family size of the farmers.

**Key words:** Tree diversity, homestead agroforestry system, farmer's characteristics.

### Introduction

Bangladesh, the most densely populated country of the world, possess about 160 million people in its area of 147570 km<sup>2</sup> with more than 910 persons per km<sup>2</sup>. There is 8.29 million hectare of cultivable land and about 19710 square km of forest in Bangladesh. Agriculture is the foundation of the country which contributes about 23.50 per cent to the gross domestic product (GDP). About 85 per cent of population lives in the rural areas in 17.60 million households spreading over 87505 villages (BBS, 2004).

The current population growth rate is 1.54 per cent per annum (BBS, 2004) which has increased the land man ratio, leading to serious depletion of forest resources through over exploitation. The per capita land is decreasing at an average rate of 0.005 ha in 1998. Present national forest area of Bangladesh is 2.24 million ha (13.4%) and out of these, only 5.4% is under actual tree coverage which is decreasing at an alarming rate. In Bangladesh 68 per cent of forest product is fuel wood but this meets only 10% of the national fuel energy need (ADB, 1993). Due to continuous transformation of forest land to agricultural land, aquaculture, industry, homestead and other purposes, 73,000 ha of forest land is being decreased per year. Annual deforestation rate is about 8,000 ha and another 99,000 ha of reserved forest land has been subjected to shifting cultivation.

Vegetation cover is continuously reduced due to utilization of forest and agricultural land for other purposes. Depletion of forest has resulted in loss of biodiversity, global climatic change, degradation of water sheds and desertification (Abedin and Quddus, 1990). Present reduction trends in agricultural and forest land may be compensated through the practices of agroforestry. Homestead agroforestry is one of the promising agroforestry systems in this aspect.

According to Januzi and Peach (1977) homestead agro-production has special significance in the context of Bangladesh where about 50 per cent of rural households are landless. Homestead farming is getting importance as the way of investing minimum capital but earning maximum income with increased participation of farmers in economic activities. Homestead has a great role in the economy of Bangladesh. It is a unique combination of

trees, shrubs, vegetables, animals, fishponds and human beings which is functioning as an eco-system and maintaining the diversity of life as well as biological wealth. Homestead agroforestry may contribute to uplift the socio-economic condition of the farmers, supply fuel wood, give protection from hazards, provide foods and other benefits etc. Through a survey on homestead agroforestry practices existing in the country, Abedin and Quddus (1991) found a variety of homestead agroforestry systems viz., *Mangifera indica* based systems, *Artocarpus heterophyllus* based systems, *Syzygium samarangense* based systems, *Cocos nucifera* based systems, *Psidium guajava* based systems, *Phoenix sylvestris* based systems, *Borassus flabellifer* based systems, *Acacia nilotica* based systems, *Dalbergia sissoo* based systems, *Eucalyptus spp.* based systems etc. They also reported that basically homestead is the unit of survival for rural population for centuries and it sustained the rural population by providing enough food and cash for families.

According to Rahman (1995), agricultural production in homesteads is indispensable for a country like Bangladesh where the population growth rate is very high and faster than its agricultural growth rate. Due to lack of fallow land new families are influencing on the existing homestead area and for building their dwelling houses on agricultural land. The construction of roads, buildings and other infrastructure are also occupying significant portion of agricultural land. The country cannot produce enough food to meet up the ever increasing demand of over population i.e. cereals, vegetables, fish, meat, milk and egg due to lack of modern techniques, inputs and arable land. In the view of proper utilization of homesteads, the homestead agroforestry systems of Kalaroa and Tala upazila of Satkhira district was studied to observe the composition and diversity of tree species in the homestead.

### Materials and Methods

The study was conducted in Kalaroa and Tala Upazila under Satkhira district, during the period from 01 October to 15 November, 2010. Satkhira district is situated between 22.35° and 22°.85' north latitude and 89°.08' and 89°.95' east latitude.

**Variables of study:** Independent variable of the study area were Age, Education, Family size, Homestead size, Pond

size, Number of trees in homestead, Number of trees on the bank of pond, Annual income and Knowledge on homestead agroforestry. Dependent variable of study area was tree species diversity

