

**EVALUATION OF THE HOMESTEAD
AGROFORESTRY PRACTICES IN TWO UPAZILAS OF
DINAJPUR DISTRICT**



A THESIS

BY

Md. Atikur Rahman

Registration No. 1605105

Session: 2016

Thesis Semester: January-June, 2017

MASTER OF SCIENCE (M.S.)

IN

AGROFORESTRY AND ENVIRONMENT

**DEPARTMENT OF AGROFORESTRY AND ENVIRONMENT
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY
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*Submitted to the Department of Agroforestry, Hajee Mohammad
Danesh Science and Technology University, Dinajpur in Partial
fulfillment of the requirements for the degree of*

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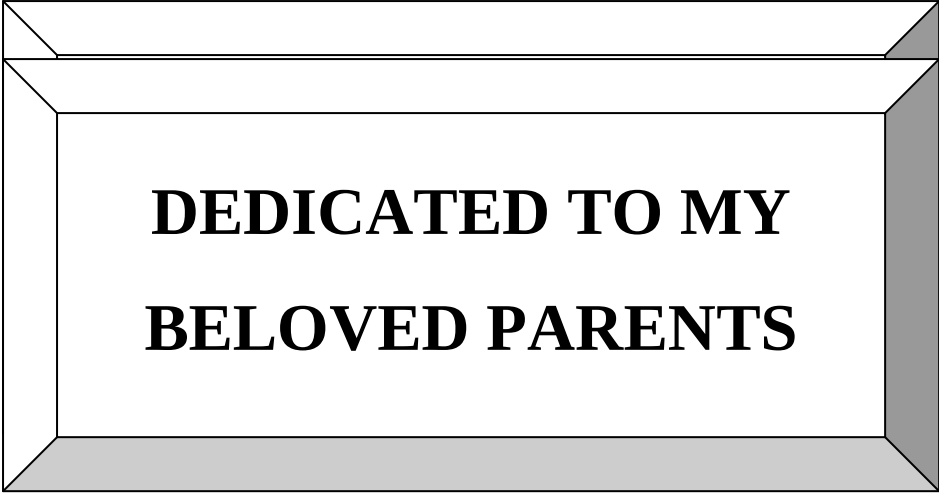
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June 2017**



**DEDICATED TO MY
BELOVED PARENTS**

ACKNOWLEDGEMENTS

All praises are gone to the almighty ALLAH, the supreme ruler of the universe give me the chance to complete this present research work and to prepare the thesis.

*The author takes the opportunity to express his sincere gratitude, heartfelt respect, immense indebtedness and the deepest appreciation to his reverend teacher and research supervisor **MD. Hafiz All Amin**, Assistant Professor, Department of Agroforestry and Environment, Hajee Mohammad Danesh Science and Technology University, Dinajpur, for his ingenious suggestions, encouragement, guidance to complete this study and also for his constructive criticism and meticulous review of the manuscript.*

*The author is honored to express his heartfelt appreciation and gratitude to his co-supervisor **Dr. Md. Shoaibur Rahman**, Associate Professor, Department of Agroforestry and Environment, Hajee Mohammad Danesh Science and Technology University, Dinajpur, for his co-operation and helpful suggestions to conduct the research work and in the preparation of this manuscript.*

*The author would like to express his sincere respect to **Prof. Dr. Md. Shafiqul Bari**, Chairman, Department of Agroforestry and Environment, Hajee Mohammad Danesh Science and Technology University, Dinajpur for his encouragement, advice and constructive criticism during research work.*

The author is also grateful to Md. Iman Uddin, Senior Lab. Technician, Mintu Chandra Roy, lab attendant, field worker Md. Abdul Quddus and Nawshad Ali, M.L.S.S. for their cordial co-operation.

Finally, the author would like to take the opportunity to express his boundless gratitude and profound respect to his parents, brothers, sister, friends, well-wishers, roommates and relatives for their blessings, inspiration and co-operation throughout the period of the study.

The Author

EVALUATION OF THE HOMESTEAD AGROFORESTRY PRACTICES IN TWO UPAZILAS OF DINAJPUR DISTRICT

ABSTRACT

The study was carried out to evaluate the homestead agroforestry status, diversity and socio-economic benefits in two selected upazilas viz. Dinajpur Sadar and Kaharole of Dinajpur district. Data were obtained from 100 randomly selected homestead agroforestry practicing farmers in four unions, two from Dinajpur Sadar (Chehelgazi and Fazilpur) and other two from Kaharole (Sundarpur and Ramchandrapur) of Dinajpur district with the help of an interview schedule. Data were collected from the sample during March to May 2017. Appropriate scales were developed in order to measure the variables. The relationships between the selected characteristics (independent variables) namely-age, education, family size, homestead area, total annual income, annual income from homestead, organizational participation, socio-economic aspect, knowledge of homestead agroforestry, communication exposure and number of trees in homestead (dependent variable). The correlation co-efficient (r) were computed to determine the relationship between the independent and dependent variables. Correlation analysis indicates that all the characteristics of respondents and farm components with number of tree in homestead agroforestry were statistically significant. A total number of 55 tree species were recorded from the homestead of the study area of which 23 were fruits and 17 were timbers 11 were medicinal and 4 were others species. Among the tree species the most prevalent species was Litchi (39.28) followed by Mango (15.35), Jackfruit (6.87), Sissoo (0.52) and Eucalyptus (0.24). The highest numbers of species (23) regardless of fruit species were found in the large farm categories, while the lowest numbers of species (4) were found in the land less farm category. It was observed that homestead was however size increased with the increase of farm size. The rate of tree plantation in the higher homestead area was higher than that of smaller ones. Among the problems faced by the farmers, the most severe problem was the quarrel with other landowner. The management practice of homestead agroforestry in the study area was found traditional system. Scientific planning in integrated homestead production systems of diversified production viz. vegetables, fruits, wood, fuel wood and timber production in agreement with the farmer's needs, goals and resource base can lead to viable farming systems towards sustainable livelihood in the coming years.

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CHAPTER 1

INTRODUCTION

Homegardens are unique agroforestry systems that are often described in detail, but whose biophysical and socioeconomic characteristics have not been extensively studied. These intensive land-use systems involving the deliberate management of multipurpose trees and shrubs (the woody component) grown in intimate association with herbaceous species (mainly annual, perennial, and seasonal agricultural crops), and livestock, are all managed within the compounds of individual homes (Fernandes and Nair, 1986). They are widespread throughout the tropics and are of immense importance in the socioeconomic structure of the rural communities (Michon *et al.*, 1983, Soemarwoto, 1987). They provide both economic and social benefits that are essential to the nutritional welfare and security of the household. These gardens, with their diversified agricultural crops and trees, fulfill the basic needs of the local population. In addition, the multistoried arrangements of plants and relatively high species diversities prevent the environmental degradation that is commonly associated with monocultures (Nair, 1993). Thus these homegardens provide economical benefits while remaining ecologically sound and biologically sustainable. Homegardens are of vital importance to the mainly subsistence-level existence of farmers in the tropics (Nair and Sreedharan, 1986; Swift and Anderson, 1993; Mendez *et al.*, 2001). Many of the benefits provided to farmers by these gardens are unknown for lack of quantification of the products used by the household.

Homegardens are intensive land-use systems involving the management of woody species grown in deliberate association with herbaceous species, with or without livestock, managed within the compounds of individual homes. These systems, which are found mainly in the tropics and subtropics, are of immense importance in the socioeconomic settings of local communities. Bangladesh is one of the most densely populated countries of the world. The total land of the country is about 14750 sq. km having about 900 persons or more lived in per sq. km. This is one of the least developed countries of the world with limited resource-base. The economy is primarily agrarian and it is the only source of income and employment for the rural people. Bangladesh has only 2.60 million ha of forest land (18.15%) including 1.49 (10.3%) millions ha land owned and managed by the forest department and

remaining 0.73 (5.1%) millions ha as Unclassified State Forest (USF) Land under the control of Civil District Administration. Besides these, there are 0.27 million ha of privately owned village forests scattered all over the country and there are also 0.04 and 0.07 million ha of strip forests and tea & rubber garden, respectively. But like other countries of the tropics, it is also under the threat of degradation and deforestation. Every year the country is losing 8,000 ha of forestland and now only 6-8% area is under active tree coverage. The trees grown in homegarden has multiple uses such as fruits/ food, timber, fuel wood, fodder, medicine, shade and handicrafts.

Homestead is an area of land in which the household has its own dwelling unit. Homestead land has been defined in different ways. According to Ninaz (1998), homestead refers to home and adjoining land occupied by a family for the purposes like small scale agricultural production, home up keeping, health, sanitation and nutrition. Homestead land is defined as the land occupied by the dwelling unit of the household and includes area such as courtyard, pond, road space and space used for cultivation of trees and vegetables (Abdullah, 1986). Homestead might be treated as the center of agricultural activities. This is the place where integrated agriculture is practiced normally by the women specially, young women. There are about 14.4 million households of which 12.7 million exists in rural areas. The size of homestead area varies with the class of farmers and it ranges on an average from 0.004 to 0.08 hectare. But approximately 28 percent of the households have only homesteads but do not have cultivated land, 28.2 percent have land up to 0.20 ha and 40.8 percent are small farmers owning up to 1 ha (BBS, 2015). Homestead has special significance in the context of Bangladesh where about 62 percent farmers are landless.

Homestead agroforestry may be a lifeboat for their survival and existence because of secured supply of food, petty cash etc. (Akanda, 1994). For effective utilization of the land in the homestead proper planning is necessary. Byron (1984) observed that 90% of the fuel bamboo and 70% of timber requirement of the country were met from the 690 km² of homestead plantation.

Objectives-

1. To investigate the farmer's response of homestead agroforestry practices in the study area.
2. To determine the species richness and relative prevalence of trees in the homesteads of the study area.
3. To assess the effect of homestead agroforestry on status in the study area
4. To identify the problems of respondent in practicing homestead agroforestry

CHAPTER 2

REVIEW OF LITERATURE

Homestead agroforestry is a new area of research in our country. Related reviews are thus sporadic, sparse and limited in this field. Even then an attempt has been made in this chapter to review some interlinked literature on this aspects and are presented in the following heads-

2.1 Concept of homestead agroforestry

Haq (1985) reported that the average area of Bangladesh homesteads 0.1 to 1.0 ha depending on the locality and financial condition of the house owner.

Abedin and Quddus (1989) conducted a study at six agro-ecologically different locations of Bangladesh and reported that the small homesteads, owned by the marginal and small farmers, have 20-21% area under housing, 29.37% under tree coverage and 9-14% under vegetable cultivation. In bigger homesteads owned by big farmers, about 16% land is under housing, 33% under tree coverage and 12% under vegetable cultivation.

