# CONTRIBUTION OF HOMESTEAD AGROFORESTRY PRACTICE TOWARDS REDUCING POVERTY OF JALOKATHI DISTRICT

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## *CERTIFICATE*

*This is to certify that the thesis entitle,* "CONTRIBUTION OF HOMESTEAD AGROFORESTRY PRACTICE TOWARDS REDUCING POVERTY OF JALOKATHI DISTRICT" *submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the requirements for the degree of* ***MASTER OF SCIENCE IN AGROFORESTRY AND ENVIRONMENTAL SCIENCE****, embodies the result of a piece of bona fide research work carried out by* ***JANNATUL FERDOUS****, Registration No.* ***16-07531*** *under my supervision and my guidance. No part of the thesis has been submitted for any other degree or diploma.*

*I further certify that such help or source of information, as has been availed of during the course of this investigation has duly been acknowledged.*

Dated: June, 2018
Dhaka, Bangladesh

**Dr. Nazmun Naher**
**Professor**
**Supervisor**

Dedicated to

My Beloved Parents

And Family

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# CONTRIBUTION OF HOMESTEAD AGROFORESTRY PRACTICE TOWARDS REDUCING POVERTY OF JALOKATI DISTRICT

## ABSTRACT

Homestead Agroforestry is an important consideration for socioeconomic development in our country and also all over the world. Systematic Agroforestry practice is being popular day by day in Jalokahti district of Bangladesh. Considering the situation, the present study aims to contribution of homestead Agroforestry practice towards reducing poverty of Jalokathi District and explore the contribution of the selected characteristics of the homestead farmers on homestead Agroforestry practice. Data were collected by purposive random sampling method of 60 respondents from 350 farmers of three villages of Jalokathi union of Jalokathi Sadar upazila under Jalokathi district by using a pretested interview schedule during the period of 15 June 2017 to 15 December, 2017. Data were analyzed by SPSS version 16. Findings indicated that near about half (48%) of the respondents had high knowledge on homestead production and high Agroforestry contribution (household income) (52%) to reduce poverty under managed Agroforestry. Unmanaged Agroforestry also contributed to reduce poverty (77% with medium household income) but lower than managed Agroforestry system. Out of 8 selected characteristics of the respondents, educational qualification, homestead size, current housing condition, current household assets, current sanitation system and knowledge on Agroforestry had positive significant relationship with Contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. The rest of the variables namely: age and family size did not show any significant relationships with Contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

## ABBREVIATIONS AND ACRONYMS

| | | |
|---|---|---|
| AEZ | = | Agroecological Zone |
| BBS | = | Bangladesh Bureau of Statistics |
| BCSRI | = | Bangladesh Council of Scientific Research Institute |
| *et al.,* | = | And others |
| e.g. | = | exempli gratia (L), for example |
| etc. | = | Etcetera |
| FAO | = | Food and Agricultural Organization |
| M.S. | = | Master of Science |
| % | = | Percentage |
| No. | = | Number |
| Kg | = | Kilogram |
| SAU | = | Sher-e-Bangla Agricultural University |
| USA | = | United States of America |
| WHO | = | World Health Organization |
| SAAO | = | Sub Assistant Agriculture Officer |
| DAE | = | Department of Agricultural Extension |
| NGO'S | = | Non-Governmental Organization |

