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Impact of traditional homestead Agroforestry on the livelihood of the farmers in northern Bangladesh

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Abstract: The study was undertaken to determine the level of acceptability of traditional agroforestry practices by the farmers of the Northern parts of Bangladesh and its impact on their livelihood condition.. It also explored the relationships among the selected characteristics of the farmers namely age, education, family size, homestead area, knowledge of homestead Agroforestry, annual income from homestead area, problem confrontation with traditional agroforestry practices and opinion regarding changes of livelihood. A structured interview schedule was used to collect data and correlation test was conducted to ascertain the relationship between concerned dependent and independents variables of the study. The majority (62%) of the farmers had medium attitude regarding changes in livelihood while; 21% had low attitude and 17% had high attitude towards traditional homestead agroforestry practices. Education, knowledge of agroforestry, homestead area, knowledge on homestead agroforestry had significant positive relationship with their attitude regarding changes in livelihood; while age, family size, annual income from homestead area and problem confrontation had no significant relationship. Therefore, there is a great scope to improve the existing homestead agroforestry practices with suitable agroforestry approaches for maximizing income of the farmers.
Keywords: Homestead Agroforestry, Socio-economic condition, Farmer's opinion.

Introduction

Bangladesh is one of the most densely populated countries of the world with more than 800 persons per km^2. About 85 per cent of population lives in the rural areas in 15.4 million households spreading over 85000 villages (FAO, 1986; BBS, 2000). Bangladesh possesses a glorious tradition of Agroforestry systems practiced by her farming communities. Well planned interacted land use system combining woody perennials and other production enterprises in accordance with the farmers' need, goals and resources base can only lead to viable farming system towards sustainable livelihood in the coming future. The homestead of rural people is a unique feature of combination of trees, shrubs, vegetables, livestock, ducks, poultry, and pigeon from ancient time. In Bangladesh 68% of the forest products is fuel wood but this met only 10% of the demand to national fuel energy (ADB, 1993. Byron (1984) observed that 90% of the fuel wood and 70% of timber requirement of the country were met from the homestead plantation. The major portion of the rural household has homestead and cropland areas, and thus can contribute to the economy of the country to a large extent (Rahman, 1995). In North Bengal of Bangladesh, innovative farmers have spontaneously developed agroforestry systems in their homesteads and croplands. This provides benefits to the rural community because trees offer facility such as shade, shelter, recreation, agro-ecological balance and so on (Roy *et al.*, 1996). Homestead agro-production has special significance in the context of Bangladesh where about 50% of rural households are landless (Januzi and Peach, 1977). 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 agroforestry may contribute to uplift the socio-economic condition of the farmers, supply fuel wood, give protection from hazards, provide food and other benefits etc. Thus the study was carried out to determine the role of traditional agroforestry practices on the livelihood improvement in a selected area of the Northern Bangladesh.

Methodology

The study was conducted at the Pabna Sadar Upazilla under the Rajshahi division. Pabna district is located at the 23^0 $48^/$ North latitude and $89^0 00^/$ East longitude. Out of nine Upazillas, Pabna Sadar is the largest with an area of 443.90 km^2. The river Jamuna and Padma influence to make the soil alluvium. To achieve the objectives of this study and to minimize errors, several repeated visits were made to collect data properly.
A stratified random sampling technique was followed to select the sample farmers.

Preparation of questionnaire: The survey schedule was carefully designed in the light of the objectives to the study. The draft schedule was pre-tested by interviewing some sample farmers and necessary modification were made accordingly.
Period of data collection: Rapport was established with the respondents through informal discussion regarding objectives of the interview. Data were collected from 10 June to 15 November 2005.
Variables of the study: Independent variables of the study were age, education, family size, homestead area, annual income from homestead area, knowledge on homestead agroforestry, communication exposure and problem confrontation. The dependent variables were adoption of traditional homestead agroforestry practices and opinion regarding changes in livelihood to the farmers.
Measurement of independent variables: Age of the respondents was measured by counting the period of time from his birth to the time of interview and was expressed in terms of years. Education was measure in terms of classes passed by him and score was given according to the class passed while a respondent who did not know reading or writing had education score of zero (0). Family size of a respondent was determined

in terms of the total number of members of a family. The family member included respondent himself, spouse, sons, daughters and other dependents. Homestead was measured by the area of the raised land in which the household has its entire living room, livestock and poultry shed, yard under vegetable, home garden, fruit and timber trees, backyard, bushes, bamboo bunches, pond etc expressed in hectare (Parveen,1993). Annual income from homestead area refers to the total earnings of all family members of a farmer from trees species, vegetables, livestock, fisheries and other sources and express in taka. Knowledge on homestead agroforestry refers to the knowledge gained by the farmers from different sources and also through their experiences of homestead agroforestry and farming. Finally problem confrontation was measured using of closed form of questions and the respondents were asked to give their opinion in 15 selected problems, which were identified during designing of the questionnaire along with their extent of confrontation in use of homestead agroforestry practices.