Abedin and Quddus (1990) recorded 28 different tree species in the homesteads of the Barind Tract in Rajshahi district. *Mangifera indica* and *Phoenix sylvestris* were the most dominant species, whereas *Artocarpus heterophyllus* was only of minor occurrence. They also mentioned that the average tree density was higher in Patuakhali and Rangpur (1.5 and 1.4 trees/10m², respectively) than in Rajshahi (0.7) where the annual rainfall is the lowest in Bangladesh.

Perera and Rajapakse (1991) distinguished that four canopy layers, the tallest being over 10m, third layer 2.5-10m, second layer 1-2.5m and first layer is less than 1m in Kandyan homegarden.

Ninaz (1998) reported that homestead is an area of land in which the household has its own dwelling unit. It refers to home and adjoining land occupied by a family for the purpose like small scale agricultural production, home-up keeping, health, sanitation and nutrition.

Hague (1994) showed that trees of the homesteads can be given suitable structure of the canopy as desired by the house owners under which vegetables, spices and some ornamental herbs, shrubs can be raised.

Sadaat (2007) observed a total of 62 different tree species recorded in the homestead of the study area. The overwhelming majority (53%) of the landless and marginal farmers grew up to 20 trees in their homestead.

Nahar (2009) observed that the average size of the homestead in the study area was 0.12 ha which increased with the increased of farm size. The homestead production system was found to be poor due to management practices. It was also observed that the major problem of planting new trees in the homestead was damaged by grazing animals (80%) followed by unavailability of space (61%); damaged by flood (55%), lack of good quality seeds (64%) and insect pest infestation (56%). There is enough scope to improve productivity in the homestead by replacing the existing tree species with the improved and/or exotic ones, planting trees in planned ways and improving management practices.

2.2 Forestry, Agroforestry and farmers Socio-economic Conditions

Douglas and Hart (1973) stated that the vital component of agroforestry is tree and it has great potentiality for feeding men and animals, for regeneration of soil, for restoring water systems, more benevolent micro-climate and more comfortable and stimulating living conditions for humanity.

The National Commission on Agriculture of India (1976) emphasized the socio-economic importance of social forestry in the rural community as well as in the management forest resources. The report revealed that by taking up the program of raising trees, grasses and fodder in the farmer's own lands, village commons, wastelands and degraded forests close to inhibitions it would be possible to meet the requirement of fuel wood, fodder, small timber for rural housing, agricultural implement, etc

Bhuiyan (1982) reported that a great deal of soil erosion and soil degradation of both forest and adjacent agricultural land was caused by deforestation. It also badly affected forest and agricultural production.

Douglas (1982) estimated that the homestead forests provided about 85 percent of the all wood consumed, including nearly 90 percent of fuel wood and 80 percent of timbers.

Keita (1982) reported that the forestry activities in West Africa provided the farmer with food, fodder, fertilizer, energy and raw materials.

Skutesh (1983) found in a study on the impact of Tanzania's policy of village afforestation that shortage of firewood was not merely an incentive to start a wood lot but also to succeeding with it, the style of forestry extension work tended to encourage the starting of wood lots but not their planting and expansion.

Fortman (1984) reported that agroforestry and other tree projects in developing countries often simply failed to take women into account. Yet women provided at least half of the rural labor and significant number of rural households as well as being the major users of fuel wood and wood products. It was essential that women would participate in agroforestry projects to get benefit from them. It was the intelligence, energy, initiative and labour of women that would determine whether agroforestry and other projects worked or not.

Kowere and Temu (1985) mentioned some major limiting factors of village forestry in Tanzania which were inadequate planning, poor follow up, lack of sufficient seedlings and lack of transportation.

Keith (1986) described the role of economic and non- commercial incentives in persuading farmers to grow tree despite risks and difficulties based on field interviews in India.

Shah (1987) showed that Arabari Forest Range in Midnapore district signified a unique opportunity to use wasteland at forestation as a means to improve livelihoods of the poor people.

Onweagba (1987) stated that the Shelterbelt Project to control desertification in Northern Nigeria had been seriously hindered by lack of communication with local landowners.

Haque (1988) stated that price of fuel wood had increased 10-15 times during the last 15 years because of the increasing fuel wood shortage.

Akter *et al.* (1989) in their study found that farmers grow tree as saving and insurance against risk of crop failure and low yield as well as assets for their children.

Sharma *et al.* (1989) estimated the fuel wood, timber and fodder requirements of three-farm household size group in the hill areas of Himachal Pradesh. The results indicated a high dependence of the people on forests.

Young (1989) in his paper entitled "agroforestry for soil conservation" stated that 20 per cent of rainfall is checked by tree cover, whereas ground shrubbery checks about 10 percent. In addition, the forest floor also intercepts rainfall to the extent of at least 5 percent. In this way grossly 35 percent of raindrops are checked.

Mercer and Hyde (1991) found that farmers with the least amount of land, labour and financial risk capital (the poor), were unlikely to take the lead in adopting agroforestry innovations.

Mondal (1991) in his study on Development Management by Gram Panchayat organization in Nadia and Hoogly districts of West Bangal found that Gram panchayat Pradhans (Chairpersons of Local Governments at the considered 'tree plantation' and protection of tree important as it contributed towards improving the quality of rural life.

Gilmour and Nurse (1991) stated the overall landscape is undergoing steady afforestation system in the middle hills of Nepal.

Chowdhury and Sattar (1993) in a study stated that farmers either retained or planted trees on the crop field for 17 reasons of which fruit, cash, insurance, fuel, juice of

palm, timber for construction material and increase of soil fertility was the main reason.

Miah (1993) found that up 1987 the farmers were not well aware about the effects of deforestation but afterwards they were becoming aware possibly due to mass campaign in this regard by the Government and non-government agencies. As a result the number of homestead trees got an increasing trend.

Fattah and Akhtar (1994) reported that afforestation and agroforestation had drastically reduced the rate of desertification, reduced the rate of desertification of land in Pakistan.

Alam (1996) stated that ethnobotany can play a catalytic role in developing options of agroforestry. It focuses the major links with agro- forestry.

Sohel (1998) conducted a survey and reported that the characteristics of the farmers such as age, education, farm size, annual income, organizational participation, communication exposure, in case of mass media farming experience and knowledge on agroforestry had significant positive relationship with farmers opinion regarding the effects of agroforestry on social, economical, environmental and technological aspects of farming.

Jha (1999) conducted a survey in three villages and socio-economic status of agroforestry adopting farmers and reported that farmers raising different crops under agroforestry systems were economically better and attained self sufficiency in fire wood and fodder.

Wani *et al.* (2002) reported that medicinal and aromatic plants can be a source of sustained income to the inhabitants of hilly areas, hakims and pharmaceutical industries. They also suggested for adopting strategies to improve marketing channels and their impact on socio-economic conditions of the local communications.

Das and Das (2005) stated that home gardens are traditional agroforestry systems with complex structure and multiple functions. To understand the system, the socio-

economic and biophysical aspects of home gardens in Dorgakona village, Barak Valley, North East India were studied. Since home gardens are also important sites for in situ on-farm conservation, the role of the rural people in the management and preservation of biodiversity in their traditional home gardening systems will be examined. The home garden size ranges from 0.02 to 1.20 ha with an average of 0.30 ha. The total number of species encountered in the home gardens will be 122, with fruits as the dominant use component. The home gardens are the sites of conservation of a large diversity of plants both wild and domesticated, because of their uses to the households. Thus the home gardens were found to be complex systems with plant diversity conserved through their use.

Hafizul (2007) stated that well planned and well managed agroforestry can play an important role in solving acute problem of food, fuel, fodder, soil fertility and ecology. He also concluded that agroforestry system practices are highly profitable and play significant role in improving the economical status of the farmers.

Pulok (2008) identified a total of five agroforestry practices viz. Palmyra palm - rice based agroforestry practices, pond size agroforestry practices, MPTs plantation the border of rice field, aile based agroforestry practices and homestead agroforestry practices in the study area. He recommended that the selection and introduction of fast growing trees and multipurpose tree species are suitable for agroforestry practices for socioeconomic improvement of the farmers.

Partha (2009) has reported that CARE assisted Road side agroforestry program bring a change in the socioeconomic status of the participants through increasing income generating capacity and using the waste land of the road side. The program also improved the overall environmental condition and prevented the soil erosion.

Nahar (2009) stated agroforestry practice had significant role in improving the economic status of the people. It is implied that if people are encouraged to plant trees in their homestead, thereby, the people can live in a healthy environment at the same time if can ensure the supply of timber, fuel, fodder, nutrient and other products. Therefore, there is a great scope to improve the prevailing homestead agroforestry

practices with modern agroforestry technologies for maximization of income of the farmers.

2.3 Benefits of Homestead Agroforestry

Abdullah (1983) conducted a survey on homestead agricultural production activities undertaken by different categories of households and reported that the family living on others land usually were not interested in growing permanent fruit or fuel trees. However, vegetable cultivation, livestock rearing, poultry raising, etc. were common in all the families.

Byron (1984) estimated that homestead forestry in Bangladesh provided 70 percent of timber, 90 percent bamboo per year in 30400 hectares. Further, he showed that the annual harvest from the village was estimated to be 8.9 percent of the standing volume and this was double the rate that the forests could sustain. If this is true and is not compensated, there would be an ultimate extinction of these forests.

Hocking (1986) stated that some 15 million household of the country occupy about 0.3 million hectare under traditional agroforestry practice in homestead.

Mercado (1987) reported in his study of the seven northern districts (now 23) of Bangladesh with the lowest tree cover in the country (only about 2% and concentration mainly on homesteads.

Hossain *et al.* (1988) reported that women in Bangladesh were actively involved in planting and protection of fruit in homestead farms.

Momin *et al.* (1988) showed in a study in non-forest area of Tangail district that number of tree unit-1 of are 10 m² of homestead according to their farm categories were 1.5,0.7,1.0 and 0.8 for marginal, small, medium and large farmer, respectively.

Abedin and Quddus (1988) reported that regarding tree raising, homestead were more relative stand points because farmer never sell their homestead before crop land. He also stated that lack of quality planting materiel and training knowledge of improved

management, technique etc. were the major limitations for improving homestead productivity.

Khan (1991) showed in his study that there were 0.27 million hectares (crown cover) of village homestead forests owned by individuals scattered over sixty eight thousand villages of Bangladesh.

Islam (1991) stated that village forest mainly covered by homesteads accounts only 0.27 million ha and out of 64 districts, as estimated, 28 districts had public forestland.

Miah and Parveen (1993) in their study found that in non-forest area 41 percent of the farmers opined that the percent of the farmers opined that the process of homestead deforestation enhanced due to building of housing materials and other development activities. 31 percent of the farmers of forest area also expressed similar views for causing homestead deforestation.

Haque (1994) reported that trees of the homesteads can be given suitable structure of the canopy as desired by the house- owners under which vegetables, spices and some ornamental herbs/ shrubs can be raised.