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# CHAPTER I

# INTRODUCTION

Agroforestry is a practical alternative agricultural farming practice for the production of food, fodder, timber and fuel wood simultaneously with environmental protection. Most Agroforestry systems constitute sustainable land use that helps to improve the soil in a number of ways. Agroforestry is promoted widely as a sustainable production system that combines the best attributes of forestry and agriculture. This practice is now recognized widely as an applied science that is instrumental in assuring food security, reducing poverty and enhancing ecosystem resilience at the scale of thousands of smallholder farmers in the tropics (Adhikari *et al*., 2007). According to World Agroforestry Center, Agroforestry is a dynamic, ecological-based natural resources management system through integration of trees into rangeland and farmland to diversify and sustain production for the increasing socio-economic and environmental benefits for all land users at all levels (Atangana *et al*., 2013; ICRAF, 2006). Agroforestry has been a traditional agricultural practice sustainable for thousands of years and an important element of the cultural rural landscape in tropical and temperate regions around the world (Alam and Sarker, 2011; Kalaba *et al*., 2010; Kumar, 2006; Lamanda *et al*., 2006; Maroy, 2009 and Peyer *et al*., 2006). More than hundred different Agroforestry practices have been identified in tropical and temperate regions (Atangana *et al*., 2013). Agroforestry practices range from open parkland assemblages, to dense imitations of tropical rainforests such as Agroforestry homegardens, to planted mixtures of only a few species, to trees planted in hedges or on boundaries with differing levels of human management of the various components (Dawson *et al*., 2013). The traditional tropical Agroforestry homegarden has been practiced in East and West Africa, South and South East Asia, Pacific Islands, and Mesoamerica, where it is a predominant tropical land use practice (Kumar and Nair, 2004; Peyer *et al*., 2006; Tesfaye *et al*., 2006; Trinh *et al*., 2003 and Wiersum, 2006). The silvo-pastoral practices as

wood pastures on the Iberian peninsula (Garrido *et al*., 2017b and Reisner *et al*., 2007) and in Sweden are some of the examples of prominent Agroforestry practices in Europe (Garrido *et al*., 2017a).

Population of Bangladesh increases in day by day. Growth rate of population in 2016 is 1.37%. Population growth has a large impact on the livelihood of smallholder farmers (Josephson *et al*., 2014). Due to rapid growth of population, farm size are declined. Land fragmentation and declining farm size is a critical problem that smallholder farmers are facing for maintaining the traditional farming practices in (Headey *et al*., 2014). Bangladesh possesses a glorious tradition of Agroforestry systems practiced by her farming communities. Agroforestry home gardens are age-old and traditional land use systems with protection and production functions, contributing particularly to the food and nutrition security of smallholders (Vieira *et al.,* 2012). It is the form of Agroforestry where different kinds of crops, including vegetables and trees are grown in mixture with or without livestock. In this farming system, deliberate planting and management of multipurpose trees and shrubs are followed in intimate association with annual and perennial agricultural crops and, invariably, livestock, within the compounds of individual houses (Motiur *et al*., 2005). Wood, tree branches, leaves and straw are the main household cooking fuels. Agroforestry provides 40% of fuel requirements, another 40% coming from home gardens and 20% from agricultural fields (Rahman *et al*., 2012). When homestead Agroforestry managed by farmer without scientific interruption is known as traditional homestead Agroforestry. It is a eco- friendly production system and have no adverse effect on environment. In Bangladesh, innovative farmers have spontaneously developed Agroforestry systems in their homesteads and croplands. This provides benefits to the rural community because trees offer facility such as shade, shelter, recreation, agroecological balance and so on (Roy, 1997). Homestead Agroforestry may contribute to uplift

the socio-economic condition of the farmers, supply fuelwood, give protection from hazards, provide food and other benefits etc.

The farmers thought that the traditional homestead Agroforestry systems had significant role in improving socio-economic status and upgradation of environmental condition in the area. Therefore, there is a great scope to improve the prevailing homestead Agroforestry practices with the modern Agroforestry technology for maximization of income of the farmers. The extent of knowledge regarding changes in attitude in livelihood encouraged them to adopt the traditional homestead Agroforestry system which is not sufficient enough to adopt a well planned and highly manageable system aiming higher profit and uplift of socio-economic condition (Miah and Hussain, 2009). Traditional Agroforestry homegarden is the main livelihood strategy of smallholder farmers that balances and maintains the natural, financial, human, social and physical livelihood assets and delivers essential livelihood outcomes for the livelihood of the rural community.

