

Tree diversity and its impact on livelihood of the farmers of char areas in Melandaha upazila of Jamalpur district

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Abstract: The study was conducted at two char areas namely, Ghoserpara and Tupkarchar of Melandaha upazila of Jamalpur district to observe the tree diversity and its impact on livelihood of the farmers and to explore their relationships with the selected characteristics of the farmers of the study area. Fifty farmers were selected from each char area for the study. An interview schedule with simple technique and visual observation were used to collect data on the selected parameters. The respondents were selected randomly and data were collected during the period from 15 July to 10 September, 2011. Pearson's product moment correlation co-efficient (r) was used for statistical analysis along with the usual descriptive statistical parameters. Eleven characteristics which were the independent variables of the study as age, education, family size, farm size, homestead size, cultivable land size, fallow land size, char land size, annual income, knowledge about trees & knowledge about agroforestry and a dependent variable as tree diversity. Seven selected characteristics of the farmers namely, education, farm size, homestead size, cultivable land size, fallow land size, knowledge about trees, knowledge about agroforestry showed significant positive relationships with the diversity of tree species, while no such relationship was observed with age, family size, char land size, annual income of the farmers. Total 35 tree species observed in the study area of which 10 timber, 12 fruit, 3 fuel wood, 2 fodder, 5 medicinal and 3 other species. Out of 35 trees Eucalyptus, Akashmoni, Jackfruit, Mahogoni, Guava, Mango, Coconut & Papaya were dominant species. Total 25 crops and vegetables species observed in the char areas of which Jute, Bottle gourd, Mustard, Okra, Rice, Sweet gourd & Bean were dominant species. Average species density and tree population density in Ghoserpara and Tupkarchar were 0.257, 0.405 and 0.255, 0.40 respectively.

Key words: Tree species diversity, plant species, tree population density, species density and char area.

Introduction

Bangladesh is one of the fifty nine least developed countries (LDCs) in the world. It has very large population about 16.44 crores living in a very small geographical area of 1,47,570 square km (BBS, 2010). The demand for food, shelter, fuel and fodder is rising at a geometric rate as jointly influenced by rapid population growth increasing per capita consumption. As a result, the gap between actual demand and supply of the products is widening day by day. Tree planting was conceived as a potential strategy to meet the needs of local people and protect the environment. The worldwide interest in tree planting and management gave birth to several popular terms with "forestry" endings such as social forestry, community forestry and Agroforestry (Tamale *et al.*, 1995; Nair, 1993; Foley and Barnard, 1984). Although these terms are new names for age-old practices, specialists maintained the distinctions among them defining a precise technical meaning (Barraclough and Ghimire, 1995).

Agroforestry does not mean planting trees in the fields or other places; rather it provides farmers with an effective land management system that can ensure more production in a balanced ecological environment. According to Saka *et al.* (1990) Agroforestry can provide a sound ecological basis for increased crop and animal productivity, more dependable economic returns, and greater diversity in social benefits on sustained basis. Hossain and Bari (1996) observed that the cropland Agroforestry is expanding as an insurance against crop failure and extra economic benefit in the northern regions of Bangladesh. They mentioned that without Agroforestry the farming systems in Bangladesh can not sustain. According to Haque (1996), at least 20 per cent of the total land area of the country outside the tree coverage of forest, may be brought under the coverage of trees if agro-forestation is done properly and extensively. Through Agroforestry, the people of Bangladesh can get more food, enough timber as well as better environment to live in.

In Bangladesh scope of Agroforestry is vast. The main venues of Agroforestry are homestead, roadside, railway

side, embankment side, pond side, charland, coastal area, deforested area, institutional premises, riverside, canal side etc. Among them charland is the most important venue for practicing agroforestry systems in Bangladesh. The major char inhabited districts of Bangladesh are Jamalpur, Mymensingh, Sirajgonj, Noakhali, Bogra, Rangpur Bhola and Patuakhali. Jamalpur district comprise a vast charland area which is frequently inundated due to monsoon flood almost every year. This district has approximately 35-40 per cent charland. In Jamalpur district there are seven upazilas of which except Jamalpur sadar, the rest six upazilas viz. Dewangonj, Bakshigonj, Madargonj, Islampur, Melandaha and Sarishabari have vast charland areas. According to population census wing of BBS (2006), the char areas of this district ranging from 35 to 64 per cent depending on upazilas. Thus, the district possesses around 767 sq. km char areas. A total of 378000 homesteads are present in Jamalpur district of which 120000 to 135000 homesteads are in char areas. A large number of populations are living in these char areas and maintaining their livelihood through char based farming systems. Therefore, for increasing production, maintaining ecological balance and improving socioeconomic condition of the charland people, integrated approach with crop and trees is necessary.