Haque *et al.* (1996) observed that to get fruits, fuel wood and timber as well as to bring back equilibrium in the ecosystem, local/ common fruit trees along with selected multipurpose trees (MPTs) in and around the homestead should be grown. Moreover, vegetables, spices and ornamental herbs and shrubs etc. could be obtained from home gardens. Through practicing homestead agroforestry, the requirements of the people for fruits, vegetables, forage, spices and fuel wood and timber could be fulfilled to a great extent by following the principles of agroforestry.

Alam (1996) showed that in Madhupur Thana 35 per cent of the farmers had high awareness. Sixty- per cent medium and only 5percent farmers had low awareness regarding the consequences of homestead deforestation. He further showed that the number of homestead plant population have decreased during 1981-85 compared to 1979-80 and again got an increasing trend during 1986-90 and onward. Also he

found that farmers cut down trees mostly for economic reasons and to accommodate additional population of their family.

Alam (1996) in the same reported that characteristics of the farmers such as age, level of education, farm size, homestead area, annual income, organizational participation, communication exposure and knowledge of homestead forestry had significant positive relationship with the awareness regarding the consequences of homestead afforestation.

Mazher (1996) pointed out a typical homestead agroforestry in Bangladesh provides and excellent opportunity for a number of economic activities to be undertaken in and around it. The homestead enterprises such as vegetables and fruits cultivation, fish culture, forest, poultry rearing etc. can contribute to increased food availability and generate of the rural farm families.

Hossain and Bari (1996) reported that generally wives (39.8%) were decomposed involved than husbands (34.8%) in the application of manure decomposed leaves, household wastes, cowdung etc.) and fertilizer to homestead vegetable gardens. However, this pattern was prominent amongst landless and marginal farm categories but husbands were more involved in soil fertility management than wives on small, medium and large farms.

Anam (1999) reported that vegetables were grown in three types of microsites within the homestead viz. in shady, open place and creepy on the tree.

Awal *et al.*, (2000) observed that homestead fruit and vegetable practices earned substantial income for all categories of farmers. The women were involved in the household decision making process to a greater extent. The evidence was more spectacular in aspects like family planning, education of children, poultry rearing, plantation of fruits and vegetables and marriages of sons and daughters.

Miah and Hossain (2001) conducted a study of Narsingdi district of Bangladesh about indigenous knowledge on homestead forestry and they explored that the households were engaged to tree planting programs (*Azadiracht aindica* with *Artocarpus*

heterophyllus), forestry products and services, women involvement, spacing of plantation, tending and cultural operations and problems in the homestead forestry. The study also reveals some important indigenous management techniques, which may be used along with the scientific management technique to sustainably manage the homestead forestry resources in Bangladesh.

Awal *et al.*, (2002) observed that homestead tree and vegetable practices earned substantial income for all categories of farmers. The women were involved in the household decision making process to a great extent. The evidence was more spectacular in aspects like family planning, education of children, poultry rearing, plantation of trees and vegetables.

Sing *et al.*, (2003) reported that medicinal plants are integral part of rural and urban lifestyle, but many of them medicinal plants species have reached endangered already and threatened because of over exploitation of forests, uncontrolled grazing and fire. India, nearly 175 million ha of land is degraded, 93 million ha of which is wasteland. This land is not suitable for growing agricultural crops economically but can be effectively used for growing medicinal plants after proper management.

Tewari *et al.* (2003) reported that the homestead agroforestry has been practiced throughout the central Himalayan region for a very long time. However, the structure of agroforestry system is more than a simple combination of woody and herbaceous components on the same unite of land. This subsistent strategy has evolved under the constraint and opportunities peculiar to the region and has permitted the rural folk to thrive in an environment of inherently low productivity. It features interaction among five component (i) crop fields (ii) a private land support system (iii) a forest support system (iv) livestock (v) man in the uniquely specific socio economic cultural setting of the region.

Vankatash *et al.*, (2003) found that in tropical home gardens species diversity is generally believed to be very high. Home gardens reached high levels of developments in terms of plant diversity, labor input and income derived from garden in region where population densities are high and create a forest like multistory

canopy structure. Moreover, species diversity sue, shape and plant density also vary from place to place depending on cultural, ecological and socio-economic factors.

Noppen *et al.*, (2004) observed the rural firewood markets and village dynamics; the impacts of the strategy (in relation to poverty, the environment/ forests, and rural urban tradeoffs etc.); the challenges that still need to be faced; the potential offered by Niger's rural fuel wood markets.

Roy *et al.*, (2005) reported the significantly gap between traditional cultivation methods and improved systems in socio-economic terms. Improved agroforestry systems provide approximately double income per capita in comparison to traditional methods. More intensified cash crop cultivation in the highlands of the East Usambara also results in double income compared to that in the low lands. However, people are sensitive to risks of changing farming practices. Encouraging farmers to apply better land management and practice suitable cultivation of cash crops in combination with multipurpose trees would be relevant in improving their economic situation in the relatively short term. The markets of most cash crops are already available. Improved agroforestry methods could ameliorate the living conditions of the local population and protect the natural reservoirs from human disturbance.

Bennett *et al.*, (2006) reported that the home gardens occur in most parts of Ghana and are of immediate use to household members for food and health requirements. Home gardens are generally multi-storied and multi-purpose. Informal discussion with farmers, interviews and structured questionnaire methods were used to gain information on home gardens in four agro ecological zones in Ghana. Home gardens ranged in size from 0.1 to 1.0 hector. In terms of structure, home gardens were found to be multi-storied, usually with three or four layers. Species diversity varied among the different agro ecological zones in the study.

Tolunay *et al.*, (2007) observed that traditional agroforestry practices of west Mediterranean region of Turkey. Each agroforestry practice will be determined and classified in the agroforestry systems. Many of the agroforestry production patterns are being seen as a traditionally in the entire region. Results showed that, agroforestry application in the region studied can be put in major agroforestry practices like,

agricultural systems, alley cropping, multilayer tree gardens, multipurpose trees on crop lands, home gardens, trees in soil conservation and reclamation, shelter belts and windbreaks, silvopastoral systems; trees on range land or pastures, protein banks, plantation crop with animals, agro-silvopastoral systems; home garden involving animals, multipurpose woody hedgerows, apiculture with trees, aqua forestry, multipurpose woodlots. As an agroforestry practice, shifting cultivation and taungya are determined in the region; however, both practices are not applicable, because of causing forest degradation.

Khan (2007) suggested that agroforestry might be considered to be practiced whenever trees and agricultural crops are grown in mixture, provided that the combined widths of the rows of agricultural crops do not exceed the heights of the forest trees at maturity.

Moontasir *et al.*, (2009) studied about different agroforestry practices for socio-economic improvement of the farmers in Comillasadar. The findings revealed that majority (40.75%) of the farmers belong to medium category possessed medium (21-30 trees) number of diversified tree species. The majority 33.33% of the farmers had low attitude regarding contribution of diversified tree species for their socioeconomic condition, where 25.92% was found to large category respectively. Within 40 different tree species, the high relative density of the study area was Mango (21.34%), Betel-nut (12.89%) and Jackfruit (8.73%) respectively.

Mamun (2009) observed that the role of rural women practicing homestead afforestation activities was measured on the basis of this performance and scores obtain through 10 statements, each of those put against a 4 point scale.

Akter *et al.*, (2013) mentioned that farmers considered trees as savings and insurance against risk of crop failure and low yield, as well as assets for their children. Some farmers stated that tree would contribute toward expenses for marriage of their daughters.

2.4 Species Richness and Densities in Homestead Agroforestry

Khaleque (1986) state from a survey of seven districts that 70 percent of the respondents had planted trees within the previous five years.

Chowdhury (1988) conducted a study at Chuadanga district and showed that the number of plant per unit homestead gradually decreased from marginal farms 8 plant/10m², 3 plant/10m². Further he showed that 77% marginal, 25% small and 42% larger feeling trees as cash in crisis period. Further he found that 89% farmer did not any formal advice on planting and managing trees.

Khan *et al.* (1988) conducted a study at Jamalpur area on homegarden and showed that of plant species grown on homestead the dominant ones were jackfruit (7.47 plant/ farmhouse), mango (4.03) and banana (1.63).

Abedin *et al.* (1990) reported that planting of jackfruit in plot boundary had emerged as a very popular practice in Madhupur districts the last 15 years.

Abedin and Quddus (1990) reported that number of plant species recorded at the different locations were 34, 28, 20, 21 and 52 at Ishurdi, Jessore, Patuakhali, Rajshahi, Rangpur and Tangail, respectively. The distribution of species is influenced by macro and micro environmental factors of the homestead and the needs and choices of the family.

Millat-E -Mustafa (1997) conducted a vegetable survey in four physiographic region of Bangladesh, deltaic, dryland, hilly and plain regions. He recorded in total of ninety-two perennial species from home garden of Bangladesh. The highest number of species were recorded in deltaic region (67) followed by plain L (56) and hilly region (54) and the lowest in the dry land region (46), he also mentioned that in the dry land region, adverse environmental condition (such as low rainfall, intense heat and low soil fertility) restrict the variety of species that could be grown.

Ahmed (1997) in his study reported that 31 minor fruits were found in homestead of Bangladesh. The minor fruits account for as many as two thirds of the total number of fruits found to grow in homestead.

Akter *et al.* (1997) studied on the socio- economic factors, including demography , land holding patterns household income and homestead tree resources. Average annual income per household was found as Tk. 49,055 and homesteads Agroforestry contribute about 22% of that income. Wood, leaves and cowdung were the main sources of domestic fuel. Trees grown on homesteads played a significant role, among others by providing fuel and cash in emergency situations.

Salehuddin *et al.* (1998) reported that farmers in homestead preferred fruit tree species over fuel, timber species because most tree species present in homesteads had multiple uses though all the uses were not considered some exotic short rotation tree species, replacing some indigenous tree species.

Mosabber and Niar (1999) studied about the floristic composition and socio-economic aspects of rural homestead forestry. They found that home gardens are located close to houses and characterized by a mixture of annual and perennial species. The proximity of natural forests and the availability of timber in local markets also have been seen to influence the propensity to plant timber and fuel wood species in home gardens. Fruit trees dominate the gardens, followed by fuel wood species.

Nahar (2000) reported that the extent of participation of rural women in homestead vegetable cultivation, post-harvest activities, poultry raising and goat rearing were 42 percent, 62 percent, 54 percent and 47 percent, respectively age of the rural women and no significant relationship with their participation in homestead agriculture activities. It has also mentioned that majority of the respondents possessed moderate level of knowledge about homestead agriculture management systems, while innovativeness and extension tendency was lower.

Tangang *et al.*, (2004) stated that agroforestry systems have been maintain as a part of rural survival over generations, with the multi-story vegetation structure and diverse type of plant composition. In the present study, plant species composition and

diversity of the traditional agroforestry systems practiced by different ethnic groups in Acronychal Pradesh, India were evaluated. The total number of tree shrubs and herbs species recorded is 41, 22, and 35 respectfully.

