Impact of Homestead Agroforestry on Socio-economic Condition of the Respondents at Kamalganj Upazila of Moulvibazar District in Bangladesh

Sajal Singha[1], M. Sharaf Uddin[1], Sujan Chandra Banik[2*],
Bani Krishna Goswami[3] and M.A. Kashem[3]

[1]*Department of Agroforestry and Environmental Science, Sylhet Agricultural University, Sylhet-3100, Bangladesh.*
[2]*Department of Horticulture, Sylhet Agricultural University, Sylhet-3100, Bangladesh.*
[3]*Department of Soil Science, Sylhet Agricultural University, Sylhet-3100, Bangladesh.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors SS and MSU designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors MAK and SS managed the analyses of the study. Authors SCB and BKG managed the literature searches. Author SCB rewrites the manuscript. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

This study was conducted at Kamalganj Upazila of Moulvibazar District in Bangladesh during January to September 2015 to explore the impact of homestead agroforestry on the socio economic condition of the respondents and to explore their relationships with the selected characteristics of the respondents. Face to face interview was performed with 135 respondents to collect the data with the help of questionnaire. Eight different characteristics of the farmers namely;

___

Corresponding author: E-mail: rahul0707sau@gmail.com;

educations, farm size, homestead size, annual income, annual expenditure, savings, knowledge on homestead agroforestry, socio-economic class of the respondents showed significant positive relationships with the numbers of diversified plant species, while negative relationship of diversified plant species was observed with age and family size. Agro forestry based practices plays a vital role to uplift the socio-economic classes of the respondents. For uses of agroforestry products, annual savings and expenditures the highest decisions comes from females 45% and 41% followed by male 38% and 39% respectively. In other cases also female participation is greater than male respondents. Results conclude that homestead agroforestry is a unique area for maintaining both plant diversity and productivity for farmers' livelihood in the studied area.

1. INTRODUCTION

Bangladesh is mainly agricultural based country and agriculture plays a great role in the national economy of the country. About 15.53% of the GDP comes from agriculture and it creates 45.10% employment opportunity of the country [1]. Like agriculture, another important resources i.e., forest which has important role in ecological balance and socio-economic upliftment of the rural people. Homestead is the most plant diversified ecosystem in Bangladesh. Homestead Agroforestry also plays a vital role in the economy of Bangladesh [2]. Trees and other woody species grown in the homesteads are significant source of food, fodder, fuel wood and timber. Most of the vegetable produced in the country are coming from the homesteads [3]. There are about 25.49 million of homesteads in our country covers about 0.80 million ha of lands [4]. Trees in the homesteads, often called, "homestead forests", play an important role in rural economy as well as national economy of Bangladesh. Homestead farming is getting importance as the way of investing minimum capital but earning maximum income with increased participation of respondents in economic activities. Homestead agroforestry may contribute to uplift the socio-economic condition of the respondents, supply fuel wood, give protection from hazards, provide food and other benefits etc [3]. Majority of the respondents cultivates their homesteads by different fruit and timber species in an unplanned way. So, exploration of existing timber and fruit tree species adaptive with changing climatic condition is needed first to have a clear understanding of the home-gardens. Adaptability of a species and its suitability to a site is indicated by its frequency and growth [5].

The accepted standard according to the experts of environmental science is that a country should have at least 25 percent of its total land area covered with trees or forests [6]. Once covered by dense forests, Bangladesh is now almost devoid of forest land, except in few selected areas of the country [7], in terms of per capita forest land, Bangladesh ranks amongst the lowest in the world, which is about 0.02 ha per person [8]. According to the Forestry Master plan (FMP) total 7,69,000 hectares or 6 percent of the country's land mass have actual tree cover [9].

For this above situation i.e. increased population and deforested condition, agroforestry practices especially in the homestead area will be an appropriate alternate land management option. Agroforestry is the combination of forestry and agriculture with the attributes of productivity, sustainability and adoptability. Agroforestry can provide sound ecological basis for increased crop and animal productivity, more dependable economic returns and greater diversity in social benefits on sustained basis. Homestead agroforestry consisting of an assemblage of plants which includes trees, shrubs, and herbaceous plants, growing in or adjacent to a homestead or home compound, has a long tradition in the study site. These are planted and maintained by members of the household with their products intended primarily for household consumption; they have considerable ornamental value and provide shade to people and animals [10].