Thus it is necessary to strengthen knowledge on homestead Agroforestry for effective utilization of homestead areas with suitable sophistical Agroforestry approach to maximize homestead productivity and family income (Miah and Hussain, 2009). So the study was conducted to fulfill the following objectives.

## Objectives

The objectives of the study were:

1. To find out the existing situation of homestead Agroforestry practices in the study area; and
2. To evaluate the contribution of homestead Agroforestry to reduce poverty regarding upgradation of socio-economic status through income generation using existing wealth

# CHAPTER II

# REVIEW OF LITERATURE

## 2.1 Homestead in Bangladesh

The country consists of 85,000 villages and each village contains about 268 homesteads (BBS, 2003). It is the center of socio-economic activities and traditional cultural heritage of villages in Bangladesh. The homesteads-in which the people live in are locally known as *'Bari',* which occur in linear, cluster or individual pattern (Hussain and Miah, 2004). Homestead perhaps the most important production unit in Bangladesh, which accounts about 25.36 million in the country with 21.90 million in the rural areas (BBS, 2001).The average size of the rural homestead is very small (0.02 ha), which varies widely according to region and socioeconomic status of the households. The homestead and their vegetation in saline (south western part) and hilly (eastern part) regions are relatively larger in size compared to dry land area (north western part) due to socioeconomic and climatic advantages. There exists a positive relationship between the farm size and homestead area i.e. larger the farm size, larger the homestead area (Anam, 1999; Ahmed, 1999 and Basak, 2002). Depending on the locations, the homestead is raised above the f1ood level from the surrounding fields.

## 2.2 Traditional systems of Agroforestry

Different patterns of Agroforestry were common in the early days. For many upland farmers, Agroforestry was a way of life. Shifting cultivation, for example, is believed to have originated in the Neolithic period around 7000 BC (Sharma, 1976). In this system, still common in many hilly areas of tropical Asia, Africa, and Latin America, trees and agricultural crops are arranged sequentially in time and space. Its sustainability in the past was due to low population pressure and availability of large tracts of undisturbed forests. Today, shifting

cultivation promotes soil erosion and land degradation. In as much as we have alternative methods of soil fertility restoration, shifting cultivation is no longer necessary. Homegarden, or homestead, is another common Agroforestry system .In this system, tall trees are intercropped with medium shrubs and short annual crops to produce a variety of foods and green manure besides reducing soil erosion. Intercropping in coconut and oil palm plantations is also common. Farmers generally plant smaller trees such as coffee, cacao, and banana underneath the palms. To arrest land degradation due to shifting cultivation, a fairly successful system called taungya was developed in the mid-1800s in Burma. In this system, the government gave land to shifting cultivators and allowed them to grow trees and agricultural crops together. When the tree canopy closed and precluded further agricultural cropping, farmers were shifted to another site. Taungya was later adopted by many countries of Asia, Africa, and Central America (King, 1968). Many of these systems have now given way to subsistence agricultural systems in several developing countries. Because subsistence farming practices are not ecologically sustainable and often not economical, interest in Agroforestry is increasing.

## 2.3 Homestead Agroforestry and its Implication

According to Alim (1980) the homestead Agroforestry practice is prevalent not only in Bangladesh but also in many South and South East Asian, Latin American and African countries.

Ahmed *et al.* (1980) mentioned that of people in west Java have shown that homegardens is an important "Social status symbol". People, who do not have a homegarden and hence, have to build their house on some one else's homegarden, were considered of low status.

Byron (1984) mentioned that trees from homegardens were estimated to produce about 65 to 70 percent of timber and about 90 per cent of fuelwood and bamboo consumed in Bangladesh

Hocking (1986) reported that some 15 million household of the country occupy about 0.3 million hectare under traditional Agroforestry practice in homestead. Hussain and Shailo (1987) esteemed that 88.5 percent of wood and 48 9% of fuelwood would come from homestead forest.

Lai (1988) found in his study that application of appropriate technology in relation to production and management of trees and crops in the homestead better utilization of land can be achieved with the creation of better living environment there.