Shabuj *et al.*, (2010) observed that a total of 32 different tree species recorded in the homestead area of which Jackfruit, Eucalyptus, Ipil-lpil, Mango, Neem and Mahogany were dominant species. On an average 21.25 tree species were found in homestead. Ten different agroforestry practices were identified from the study area within four layers.

Mahamud (2010) studied on species composition and its diversity in the homesteads and found that a total of 69 different tree species was recorded in the homestead of the study area of which Akashmoni, Mahogoni, Jackfruit, Coconut and Papaya were dominant species.

Jahan (2010) identified that a total of 50 different tree species was recorded in the homestead area of which Jackfruit, Betel nut, Rain tree, Mango, Mahogoni and Banana were dominant species.

Yasmin *et al.*, (2010) observed that a total of 68 different tree species recorded in the homestead, cropland and on the bank of pond of the study area of which Akashmoni, Jackfruit, Coconut, Mango, Neem, Eucalyptus and Bokain were dominant. On an average 22.75 and 4 tree species were found in homestead and cropland area respectively.

Belali (2011) studied on homestead agroforestry and species composition in Sonargaon upazila of Narayangonj district. He stated that the homesteads in Sonargaon upazila of Narayangonj district are cluster with nearly 78 different tree species, 11 crop species and on average 25.75 tree species were found in homestead. There are the habitats for many herbs, shrubs and creeper species.

Chandra (2011) studied on species richness and tree diversity in the homestead and he found that a total of 75 different tree species was recorded in the homestead of the study area of which Jackfruit, Mango, Eucalyptus, Akashmoni and Guava were dominant species.

CHAPTER 3

MATERIALS AND METHODS

In this section the materials and methods have been presented which include brief description of location of the experimental site, materials used and methodology followed in the experiment. The details of these sections are described below.

3.1 Site Selection

Two upazilla viz. Dinajpur Sadar and Kaharole under Dinajpur district were selected purposively from a total of 13 upazillas areas. Two Unions were selected from each of the upazilla using multistage sampling for the study.

3.2 Geographical Location of the Study area

The study area is located in the northern region of Bangladesh lies between $25^{\circ} 13'$ and $25^{\circ} 54'$ north latitudes and between $88^{\circ} 23'$ and $89^{\circ} 18'$ east longitudes. The District is bounded on the north by Panchagarh and Thakurgaon District, on the south by Joypurhat District and India, on the east by Rangpur and Nilphamari District and on the west by Thakurgaon District and India (Fig. 3.1).

3.3 Sampling procedure

A sample of 100 farmers were selected, fifty (50) from two unions of Dinajpur Sadar viz. Chehelgazi and Fazilpur union and fifty (50) from two unions Sandarpur and Ramchandrapur of Kaharol upazilla with equal probability to each farm category by stratified random sampling. The list of all core farmers in the selected upazillas, including their farm size were collected from the farmers who were engaged in tree planting in homestead for this sampling exercise (Appendix-II).

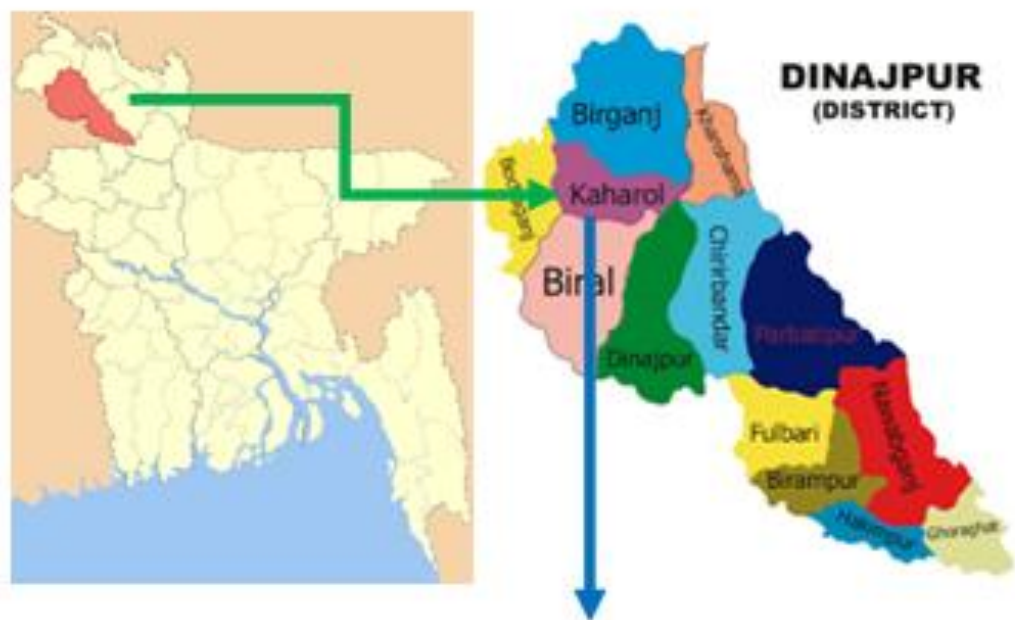


Figure 3.1. Map of Bangladesh showing locale of the study area Kaharol (Source: Wikipedia)

Table 3.1 Distribution of population and sample size in the study area

Upazila	Union	No. of farm families finally selected for data collection (sample size)
Dinajpur Sadar	Chehelgazi	25
	Fazilpur	25
Kaharol	Sundarpur	25
	Ramchandrapur	25
Total=	4	100

All farmers of the four unions were grouped into five farm categories i.e. landless, marginal, small, medium and large following Abedin and Quddus (1988).

Table 3.2 Different farm categories and their sizes

Farm category	Farm size (ha)
Landless	Upto 0.20
Marginal	0.21-0.5
Small	0.51-1.00
Medium	1.01-2.00
Large	Above 2.00

3.4 Development of the Instrument

In order to collect relevant information, interview schedule was carefully designed keeping the objectives of the study in view. It contained both open and closed form of questions. The draft instrument was pre-tested before finally using that for data collection. Pre-test helped the researcher to examine the suitability of different question and statements included in the questionnaire. Necessary correction, alternation and adjustments were made in his questionnaire on the basis of the experience of pre-testing and suggestions of the experts. The final version of the instrument was done on the basis validity, suggestions, corrections and comments of the research supervisor (Appendix –II).

3.5 Data Collection

Data for this study were collected through personal interview by the researcher during April to June 2017 using the interview schedule prepared earlier. All possible efforts were made to explain the purpose of the study to the respondents in order to get actual and valid information from them and they were assured that the study was purely an academic one which is not likely to have any adverse effect on them.

The interviews were conducted with the respondents in their houses. Proper rapport was established with respondents so that they did not feel hesitant to furnish proper responses to the questions and statements in the schedule. The questions were explained and clarified whenever any respondent felt difficulty in understanding the question. Data obtained from the respondents were transferred to master sheet and then compiled to facilitate tabulation. The qualitative data were converted into quantitative by means of suitable scoring techniques.

3.6 Measurement of Independent Variables

For selection of independent variables, the researcher went through related literature as far as possible. He discussed with the relevant experts, departmental teachers and concern researchers of the related fields. In this study independent variables were age, level of education, family size, homestead size, annual income, organizational participation, communication exposure, knowledge on homestead agroforestry, socioeconomic aspect.

Measurement procedures of independent variables are discussed below:

3.6.1 Age

The age of the respondent was measured in terms of years from his birth to the time of interview. This was measured in the item no. 1 of the interview schedule (Appendix-II)

3.6.2 Level of education

The level of education of a respondent was measured by the years of schooling he or she completed. If a respondent did not know how to read and write his/her literacy

score was taken as zero. A score of one was given to that respondent who should sign his name only. Besides this, the respondent get actual score of his every year of schooling i.e. one for class one, 2 for class two thus the level of education score of a respondent was determined from response to item no. 2 of the interview schedule.

3.6.3 Family size

The family size of a respondent was measured in terms of the number of member in his family including children, wife, parent's etc. The actual number of family members of a respondent was considered as his family size score.

3.6.4. Farm size

Land is the most important capital to a farmer and farm size influence on many personal characteristics of a farmer. Data obtained in response to questions under item no. 5 of the interview schedule formed the basis for determining the farm size of the respondent. Here farm size was expressed in hectare and was computed by using the following formula:

$$\text{Farm size (FS)} = A_1 + A_2 + A_3 + A_4 + \frac{1}{2} (A_5 + A_6)$$

Where,

FS = Farm Size score

A_1 = Homestead area with pound

A_2 = Own land under own cultivation

A_3 = Land taken from other on lease

A_4 = Others (Fallow land, garden etc)

A_5 = Land given to others on barga

A_6 = Land given from others on barga

3.6.5 Homestead size

Homestead size was measured as the size of one's homestead area including living room, kitchen room, cattle shed, farm yard, court yard under vegetables, fruit and timber trees, back yard, bushes, bamboo grove, pond etc. following the style of Parveen (1993). The area is expressed in hectare.

3.6.6 Annual income

This variable was measured by the total income earned by a respondent's family from agricultural and non- agricultural sources. It was measured in taka per year. One is use for one thousand taka.

3.6.7 Organizational participation

Organizational participation of a respondent was measured on the basis of the nature of his involvement and duration of participation in different local formal groups organization. The researcher identified 8 organizations in the study area as shown in item no 7 of the interview schedule. For computing organizational participation score a formula was developed as given below:

$$\text{Organizational participation score} = \sum A + D$$

Where, A = Activity score

D =Duration score

Participation score was assigned in the following manner for activities of farmer in each group or organizations

<u>Nature of involvement</u>	<u>Scores assigned</u>
No involvement	0
Ordinary member	1
Executive member	2
Executive officer	3

Duration score were assigned in the following manner

<u>Duration of activities</u>	<u>Scores assigned</u>
Nill period	0
Up to 3 years	1
4-6 years	2
7 years and above	3

3.6.8 Communication exposure

It refers to expose contact with some selected information sources and personalities. The communication exposure of a respondent was measured on the basis of his extent

of contact with some selected information media. Each respondent was asked to indicate his extent of contact with a particular extension media along a four- point scale: “regularly”, “frequently”, “seldom” and “not at all”. These responses were scored as 3, 2, 1 and 0 respectively. The extension contact score of a respondent was obtained by adding his scores for all the selected extension media.

3.6.9 Knowledge on homestead agroforestry

It refers to the farmer’s knowledge of forestry from different activities and also through their experience of cropland and homestead forestry activities. The selected farmers were asked 20 questions. The total assigned score on the entire question could be maximally 40. Score was assigned 2 for correct answer and zero for incorrect answer for each question. Total score obtained by a respondent was taken as his knowledge of Agroforestry activities score.

