# Impact of Agroforestry practices on livelihood improvement of the farmers of char Kalibari area of Mymensingh

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**Abstract**: A study was conducted for a period of three months from June to August, 2011 to evaluate the tree diversity and agroforestry practices, its impact on farmer's livelihood improvement of the selected char area (Kalibari) in Mymensingh district. A questionnaire was prepared to know the independent and dependent variables. The independent variables were age, education, family member, farm size, homestead size, cultivable land, fallow land, char land, annual income, knowledge about trees, knowledge of agroforestry; while the dependent variable of the study was plant diversity and existing agroforestry practices. Average age of farmers was 48.02 years and it ranged from 25 to 70 years. Most of the people in this char land have no education and their education level ranged from 0 -14 with an average of 1.9. Family size of the respondents in Kalibari ranged from 3-10 with an average of 5.88. The farm size of the farmers ranged from 0.04 -1.57 ha. Homestead size of the respondents ranged from 0.01- 0.20 ha with an average of 0.055 ha. The fallow land size of the farmers ranged from 0-1.80 ha with an average of 0.11ha. Annual income of the farmers in this char ranged from 18000 to 120000 Tk. with an average of 52320 Tk. A total of 66 plant species were recorded in the study area of which 9 timber, 20 fruit, 7 medicinal, 9 fodder and 21 crops and vegetables. Farmers of char Kalibari recently i.e., cultivate crops / vegetables in association with different tree species. As a result some different newly developing agroforestry practices were found in this charland. Ten different agroforestry practices were found under agrisilvicultural system in the char Kalibari. These agroforestry practices were as follows: Lombu - Olive - Radish - Red amaranth- Pat (Jute) shak, Akashmoni - Cucumber - Chilli, Akashmoni - Mustard - Sweet gourd, Akashmoni - Sweet gourd - Radish, Mango - Jujube - Lemon - Red amaranth - Coriander, Akashmoni - Mango - Jujube - Olive - Mustard, Eucalyptus - Lemon - Sweet gourd, Akashmoni - Lemon - Sweet gourd - Indian Spinach, Mehogoni - Papaya - Mung Bean and Eucalyptus - Mango - Lemon - Papaya - Tomato based agroforestry system.There is a great scope for developing different agroforestry system in the char Kalibari. By the proper implementation of agroforestry practices with proper tree-crop combination the people of Kalibari Char area can improve their livelihood and socioeconomic status.

**Key words:** Agroforestry practices, Tree diversity, plant species, homestead, Charland ecosystem, Kalibari.

## Introduction

Bangladesh, our homeland, is mainly an agriculture based country and agriculture play a great role in the national economy of the country. The Population of Bangladesh in 2011 was estimated by the BBS at 16.44 Crore. According to the BBS, the annual population growth rate for 2010-11 is 1.4%. This sector is playing a vital role in achieving self-sufficiency in food production. However, the contribution of agriculture to the GDP and incremental employment is likely to diminish day by day. The natural resources are depleting due to constant pressure by the increasing population. To feed the over increasing population appropriate production system should be developed to maximize production without deteriorating the existing resources.

At present situation it has been seen that the forest land are now replaced by cropland agroforestry, so conflict for land use between agriculture and forestry are prevalent in Bangladesh. Under this circumstance it is necessary to find out a suitable alternative to overcome this situation. Since there is neither scope for expanding forest area nor sole grain crop area, the country has to develop combined production system integrating trees and crops which is now being called agroforestry. Due to increasing population, land holdings are being fragmented and area devoted to small scale agriculture is decreasing. In agroforestry systems, different types and nature of species are grown in association, therefore, there is an inevitable competition for growth resources such as light, water and nutrients which may reduce the productivity of understoryed crops in particular. Agro forestry can provide a sound ecological basis for increased crop and animal productivity, more dependable economic returns, and greater diversity in social benefits on a sustained basis (Rahim, 1997).