**Measurement of independent variables:** The age of respondent was measured by counting the period of time from his birth to the time of interview on the basis of response of the respondent and was expressed in terms of years. Education of a respondent was measured in terms of classes passed by him. Family size of a respondent was determined in terms of the total number of members of each respondent. It was measured by the area of the raised land in which the household has its entire living room, kitchen room, cow shed and, area under vegetable, fruit and timber trees, yard, bushes, fallow land, bamboo bunches, pond etc. following the style of Praveen (1993). It was expressed in hectare. Size of ponds was measured by the land which remained filled with water all the year round and bank of the pond which was earthen up by the pond mud. It was expressed in hectare. It was measured by number of trees, which were grown on the home yard area. Timber, fruits and fuel wood trees were considered here. It was expressed by numbers. It was measured by number of trees, which were grown on the bank of pond. The timber, fuel, fodder, fruit trees etc. grown along with sapling and young trees were considered. It was expressed by numbers. This refers to the total earnings of all family members of a farmer from farming, livestock and fisheries and other sources as contained in item number 11 of the interview schedule. A score of one (1) was assigned for each one thousand taka. It refers to the knowledge gained by the farmers from different sources and through their experiences of homestead agroforestry and farming. Farmers were asked 13 questions in item number 9-interview schedule. The total assigned score of all the questions was 47. But, the score of each question was not

equal. A farmer answering a question correctly obtained the full score, while for wrong answer he obtained '0' (zero) score. However, for correct answers to all the questions he could get a total score of 47 while wrong answers to all the questions he gets '0' (zero). '0' indicating no homestead agroforestry knowledge and 52 indicates very high knowledge on homestead agroforestry.

After completion of field survey data from all the interview schedules were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Pearson's product moment co-efficient of correlation (r) was used in order to explore the relationship between the concerned variables.

Throughout the study, at least five per cent (0.05) level of probability was used. In order to have an understanding on the influence of independent variables on the dependent variable, stepwise regression analysis was conducted.

### Results and Discussion

Age of the respondents ranged from 25 to 55 years with an average of 39.00 years and standard deviation of 9.15. On the basis of their age, the respondents were classified into three categories as presented in Table 1. Data presented in Table 1 showed that the highest proportion of 49 per cent of the farmers was in the middle age, 21 per cent old and only 30 per cent was in young category. The education level of the farmers ranged from 0-12 with an average of 2.28 and standard deviation of 0.85 of schooling. In this study, 45 per cent of the farmers had primary level of education whereas 15 per cent of them were illiterate, 30 per cent were of secondary level and 10 per cent were of higher level of education (Table 1). The family size scores of the farmers ranged from 4-15 with an average of 5.49 and standard deviation 1.57. Most of the farmers (39 per cent) had medium families compared to 32 per cent small and 29 per cent large families (Table 1).

**Table 1.** Basic Statistical values of the Selected Characteristics (N = 100)

Characteristics	Measuring system	Observed range	Mean	Standard deviation
Age	Years	25-55	39.00	9.15
Education	Level of schooling	0-12	2.28	0.85
Family size	Numbers	4-15	5.49	1.57
Homestead size	Hectare	0.01-0.53	0.89	0.79
Pond size	Hectare	0.0001-0.914	0.14	1.18
Number of trees in homestead	Numbers	10-50	20.71	5.49
Number of trees on the bank of pond	Numbers	14-33	21.22	3.75
Annual income	Thousand	7800-187000	61117.00	33601.437
Knowledge on homestead agroforestry	Scale score	12-35	21.91	4.60

The homestead of the farmer ranged from 0.01-0.53 hectare with an average of 0.89 hectare and standard deviation of 0.79. Among the farmers 47 per cent had landless and marginal, 39 per cent had small and only 10 per cent had medium homesteads and while lastly large was 4 per cent (Table 1). The pond size of the respondents ranged from 0.0001-0.941 hectare with mean and standard deviation of 0.14 and 0.18, respectively. The study reveals that 55 per cent respondents were without pond and 11, 25 and 9 per cent possessed small, medium and large sized pond, respectively (Table 1). Number of trees in homestead of the farmers ranged from 10 to 50 trees with an average