3.6.10 Change in socio-economic aspects

The change in socio- economic aspects of the farmers was defined as the improvement of social as well as economic status towards positive direction. The farmers were asked to give their opinion regarding the improvement in socio-economic aspects of their livelihood due to the direct or indirect contribution of homestead afforestation. It was measured on the basis of opinion on the improvement of socio- economic aspects of their livelihood. A 4-point modified Likert- type scale as strongly agree, partially agree and disagree was used to measure the extent of agreement of farmers with the statement. The score assigned to each of the scale for measuring the extent of agreement was 3, 2, 1 and 0 respectively for each of the 13 statements.

3.7 Measurement of Dependent Variable

Before selecting the dependent variable the researcher reviewed available books, journals, research reports etc. He also discussed with the resource persons in this area for better understanding of the dependent variable. The dependent variable was “Number of different tree in homestead Agroforestry. Existing number of trees (fruits, forest, medicinal and others) along with saplings and young trees observed in the study area. It was measured by number.

3.8 Data Processing and Analysis

For data processing and analysis the following steps were followed:

3.8.1 Compilation of data

After compilation of field survey all the interview schedules were compiled, tabulated and analyzed according to 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. The responses to the questions in the interview schedule were transferred to a master sheet to facilitate tabulation. Tabulation and cross tabulation was done on the basis of categories developed by the investigator himself.

3.8.2 Research hypothesis

The null hypothesis is “There is no relationship between the effect of tree species in homestead Agroforestry and each of the selected characteristics of the farmers. The selected characteristics are age, education family size, farm size homestead size, annual income, organizational participation, communication exposure and knowledge on homestead Agroforestry Socio- economic aspect.

3.8.3 Data analysis procedure

After completion of data collection the responses were coded, tabulated and analyzed according to the objectives of the study. Local units of measurement were converted in to standard units. The responses to the question in interview schedule were transferred to a master sheet to facilitate tabulation. Necessary and cross tabulation were also computed.

Statistical measures such as number, percentage, frequency distribution, range, rank, order, mean and standard deviation were used in describing the variable of the study. For clarity of understanding tables and graphs were also used for presenting the data. Pearson’s product- moment’s correlation was used to find out the relationship between selected characteristics of the farmers and number of trees in homestead as perceived by the farmers. Five percent (0.05) and one percent (0.01) level of probability was used as the basis of rejection of any null hypothesis whenever necessary through the analysis.

Relative prevalence of tree species was determined by multiplying the number of trees per farm by the percentage of farm containing that species. It was calculated by the following formula (Ahmed, 1999).

Relative prevalence = number of trees/farm x % farm with species.

CHAPTER 4

RESULTS AND DISCUSSION

The present study was focused on homestead agroforestry in socio-economic aspects along with other related matters. The study considered some selected characteristics of the farmers and explored relationship with homestead agroforestry. These are described in the following sections:

i) Characteristics of the farmers of the study area. ii) Characteristics of farm components. iii) Tree species richness and relative prevalence of some common species found in homestead iv) Trend of increasing/decreasing plant population in homestead from certain period v) Vertical utilization of homestead vi) Relationship between the characteristics of respondents, farm components and number of trees observed in agroforestry system.

4.1 Characteristics of the Farmers of the Study Area

4.1.1 Age of the respondents

The age of the respondents ranged from 22-75 years. There are three categories of the respondents on the basis of age groups, these were young age, middle age and old age, are ranged from 20-35 years, 36-50 years and 50 years above respectively. Category of age, number of the respondents, per cent, mean and standard deviation of the respondents are shown in Table 4.1. The mean value of the respondents was found 47.96 years with standard deviation 12.85. The highest respondents was found on as 'middle aged' (44.0%) and lowest percentage on 'old aged' (21.0%). The results was revealed that the middle group was majority in responding the interview schedule than young and old age groups. These findings commensurate with the national statistics indicating that selected homestead were typical homestead of the country. The result observed in this study is in good conformity with that of Ahemed (1999). Similar results also found by Awal *et al.*, (2002) in their study.

Table 4.1 Categorization of respondents according to their age

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Young aged (≤35)	35	35	22	75	47.96	12.85
Middle aged (36-50)	44	44				
Old aged (>50)	21	21				
Total=	100	100				

4.1.2 Level of education

The educational level of the respondents ranged from 0-16 (non-formal education to graduate level) observed in the study area. There were 5 (five) categories of education levels in the study area. These were illiterate (no schooling), can sign only, primary level (class I-V and only can sign), secondary level (class VI- X) and above secondary level (college and university). The category respondents, range, number of respondents, percent, mean and standard deviation are shown in Table 4.2. In this study the education of the farmers were ranged from 0-16 years of schooling with an average of 4.83 and standard deviation 4.56. The result showed that 23 per cent of the respondents were illiterate that was portion in the study area, major the primary level, secondary which level and above secondary level of the respondent were 37%, 24%, and 16%, respectively.

Table 4.2 Distribution of respondents according to their level of education

Category	Respondents		Mean	Standard deviation
	Number	Percent		
No Schooling (00)	10	10	4.83	4.56
Can sign only	13	13		
Primary (1-5)	37	37		
Secondary (6-10)	24	24		
Above secondary (>10)	16	16		

4.1.3 Family size

Category of family size, number of the respondents, percent, range, mean and standard deviation of the respondents was shown in Table 4.3. Family size of the respondents ranged from 2-13 members with an average of 5.89 having standard

deviation of 2.56. There were three categories of the family size of the respondents. The results were indicated that medium sized family was the highest portion (54%) of the respondent, while the small and large sized family was 18% and 28% respectively. The families which have more family member have more income as they work with their own efforts. Millat-e-Mustafa (1997) observed a clear sharing of tasks among family members.

Table 4.3 Distribution of respondents according to their family size

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Small (2-4)	18	18	2	13	5.89	2.56
Medium (5-8)	54	54				
Large (>8)	28	28				
Total=	100	100				

4.1.4 Total annual income

The annual income of the respondents is an important indicator of how much they can invest in their farm practice. The Annual income of the respondents of the study area varied from Tk. 10 thousands to Tk. 200 thousands with an average of 50.35 and standard deviation 32.09 (Table 4.4). Data revealed that 32% of the farmers were found low, 48% medium, and 20% high income categories. Thus, the majority (48%) of the respondents had medium family income indicated that Agroforestry practices are usually practiced by the having comparatively higher economic standings.

Table 4.4 Distribution of respondents according to their annual income

Categories	Respondents		Range (thousand)		Mean	SD
	No.	(%)	Min.	Max.		
Low income (up to 24)	32	32	10	200	50.35	32.09
Medium income (24.1-80)	48	48				
High income (>80)	20	20				
Total=	100	100				

4.1.5 Annual income from homestead

Annual income from homestead of the respondent was measured in ‘thousand taka’ per year and it scored as 1 for thousand taka. In the present study, it ranged from 2 to 35 with an average of 13.95 and standard deviation of 7.28. The respondents were grouped into three categories depending on the annual income from homestead as given in table 4.5. The result revealed that more than 51 percent of the respondents belonged to medium income from homestead, while 38 per cent had high income and only 11 per cent had low income from homestead. Thus the results were indicated that homestead agroforestry is an vital source of income of the house hold.

Table 4.5 Distribution of respondents according to their annual income from homestead

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Low income (up to 6)	11	11	2	35	13.95	7.28
Medium income (6.1-15)	51	51				
High income (above 15)	38	38				
Total=	100	100				

Note: 1 indicate thousand taka

4.1.6 Knowledge on homestead agroforestry

The computed knowledge on homestead agroforestry score of the respondents ranged from 6 to 25 against the possible range 0 to 26. The mean and standard deviation were 19.60 and 7.55 respectively. On the basis of knowledge Agroforestry scores, the respondents were classified into the following three categories (Table 4.6).

Table 4.6 Distribution of respondents according to their Knowledge on homestead agroforestry

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Low knowledge (up to 12)	38	38	0	26	19.60	7.55
Medium knowledge- (13-20)	44	44				
High knowledge (above 20)	18	18				
Total=	100	100				

4.1.7 Organizational participation

People's participation in local organization is a vital step in any rural development programmed. It is an indication of people's own involvement. It is also an indication of people's neighboring farmers and field extension workers. The score of the respondents varied from 1 to 22 against possible range 0 to 48 regarding organizational participation. On the basis of observed scores, farmers were classified into 3 categories (Table 4.7). The result revealed that the highest proportion (45%) of the respondents of the study area had low organization participation, 40% of the respondents had medium participation and 15% of the respondents had high participation.

Table 4.7 Distribution of respondents according to their organizational participation

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Low participation (1 to 7)	45	45	0	48	9.34	3.16
Medium participation (8-15)	40	40				
High participation (above 15)	15	15				
Total=	100	100				

4.1.8 Communication exposure

The computed communication exposure of the respondents ranged from 3-26 against the possible range of 0-45 and average being 14.45 and standard deviation of 5.58. On the basis of communication exposure score, the respondents were classified into three categories (Table 4.8). The table 4.8 indicated that the highest proportion (42%) of the respondents of the study area had medium communication exposure, while 33% had low communication exposure and 25% of the respondents had high communication exposure.

Table 4.8 Distribution of respondents according to their communication exposure

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Low contact (up to 8)	33	33	0	45	14.45	5.58
Medium contact (9-15)	42	42				
High contact (above 15)	25	25				
Total=	100	100				

4.1.9 Changes in socio-economic aspects due to homestead afforestation

Farmers' opinion regarding changes in socio-economic aspects due to homestead afforestation score ranged from 7 to 32 against the possible range of 0 to 39, 0 indicating no opinion and 39 indicating high opinion. The farmers were classified into three categories based on their obtained opinion scores considering the mean (20.22) and standard deviation (7.45). The categories and distribution of farmers were showed in Table 4.9. The results was exposed that the highest proportion (45%) of the respondents were in medium opinion category, while 24% had low opinion and 31% was in opinion on changes in socio-economic aspects due to homestead afforestation.

Table 4.9 Distribution of respondents according to their changes in socio-economic aspect

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Low (up to 15)	24	24	0	39	20.22	7.45
Medium (15-20)	45	45				
High (21 and above)	31	31				
Total=	100	100				

4.2 Characteristics of the farm components

4.2.1 Farm size

The farm size of the respondent varied from 0.02-2.99 hectare with the mean of 0.67 and standard deviation of 0.65. There were five-farm categories of the respondents on the basis of their farm size. The distribution of the respondent with number, percent, mean and standard deviation is shown in Table 4.10. The result was revealed that the highest proportion 30 percent of the respondent were marginal compared to 27 percent, 23 percent, 13 percent and 7 percent landless, small, medium and large farm categories, respectively.

