J. Sher-e-Bangla Agric. Univ., 3(2): 1-7, July 2009 ISSN 1997-6038

POTENTIAL TREE SPECIES, THEIR DISTRIBUTION PATTERN AND BIOMASS PRODUCTION IN HOMESTEAD OF MADHUPUR TRACT

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ABSTRACT

A study was conducted in Rangchapra village belong to the Muktagacha Thana under Mymensingh District to find out the potential tree species, their growth and distribution pattern as well as biomass production in homesteads. Data were collected from selected randomly 100 households out of 253 households with the help of interview schedule during July to December 2004. The study revealed that potential tree species found in homesteads are wood (59%) followed by fruit (51%), and fruit and wood (33%), respectively. Among the respondents, large farm categories prefer pond micro site (53.89 dcml) for desired species plantations followed by medium (23.10 dcml) and small (18.63 dcml) farmers. Estimated tree biomass production was increased (0.50 t/ha) slightly from year 1985 to 2004. The correlation value indicated that there is insignificant relation between age with tree number and biomass production. While other independent variables are strongly correlated with tree number and biomass production.

Key word: Tree species, distribution, biomass production, homestead, Madhupur

INTRODUCTION

Bangladesh is one of the densely populated countries of the world. According to 2001 population census, Bangladesh has a population of about 13 crore living on 1,47,570 square kilometer of land (Anonymous, 2005). It has 15.4 million homesteads occupying 0.3 mha of land and are providing major requirement of food, fruit, vegetables, timber and fuel wood (Abedin. and Quddus, 1990). It is one of the potential sources of plant genetic diversity in Bangladesh. Wide ranges of tree diversity for timber and food crops were found in the homesteads (Bashar, 1999). Homegardens have numerous benefits from the perspective of production, conservation and aesthetics (Wickramasinghe 1995). Due to continuous expansion of population, capita^{-1} land is decreasing day by day. Presently capita^{-1} land is only 0.06 ha. The limited forest reserve, which is less than 10% of the total land area, is being encroached at a faster rate due to agricultural expansion, industrialization, fuel wood, timber and raw material collection, housing and collection of other non-timber forest produces. It creates heavy pressure on food and energy for whole population. About 80% people live in the rural area where biomass plays an important role as cooking, heating, lighting, construction, timber, furniture etc. Total homestead area of Bangladesh is increasing @ 5 m^2/ha/year due to increasing population. This system contributes about 70% fruit, 40% vegetables, 70% timber and 90% fire wood and bamboo requirement of the country (Miah and Hossain, 2001). Income from homesteads ranges from 26% to 47% of the total family expenses.

Species choice, abundance, distribution and management of potential trees in homesteads depend on owner's choice while productivity, growth and biomass production largely depends on soil, agro-climatic conditions of the AEZ. Farmers usually prefer to grow fruit, timber, fuel wood, and medicinal plants in frontyard, homeyard, backyard, boundary, approach road and pond site. Variations of growth and productivity depend on species and their density. However the species-mix varied from location and farm category. Besides the ecological reasons and the socio-economic condition of the household

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also a major determinant of the species-mix in homestead. Considering the above mentioned factors, the study was undertaken for identifying different tree species grown in the homestead, their growth & distribution pattern, biomass production and policy for increasing production.

MATERIALS AND METHODS

A total of 100 households were selected randomly from 253 households from Rangchapra village belong to the Muktaghacha Thana of Mymensingh district to collect necessary information's for the study during July to December 2004. A set of interview schedule was prepared to collect: various socio-economic aspects, plant species diversity and distribution pattern as well as biomass production of potential tree species of this village. In this study, the independent variables were age, total land, level of education, homestead area and pond area. Existing number of trees viz. fruit, forest and medicinal along with saplings observed in the study area and measured by numbers. Relative prevalence of tree species was determined by multiplying the number of trees per homestead by the percentage of farm containing that species. It was calculated by using the following formula:

Relative prevelance = Number of trees per farm x percent farm with the species.

Species richness is the number of tree species within an area.

Collected data were compiled, tabulated and analyzed in accordance with the objectives of the study. Statistical measures such as number and percent of distribution, range, mean and standard deviation were used. Pearson product-moment correlation was used to explore the relationship of the characteristics of the farmers.

RESULTS AND DISCUSSION

Socio-economic condition of the village

There are 253 households consisting of 1406 persons with about 53.62 per cent male and 46.38 per cent female. The literacy rate of the selected village is 57%, where 59.30% male and 54.50% female (Table 1). The average family size of Rangchapra village is 5.56.