2. MATERIALS AND METHODS

The study was conducted at 9 unions of Kamalganj upazila under Moulvibazar district, Bangladesh. To get valid information the researcher made all possible effort to explain the purpose of the study to the respondents. Data were collected from a total of 135 respondents during January to September, 2015.

In order to collect relevant information from the respondents a set of preliminary survey questionnaire was used which contained both open and closed form questions. The final questionnaire was prepared on the basis of valid suggestions, logical sequences and comment of the research supervisor.
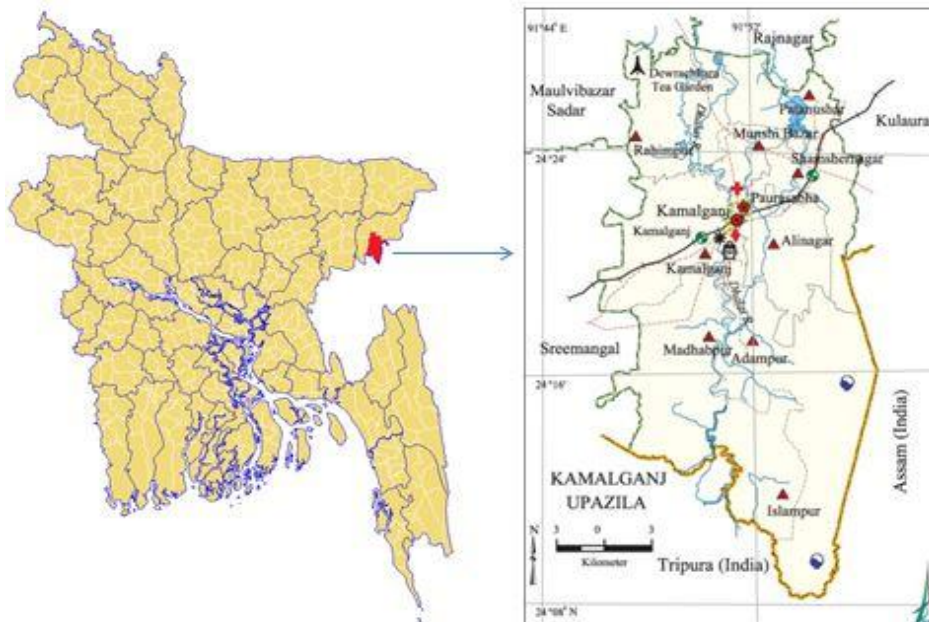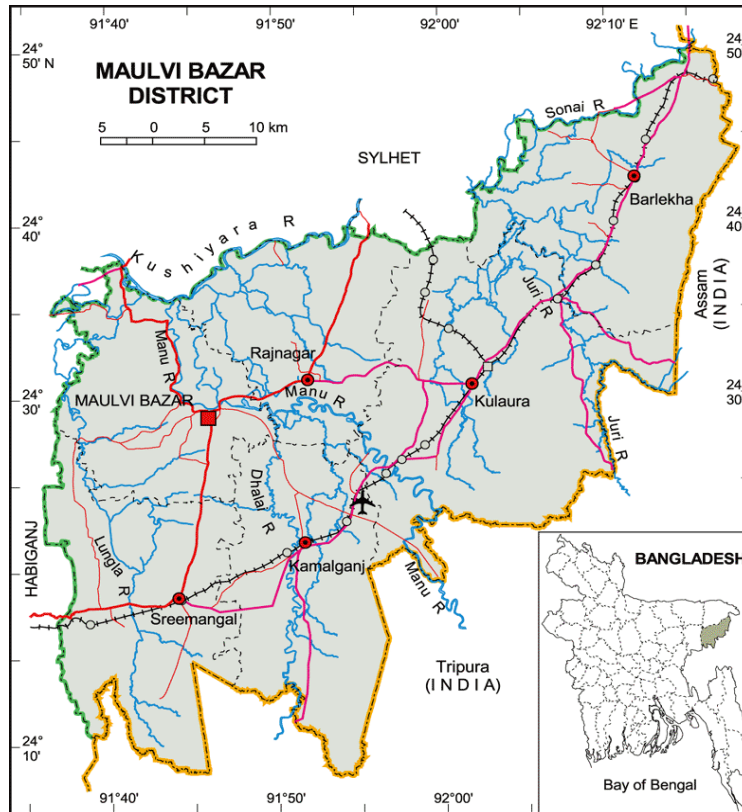