Table 4.10 Distribution of respondents according to their farm size

Farm category	Farm size (ha)	Respondents		Range (hectare)		Mean	SD
		No.	(%)	Min.	Max.		
Land less	Up to 0.2	27	27	0.02	2.99	0.67	0.65
Marginal	0.21-0.50	30	30				
Small	0.51-1.0	23	23				
Medium	1.01-2.0	13	13				
Large	Above 2.0	7	7				
Total=		100	100				

4.2.2 Homestead size

The homestead size of the respondents varied from 0.01-0.72 hectares. The average homestead size was 0.18 hectare with a standard deviation of 0.15. There were five categories of homestead size on the basis of farm categories. The range, categories, percent, mean and standard deviation were given in table 4.11. The results was indicated that highest proportion 42 percent of the respondent was small and lowest was large homestead size compared to 27,8 and 17 percent of marginal, landless, and medium homestead size respectively. Clearly indicates that the homestead size was very much related to farm size.

Table 4.11 Distribution of respondents according to their homestead size

Farm category	Farm size (ha)	Respondents		Range (hectare)		Mean	SD
		No.	(%)	Min.	Max.		
Land less	Up to 0.05	8	8	0.01	0.72	0.18	0.15
Marginal	0.05-0.10	27	27				
Small	0.11-0.20	42	42				
Medium	0.21-0.50	17	17				
Large	Above 0.50	6	6				
Total=		100	100				

4.2.3 Number of tree per homestead

The number of tree of the respondents varied from 4 to 100. The average number of tree of the respondents was 25.18 with standard deviation of 20.48. The categories, percent, mean and standard deviation were given in table 4.12. The results was exposed that the highest proportion medium plantation (48%), compared to the low plantation (37%) and high plantation (15%).

Table 4.12 Distribution of the respondents according to their number of trees

Categories	Respondents		Range		Mean	SD
	No.	(%)	Min.	Max.		
Low plantation (up to 14)	37	37	4	100	25.18	20.48
Medium plantation (15-45)	48	48				
High plantation (above 45)	15	15				
Total=	100	100				

4.3 Tree species richness and relative prevalence of tree species in homestead

4.3.1 Tree species richness in homestead area

Al most the homestead area had mixer vegetation with various annual and perennial trees, and seasonal vegetables. The study revealed that a wide variety of plant species was found in the study areas. More than 55 useful species (Appendix-I) were identified in the homestead, area of Chehelgazi, Fazilpur, Sundarpur and Ramchandrapur. Among them 41.81 % were fruit (perennial and Annual), 30.90% were forest, 20% were medicinal and 7.27% were other plant species (Table 4.13).

Abedin and Quddus (1990) studied six agro-ecological different locations of Bangladesh including barind tract and observed average tree population was lowest, in the barind tract, which supports the finding of the present study. Number of species in each of 4 locations of the study area was found higher than those found by Abedin and Quddus (1990). Millate-e-Mustafa (1997) identified 92 perennial plant species at 4 sites of the country.

Table 4.13 Tree species richness of different plant group at 4 study area

Area	Fruit	Forest	Medicine	Others	Total
Chehelgazi	21	16	10	4	51
Fazilpur	22	15	9	3	49
Sundarpur	20	14	7	3	45
Ramchandrapur	21	15	9	3	48
Average	21	15.25	8.50	3.50	48.25
All	23	17	11	4	55
(%)	(41.81%)	(30.90%)	(20%)	(7.27%)	

Fruit species

From the present study, it was revealed that the highest number of fruit species (23.00) was found to prevail in the homesteads in all the regions.

Abedin and Quddus (1990) and Millate-e-Mustafa (1997) also reported fruit as the prime component of homestead vegetation. Number of fruit species in the homestead, area of Fazilpur (22.00) was found maximum followed by, Chehelgazi (21.00), Ramchandrapur (21.00) and Sundarpur (20) (Table 4.13).

Forest species

The result revealed that forest occupied the 2nd position on the basis of average number of tree species. It was one of the major components of homestead vegetation (Table 4.13). Number of forest species was found maximum in the homestead area of Chehelgazi (17.00) followed by Fazilpur (15.00), Ramchandrapur (15.00) and the minimum number of forest species (14.00) was observed in Sundarpur area.

Medicinal species

From the present study, it was revealed that the medicinal plants occupied the 3rd position on the basis of average number of tree species (11.00). The highest number of medicinal plants (10.00) was found in Chehelgazi area while the lowest number of medicinal plants (7.00) was recorded in Sundarpur area, respectively (Table 4.13).

Other species

Other species of the study area was found in 4th position on the basis of average number of tree species (Table 4.13). Fodder, fuel wood and living fence include here. Number of other plant was found maximum in the homestead, area of Chehelgazi (4.00) followed by other areas.

4.3.2 Relative prevalence of tree species grown in the homesteads

The relative prevalence of fruit, forest, medicinal and others tree species were presented in table 4.14. The highest prevalent species of homestead in the study area was Litchi (39.28) compared by Mango (15.35), Jackfruit (6.87), lemon (3.10),

coconut (2.87) and Guava (1.71). The results was also indicated the dominance of Litchi Mango, Jack fruit in almost all the farm categories. There were minor differences in relative prevalence of less common species.

Table 4.14 Relative prevalence of some common tree species found in the homestead of study area

Homestead		
Common name	Scientific name	Relative prevalence
Litchi	<i>Lichi chinensis</i>	39.28
Mango	<i>Mengifera indica</i>	15.35
Jack fruit	<i>Artocarpus heterophyllus</i>	6.87
Lemon	<i>Citrus limon</i>	4.54
Betelnut	<i>Areca catechu</i>	3.10
Coconut	<i>Cocos nucifera</i>	2.78
Guava	<i>Psidium guajava</i>	1.71
Indian black berry	<i>Syzygium cumini</i>	1.44
Debdaru	<i>Polyalthia longifolia</i>	1.32
Pummelo	<i>Citrus grandis</i>	0.67
Palmyra palm	<i>Borassus flabellifer</i>	0.65
Jujube	<i>Zizyphus jujuba</i>	0.65
Gora neem	<i>Melia azedarach</i>	0.62
Date plam	<i>Phoenix sylvestries</i>	0.60
Mahogoni	<i>Swietenia mahogoni</i>	0.58
Sissoo	<i>Dalbergia sissoo</i>	0.52
Indian olive	<i>Elaeocarpus floribundus</i>	0.51
Wood apple	<i>Aegle mermelos</i>	0.47
Babla	<i>Acacia nilotica</i>	0.46
Koroi	<i>Albizia procera</i>	0.46
Rain tree	<i>Samanea saman</i>	0.41
Pomegranate	<i>Punica granatum</i>	0.39
Neem	<i>Azadirachta indica</i>	0.37
Krishna chura	<i>Delonix regia</i>	0.28
Eucalyptus	<i>Eucalyptus spp</i>	0.24
Tamarind	<i>Tamarindus indica</i>	0.23

4.4 Relationship between the selected characteristics of farmers, different farm characteristics and number of trees in homesteads

The relationship between selected characteristics of the respondents and farms with the number of trees of farm was observed (Table 4.16). The selected characteristics were age, level of education, family size, annual income organizational participation communication exposure, knowledge on homestead agroforestry, farm size, homestead area, socio-economic aspect included. The characteristics of the farmers

were constituted an independent variable while number of trees existing in the homestead area was the dependent variable.

The relationship between the selected characteristics and number of trees as perceived by the farmers was explored by Pearson's Product Moment Correlation Co-efficient 'r' had been used. Table 4.15 was placed below with description and interpretation of the meaning of 'r' (Cohen and Holliday, 1982).

Table 4.15 The meaning of correlation co-efficient 'r'

r value	Meaning
± 0.00-0.19	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

4.4.1 Relationship between age of the framers and number of trees in homestead

The relationship between respondent's age and the number of trees was examined by testing null hypothesis: "There is no relationship between age of the farmers and number of trees".

The computed value of the co-efficient of correlation between the concerned variables were found (0.409**) as shown in Table 4.16. The following observations were recorded regarding the relationship between the variables on the basis of 'r' value. The relationship showed a positive trend. The computed value $r = 0.409^{**}$ suggested that the relationship between age of the farmers and number of trees were highly significant. Age of an individual is one of the most important factors to adopt the new technology. To adopt the new technology youth are more enthusiastic than the older. But in case of this study, age of the farmers had good influenced on the formation of favorable perception towards the plantation of trees.

4.4.2 Relationship between level of education of the farmers and number of trees in homesteads

The relationship between level of education of the farmers and number of trees as perceived by the farmers was examined by the null hypothesis: “There is no relationship between level of education of the farmers and number of tree”.

The co-efficient of correlation between the concerned variables were found (0.286*) as shown in Table 4.16. The relationship between the two variables was low. The computed value r (0.286*) was suggested that the relationship between level of education of the farmers and number of trees were positively significant at 0.05 level of probability.

Education helps and individual to develop sound mental made up that given a judging capability with rationality. Moreover, education enhances an individual’s contact with the printed mass media and his message understandability.

4.4.3 Relationship between family size of the farmers and number of trees in homesteads

The relationship between family size of farmers and trees in farms was examined by testing the following null hypothesis: “There is no relationship between family size of the farmers and number of trees”.

The computed values of the co-efficient of correlation between the concerned variables were found 0.123 presented in Table 4.16. The relationship was statistically insignificant. The reason may be that large number of family member of respondents have needed more trees for their uses but they did not plant trees as they cut. On the other hand, the small number of family member need small number of trees and the tree number appeared higher in their homestead.

4.4.4 Relationship between farm size of the farmers and number of trees in homesteads

The relationship between farm size of the farmers and number of trees as was tested by examining the following null hypothesis: “There is no relationship between farm size of the farmers and number of trees”.

The computed value of the coefficient correlation between the concerned variables were found (0.362**) was showed in Table 4.16. The computed value ($r = 0.352^{**}$) was suggested that the relationship between farm size of the farmers and number of tree were positive and highly significant at 0.01 level of significance.

4.4.5 Relationship between homestead area of the farmers and number of trees in homesteads

The relationship between homestead area of the farmers and number of trees was tested by null hypothesis: “There is no relationship between homestead area of the farmers and number of trees”.

The computed value of ‘ r ’ was found (0.695**) and presented in Table 4.16. A highly significant relationship was found between the concerned variables.

Homestead was considered the sources of income for the farmers. The farmers who have large homestead area may have better scope for homestead tree plantation than the farmers having small homestead area.

4.4.6 Relationship between annual income of the farmers and number of trees in homesteads

The relationship between annual income of the farmers and number of trees was examined by the following null hypothesis: “There is no relationship between annual income of the farmers and number of trees.

The computed value of ‘ r ’ was found (0.497**) in Table 4.16. A highly significant relationship was found between the concerned variables. The findings were indicated that the concerned variables were not independent to each other.

4.4.7 Relationship between annual income from homestead of the farmers and number of trees in homesteads

The relationship between annual income from homestead of the farmers and number of trees was tested by the following null hypothesis: “There is no relationship between annual income from homestead of the farmers and number of trees. The computed value of ‘r’ was found (0.497**) presented in Table 4.16. The computed value ($r = 0.373$ **) was suggested that the relationship between annual income of the farmers and number of trees was positively significant. The findings were indicated that the concerned variables did not independent to each other. The rural farmers having higher income were found to have higher number of trees in the homestead.