Measurement of dependent variable: A four point scale was used for computing the extent of adoption to homestead agroforestry practices. Weights of responses against the applicable ones of the 25 practices were assigned in the following way. A score of 3, 2, 1 and 0 was assigned for high use, medium use, low use and no use respectively. The weights of responses of all homestead agroforestry practices were added together to obtain the extent of use homestead agroforestry practice and the score of the respondents could range from 0 to 75 where 0 indicating no use and 75 indicating high use of agroforestry practices.

Opinion regarding changes in livelihood is another dependent variable which was measured by the changes in socio-economic aspects of the farmers. It referred to the improvement of social as well as economic status of the respondent farmers. The farmers were asked to give their opinion regarding the improvement in socio-economic aspects of' their livelihood due to the contribution of homestead agroforestry. It was measured on the basis of opining obtained from the farmers in 14 statements containing information on the improvement of socio-economic aspects of their livelihood.

After completion of field survey data 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 were converted into standard units and qualitative data were converted into quantitative ones by means of suitable scoring techniques whenever necessary. 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.

Results and Discussion

During the extensive survey of the selected Sadar Upazila of Pabna district, eleven different traditional Agroforestry practices were identified namely Jackfruit-Goraneem-Bottle gourd- Ribbed gourd based Agroforestry system, Mango-Papaya- Potato-Onion based Agroforestry system, Mahogany-Litchi-Cauliflower based Agroforestry system, Mahogany-Goraneem-Brinjal based Agroforestry system, Mango-Raintree based Agroforestry system, Mango-Ipil-lpil-Bean based Agroforestry system, Mango-Date palm -Cauliflower based Agroforestry system, Brinjal-Bean-Date palm based Agroforestry system, Jackfruit-Betel nut-Bean based Agroforestry system, Rain tree-Mustard based Agroforestry system and Guava-Coconut-Pasture based Agroforestry system.

Characteristics of the farmers:

Age of the respondents ranged from 16 to 75 years with an average of 42.03 years and standard deviation of 14.28. On the basis of their age, the respondents were classified into three categories as presented in Table 1. The highest proportion (45%) of the farmers was in the middle age, 27% old and only 28% was in young category. The major proportions of the household members are middle aged and they have the working ability to change their livelihood. The educational level of the farmers ranged from 0-13 with an average of 4.79 and standard deviation of 3.66. The data stated that the good numbers of household members are educated and they are well motivated to change their socio-economic status by using modern agroforestry approaches. The family size of the farmers ranged from 2-12 with an average of 6.69 and standard deviation 2.42. Most of the farmers (54%) had medium families compared to 31% small and 15% large families (Table 1). The homestead of the farmer ranged from 0.01-0.17 hectare with an average of 0.059 hectare and standard deviation of .029. Among the farmers 23% had Landless and marginal, 17% had medium and only 7% had large homesteads. With the lack of homestead area the farmers had no scope to practices modern homestead agroforestry approaches and it is one of the major constraints to uphold their socio-economic conditions.

Annual income of the farmers ranged from Tk. 1400.00 to 98002.00 with an average value of Tk. 12817.660 and standard deviation of Tk. 16849.50. The study indicates that most of the farmers (63%) were small category, (average annual income Tk. up to 12817.00) 25% of the farmers were medium category (average annual income Tk. 12818.00 to 25000.00), 12% of the farmers were large (average annual income above Tk. 25000.00) (Table 1).

Table-1: Description of farmers characteristics treated as independent variables of the study (N=100)

Characteristics	Category	Respondent, %	Measuring system	Observed range	Average	Standard deviation
Age	Young age(up to 30)	28	Years	16-75	42.03	14.28
	Middle age(31 to 45)	45				
	Old age (above 45)	27				
Education	Illiterate (0)	16	Level of Schooling	0-13	4.79	3.66
	Primary level (1 to 5)	32				
	Secondary level (6 to 10)	40				
	Higher level (Above 10)	12				
Family size	Small (up to 5)	31	Numbers	2-12	6.69	2.42
	Medium (6-9)	54				
	Large (above 9)	15				
Homestead area	Landless and marginal (Up to 0.02 ha)	23	Hectare	0.01-0.17	0.0597	0.02945
	Small (0.03 to 0.05 ha)	53				
	Medium (0.06 to 0.09ha)	17				
	Large (above 0.09 ha)	7				
Knowledge of Homestead Agroforestry	Low	32	Scale score	12-44	26.16	7.007
	Medium	48				
	High (above)	20				
Annual income from homestead Agroforestry (HAF)	Small (Tk. up to 12817)	63	Taka	1020-98002	12817.6	16849.50
	Medium (Tk.12818 to 25000)	48				
	High (above Tk. 25000)	20				
Problem confrontation	Low (up to 15 score)	23	Scale score	9-41	21.02	6.231
	Medium (16 to 30 score)	59				
	High (above 30 score)	18				

The computed knowledge on homestead agroforestry scores ranged from 12-36. The mean and standard deviation were 26.1600 and 7.007 respectively. The highest proportion of (48%) farmers has medium homestead agroforestry knowledge, 32% had low and 20% had high categories knowledge on homestead agroforestry, respectively (Table 1). The problem confrontation scores of all respondents ranged from 9-41. The mean and standard deviation were 21.02 and 6.231, respectively.