According to Leach and Meams (1988) and Dewees (1989), the projection of fuelwood consumption simply in line with population growth is rather unrealistic. Even when fuelwood becomes physically scarce, households have a great deal of latitude in changing their consumption patterns in response. As scarcity worsens and wood prices or the labour cost of gathering fuels increase many new coping strategies would come into play. Tree plantation might increase consumers may use fuels more economically switch to more abundant fuels such as crop residues or intensify efforts to encourage the natural regeneration of woody vegetation and so on.

According to Khandaker (1991), 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.

Islam (1991) found that village forest mainly covered by homesteads accounts only 0.27 million ha and out of 64 district as estimated 28 districts had no public forest land.

Mazher (1996) point out a typical homestead Agroforestry in Bangladesh provides an 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 have increased food availability and generate income of the rural farm families.

Homestead is an area of land in which the household has its own dwelling unit. Different authors have been defined homestead in different ways. Homestead 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 (Ninaz, 1998).

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

Mosabber and Niaz (1999) studied about the floristic composition and socioeconomic aspects of rural homestead forestry. Home gardens are located close to houses and characterized by a mixture of annual and perennial species. The proximity to natural forests and the availability of timbers in local markets also seen to influence the propensity to plant timber and fuel wood in homegardens. Fruit trees dominate the gardens, followed by fuel wood species. Women play an intensive role in the management of homegardens.

Forestry and Agroforestry production systems have been found to provide a multitude of goods and services and hence the capacity to address different constraints for different consumers over different time periods (BBS, 2002). They can contribute to household income/consumption directly through the production of goods (fruits, poles, fuel wood) and indirectly through goods and services such as fodder for livestock, reduction of land degradation, improved soil and water conservation. In addition, other benefits can be realized downstream through reduction of soil erosion and/or increased water flow control. These systems at a more aggregate level can also provide services for international consumers, through benefits for example of carbon sequestration and protection of international waters (BBS, 2002).

## 2.4 Structure and Components of Homestead Agroforestry and their Contribution

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

Dasgupta *et al.* (1988) showed that farmers grew various fruits and vegetables in their homestead These vegetables and fruits (i.e. Guava, papaya, lemon, jujube amaranth, bitter gourd, egg-plant, coconut, date plain, betel nut etc.), which are grown on homestead and farms varied according to their sizes and categories. Large farmers prefer growing a wide range of fruits and vegetables. They were not interested in replacing perennial trees. The potential of the homestead was great which could be improved by replacing the less productive plants with fast growing nitrogen fixing species to provide more fuel, fodder and green manure.

Sultana (1993) stated that homestead vegetables and fruits form in integral part of the family diet and a part of them enters the commercial market. Although every member of the family has some contribution, the major labor input was contributed by women. Most of the homestead agricultural activities, including seed preservation, land preparation, transplanting, watering and harvesting are done by women Men usually help in fertilizer and pesticide application

Rahman (1995) dealt with the consequences of homestead crop production under homestead Agroforestry practices on family income and women's status. These farms had earned substantial income and production gains. The women of the households gained in terms of higher social status. The gender status in particular has improved significantly on these households as evidenced by the increased participation of homestead Agroforestry practicing women in taking decisions on crucial socioeconomic matters in the households.

Alam *et al.* (1996) conducted a study on diversity and economic aspects of village forests in Bangladesh. Both indigenous and trees are the major components of the village forests. Most of the village trees have multiple uses. About 40 per cent are fruit trees, and others produce timbers, fuel woods, fodders, tannins pharmaceutical products, etc. Homestead tree production system in villages is a mode of species and genetic conservation for a good number of trees. They can contribute to household income/consumption directly through the production of goods (fruits, poles, fuelwood) and indirectly through goods and services such as fodder for livestock, reduction of land degradation, improved soil and water conservation. In addition, other benefits can be realized downstream through reduction of soil erosion and/or increased water flow control.