4.4.8 Relationship between organizational participation of the farmers and number of trees in homestead

The relationship between organizational participation of the farmers and number of trees was tested by the following null hypothesis: “There is no relationship between organizational participation of the farmers and number of trees in homestead”.

The computed value of ‘r’ was found (0.432 **) and presented in Table 4.16. The relationship was showed a tendency in the positive direction between the concerned variables at 0.01 level of probability. The relationship was highly significant. Based on the above findings the null hypothesis could be rejected and, therefore, it may be concluded that organizational participation of the farmers had a significant relationship which number of trees homestead.

4.4.9 Relationship between communication exposure of the farmers and number of trees in homesteads

The relationship between communication exposure of the farmers and number of trees was examined by testing the following null hypothesis: “There is no relationship between communication exposure of the farmers and number of trees. The correlation co-efficient value was found 0.410 ** (Table 4.16). The computed value $r = 0.410$ ** was suggested that the relationship between communication exposure of the farmers and number of trees were positively significant at 0.01 level of probability. Media exposure pertains to one’s contact with multifarious bodies of knowledge and

information. The farmers having more exposure with communication sources of information have better knowledge about different aspects of crop cultivation, homestead farming, forestry and their agricultural activities.

4.4.10 Relationship between knowledge of the farmers and number of trees in homesteads

The relationship between knowledge of the farmers and number of was examined by testing the null hypothesis: “There is no relationship between knowledge of the farmers and number of trees”. The computed value ‘r’ was found 0.424 ** (Table 4.16). The relationships between the concerned variables were moderate. The relationship was highly significant. The null hypothesis was, therefore, rejected on the basis of the finding. Thus, it may be concluded that knowledge of the farmers had significant positive relationship with the number of trees.

4.4.11 Relationship between socio-economic aspects of the rural farmers and number of trees in homestead

The following null hypothesis was coined to test the relationship between socio-economic aspects of the respondents and number of trees in homestead “There is no relationship between socio-economic aspects of the farmers and the number of trees homestead”. The co-efficient of correlation between the concerned variables was found 0.408 ** (Table 4.16). The degree of relationship was medium. The computed value of ‘r’ = 0.408** was found to be greater than the table value ($r = \pm 0.324$) suggest that the relationship between socio-economic aspects and number of trees was positively significant at 0.001 level of probability. From the above observations, the formulated null hypothesis was rejected which implied that socio-economic aspects of the respondents were related to the number of trees in homestead. That means the educated farmers were more interested in socio-economic aspects of homestead agroforestry practices than the illiterate farmers.

Table 4.16 Correlation between the dependent and independent variables

Number	Independent variables	Dependent variable (number of trees)
1.	Age	0.409**
2.	Level of education	0.286*
3.	Family size	0.123 ^{ns}
4.	Farm size	0.362**
5.	Homestead area	0.695**
6.	Annual income	0.497**
7.	Annual income from homestead	0.373**
8.	Organizational participation	0.32**
9.	Communication exposure	0.410**
10.	Knowledge on homestead agroforestry	0.424**
11.	Socio- economic aspect	0.408**

*Correlation significant at the 0.05 level,

** Correlation significant at the 0.01 level,

ns= not significant.

4.5 Problem faced by the owner in homestead

In the present research work, the respondents were faced different problems that were created looser financially in their homestead activities. It was observed from the Table 4.17 that the foremost (score 23 and rank 1) problem by the respondents was ‘make quarrel with other land owner’. This problem was hindrance to improve the homestead agroforestry. To solve this big issue the facilitator can took decision to benefit shearing with both land owners. On the other hand, densely planted tree obstructs sunlight and air was the 2nd vital problem (score 17 rank 2). Need proper knowledge about planting trees in homestead, the extension worker and also the members of NGOs can be played a crucial role to overcome this problem.

Table 4.17 Problem faced by the respondents in homestead agroforestry practices

Problem faced by the respondents	Score	Rank order	Remarks
Make quarrel with other land owner	23	1	Benefit shearing with both land owner
Densely planted tree obstructs sunlight and air	17	2	Need proper knowledge about planting trees in homestead
Lack of good quality sapling for plantation	15	3	Providing good quality sapling in proper time
Lack of cash	11	4	Providing lone
Planted sapling hampered by dweller and domestic animal	10	5	Giving some money was lone to by buy bamboo to protect those sapling
High price of saplings	9	6	Providing subsidy to by sapling
Problems regarding infestation of pest and diseases	8	7	Providing training on pest and disease control
Death of trees after planting due to various causes	7	8	Providing training and lone to execute Govt. and non Govt. organization

DISCUSSION

From the aforementioned results it is clearly understood the socio-economic evaluation of the homestead agroforestry practices in two upazilas of dinajpur district. The 100 respondents from Dinajpur Sadar (Chehelgazi and Fazilpur unions) and Kaharole upazilla (Ramchandrapur and Sundarpur unions) were focusing their information related to homestead agroforestry. Homestead agroforestry is the household practice that brings year-round benefits not only meets the domestic purpose but also a source of high income. Homestead agroforestry is a complex issue involving different factors to progress its success, mainly the education as well as money of investment. The farmers of the four (4) study area had lack of knowledge, financial supports and available time to contact with resource person for proper planning and managing of homestead agroforestry.

The results was also revealed that the middle group was majority in responding the interview schedule than young and old age groups. These findings commensurate with the national statistics indicating that selected homestead were typical homestead of the country. The result was showed that the respondents were illiterate that was major portion in the study area, while the primary level, secondary level and above secondary level of the respondent were minor portion. The families which have more family member have more income as they work with their own efforts. The majority of the respondents had medium family income indicated that agroforestry practices are usually practiced by the having comparatively higher economic standings. The results were indicated that homestead agroforestry is a vital source of income of the house hold. Khandaker (1991) reported that agroforestry system is traditional in the homesteads of moist tropical world including rural areas of Bangladesh since the establishment of houses. This system could be considered as potential technology for rural poverty alleviation because of its diversified functions.

CHAPTER 5

SUMMARY CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Four unions were selected from two upazilas namely Dinajpur Sadar and Kaharole under Dinajpur district. Out of 100 farmers, 50 were randomly selected from each upzila and from each union 25 farmers were selected. Farmers for the survey were selected based on five different farm categories.

Data were collected by using an interview schedule developed earlier considering the objective of the study. The schedule contained both open and close form of questions. Simple, direct questions and a few scales were included in the interview schedule. Data obtained from the respondents were coded, complied, tabulated and analyzed in accordance with the objectives of the study. Data were collected during the period from April to June 2017.

The number of tree species of the farmers was the dependent variable of the study. The selected characteristics of the farmers, and homesteads components were taken as independent variables. The selected characteristics of farmers were age, level of education, family size, farm size, homestead area, annual income, and knowledge on homestead agroforestry, organizational participation, and communication exposure socio-economic aspects in this study. Appropriate methods and procedures were followed to measure the independent and dependent variables of the study. The age of the farmers ranged from 22 to 75 years with an average of 47.96 years. The highest proportion (44 per cent) of the farmers fell in the middle aged, 35 per cent of young and only 21 percent old aged category. Thus the majority of the farmers were middle aged. The level of education of the farmers was ranged from 0-16 years of schooling. In this study, 24 percent of the farmers had secondary level of education, 23 per cent illiterate, 37 percent primary level and 16 percent upper secondary level. The family size scores from 2 to 13 members with an average of 5.89. Most of the farmers (54 percent) had medium families compared to 18 percent small and 28 per cent large families.

In the study area the farm size of the farmers ranged from 0.02-2.99 hectares with an average of 0.67. Among the farmers 27 per cent landless, 30 per cent marginal, 23 percent small, 13 per cent medium and only 7 per cent large farm category. The homestead of the farmers was ranged from 0.01 to 0.72 hectares with an average of 0.18 ha. The annual income of the farmers was varied from Tk. 20,000 to Tk. 350000. Annual income of the respondents varied within the farm category. The average annual income was Tk. 50,350. Among of the farmers, it was found that 32 percent low, 48 percent medium and 20 per cent high-income category. The scores of the respondents regarding organizational participation range from 0 to 48. The majority respondents were (45%) found in low participation. On the other hand, minimum contract 15 was found in higher participation.

The scores of the respondents regarding communication exposure ranged from 0 to 45 with an average 14.45. The farmers were showed that majority (42 percent) of the farmers had medium exposure compared to 25 per cent high exposure and 33 per cent low exposure. The knowledge on homestead agroforestry scores of the farmer ranged from 0-26 with an average of 19.60. Majority (44 percent) of the farmers had medium knowledge compared to 38 percent low knowledge and 18 percent high knowledge. A total number of 55 tree species were identified in the homesteaded of the study area of which 23 were fruit, 17 were forest, 11 were medicinal and 4 were others tree species. Among the tree species, the most prevalent species was litchi and lowest of tamarind in study area.

To explore the relationship of the selected 10 characteristics of the farmers with the abundance of tree species observed in Agroforestry farming system as perceived by the farmers, overall 10 null hypothesis were formulated. For testing the hypothesis, coefficient of correlation (r) was used 1% level of significance was the basis for rejecting a null hypothesis. Selected characteristics were statistically significant. Most of the respondents reported that the major problem of planting new trees on homestead makes quarrel with other landowner and densely planted tree obstructs sunlight and air. Some respondent reported that high price of sapling was also another common constraints some of the respondents reported that lack for good quality sapling, infestation of pest and diseases and lack of cash. However, this problem was reported as a major problem mostly by medium and large farmers.

5.2 Conclusion

Bangladesh is predominately a rural economy based country. A large number of rural people are absolutely or functionally landless and remain unemployed or under employed throughout the year. It can be concluded the number of 55 tree species were recorded from the homestead of the study area of which 23 were fruits and 17 were timbers 11 were medicinal and 4 were others species. Among the tree species the most prevalent species was Litchi (39.28) followed by Mango (15.35), Jackfruit (6.87), Sissoo (0.52) and Eucalyptus (0.24). The highest numbers of species (23) regardless of fruit species were found in the large farm categories, while the lowest numbers of species (4) were found in the land less farm category. On the other hand, homestead enterprises play a vital role in providing nutrition, extra income and employment as well as in poverty alleviation.

In a nut shell, the management practice of homestead agroforestry in the study area was found traditional system. Despite land constraint in the country, the rural homesteads are often under-utilized and can be made more productive through application of production technology. Scientific planning in integrated homestead production systems of diversified production viz. vegetables, fruits, wood, fuel wood and timber production in agreement with the farmer's needs, goals and resource base can lead to viable farming systems towards sustainable livelihood in the coming years.