Before the implementation of Agroforestry system in any areas it is necessary to know the present situation. For this purpose benchmark survey is the most appropriate tools. Therefore present study observed the tree diversity and its impact on livelihood of the farmers of char areas in Melandaha upazila of Jamalpur district.

Materials and Methods

Study site: Two char villages viz. Topkarchar and Ghoserpara under Melandaha upazila of Jamalpur district were selected for the study (Fig. 1). Data were collected from 15 July to 10 September, 2011.

Methodology: The study was based on field level primary data and researcher himself collected data for the study.

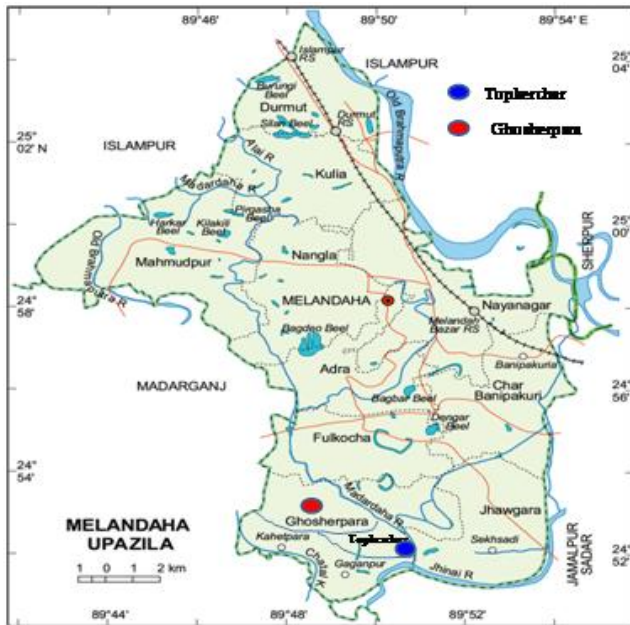


Fig. 1. Map showing the study site

Before going to make actual interview, each farmer was given a brief introduction about the nature and purpose of the study and the researcher assured them that, all information would be kept confidential. Data were collected through repeated field visits in the study area and personal interview with the sample farmers. Interviews were normally conducted in farmer's house in their leisure time and even in the field when they work in the plots. They provided information from their memory. In order to minimize the response error, questions were asked in simple Bengali. After completion of each interview, each interview schedule was checked to be sure that information to each of the items had been properly recorded. If there were any items, which were overlooked or contradictory, was corrected in the second visit. Total 100 farmers were selected for data collection of which 50 from each of the char village.

Variables of the study: Two types of variables are observed in this study viz., independent and dependent variables. Independent variables were Farmer characteristics represent the independent variable in this study. Total eleven characteristics of farmers selected for this study as independent variable which are as: age, education, family size, farm size, homestead size, cultivable land size, fallow land size, char land size, annual income, knowledge about trees and knowledge about Agroforestry. Dependent variable was Tree species diversity treated as dependent variable of the study.

Data processing and analysis: 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. In this process, all the responses in the interview schedule were given numerical coded values. Local units after checking were converted into standard international units. Qualitative data were converted into quantitative ones by means of suitable scoring whenever necessary. The responses to the questions in the interview

Table 1. Description of farmer's characteristics treated as independent variables of the study (N=50)

schedules were transferred to a master sheet to facilitate tabulation. For describing the different characteristics and their constraint facing, the respondents were classified into several categories. These categories were developed by considering the nature of distribution of data, general understanding prevailing in the social system.

Descriptive analysis such as range, number and percentage, mean, standard deviation and rank order were used whenever possible. Pearson's product moment co-efficient of correlation (r) was used in order to explore the relationship between the concerned variables. Throughout the study, five per cent (5%) and one per cent (1%) level of probability were used. The computed values of correlation co-efficient (r) were compared against relevant table values. In order to have an understanding on the influence of independent variables on the dependent variable, stepwise regression analysis was conducted.

Results and Discussion

Characteristics of the respondents

Eleven characteristics of the farmers were investigated viz age, education, family size, farm size, homestead size, cultivable land size, fallow land size, char land size, annual income, knowledge about trees and knowledge about Agroforestry. Measuring system of the each characteristic, their observed range, mean and standard deviation are presented in the Table 1.