Adoption of traditional homestead Agroforestry practices: The adoption of traditional homestead agroforestry practice score to the farmer ranged from 21 to 63 with the mean value to 30.23 and standard deviation 8.77. Based on the adoption scores, the respondents were classified into 3 categories (Table 2). The overwhelming majority of the farmers (57%) were medium category who was found to have high adoption of traditional homestead agroforestry practices.

Opinion regarding changes in livelihood: Scores of farmer's opinion regarding changes in livelihood through traditional homestead agroforestry practice ranged from 24 to 72 with a mean value to 42.40 and standard deviation 13.98. Based on the scores, the respondents were classified into 3 categories (Table 2). The overwhelming majority of the farmers (62%) were medium category who was found to have medium opinion on livelihood of traditional homestead agroforestry practices, where 21% had low and 17% of them had high adoption.

Table 2: Distribution of farmers according to their adoption of homestead Agroforestry practices and attitude regarding the impact of traditional homestead Agroforestry practices.

Characteristics	Category	Respondent, %	Measuring system	Average	Standard deviation
Adoption of traditional homestead Agroforestry practices	Low (up to 30)	25	Scale score	30.23	8.77
	Medium (30 to 50)	57			
	High (above 50)	18			
Attitude regarding changes in livelihood	Low (up to 35)	21	Scale score	42.40	13.98
	Medium (36 to 55)	62			
	High (above 56)	17			

Relationship between the selected characteristics of the respondents and impact of traditional homestead Agroforestry practices on livelihood:

To explore the relationship between the selected characteristics and their adoption and impact of their livelihood observed in traditional homestead agroforestry system, Pearson's product moment co-efficient of correlation (r) has been used (Table 3) with description of the meaning of 'r' (Cohen and Holiday, 1982).

All the characteristics of the farmers and situational factor to the farmers except age and problem confrontation had significant positive relationship with the adoption to traditional agroforestry practices. Problem confrontation to the farmer faces had had significant negative relationship with their adjusted behavior to

agroforestry practices. While the education, family size, homestead area, annual income from homestead and knowledge of homestead agroforestry had shown the significant positive relationship with the adoption towards the traditional homestead agroforestry. In case of age Sultana (2003) found the similar type of findings for adoption of traditional homestead agroforestry.

Farmer characteristics like age, family size, and annual income from homestead had no significant relationship with the opinion regarding changes in livelihood in homesteads while problem confrontation showed the negative non-significant relationship. On the other hand education, homestead area and knowledge of homestead agroforestry had positive relationship to the attitude regarding changes in livelihood in homestead.

Table-3: Computed co-efficient of correlation (r) among dependent variables and selected characteristics (N=100).

Farmer's characteristics	Values of 'r' with df. 98 for adoption of traditional homestead agroforestry	Values of 'r' with df. 98 for attitude regarding changes in livelihood in homesteads
Age	-0.079^{NS}	0.008^{NS}
Education	0.475^{**}	0.417^{**}
Family size	0.223^{*}	0.091^{NS}
Homestead area	0.253^{**}	0.267^{**}
Annual income from homestead	0.201^{*}	0.096^{NS}
Knowledge of homestead agroforestry	0.513^{**}	0.476^{**}
Problem confrontation	-0.295^{**}	-0.178^{NS}

NS = Non significant, * = Significant at $p \leq 0.05$ and ** = Significant at $p \leq 0.01$

Meaning of correlation co-efficient (r)

r value	Meaning
± 0.009-0.19	Very low correlation
± 0.20-0.39	Low correlation
± 0.40-0.69	Medium correlation
± 0.70-0.89	High correlation
± 0.90-1.00	Very high correlation

Conclusion

Farmers are used to practicing traditional homestead agroforestry systems from time immemorial. Homestead size was a factor for the increase of production. Some areas of the homestead were found to be unutilized that could be used for growing more trees and vegetable crops. The selected farmers thought that the traditional homestead agroforestry systems had significant role in improving socio-economic status and up gradation of environmental condition in the area. Therefore, there is a great scope to improve the prevailing homestead agroforestry practices with the modern agroforestry technology for maximization of income of the farmers. From this study it was also found that highest percentage of the respondents had medium level of adoption to the traditional homestead agroforestry that might have ultimate reflection in their adoption of homestead agroforestry practices. The extent of knowledge regarding changes in attitude in livelihood encouraged them to adopt the traditional homestead agroforestry system which is not sufficient enough to adopt a well planed and highly manageable system aiming higher profit and uplift of socio-economic condition. Thus it is necessary to strengthen knowledge on homestead agroforestry for effective utilization of homestead areas with suitable sophistical agroforestry approach to maximize homestead productivity and family income.

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