5.3 Recommendation

Based on the findings of this study and observation in the study area, the following recommendation may be considered.

1. Multistoried tree plantation program at the farmer's homestead should be straightened by extension and development agencies.
2. It may be recommended that the extension and development agencies could motivate the farmers having large homestead area to establish integrated homestead production system and increase the homestead agroforestry program. This would create employment opportunity at the rural areas as well as ensure available of fruit, fodder, vegetable, fish and dairy product to the rural people.
3. More emphasis should be given in the supply and availability of good quality seeds/seedlings to the farmers for more production and income.
4. The homestead agroforestry system can be improved by proper care and management and crops having low economic value should be replaced by high economic value.
5. More income generating activities should be created from homestead sources. Since litchi and mango is multipurpose fruit tree commonly found in all locations, industry can be made on the basis of litchi and mango production.
6. It may be recommended that extension and other development agencies should be encouraged for the activities on afforestation program in homesteads as well as grow vegetables or shade loving spices under young orchard or single layered tree in the homesteads.

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APPENDICES

Appendix I. List of plant species observed in the study area

Fruit species			
Sl No.	Common name	Scientific name	Family
1.	Jackfruit	<i>Artocarpus heterophyllus</i>	Moraceae
2.	Mango	<i>Mangifera indica</i>	Anacardiaceae
3.	Coconut	<i>Cocos nucifera</i>	Palmae
4.	Betelnut	<i>Areca catechu</i>	Palmae
5.	Lemon	<i>Citrus limon</i>	Rutaceae
6.	Palmyra palm	<i>Borassus flabellifer</i>	Palmae
7.	Jujube	<i>Zizyphus jujuba</i>	Rhamnaceae
8.	Indian black berry	<i>Syzygium cumini</i>	Myrtaceae
9.	Litchi	<i>Lichi chinensis</i>	Sapindaceae
10.	Sapota	<i>Achras sapota</i>	Sapotaceae
11.	Tamarind	<i>Tamarindus indica</i>	Leguminosae
12.	Pomegranate	<i>Punica granatum</i>	Punicaceae
13.	Pummelo	<i>Citrus grandis</i>	Rutaceae
14.	Guava	<i>Psidium guajava</i>	Myrtaceae
15.	Carambola	<i>Averrhoa carambola</i>	Averrhoaceae
16.	Indian olive	<i>Elaeocarpus floridus</i>	Elaeocarpaceae
17.	Emblica	<i>Phyllanthus emblica</i>	Euphorbiaceae
18.	Hog plum	<i>Spondias mangifera</i>	Annonaceae
19.	Bullock hant	<i>Amona reticulata</i>	Ebenaceae
20.	Gab	<i>Diospyros peregrina</i>	Bromeliaceae
21.	Date palm	<i>Phoenix sylvestris</i>	Palmae
22.	Dewa	<i>Artocarpus lakucha</i>	Anacardiaceae
23.	Hartaki	<i>Terminalia bellirica</i>	Combretaceae

Appendix I. (contd.)

Forest species			
Sl No.	Common name	Scientific name	Family
1.	Babla	<i>Acacia nilotica</i>	Leguminosae
2.	Koroi	<i>Albizia procera</i>	Leguminosae
3.	Raintree	<i>Samanea saman</i>	Leguminosae
4.	Teak	<i>Tectona grandis</i>	Verbenaceae
5.	Eucalyptus	<i>Eucalyptus sp</i>	Myrtaceae
6.	Sissoo	<i>Dalbergia sissoo</i>	Leguminosae
7.	Krishna chura	<i>Delonix regia</i>	Leguminosae
8.	Minjiri	<i>Cassia simea</i>	Leguminosae
9.	Akasmoni	<i>Acacia auriculiformis</i>	Leguminosae
10.	Simul	<i>Bombax ceiba</i>	Bombacaceae
11.	Sal/Gozari	<i>Shorea robusta</i>	Diptrocarpaceae
12.	Gora neem	<i>Melia azadirach</i>	Meliaceae
13.	Mahagoni	<i>Swietenia mahagoni</i>	Meliaceae
14.	Jarul	<i>Lagerstroemia speciosa</i>	Lythraceae
15.	Mangium	<i>Acacia mangium</i>	Leguminosae
16.	Ipil- ipil	<i>Leucuana lecucephata</i>	Leguminosae
17.	Debdaru	<i>Polyalthia longifolia</i>	Annonaceae

Appendix I. (contd.)

Medicinal plant species			
Sl No.	Common name	Scientific name	Family
1.	Bohera	<i>Terminalia bellirica</i>	Combretaceae
2.	Hartaki	<i>Terminalia chebula</i>	Combretaceae
3.	Kharajora	<i>Litsacea monopetala</i>	Lauraceae
4.	Sajna	<i>Morinja oleifera</i>	Morinjaceae
5.	Amloki	<i>Plyllunthus emblica</i>	Euphorbiaceae
6.	Sonalo	<i>Cassia fistula</i>	Leguminosae
7.	Neem	<i>Azadirachta indica</i>	Meliaceae
8.	Wood apple	<i>Aegle mermelos</i>	Rutaceae
9.	Arjun	<i>Terminelia arjuna</i>	Combrataccae
10.	Basaka	<i>Adhatoda vasica</i>	Acanthaceae
11.	Tulsi	<i>Ocimum sanctum</i>	Labiatae

Others plant species			
Sl No.	Common name	Scientific name	Family
1.	Kadam	<i>Anthocephalus chinensis</i>	Rubiaceae
2.	Mandar	<i>Barringtonia acutangula</i>	Leguminosae
3.	Malbery/tut	<i>Morus alba</i>	Moraceae
4.	Petali	<i>Triwia nodiflora</i>	Eaphorbiaceae

Appendix II: An English Version of Survey Questionnaire

Department of Agroforestry and Environment

Hajee Mohammad Danesh Science and Technology University, Dinajpur

“Evaluation of the homestead agroforestry Practices in two upazilas of Dinajpur District”

Name of the respondent: Sl. No.....

Village: Union:

Upazila: District:

(Please reply the following questions)

1.0 Age:

Please mention your present age Years.

2.0 Level of education:

- a) Cannot read and write ()
- b) Can sign only ()
- c) Did not go to school but can read and write ()
- d) I have passed class ()

3.0 Family size:

What is the member of your families (including you)

Male:

Female:

Total:

4.0 Farmer's classification:

Categories	Cultivated land	Tick(✓)
Landless	Upto 0.20 hectare	
Marginal	0.21-0.50 hectare	
Small	0.51-1.00 hectare	
Medium	1.10-2.00 hectare	
Large	More than 2.00 hectare	

5.0 Farm size:

Please state your farm size

Types of land	Local unit	Hectare
Homestead		
Own land under own cultivation		
Own land given to others on borga		
Land taken from other on borga		
Land given to other on lease		
Land taken from others on lease		
Fallow land		
Garden/Nursery/Wood lot		
Total		

6.0

7.0 Use of Homestead area:

Please indicate the extent use of your homestead area.

Description (use of nature)	Amount of area	
	Decimal	Hectare
Living room		
Kitchen room		
Cowshed		
Area Under Vegetable		
Area for fruit tree		
Area for timber		
Court yard		
Fallow		
Pond		
Total		

7.0 Annual income:

Please mention the annual income of your family.

Source	Product	Taka
Homestead	Vegetables	
	Timber and Fuel	
	Fruit	
	Livestock	
	Fish	
Other than Homestead	Field crops	
	Service	
	Business	
	From labour	
	Others	
Total		

8.0 Organizational participation:

Please indicate the nature of your past and present participation in the following Organizations along with duration of participation.

Name of organization	Not involved	Ordinary Member	Executive committee		Duration
			Member	Officer	
Union Council					
Krishok Shamabay Samaity					
Local club					
NGO Group					
School Committee					
Madrasa Committee					
Market Committee					
Others					

9.0 Communication exposure:

Please state your extent of contact with the following extension media

Nature of Communication	Extent of communication			
	Regularly	Occasionally	Seldom	No contact
A) Personal				
Neighbours				
Relatives				
Ideal farmer				
Block supervisor				
Agriculture officer				
Department of forest personnel				
B) Group				
Farmers training meeting				
Agricultural fair/tree fair				
C) Mass				
Printing materials				
News paper				
Listing of tree related programme broadcasted through Radio				
Watching of tree related programme telecasted through TV				

10.0 Number of different trees in homestead area:

What kind of different tree species are there in your homestead area?

Types of plants	Name of trees	Number of trees
Fruit plant species		
Forest plant species		
Medicinal plant species		
Other plant species		

11.0 Knowledge on homesteads agroforestry:

Questions	Full marks	Obtained marks
Please mention the name of 2 shade tree	2	
Please mention the name of 5 fruits tree	2	
Please mention the name of 5 timber tree	2	
Please mention the name of 2 tree which are related with fruits and timber simultaneously	2	
Please mention the name of 2 ornamental tree	2	
Please mention the name of 1 fodder tree	2	
Please mention the name of 2 fast growing tree	2	
Please mention which plants can be planted in limited place ?	2	
Please state the method of pit preparation for planting	2	
Please mention the proper time of planting	2	
Please state the importance of plant for homestead	2	
Please mention the name of 2 trees from which early fruits can be obtained	2	
Please mention which plants can be planted by the pond side ?	2	
Please mention the name of 2 vegetables which cultivated under shade ?	2	
Please mention the name of 2 spices.	2	
Please mention the name of 1 medicine tree	2	
Please mention the name of 2 climbing trees	2	
Please mention the name of 2 creeper.	2	
What is pruning?		
Total	40	

12.0 Please give your opinion on the following statements related with socio-economic aspects due to homestead agroforestry:

Statements	Extent of agreement			
	Strongly agree	Agree	Partially agree	Disagree
Increasing the income due to plantation				
Increasing the availability of fuel materials due to plantation				
Increasing the supply of animal feed from plantation				
Increasing the availability of useful fruits				
Increasing the quantity of vegetables				
Increasing the supply of timber, house making materials, agricultural implements, raw materials for industry due to plant in homestead area.				
Increasing of Zinger, Turmeric cultivation under the shady plant in homestead area.				
Increasing the agroforestry practices				
Decreasing family malnutrition				
Increasing economic security during crisis period.				
Opportunity for use of fallow land for plantation.				
Creation of employment opportunity in establishing nursery and homestead garden				
Improvement of social status				

13.0 Problem related with homestead agroforestry:

Please mention the problems being faced by you regarded homestead agroforestry

- a)
- b)
- c)
- d)

14.0 Give opinion for solve the above mention problems:

- a)
- b)
- c)
- d)

Thanks for co-operation

Signature of investigator

Date

Appendix III: Some pictures showing different homestead area during survey work



a) The researcher was collected data



b) The supervisor helped to understand



c) The supervisor checked the data



d) The researcher asked questions



e) Ideal homestead agroforestry in study area



F) Dwelling place of the respondent