Tree species diversity:

Different types of tree species observed in the study area viz. timber, fruit, fuelwood, fodder, medicinal and other species. Total 35 tree species observed in the study area of which 10 timber, 12 fruit, 3 fuel wood, 2 fodder, 5 medicinal and 3 other species (Table 2). Similar type of research work also done by Yasmin *et al.*, (2010) in the Tangail district, Chandra (2011) in the Jamalpur district, Mahamud (2010) in the Satkhira district and Jahan (2010) in the Kishorgonj district. Yasmin *et al.*, (2010) observed total 68 tree species of which 12 timber and the dominant timber species was Akashmoni, Jackfruit, Coconut, Mango, Neem, Eucalyptus & Bokain. Chandra (2011) observed total 75 tree species of which 16 timber and the dominant timber species was Jackfruit, Mango, Eucalyptus, Akashmoni & Guava. Mahamud (2010) observed total 69 tree species of which dominant timber species was Akashmoni, Mahogoni, Jackfruit & Coconut. Jahan (2010) observed total 50 tree species of which dominant timber species was Jackfruit, Raintree, Mango, Mahogoni. Belali (2011) observed total 78 plant species of which Eucalyptus, Akashmoni, Mehogoni wer dominant species and Shabuj *et al.* (2010) reported that Eucalyptus, Akashmoni, Mehogoni, Raintree, Sissoo were dominant.

Crops and vegetables species:

Farmers of Ghosherpara & Tupkarchar cultivate in their char areas different types of crops and vegetables. During winter these charland area is suitable for crops/vegetables cultivation and in summer season only a few crops can cultivate only in the upper side of chars. The soil texture of this char sandy-clay-loamy type which good for growing different type crops and vegetables. Total 25 different species of crops and vegetables species observed

Characteristics	Location	Measuring system	Observed range	Mean	Standard deviation
Age	Ghoserpara	Years	25-72	48.81	12.83
	Tupkarchar		24-67	45.28	11.43
Education	Ghoserpara	Level of schooling	0-14	4.08	3.98
	Tupkarchar		0-12	2.48	3.67
Family size	Ghoserpara	Numbers	2-10	5.52	2.01
	Tupkarchar		2-11	5.6	2.38
Farm size	Ghoserpara	Hectare	0.08-1.8	0.58	0.46
	Tupkarchar		0.07-1.5	0.42	0.33
Homestead size	Ghoserpara	Hectare	0.01-0.21	0.05	0.031
	Tupkarchar		0.01-0.20	0.04	0.03
Cultivable land size	Ghoserpara	Hectare	0.04-1.01	0.39	0.31
	Tupkarchar		0.03-1.00	0.33	0.28
Fallow land size	Ghoserpara	Hectare	0-0.12	0.02	0.03
	Tupkarchar		0-0.15	0.03	0.04
Char land size	Ghoserpara	Hectare	0-1.0	0.07	0.13
	Tupkarchar		0-1.2	0.11	0.16
Annual income	Ghoserpara	Thousand	18000-100000	52000	22260.3
	Tupkarchar		17000-90000	41280	19907.6
Knowledge about trees	Ghoserpara	Scale score	5.0-75.0	18.24	16.82
	Tupkarchar		4.0-72.0	16.21	16.11
Knowledge about agroforestry	Ghoserpara	Scale score	5.0-50.0	13.41	10.11
	Tupkarchar		4.0-48.0	13.01	10.04