Agroforestry systems at a more aggregate level can also provide services for international consumers, through benefits for example of carbon sequestration and protection of international waters (BBS, 2002).

Populations have greatest likelihood of persistence if their habitat is sufficiently connected to enable movements by individuals between subpopulations. Landscapes with good habitat connectivity (vegetation patches in close proximity to one another, retained riparian strips and other linking corridors, and the presence of native species such as pasture species and scattered „paddock" trees in the landscape matrix between remnants) generally represent better quality habitat for native flora and fauna than isolated patches of vegetation ( Seddon *et al.* 2005).

A study was conducted at Sitakunda, Chittagong. Bangladesh, purposively from 14 May to 28 June 2006 *Eucalyptus* was found to raise as a component of Agroforestry in agricultural field and other fallow land of Homestead with the objective of getting more economic return. The main agricultural crops found were bean and rice. The study revealed that agriculture was the major occupation of the selected respondents (69%). The mean annual income of the respondents

was Tk. 67,000.00 and average land holding was 31.5 decimal for the respondents who were practicing Agroforestry in their croplands and 14.5 decimal, which raised mono plantation of Eucalyptus and 13.27 decimal lands, which raised mixed home garden. All most all farmers reported the negative effect of Eucalyptus on rice yield. Regarding the investigation on allelopathic effect of Eucalyptus most of the farmers (92%) said that they did not know any allelopathic effect of it on other crops. The farmers in the study area favor the planting of eucalyptus for six important reasons of which the most important ones are it‟s adoptability to grows wells both in dry and wet sites followed by its fast growing characteristics (Ahmed, 2002).

The characteristics of traditional homestead Agroforestry have been discussed in terms of area distribution in different components, types of crops, trees grown, diversity of plants and changes made in the homestead Agroforestry. A traditional homestead Agroforestry is made of a house and other components such as Crops, plants and trees animal house tubewell/dug well open space. The vegetation in the homestead Agroforestry can be divided into three categories, *viz*., crops, woody trees and non-woody trees. Crops such as different vegetables formed the ground strata. Non-woody trees are mostly the middle-strata whereas the trees are the high-strata plants (Jana *et al.,* 2015).

Agroforestry is a dynamic, ecologically based natural resource management system that, through which the integration of trees/woody perennials in farm and rangelands, diversifies and sustains production for increased social, economic and environmental benefits (Leakey, 1996). Agroforestry was expected to reduce soil erosion, improve soil quality, vegetative cover, land productivity and uplift the farmers level of living through sustained farm productivity Agroforestry can play a major role in bringing the desired level of diversification along with sustainability.

There are different combinations of fruit tree-vegetable associates. In a study (Ahmed, 1999) a total of 32 vegetables were found to grow in association with trees either under direct shade were food and cash generating plants and the associated fruit trees were Jackfruit, Mango, Date palm, Coconut, Jujube and Litchi etc. The creeper vegetables grown on the trees were sponge gourd, ribbed gourd, country bean, bitter gourd; sweet gourd and most common host plant were jackfruit, mango, coconut, jujube etc. Pineapple was grown under shade of jackfruits, litchi and coconut.

Home garden‟ (HG) is a complex sustainable land use system (Marambe *et al.,* 2012), which generally combines multiple farming components, i.e., annual and perennial crops, trees, shrubs, livestock and fishery. The flow of goods and services from the home garden not only provides the household needs and employment support, but also environmental services similar to those of natural forests as a result of being a mixed farming system consisting of fruits, vegetables, trees and animals. Gautam *et al.* (2004) reported that in India Agroforestry homegarden contributed 60% of the household‟s total fruit and vegetable consumption, in Philippines, twenty percentage (20%) of the foods consumed by families are produced in the homegarden whereas in Vietnam 51% of their produce is used by household members. Small animals such as rabbits, poultry and bees can be associated with the garden for animal protein intake and vitamins. In home garden or Agroforestry systems, tree fruits are increasingly cultivated for securing food and nutrition sources during crisis period of a year when adequate access to food is not possible (Rahman *et al.,* 2012).