In Bangladesh scope of agroforestry is vast. The main venues of agroforestry are homestead, roadside, railway side, embankment side, charland, coastal area, deforested area, institutional premises, riverside etc. Among them charland is the most important venue for practicing agroforestry systems. The major char inhabited districts of Bangladesh are Jamalpur, Sirajgonj, Noakhali, Bogra, Rangpur and Mymensingh. In Mymensingh district there are 12 upazilas of which Mymensingh sadar, Ishwargonj, Trishal, Gaffargaon and Gouripur upazila are char inhabited area containing about 584 sq. km charland areas. These five upazilas contained at least 361000 homesteads of which 25 percent i.e. 90000 homesteads remained in char areas (BBS, 2006). 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 socio-economic condition of the charland people, integrated approach with crop and trees is necessary. Therefore present study observed the tree diversity, existing agroforestry systems and its impact on the livelihood improvement of the farmers of char kalibari areas of Mymensingh district.

## Materials and Methods

**Location of the study area:** The district Mymensingh is located between 24°38'3" North and 90°16'4" East Latitude. Total area of this district is 4363.48 km$^2$ and situated on the west bank of Brahmaputra river. This district has total 12 upazila and the studying area i.e. Char Kalibari belong to the Mymensingh sadar upazila. The geographical position of char kalibai located between 24°45' - 24°45'40" North and 90°24'4"- 90°24'44" East Latitude (Fig. 1).
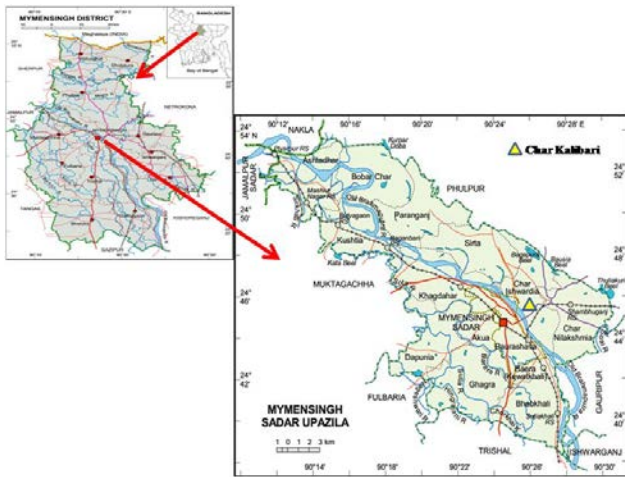
**Fig. 1.** Location of the study area

**Physiography of the study area:**

The soil of this area is mainly formed with recent and sub-recent alluvial sediments of low parts of the Old Brahmaputra Flood plain. Most of the soil has silty to clay texture and low contents of organic matter. Total area of this Charland is about 2.57 km$^2$ where cultivated land is about 175 ha, 10 ha wetland, 40ha fallow land, 23 ha household and 2 ha forest area. Total family number of this Char area is about 590. Total population in this charland area is about 2350 of which 1238 man and 1112 woman (Based on 6 no.Char Ishwardia Union Parishad Office records).

**Sampling procedure and Survey schedule:** A questionnaire was prepared for collecting information from the study area. Using this questionnaire relevant information was collected from 100 farmers which were randomly selected from the whole study area. Data were recorded from these selected farmers from June 2011 to August 2011. In conformity with the set objectives of the study, a set of preliminary survey schedules has been designed for collection of data for the study. Simple questions and / or statements regarding the n - basic factor were included in the schedule. The draft schedule has been pre-tested interviewing some sample farmers of Kalibari Char in Mymensingh Sadar Upazila by the researcher himself. Thus, the final survey schedule has been prepared in a simple manner maintaining logical sequences and necessary adjustments.

**Variables of the study:** Two types of variables are observed in this study area viz. Independent and dependent variables. The independent variables of the study were age, education, family member, farm size, homestead size, cultivable land size, fallow land size; char land size, annual income, knowledge about trees, knowledge of agroforestry. The dependent variable of the study was: Plant diversity and existing agroforestry practices.

**Data processing and analysis:** After data collection 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, at least five percent (0.05) level of probability was 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**

Nine characteristics of which were the independent variables of the study 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.