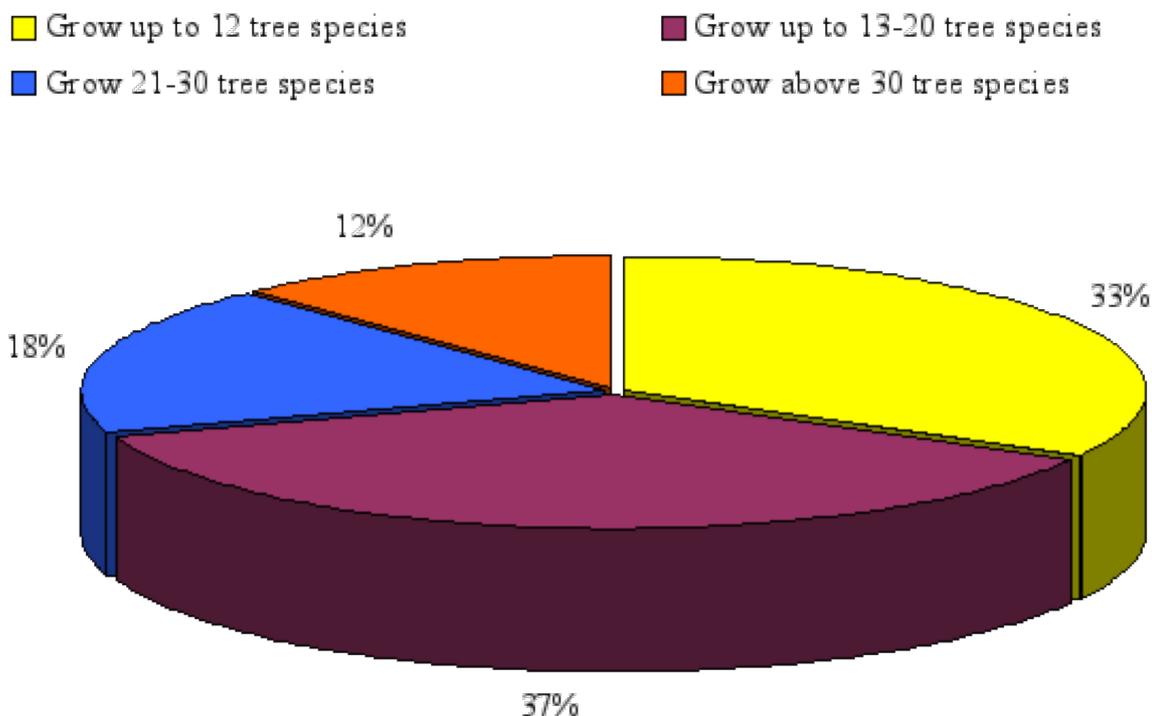
value of 20.17 and standard deviation of 5.49. The study showed that 45 per cent were in small category that grows 16 to 30 numbers of trees, 36 per cent of the respondents were in medium category that grew 31 to 45 trees and 19 per cent respondents were in large category that grows above 45 numbers of trees (Table 1). Number of trees on the bank of pond of the respondents ranged from 14 to 33 trees with an average value of 21.22 and standard deviation of 3.75. The study showed that 62 per cent of the respondents were small category who grew up to 15 trees, 34 per cent of the respondents were medium category who

grew up to 25 trees and 4 per cent of the respondents were large who grew above 25 trees (Table 1).

**Table 2.** Relationship between independent variables and tree diversity

Farmer's characteristics	Values of 'r' with df.98	Tabulated value of 'r'
Age	0.131 NS	0.197
Education	0.291**	0.257
Family size	0.188 NS	0.197
Homestead land size	0.313**	0.257
Pond size	0.328**	0.257
Number of trees in homestead	0.828**	0.257
Number of trees on the bank of pond	0.571**	0.257
Annual income	0.459**	0.257
Knowledge on homestead agroforestry	0.318**	0.257

\*\* Correlation is significant at the 0.01 level \* Correlation is significant at the 0.05 level NS= Non-significant



**Fig. 1.** Pie graph showing percentage of the farmers growing different tree species in their homesteads

Annual income of the farmers ranged from Tk.7800 to 187000 with an average value of Tk76900.00 and standard deviation of Tk24674.65. The study indicates that most of the farmers (42 per cent) were small, (average annual income Tk 75000, 36 per cent of the farmers were medium category (average annual income Tk 75000.00 to 100000.00) and 22 per cent of the farmers were large category (average annual income above Tk. 100000.00) (Table 1). The computed knowledge on homestead agroforestry scores of the farmers ranged from 12-35. The mean and standard deviation were 18.84 and 3.72 respectively. It was observed that the highest

proportion of (45 per cent) farmers has medium homestead agroforestry knowledge, 34 per cent had low and 21 per cent had high categories knowledge on homestead agroforestry, respectively (Table 1). Scores of farmers diversified tree species observed in homestead and cropland agroforestry system ranged from 13 to 69 with mean value 36.76 and standard deviation 21.88. Based on the observed scores, farmers were classified in 3 categories (Table 1). It was observed that an overwhelming majority of the farmers (45 per cent) were small category who grew 31 to 50 trees, 40 per cent of the farmers were land less and marginal category who grew

up to 30 trees, 11 per cent of the farmers were medium category who grew 51 to 90 trees and 4 per cent of the farmers were large category who grew above 50 trees (Fig. 1).

Relationship between independent variables such as education, homestead size, pond size, number of trees in homestead, number of trees on the bank of pond, annual income, and knowledge on homestead agroforestry showed significant positive relationship and age and family size, showed no relationship with their diversified tree species (Table 2).

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