Consumption of fruits and vegetables is vital for a diversified and nutritious diet for a family. Increasing dietary diversification is the most important factor in providing a wide range of micronutrients and this requires an adequate supply, access to and consumption of a variety of foods (Iannotti *et al*., 2009).

Khan *et al*. (2009) asserted that farmers consumed their harvested vegetables, sold some of them and also distributed to other to strengthen social relation. The findings also agreed with Islam *et al*. (2003). Bloem *et al*. (2001) reported that vegetables and fruits production and consumption increased as well as income also increased among the beneficiaries of the homestead food production programme in Bangladesh.

Farmers benefited from homegarden in several ways. Homegarden act as a reserve bank" of food and cash for farmers. The income from homegarden was significantly different within the farm categories. Larger farm categories were getting more income than the smaller farm categories because of having large pieces of land. It was observed that the medium farmers intensively cultivated the homegarden. This might be the reason for getting more income from their homegarden (Alam *et al*., 2005).

Homesteads are multipurpose entities with dwellings, vegetables, spices, fruits and fuel wood/timber species. Historically, homesteads have been providing multiple products to the households and meet their diversified need through the production of a wide variety of fruits, vegetables, spices and different tree products (Miah and Danesh, 2002). The prevailing climatic and edaphic conditions of Bangladesh are the key factors for providing such a unique opportunity of producing a wide range of products. It has been reported that homestead production system collectively contributes about 70 percent fruits, 40 percent vegetables, 70 percent timber and 90 percent firewood and bamboo requirement of the country (Miah and Ahmed, 2003).

A vast majority of rural people in Bangladesh who cultivate land for crop production remains unemployed for a considerable period of the year because of seasonality of production activities and labor requirements. Homestead farming is the best answer to such unemployment situation through both vegetable growing, and culture of quick growing fruits enabling the people to remain

employed round the year (Ahmad, 1995). It has been found that over the decades, small-scale homestead activities have become the most significant income generating activities of poor households. For example, over 5 million people in Bangladesh live in the riverine sand and silt landmasses (known as char in Bengali). These areas are highly prone to sudden flooding and erosion of land, and makes living in the chars hazardous and insecure. The Helen Keller International's homestead food production program was found to provide support to the fragile livelihood in the chars and improved the wellbeing of the entire household by promoting low cost technologies for gardening and livestock-raising, improving food security and dietary practices, providing employment for women and a source of income for the household (Helen Keller International, 2003). *Artocarpus heterophvllus* (Jackfruit) based system provides diversified outputs to the growers. The jackfruit is consumed almost as the main food during the main harvesting periods (July-August) and the seeds are used in various cooked forms (Miah and Ahmed, 2003). In addition, non-edible portion of the fruit and green leaves are fed to cattle and goats, its wood is used for making all kinds household furniture. During the season, almost all members of the family remain busy with harvesting, transportation and marketing of fruit.

Women - the vulnerable group of the society and half of the population have the great opportunity for self-employment in the income-generation activities through the practice of vegetable and fruit production in the homestead. Use of family labour, especially women labour in the production process not only satisfies a wide range of domestic needs more economically but also ensures lowering of production costs and ultimately promotes more income. Average return per decimal of homestead land is far more than that of large farmhouseholds, possibly due to the more intensive labor inputs on the part of women in poor households (Ahmad, 1995).

Livelihood security comparison of traditional Agroforestry system and commercial Agroforestry system: In the traditional Agroforestry systems since

the trees are naturally growing especially in traditional Agroforestry region and are just allowed to be thriving by the farmers, the costs associated with management of the trees are negligible except that of indirect costs associated with the shade and competition due to moisture and nutrient needs (Dwivedi *et al.,* 2007 ). Therefore, only the benefits from trees on account of harvest and sale of tree produce were accounted, while commercial Agroforestry system is characterized by trees in close association with crops either on farm bunds/ boundaries or within the fields. Although traditional Agroforestry seems less promising as compared to commercial Agroforestry, but it is also relevant to the farmers. Both the system will helpful for farmers livelihood.