Plate 1. Map of the study area (Kamalganj upazila of Moulvibazar district) [11]

Data were collected by using the individual questionnaire. Before going to make interview, each respondent 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. The collected data was verified through surveying the villages and personal interview with the sample respondents. Interviews were normally conducted in respondents' house in their leisure time and even in the field when they worked in the field. After the completion of each interview, each questionnaire was checked to be sure that information to each of the items had been properly recorded.

The collected data from all the interview schedules were coded, compiled, tabulated and analyzed in accordance with objectives of the study. Local units were converted into standard international units. Qualitative data were converted into quantitative ones by means of suitable scoring. The responses to the questions in the interview schedules were transferred to master sheet to facilitate tabulation for describing the different characteristics and their constraint facing, the respondents were classified into several categories according to requirement. These categories were developed by considering the nature of distribution of data, general understanding prevailing in the social system and possible scoring system. Descriptive analysis such as range, number, 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 using MS Excel and SPSS (Statistical Package for Social Science) software. The computed values of correlation co-efficient (r) were compared against corresponding tabulated values.

3. RESULTS AND DISCUSSION

3.1 Age

Age of the respondents of Kamalganj Upazila of Moulvibazar district was ranged from 25 to 80 with an average of 43.66 years and standard deviation of 11.71 (Table 1). Begum (2012) found similar results as average age of the respondents of Gopalpur Upazila of Tangail district which was average of 41.688 years. Age of the respondents ranged from 19-70 years with a standard deviation of 9.936 [12].

3.2 Education

In this study 12 percent of respondents had higher level education whereas 23 percent had both of primary and secondary level, 25 percent had college level and 17 percent of them were illiterate (Table 2). Respondents replied that, in their childhood period education facilities were not available as now. That's why the respondents are not able to complete their education.

3.3 Occupation

Different occupations of the respondents of study area presented in Table 3 shows that service holder ranks highest with 37.8%, business 21.5%, foreign worker 20.7% and laborer 14.1% and the lowest was housework (5.9%).

3.4 Family Size

Family size in the study area ranged from 2 to 11 with an average of 4.71 and standard deviation 1.21. Most of the respondents (48.9 percent) had medium families compared to 44.4 percent small families and 6.7 percent large families (Table 4). The average family size of Bangladesh is 5.6, which was higher than the present findings [13].

3.5 Farm Size

Data presented in Table 5 Shows that the highest proportion (65.9%) of the respondents were in small category compared to 28%, and 6.1% were for marginal and medium categories, respectively. The respondents having large farm size contains large homestead area whereas the marginal respondents have small farm size with smaller homestead area. The standard deviation and average farm size was 0.41 with mean 0.70 hectare.

3.6 Homestead Size

Average homestead size of the respondent in Kamalganj Upazila of Moulvibazar district was 0.13 hectares with a standard deviation of 0.06. Data presented in Table 6 revealed that highest proportions of respondent were in medium category (48%) compared to small, large, Landless and Marginal categories (24%, 18%, 10%) respectively.

3.7 Knowledge on Homestead Agro-forestry

The computed knowledge on homestead agroforestry scores of the respondent ranged

from 6 to 20 with the mean 11.89 and standard deviation were 3.96 (Table 7). It was observed that the highest proportion of (61.04%) respondent had medium agroforestry knowledge, 27.21 percent had low and 11.75 had high knowledge on agroforestry respectively.