Table 1. Population and literacy rate of Rangchapra village

Category	Population		Literacy rate (%)
	Number	%	
Male	754	53.62	59.30
Female	652	46.38	54.50
Total	1406	100	57.00

Land use

The total land area of the Rangchapra village is 178.29 ha. Out of 253 households in the village, 21.74% landless, 65.22% are small, 11.46% medium and 1.58% large farm families (Table 2).

Table 2. Land classification under different farm size category

Farm size	No. of farm	Percentage of total	Land farm^{-1} (ha)	Total land (ha)
Landless	55	21.74	0.09	5.00
Small	165	65.22	0.61	100.60
Medium	29	11.46	1.87	54.49
Large	4	1.58	4.55	18.20
Total	253	100.00	-	178.29

Homestead microsite

Homestead microsite represented the smallest production unit having similar configuration of land served specific purposes. The homestead is not a homogenious system and what is suitable for approach road may not be suitable for backyard, and similarly, what are feasible at the pondsite may not be feasible at the homeyard.This makes new thinking for the researchers, academicians and development workers to divide the homestead into several production units/ micriosites i.e., boundary, backyard, homeyard, pondsite and approach road. The size of different microsites and available tree species are shown in Table 3 and 4.

Table 3. Distribution of the homestead area into different micro sites of the studied homestead in Rangchapra village

Farm category	Area occupied by different microsites (decimal)					
	Backyard	Frontyard	Homeyard	Pondsite	Approach road	Average (decimal)
Landless	1.08	2.08	1.67	11.83	0.33	16.99
Small	0.75	5.50	4.44	18.63	0.50	29.81
Medium	2.22	5.03	3.78	23.10	0.61	34.72
Large	4.37	7.82	4.07	53.89	1.41	71.56
Average	2.105	5.11	3.49	26.86	0.71	

A whole variety of fruit, timber and medicinal as well as fuel wood trees were found in the homesteads of Rangchapra village during 2004 (Table 4) but the general openion of the farmers is to grow timber and fuel and other than fruit plants as quick and year round return of them.

Table 4. Trees available at Rangchapra village in 2004

SL No.	Common/Local name	Scientific name	Family
		Fruit trees	
1	Mango	*Mangifera indica*	Anacardiaceae
2	Jackfruit	*Artocarpus heterophyllus*	Moraceae
3	Date palm	*Phoenix sylvestris*	Palmae
4	Litchi	*Litchi chinensis*	Sapindaceae
5	Guava	*Psidium guajava*	Myrtaceae
6	Pomegranate	*Punica granatum*	Punicaceae
7	Blackberry	*Syzygium cumini*	Myrtaceae
8	Tamarind	*Tamarindus indica*	Leguminosae
9	Jujube	*Zyziphus jujuba*	Rhamnaceae
10	Dewa	*Artocarpus lakoocha*	Moraceae
11	Chalta	*Dillenia indica*	Dilleniaceae
12	Gab	*Diospyros embryopteris*	Ebenaceae
13	Betel nut	*Areca catechu*	Palmaceae
14	Pulmyra palm	*Borassus flabellifer*	Palmaceae
15	Papaya	*Carica papaya*	Caricaceae
16	Pummelo	*Citrus acida*	Rutaceae
17	Lemon	*Citrus lemon*	Rutaceae
18	Coconut	*Cocos nucifera*	Palmae
19	Olive	*Elaeocarpus robustus*	Elaeocarpaceae
20	Amloki	*Emblica officinalis*	Euphorbiaceae
21	Bel	*Aegle marmelos*	Rutaceae
		Timber and Fuel wood trees	
1	Acacia	*Acacia auriculiformis*	Leguminosae
2	Pitraz	*Aphanamixix polystachya*	Meliaceae
3	Neem	*Azadirachta indica*	Meliaceae
4	Gora neem	*Melia azadirach*	Meliaceae
5	Bamboo	*Bambusa vulgaris*	Gramineae
6	Jarul	*Lagerstroemia speciosa*	Lythraceae
7	Ipil.ipil	*Leucaena leucocephala*	Leguminosae
8	Raintree	*Samanea saman*	Leguminosae
9	Mahogany	*Swietenia macrophylla*	Meliaceae
10	Teak	*Tectona grandis*	Verbenaceae
11	Chatim	*Alstonia scholaris*	Apocynaceae
12	Kadam	*Anthocephallus chinensis*	Rubiaceae
13	Sonalu	*Cassia fistula*	Leguminosae
14	Minjiri	*Cassia siamea*	Leguminosae
15	Sissoo	*Dalbergia sissoo*	Leguminosae
16	Krishnochura	*Delonix regia*	Leguminosae
17	Mandar	*Erythrina variegata*	Leguminosae
18	Eucalyptus	*Eucalyptus camaldulensis*	Myrtaceae
19	Debdaru	*Polyalthia longifolia*	Annonaceae
	Arjun	*Terminalia arjuna*	Combretaceae