Agroforestry homegardens are common in most tropical countries and they play a vital role in supporting households in many diverse ways, including provision of food, fuel wood, building materials, and fodder for livestock, and income. They are regarded as source of income diversification and also play crucial cultural and social role in rural communities (Fernandes and Nair, 1986; Bonifasi, 2004; Guuroh *et al*., 2011) defined homegardens as land use practices involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably, livestock, within the compounds of individual houses, the whole crop-treeanimal unit being managed by the family labour. Agroforestry homegardens are primarily used for subsistence purposes by households; they are increasingly being used to generate income (Mendez *et al*., 2001). The quantity of Agroforestry homegardens production that actually gets sold is highly variable, differing from one household to another. Hoogerbrugge and Fresco (1993) reported that between 9% and 51% of production is sold in Indonesia.

In most tropical Agroforestry homegardens, food production is the first function and role. One major aspect of significant role of food production in homegardens is to hold up continuous production throughout the year (Kebebew *et al*., 2011) reported that in Southern Ethiopia 88.8% of the surveyed households were food

secured throughout the year. Homegardens also can solve the problem of land scarcity by using a small land the households have by integrating various components in the same piece of land hence food security and income generation (Abebe, 2005).

The combination of crops with different production cycles and rhythms results in a relatively uninterrupted supply of food products (Nair, 2012). Depending upon the climate and other environmental characteristics, there may be peak and slack seasons for harvesting the various products, but generally there is something to harvest daily from most homegardens (Kumar and Nair, 2004). Most of this production is for home consumption, but any marketable surplus can provide a safeguard against future crop failures and security for the interval between the harvests (e.g. rice in Java and Sri Lanka, coffee and maize in Tanzania, coconut and rice in southwestern India, and so on). Additionally, these harvesting and maintenance operations require only a relatively small amount of labor from the members of the family (Krishnal *et al*., 2012). Hence homegardens are among the best solutions of household food security and income generation to smallholder farmers due to their diversity (Kebebew *et al*., 2011). This is especially in all areas of the tropics under pressure from increasing populations and unsystematic deforestation.

Homegardens can contribute to household income in several ways. Income from homegardens comes from selling cereal crops, fruits, vegetables and other cash crops (e.g., lime, rambutan, jackfruits, durian, cloves, and coffee) to local brokers or merchants (Marsh, 1998). In many cases, sales of products produced in homegardens significantly improve the family‟s financial status. For example in West Java, as much as two-thirds of the homegardens production is reported to be sold (Wilson, 1995), while in South African homegardens only 28% of such products were sold, the remainder being used for household consumption (High and Shackleton, 2000). In Indonesia and Nicaragua homegardens contributed 21.1% and 35% of their total income respectively (Tynsong and

Tiwari, 2010). In South-West Bangladesh and North Eastern Bangladesh, an average of 15.9% and 11.8% of household income is derived from homegardens respectively (Motiur *et al*., 2005). Hence generally, homegardens play a great role in income generation as compared with other sources as it uses multiple components that produce diverse products. In this study it is aimed to assess the Agroforestry homegardens contribution to household food security and income generation in Mbeya Rural District which is unknown.

# CHAPTER III

# MATERIALS AND METHODS

The methods used and a chronological description of the methodology followed in conducting this research work has been presented in this chapter.

## 3.1. Locale of the study

Jalolkathi Sadar upazilla of Jalokhati district was selected purposely as the locale of the study. Three villages namely, Balakdia, Sugandha and Jalolkathi of Jalolkathi union under Saddar upazila were selected randomly. Generally, flood water does not overflow this area. The soil of this area is fertile and suitable for homestead farming. Besides, local communication system in this union is satisfactory.