3.8 Annual Income

Most of the respondents (77.03%) of the study area had higher annual income compared to 4.5% and 15.5% had low and medium income respectively with an average of 118.53 thousands taka and standard deviation of 84.66 (Table 8). Along with agricultural activities most of the respondents are engaged with different earning sources.

3.9 Annual Expenditure

Most of the respondents (68.88%) of the study area had medium expenditure according to their annual expenditure compared to 5.9% and 22.96% had low and high expenditure respectively with an average of 111.22

thousands and standard deviation of 79.44 (Table 9).

3.10 Savings per Year

Most of the respondents (80%) of the study area had low savings according to their annual savings compared to 13.3% and 5.1% had medium and high savings respectively with an average of 136.18 thousands and standard deviation of 90.7 (Table 10).

3.11 Socio-economic Class of the Respondents

Data presented in Table 11 indicates that majority (85%) of the respondents had medium socio economic class where 8 percent had low and 7 percent had high class with an average of 17.1 having standard deviation of 4.36. Based on annual income and expenditure most of the respondents are belongs from medium socio-economic class. Agro forestry based practices plays a vital role to uplift their socio-economic class.

Table 1. Description of respondents' age group at different unions of the studied area

Category	Number of respondent	Age range	Average age (years)	Standard deviation S.D.(±)
Respondents	135	25-80	43.66	11.71

Table 2. Description of respondents' education treated as independent variables at Kamalgonj upazila of Moulvibazar district

Category	Frequency	Percent
Illiterate (0)	23	17
Primary (Class I-V)	31	23
Secondary(Class VI-X)	31	23
College (Class XI-XII)	34	25
Above class XII	16	12
Total	135	100

Table 3. Description of respondents' occupation treated as independent variables at Kamalganj Upazila of Moulvibazar District

Category	Frequency	Percent
Service holder	51	37.8
Foreign worker	28	20.7
Business	29	21.5
Laborer	19	14.1
House worker	8	5.9
Total	135	100

Table 4 . Description of respondents' family size treated as independent variables at Kamalganj Upazila of Moulvibazar District

Category	Frequency	Percent	Range	Mean	S.D. (±)
Small family (up to 4)	60	44.4	2-4		
Medium family (5 to 7)	66	48.9	5-7	4.71	1.21
Large family (8 and above)	9	6.7	8-11		
Total	135	100			

Table 5. Respondents' farm size treated as independent variables at studied area

Category	Frequency	Percent	Average farm size (ha)	Mean (ha)	S.D. (±)
Marginal (0.21-0.50 ha)	39	28	0.34		
Small (0.51-1.00 ha)	89	65.9	0.67	0.70	0.41
Medium (>2.00 ha)	7	6.1	1.29		
Total	135	100			

Table 6. Respondents' homestead size treated as independent variables at studied area

Category	Respondent	Percent	Average homestead size (ha)	Mean (ha)	S.D. (±)
Landless and Marginal (Up to 0.02 ha)	14	10	0.01		
Small (0.03 to 0.05 ha)	33	24	0.04	0.13	0.06
Medium(0.06 to 0.09 ha)	65	48	0.08		
Large Above 0.09 ha	23	18	0.39		
Total	135	100			

Table 7. Description of the respondents' knowledge on homestead agroforestry

Category	Respondent	Percent	Range (Scale score)	Mean	S.D. (±)
Low (Up to 8)	36	27.21	6-8		
Medium (9-16)	79	61.04	9-16	11.89	3.96
High (Above 16)	20	11.75	17-20		
Total	135	100			

Table 8. Description of respondents' annual income treated as independent variables

Category	Respondent	Percent	Average income/Family (Thousands taka)	Mean (Tk./Family)	S.D. (±)
Low income (Up to 60 thousands)	6	4.5	43.20		
Medium income (61 to 120 thousands)	21	15.5	89.90	118.53	84.66
High income (Above120 thousands)	104	77.03	222.605		

3.12 Medicinal Uses of Plants

Respondents of the studied area opinioned that some of the plants like neem, arjun, basok grown in their homestead area for different medicinal purposes. Different plant parts are used for different medicinal uses.