Table 2. List of existing tree species observed in the study area

Sl. No.	Common name	Scientific name	% farmers possessing	Rank
<u>Timber trees</u>				
1	Eucalyptus	<i>Eucalyptus camaldulensis</i> Dehnh	100	1
2	Akashmoni	<i>Acacia auriculiformis</i> A. Cunn. ex Benth	82	2
3	Mahogoni	<i>Swietenia Mahagoni</i> (L.) Jacq.	75	3
4	Kalo koro	<i>Albizia lebbeck</i> (L.) Benth	60	4
5	Sada koro	<i>Albizia procera</i> (Roxb.) Benth	60	4
6	Gamar	<i>Gmelina arborea</i> Roxb.	40	5
7	Goraneem	<i>Melia azedarach</i> L.	35	6
8	Raintree	<i>Albizia saman</i> F. Muell	30	7
9	Bokain	<i>Melia sempervirens</i> Sw.	30	7
10	Sissoo	<i>Dalbergia sissoo</i> Roxb.	25	8
11	Jackfruit	<i>Artocarpus heterophyllus</i> Lam.	100	1
12	Mango	<i>Mangifera indica</i> L.	100	1
13	Guava	<i>Psidium guajava</i> L.	82	2
14	Papaya	<i>Carica papaya</i> L.	82	2
15	Banana	<i>Musa sapientum</i> L.	75	3
16	Coconut	<i>Cocos nucifera</i> L.	75	3
17	Betelnut	<i>Areca catechu</i> L.	60	4
18	Lemon	<i>Citrus spp.</i>	50	5
19	Jujubi	<i>Ziziphus jujuba</i> Mill.	50	5
20	Tamarind	<i>Tamarindus indica</i> L.	40	6
21	Black berry	<i>Syzygium cumini</i> (L.) Skeels.	35	7
22	Anra	<i>Spondias pinnata</i> L.	30	8
<u>Fuelwood trees</u>				
23	Kadam	<i>Anthocephalus cadamba</i> (Roxb.) Miq.	30	8
24	Shimul	<i>Bombax ceiba</i> L.	20	9
25	Krishnachura	<i>Delonix regia</i> (Boj. ex Hook.) Raf.	10	11
<u>Fodder trees</u>				
26	Minjiri	<i>Cassia siamea</i> Lam.	50	5
27	Ipil-ipil	<i>Leucaena leucocephala</i> (Lam.) de Wit	50	5
<u>Medicinal trees</u>				
28	Neem	<i>Azadirachta indica</i> (L.) Adelb	30	8
29	Dalim	<i>Punica granatum</i> L.	20	9
30	Bel	<i>Aegle marmelos</i> (L.) Corr. Serr.	15	10
31	Kathbel	<i>Feronia elephantum</i> Corr.	10	11
32	Chalta	<i>Dillenia indica</i> L.	5	12
<u>Other trees</u>				
33	Pitraj	<i>Aphanamixis polystachya</i> (Wall.) R. N. Parker	15	10
34	Jiga	<i>Garuga pinnata</i> Roxb.	35	7
35	Sajna	<i>Moringa oleifera</i> L.	15	10

in this char area. The species were Bottle gourd, Sweet gourd, Bitter gourd, Brinjal, Jute, Rice, Mustard, Chilli, Pulse, Potato, Red amaranth, Bean, Carrot, Okra, Snake gourd, Raddish, Cucumber, Indian spinach etc. (Table 3). The dominant species were Rice, Jute, Mustard, Chilli, Bottle gourd, Sweet gourd, Okra. Along with these crops and vegetables farmers are not habited for planting trees.

Recently, the farmers of this char planted different tree species viz. Eucalyptus, Akashmoni, Mahogoni, Papaya etc in association with crops/vegetables. It was found that last one year they are planted these tree species along with crops/vegetables and growth planted trees in char area satisfactory especially in upper side of char.

Table 3. List of existing crops & vegetables species observed in the study area

Sl. No.	Common name	Scientific name	% farmers possessing	Rank
Crops				
1	Rice	<i>Oryza sativa</i> L.	85	1
2	Jute	<i>Corchorus spp.</i> L.	75	2
3	Pulse	<i>Vigna mungo</i> (L.) Hepper	60	3
4	Potato	<i>Solanum tuberosum</i> L.	60	3
5	Maize	<i>Zea mays</i> L.	40	5
6	Dhoincha	<i>Crotalaria juncea</i> L.	50	4
7	Mustard	<i>Brassica spp.</i>	75	2
8	Chilli	<i>Capsicum annum</i> L.	50	4
9	Cown	<i>Setaria italica</i> L.	30	6
Vegetables				
10	Bottle gourd	<i>Lagenaria siceraria</i> (Molina) Standl.	100	1
11	Okra	<i>Abelmoschus esculentus</i> (L.) Moench	75	2
12	Brinjal	<i>Solanum melongena</i> L.	60	3
13	Bean	<i>Lablab niger</i> L.	75	2
14	Sweet gourd	<i>Cucurbita moschata</i> Duchesne ex Poir	75	2
15	Bitter gourd	<i>Momordica charantia</i> Descourt	60	3
16	Cucumber	<i>Cucumis sativus</i> L.	75	2
17	White/Wax gourd	<i>Benincasa hispida</i> Thunb.	40	5
18	Teasle gourd	<i>Momordica cochinchinensis</i> (Lour) Spreng.	20	7
19	Snake gourd	<i>Trichosanthes anguina</i> L.	30	6
20	Red amaranth	<i>Amaranthus mangostanus</i> L.	60	3
21	Indian spinach	<i>Basella alba</i> L.	60	3
22	Carrot	<i>Daucus carota</i> L.	30	6
23	Aroids	<i>Alocasia alba</i> (Schott) G. Don	20	7
24	Radish	<i>Raphanus sativus</i> L.	60	3
25	Amaranth	<i>Amaranthus spp.</i> L.	60	3