**Table 1.** Farmer's characteristics i.e., independent variables in Char Kalibari of Mymensingh (N = 100)

| Characteristics | Measuring system | Observed range | Mean | Standard deviation |
|---|---|---|---|---|
| Age | Years | 25-70 | 48.02 | 11.74 |
| Education | Level of schooling | 0-14 | 1.9 | 7.01 |
| Family size | Numbers | 3.0-10.0 | 5.88 | 1.91 |
| Farm size | Hectare | 0.04 -1.57 | 0.51 | 0.34 |
| Homestead size | Hectare | 0.01- 0.20 | 0.055 | 0.037 |
| Cultivable land size | Hectare | 0.04 -1.0 | 0.47 | 0.33 |
| Fallow land size | Hectare | 0 -1.80 | 0.11 | 0.33 |
| Char land size | Hectare | 0-0.60 | 0.2 | 0.19 |
| Annul income | Thousand | 18000-120000 | 52320 | 22169.97 |
| Knowledge about trees | Score | 5.0-75.0 | 20.92 | 16.57 |
| Knowledge about agroforestry | Score | 5.0-75.0 | 20.08 | 16.5 |

**Tree species diversity:**

Total 45 tree species observed in the study area of which 9 timber, 7 medicinal, 9 fodder or fuel and 20 fruit species (Table 2). Among the 9 timber species, Akashmoni and Lombu found almost all farmers lands. Depending on the percent of trees possessing in the respondent lands ranking as Mehogoni ›Akashmoni ›Eucalyptus ›Lombu ›Raintree ›Sadakoroi ›kalokoroi ›Ipilipil ›Gamar. Therefore the dominant timber species were Akashmoni, Mehogoni, and Eucalyptus. Recently farmers show their interest on Raintree and Lombu in their charland as well as homestead also. The people of the study area did not want

**Table 2.** Tree species observed in the Char Kalibari area of Mymensingh

| Sl. No. | Species | Scientific name | % farmers possessing |
|---|---|---|---|
| | Timber | | |
| 1 | Akashi | *Acacia auriculiformis* | 95 |
| 2 | Eucalyptus | *Eucalyptus cameldulensis* | 80 |
| 3 | Mahogoni | *Swetenia mahogoni* | 96 |
| 4 | Lombu | *Switenia hybrida* | 70 |
| 5 | Raintree | *Albizia saman* | 60 |
| 6 | Kalo koroi | *Albizia lebbeck* | 62 |
| 7 | Sada koroi | *Albizia procera* | 60 |
| 8 | Sissoo | *Dalbergia sissoo* | 70 |
| 9 | Gamar | *Gmelina arborea* | 50 |
| | Medicinal | | |
| 10 | Deshi Neem | *Azadirachta indica* | 30 |
| 11 | Ghora Neem | *Melia azadarach* | 40 |
| 12 | Horitoki | *Terminalia chebula* | 20 |
| 13 | Amloki | *Phyllanthus emblica* | 20 |
| 14 | Bohera | *Terminalia bellerica* | 20 |
| 15 | Arjun | *Terminalia arjuna* | 35 |
| 16 | Tulsi | *Ocimum americanum* | 15 |
| | Fuel and Fodder | | |
| 17 | Minjiri | *Cassia siamea* | 40 |
| 18 | Ipil ipil | *Leucaena leucocephala* | 50 |
| 19 | Shaora | *Streblus asper* | 30 |
| 20 | Khoksa | *Ficus hispida* | 20 |
| 21 | May flower | *Cassia nodosa* | 10 |
| 22 | Sonalu | *Cassia fistula* | 20 |
| 23 | Krishnochura | *Delonix regia* | 30 |
| 24 | Mander | *Erythrina orientalis* | 30 |
| 25 | Tentul | *Tamarindus indica* | 40 |
| | Fruit | | |
| 26 | Jackfruit | *Artocarpus heterophyllus* | 60 |
| 27 | Coconut | *Cocos nucifera* | 40 |
| 28 | Banana | *Musa sapientum* | 80 |
| 29 | Papaya | *Carica papaya* | 95 |
| 30 | Jujube | *Zizyphus jujuba* | 60 |
| 31 | Lemon | *Citrus spp* | 40 |
| 32 | Amra | *Sponolias pinnata* | 20 |
| 33 | Guava | *Pisidium guajava* | 40 |
| 34 | Chalta | *Dillenia indica* | 20 |
| 35 | Mango | *Mangifera indica* | 40 |
| 36 | Betelnut | *Areca catechu* | 80 |
| 37 | Ataphal | *Annona reticulata* | 20 |
| 38 | Sajna | *Moringa oleifera* | 20 |
| 39 | Olive | *Elaocarpus floribundus* | 30 |
| 40 | Amloki | *Phyllanthus emblica* | 20 |
| 41 | Jam | *Syzygium cumini* | 20 |
| 42 | Tal | *Borassus flabellifer* | 40 |
| 43 | Tentul | *Tamarindus indica* | 20 |
| 44 | Jamrul | *Syzygiym samarangense* | 20 |
| 45 | Bel | *Aegle marmelos* | 20 |