Tree biomass

Total amount of biomass estimated for trees in the Rangchapra village is shown in Table 5. During 1985, total tree biomass production in the village was estimated 1348.49 tonnes while during 2004, it was 2032.86 tonnes. Per farm tree biomass observed were 5.33 and 8.04 tonnes during 1985 and 2004, respectively. Per capita tree biomass was recorded 0.95 and 1.45 tonnes/ha, respectively. Data obtained in Table 5 revealed that capita^{-1} biomass situation was improved over 19 years. The biomass situation was better in comparison to the national average.

Table 5. Total amount of biomass and energy from trees of Rangchapra village

	Estimated tree biomass(t)			Estimated energy (GJ)*		
	1985	2004	Increase over 19 yrs	1985	2004	Increase over 19 yrs
Village	134849	2032.86	648.37	20227.35	30492.90	10265.55
Per household	5.33	8.04	2.71	79.95	120.52	40.58
Per capita	0.95	1.45	0.50	14.38	21.68	7.30

Farmer's choice in site selection for tree plantation

Farmer's choice in site selection for tree plantation was survayed in Rangchapra village. Findings indicated that 100% farmers opined their choice about site selection for tree plantation in homestead area (Table 6). Besides, 30, 18, 3 and 59% respondents preferred roadside, ail, cropland and other (mainly river bank) areas, respectively. The choice of tree plantation around homestead might be due to take proper care of them, management and their better utilization.

Table 6. Farmers choice in site selection from tree plantation in Rangchapre village

Place of plantation	Responding farm (%)
Homestead area	100
Roadside	30
Ail	18
Crop land	3
Other (river bank)	59

Decision making about tree plantation

Decision making is the important aspect for tree plantation in rural area. Decision making in tree plantation was dominated by husbands (89%), which was followed by wives (56). The joint decision was come from 20% respondent (Table 7). The decision by parents (3%) and children (7%) were negligible.

Table 7. Decision making about tree plantation in Rangchapra village

Respondent category	% respondent
Husbands	89
Wives	56
Both	20
Parents	3
Children	7

Farmer's choice of plant species for future plantation

Farmer's choice of future tree plantation was interviewed in Rangchapra village. Findings indicated that 51% respondent preferred fruit trees for homestead plantaion (Table 8) while 59 % wood tree, 33% fruit and wood, 3% bamboo and 7% choose other species.

Table 8. Farmer's opinion for future tree plantation in Rangchapra village

Choice of plant species	% respondent
Fruit	51
Wood	59
Fruit & wood	33
Bamboo	3
Others	7

Saplings source

Among the farmers 88% used the saplings by growing in their own backyard nursery (Table 9). Sixty nine per cent opined that they got some of their seedlings from the farming systems and environment studies of Bangladesh Agricultural University and 65% buy saplings from private nursery or market. Only 2% respondent said they got saplings from different NGOs. It was also observed that there was no contribution of Government Organizations in supplying saplings to the villages.

Table 9. Source of saplings for tree plantation in Rangchapra village

Name of source	% respondent
Own backyard nursery	88
Farming System and Environment Studies (FSES)	69
Buy from private nursery/market	65
Government Organization (GO)	0
NGOs	2

Training

Training need on tree plantation was assessed in Rangchapra village. In the village, 79% farmers said that they were in need of training on tree plantation but 21% gave negative answer (Table 10). They also opined that the necessary training topic, might be the method of tree plantation for different species, nursery raising, fertilizer and manure application, tree management etc.