Species density:

Species density is a measurement of different species i.e. plant species per unit area or unit volume. Species density was measured for Ghoserpara & Tupkarchar per 10m² area. In Ghoserpara, species density was observed in different farm size as marginal, small, medium & large were 0.20, 0.26, 0.27 & 0.30 respectively and average numbers of plant species/respondent & species density were 13.75 &

0.257 respectively (Table 4). In Tupkarchar, species density was observed in different farm size as marginal, small, medium & large were 0.20, 0.25, 0.28 & 0.29 respectively and average numbers of plant species/respondent & species density were 12.50 & 0.255 respectively (Table 4). Overall average numbers of plant species/respondent & species density in both char areas were 13.125 & 0.256 respectively (Table 4).

Table 4. Species density observed in the study area

Location	Farm category	Average no. of plant species/ respondent	Average farm size (m ²)	Species density/10m ²
Ghoserpara	Marginal	6	300	0.20
	Small	11	450	0.26
	Medium	16	600	0.27
	Large	22	750	0.30
	Average	13.75	525	0.257
Tupkarchar	Marginal	5	250	0.20
	Small	10	400	0.25
	Medium	15	550	0.28
	Large	20	700	0.29
	Average	12.5	475	0.255
Total average		13.125	500	0.256

Tree population density:

Tree population density is a measurement of different tree species per unit area or unit volume. Tree population density was measured for Ghoserpara & Tupkarchar per 10m² area. In Ghoserpara, tree population density was observed in different farm size as marginal, small, medium & large were 0.33, 0.40, 0.42 & 0.47 respectively and average numbers of tree species/respondent & tree population density were 22 & 0.405 respectively (Table 5). In Tupkarchar, tree population density was observed in

different farm size as marginal, small, medium & large were 0.32, 0.40, 0.42 & 0.46 respectively and average numbers of tree species/respondent & tree population density were 19.75 & 0.40 respectively (Table 5). Overall average numbers of tree species/respondent & tree population density in both char areas were 20.87 & 0.402 respectively (Table 5). Belali (2011) Shabuj *et al.* (2010) also reported similar type tree population density in their study area.

Table 5. Tree population density observed in the study area

Location	Farm category	Average no. of tree species/ respondent	Average farm size (m ²)	Tree population density/10m ²
Ghoserpara	Marginal	10	300	0.33
	Small	18	450	0.40
	Medium	25	600	0.42
	Large	35	750	0.47
	Average	22	525	0.405
Tupkarchar	Marginal	8	250	0.32
	Small	16	400	0.40
	Medium	23	550	0.42
	Large	32	700	0.46
	Average	19.75	475	0.40
Total average		20.87	500	0.402

Relationship between independent variables with dependent variable

To explore the relationship between 11 selected characteristics of the farmers with tree species diversity,

Pearson's product moment co-efficient of correlation (r) has been used. Among the 11 independents 7 showed significant relationships with dependent variable i.e., tree species diversity and 4 were non significant (Table 6).

Table 6. Computed co-efficient of correlation (r) between independent variables with dependent variable in the study area (N=50)

Farmer's characteristics	Computed value of 'r'		Tabulated value of 'r' with 49df	
	Ghoserpara	Tupkarchar	5% level	1% level
Age	0.177 NS	0.158 NS		
Education	0.541**	0.495**		
Family size	0.251 NS	0.205 NS		
Farm size	0.307*	0.298*		
Homestead size	0.395**	0.358**		
Cultivable land size	0.306*	0.293*	0.273	0.354
Fallow land size	0.282*	0.277*		
Char land size	0.061 NS	0.112 NS		
Annual income	0.198 NS	0.188 NS		
Knowledge about trees	0.288*	0.281*		
Knowledge about agroforestry	0.276*	0.274*		

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