3.13 Plants Having Multiple Uses

Plants having multiple uses as perceived by the respondents were given in Table 13. According to the respondent's opinion jackfruit, coconut, olive, ipil-ipil and acasia are widely used as multiple purpose tree than other trees grown in homestead agroforestry system.

Table 9. Description of respondents' expenditure treated as independent variables

Category	Respondent	Percent	Average expenditure/Family (Thousands taka)	Mean (Tk./Family)	S.D. (±)
Low expenditure (Up to 60 thousands)	8	5.90	52.15		
Medium expenditure (61 to 120 thousands)	93	68.88	186.62	111.22	79.44
High expenditure (Above120 thousands)	31	22.96	94.90		

Table 10. Description of respondents' savings treated as independent variables of the study

Category	Respondent	Percent	Average savings/Family (Thousands taka)	Mean (Tk./Family)	S.D. (±)
Low saving (Up to 60 thousands)	108	80	25.48		
Medium saving (61 to 120 thousands)	18	13.3	79.38	136.18	90.7
High saving (Above120 thousands)	7	5.1	303.70		

Table 11. Description of respondents' socio-economic classes of the respondents

Category	Percent	Range (Scale score)	Mean	S.D. (±)
Low condition (Up to 12)	8	8-12		
Medium condition (13-20)	85	13-20	17.1	4.36
High condition (Above 20)	7	21-23		
Total	100			

Table 12. Uses of some medicinal plants by the respondents

Name of the plant	Used plant parts	Uses
Neem (*Azadirachta Indica*)	Leaf, oil, seed	Skin problem, liver tonic, blood purifier
Arjun (*Terminalia arjuna*)	Bark	Heart tonic
Thankuni (*Centella asiatica*)	Whole plant	Memory booster, blood purifier
Basok (*Justicia adhatoda*)	Leaf	Cough remover
Tulsi (*Ocimum tenuiflorum*)	Leaf, flower	Good for heart, blood, lung, cough and flue cure, prevent tuberculosis
Lemon (*Citrus limon*)	Fruit, leaf	Reduce cholesterol, blood purifier, anti-vomiting
Pudina (*Mentha spicata*)	Leaf	increase digestion, prevent tuberculosis
Kalomegh (*Andrographis paniculata*)	Leaf mainly, root	Heal the liver, reduce hokeworm
Ginger (*Zingiber officinale*)	Rhizome, leaf	Reduces nausea, sickness and vomiting
Sajna (*Moringa oleifera*)	Fruit, leaf	Control blood pressure, prevent stroke
Nishinda (*Vitex trifolia*)	Leaf, root	Liver tonic
Nayantara (*Catharanthus roseus*)	Leaf	Blood purifier, anti-cancer
Bael (*Aegle marmelos*)	Fruit, leaf	Reduce diarrhoea, balance body temperature
Cucumber (*Cucumis sativus*)	Fruit	Good for heart
Papaya (*Carica papaya*)	Fruit	Cure ulcer, prevent cancer
Horitoki (*Terminalia chebula*)	Seed	Cure liver and stomach disease

Table 13. Some plants having multiple uses found in the study area

Name of plants	Scientific name	Uses
Jackfruit	*Artocarpus heterophyllus*	Fruit, fodder, fuel, wood, shade
Mangium	*Acacia mangium*	Fodder, wood, shade, N-fixation
Olive	*Olea europaea*	Fruit, medicine, shade, fuel, wood
Akashmoni	*Acacia auriculiformis*	Fuel, wood, N-fixation
Mango	*Mangifera indica*	Fruit, shade, fuel, wood, fodder
Wood apple	*Aegle marmelos*	Fruit, shade, fuel, wood
Banana	*Musa sp.*	Fruit, vegetable, fodder
Chapalish	*Artocarpus chama*	Wood, fuel, shade
Papaya	*Carica papaya*	Fruit, vegetable, medicine
Ipil ipil	*Leucaena leucocephala*	Fodder, timber, shade, N-fixation