Table 10. Farmer's opinion regarding training need

Types of training	% respondent	Type of answer
Tree plantation, maintenance and management	79	Yes
	21	No

Relationship of the selected variables of the respondent with their number of tree farm^{-1}

Age of family heads vs number of trees farm^{-1}

The correlation value between age of the respondents and number of trees farm^{-1} was found to be 0.036 (Table 11). The computed value was smaller than the tabulated value with 98 degrees of freedom. However, statistically it indicates that the variables shown insignificant positive relationship. Therefore, it revealed that age has no effect on the presence of number of tree farm^{-1}.

Total land vs number of trees farm^{-1}

Computed value of the correlation (r) between total land of farmers and number of tree farm^{-1} was found to be 0.468 (Table 11). A positive significant relationship was found between total land vs the number of trees farm^{-1}. The computed value of r was found to be larger than the tabulated value with 98 degrees of freedom at 0.01 level. Based on the above findings the null hypothesis was rejected and it may be concluded that total land of the respondents exerted significant positive influence into their homestead plantation. Therefore, based on the relationship it can be said that total land relating to the tree plantation would be very helpful at farmer's level.

Education vs number of trees farm^{-1}

The relationship between education and number of trees farm^{-1} was significant (r = 001). The computed value of r was found to be 0.295 (Table 11). From the findings it may be concluded that education of the respondents exerted significant positive influence into their homestead plantation.

Homestead area vs number of trees farm^{-1}

A positive significant relationship (r = 0.487) was found between homestead area and number of trees farm^{-1} (Table 11). Findings indicate that the number of trees farm^{-1} increased with the increase of homestead area.

Pond area vs number of trees farm^{-1}

The computed value of r was found to be 0.231 in the relationship between pond area and number of trees farm^{-1} (Table 11). The peoples of Bangladesh, generally, planted trees around the pond and it may be the cause of positive significant correlation.

Table 11. Correlation of five independent variables with number of trees farm^{-1}

Dependent variable	Independent variables	Correlation value (r) (n = 100)
Number of trees farm^{-1}	Age of family heads	0.036NS
	Total land	0.468**
	Education	0.295**
	Homestead area	0.487**
	Pond area	0.231*

* Significant at 5% level; * * Significant at 1% level; NS = Not significant

Relationship of the selected variables of the respondent with tree biomass production

Age of family head vs tree biomass

The computed value of r between age of respondents and tree biomass was found to be 0.04 (Table 12). The computed value was smaller than the tabulated value i.e., the relationship was insignificant.

Total land vs tree biomass

The correlation between total land of the respondents and their tree biomass was found to be 0.43 (Table 12). The computed value of r was greater than the tabulated value with 98 degrees of freedom. The findings indicated that more biomass was noticed in large land holding size. Similar result was reported by Abedin *et al.* (1990).

Education vs tree biomass

The correlation between education and tree biomass farm^{-1} was insignificant (Table 12). The computed value of r was found to be 0.13 which indicated that the education had no significant influence on biomass production.

Homestead area vs tree biomass

The correlation between homestead area and tree biomass was found to be 0.46 (Table 12). The computed value of r was larger than the tabulated value with 98 degrees of freedom. The positive correlation between the variables indicated that larger homestead area of the respondents produced higher amount of biomass.

Pond area vs tree biomass

A positive significant relationship was found between the pond area vs tree biomass (Table 12). The computed value of r between variables was found to be 0.22 which was larger than the tabulated value with 98 degrees of freedom at p = 0.05 level. Hence, it may be concluded that pond area of the respondents exerted significant positive influence in the tree biomass production. Based on the findings it was found that tree biomass increased with the increased area farm^{-1}.

Table 12. Correlation of five independent variables with tree biomass farm^{-1}

	Independent variables	Correlation value (r) (n = 100)
Tree biomass farm^{-1}	Age of family heads	0.04 NS
	Total land	0.43**
	Education	0.13NS
	Homestead area	0.46**
	Pond area	0.22*

* Significant at 5% level; * * Significant at 1% level; NS = Not significant

It is necessary to say there is a very little scope to increase land under cultivation, therefore, the alternate is to turn to the increased biomass production through increasing yield unit-1 area. From the study it has been found that each homestead has different microsites for potential tree plantation along with fish-poultry-animal production which ensures large amount of biomass production. The common fruit tree species are mango, jackfruit, blackberry, guava, litchi etc and fuel and timber trees such as acacia, mahogony, jackfruit, neem, eucalyptus etc. These trees are the important source of biofuel in village families and most of the biofuel come from their own homesteads. Therefore, it is necessary to improve homestead vegetation with intensive farming approach.

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