to plant trees (Lombu, Mehogoni, Raintree) in their crop field for its wide spread canopy but also planted trees (Akashmoni, Eucalyptus) for its minimum canopy structure in the border of their agricultural plot. Total 7 (seven) medicinal plant species were found in this study area and these were Deshi neem, Ghora neem, Bohera, Horitoki, Amloki, Tulsi, Arjun. The diversity of fuel wood and fodder species also low in the char Kalibari. Total 9 (nine) different species of fodder and fuel wood producing species observed in this char area. These species were Minjiri, Ipil ipil, Shaora, Khoksa, May flower, Sonalu, Krishnochura, Mander and Tentul. The diversity of fruit species in char Kalibai bit higher than timber and medicinal plants. Total 20 different fruit species were recorded in this char area of which Papaya, Banana and Betelnut were found near 80% respondent lands and the population density of other 17 species were very low in the study area. Papaya and Banana were dominant in the char kalibari may be due to early cash income. These two species can give fruit within a year for this reason people of this char cultivate these two species in their homestead frequently. Similar type of research work also done by Belali (2011) in the Narayangonj district and Sabuj (2010) in the Natore district. Belali (2011) observed total 78 plant species of which 25 are average and the dominant timber species was Eucalyptus, Akashmoni, Mehogoni. Shabuj (2010) reported that Eucalyptus, Akashmoni, Mehogoni, Raintree, Sissoo were dominant.

**Agroforestry practices in the study area:**
Farmers of char Kalibari recently i.e., cultivate crops / vegetables in association with different tree species. Total 10 different agroforestry practices were found under agrisilvicultural system in the char Kalibari. These agroforestry practices were as: (1) Lombu - Olive - Radish - Red amaranth- Pat (Jute) shak based agroforestry system, (2) Akashmoni - Cucumber - Chilli based agroforestry system, (3) Akashmoni - Mustard - Sweet gourd based agroforestry system, (4) Akashmoni - Sweet gourd - Radish based agroforestry system, (5) Mango-Jujube-Lemon-Redamaranth-Coriander based agroforestry system, (6) Akashmoni - Mango - Jujube-Olive - Mustard based agroforestry system, (7) Eucalyptus - Lemon - Sweet gourd based agroforestry system, (8) Akashmoni - Lemon - Sweet gourd - Indian Spinach based agroforestry system, (9) Mehogoni - Papaya - Mung Bean based agroforestry system and (10) Eucalyptus - Mango - Lemon - Papaya - Tomato based agroforestry system. There is a great scope for developing different agroforestry system in the char Kalibari. Farmers of this char identified some problem for planting tree seedling / sapling viz. lack of planting materials, seedling damage by animals, specific pest infestation / infection, poverty etc. Though there are some problems but they are now very much interested planting crops / vegetables with timber or fruit tree species. Now the farmers of this char realizing the benefits of integrated farming system i.e., agroforestry and impact also observed in their socioeconomic status. By the proper implementation of agroforestry practices the people of Kalibari Char area can improve their livelihood and socioeconomic status. 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 they also found trees and crops as mixed combination in the respective study areas. .

**Relationship between dependent and independent variables:** To explore the relationship between dependent and independent variables, Pearson's product moment co-efficient of correlation (r) has been used (Cohen and Holiday, 1982). Eight characteristics of the farmers namely; education, farm size, homestead size, cultivable land size, fallow land size, Charland 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 & annual income (Table 3).

**Table 3.** Relationship between dependent and independent variables in char Kalibari

| Farmer's characteristics | Computed value of r | Tabulated value of r (5% level) |
|---|---|---|
| Age | 0.061NS | |
| Education | 0.381* | |
| Family size | 0.073 NS | |
| Farm size | 0.329* | |
| Homestead size | 0.397* | |
| Cultivable land size | 0.375* | 0.319 |
| Fallow land size | 0.391* | |
| Char land size | 0.389* | |
| Annul income | 0.028NS | |
| Knowledge about trees | 0.376* | |
| Knowledge about Agroforestry | 0.383* | |

*Correlation significant at the 0.05 level, NS -Non significant

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