Table 14. Gender participation in decision making at Kamalganj upazila

Item	Decision maker (%)		
	Male	Female	Both male and female
Tree plantation	47	23	30
Housing	44	24	32
Family planning	21	20	59
Schooling	35	31	27
Saving and expenditure	39	41	20
Participation in training program	1.1	5.1	0.0
Uses of agroforestry product	38	45	17

3.14 Gender Participation in Decision Making

The percentage of male and female on decision making in various activities such as tree plantation, housing, family planning, schooling, savings and expenditure, participation in training program, uses of agroforestry product presented in Table 14. In case of tree plantation and housing, respondents opined that 47% and 44% decisions come from the male, 30% and 32% from both male and female and rest 23% and 24% decisions comes from female. For family planning both male and female decide in 59% cases. For uses of agroforestry product, savings and expenditures the highest decisions comes from females 45% and 41% followed by male 38% and 39% respectively.

4. CONCLUSION

The positive significant relationship was found with socio-economic condition of the respondents and the diversity of plant species which indicates the positive impact of agroforestry in socio-economic condition of the respondents. Agroforestry practices ensure direct or indirect income for the respondents with less labor and investment. Gender balance is maintained for decision making in the family and in some cases female respondents play vital role. Some medicinal plants are grown in homestead areas which are used for different medicinal purpose.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bangladesh Economic Review (BER). Ministry of Finance, The People's Republic of Bangladesh, Bangladesh Secretariat. Dhaka-1000; 2016.
2. Foysal AM, Hossain ML, Rubaiyat A, Hasan MB. Economics of homestead forestry and their management activities at Fatickchari Upazila of Chittagong district, Bangladesh. Agriculture, Forestry and Fisheries. 2013;2(4):161-176.
3. Begum M. Haque MA. Karim MR. Akter M, Wadud MA. Study on homestead Agroforestry and plant diversity in Gopalpur upazila of Tangail district. ofor. Environ. 2013;7(1):135-138.
4. BBS (Bangladesh Bureau of Statistics). Statistical Yearbook of Bangladesh. Minist. Plan. Govt. People's Repub. Bangladesh, Dhaka; 2010.

5. Dutta AK, Iftekhar MS. Tree species survival in the homestead forests of salt affected areas: A perception analysis for Bangladesh. Advances in Biological Research. 2004; 4(3):309-313.

6. Huda N, Roy MK. State of the Forest. In: Chowdhury QI. (Ed.) Bangladesh State of Environment report 1999. Forum of Environmental Journalists of Bangladesh (FEJB). Dhaka. 1999;95-100.

7. Giri C, Shrestha S. Land covers mapping and monitoring from AVHRR data in Bangladesh. International Journal of Remote Sensing. 1996;14:2749-2759.

8. UNEP, Bangladesh: State of the Environment 2001. United Nations Environment Programme, Regional Resources Center for Asia and the Pacific (UNEP RRC. AP), Pathumthani, 12120, Thailand. 2002;5-121.

9. Huda N, Roy MK. State of the Forest. In: Chowdhury QI. (Ed.) Bangladesh State of Environment Report 2000. Forum of Environmental Journalists of Bangladesh (FEJB) Dhaka. 2001;247-254.

10. Ahmed MFU, Rahman SML. Profile and use of multi-species tree crops in the homesteads of Gazipur district, central Bangladesh. Journal of Sustainable Agriculture. 2004;24:81-93.

11. Singha S, Uddin MS, Banik SC, Kasem MA. Homestead Agroforestry Systems Practiced at Kamalganj Upazila of Moulvibazar District in Bangladesh. Asian Journal of Research in Agriculture and Forestry. 2018;2(2):1-8.

12. Begum M. Study on Homestead Agroforestry and Plant Diversity in Gopalpur Upazila of Tangail District. MS thesis Department of Agroforestry, Bangladesh agricultural university, Mymensingh. 2012;79.

13. Anonymous. Working paper for 3rd National Project Steering Committee Meeting. 3PFS, DAE, Dhaka; 2005.