## 3.2. Population and sample

People who permanently reside in the selected villages constituted the active population of this study. As all population of the study area cannot measure, head of the farm families of three villages under Jalolkathi union was the population of the present study. However, representative sample from the population were taken for collection of data following purposive random sampling technique. One farmer (who mainly operated the farming activities of the family) from each of the farm families was considered as the respondent. An updated list of all farm family heads of the selected villages was prepared with the help of Sub-Assistant Agricultural Officer (SAAO) and local leader.


**Figure 3.1. Map of Jalolkathi district**

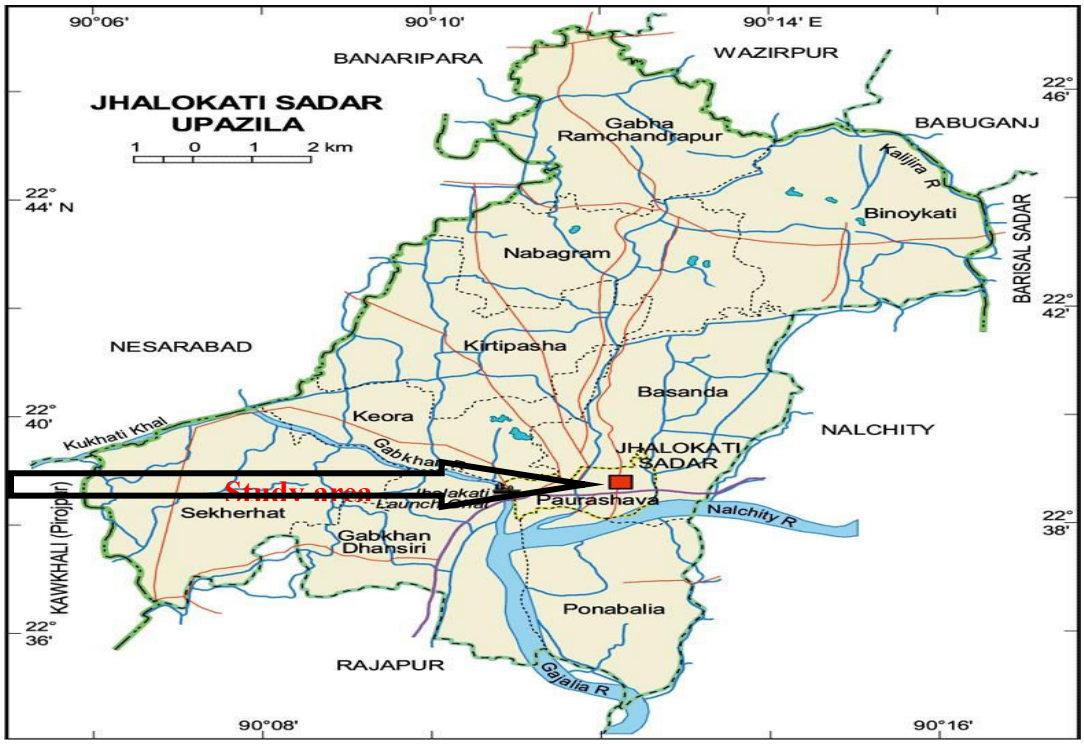


**Figure 3.2. Map of Jalolkathi Sadar Upazila showing study area**

The list comprised of a total 350 farm families in the study area. These rural families constituted the population of this study. Twenty percent of the farm families of these villages were randomly selected as representative sample by using a Table of Random Numbers (Kerlinger, 1973). Thus, 60 farm family head constituted the sample of the study. Further 10 respondent farmers were selected randomly from the population except the sample included in the reserved list, which were interviewed when the respondent in the original sample list were not available at the time of interview. A detailed structure of population and sample has been presented in the Table 3.1.

**Table 3.1: Distribution of population and sample of the selected villages**

| Village | Population (Families) | Sample size | Reserved list |
|---|---|---|---|
| Balakdia | 110 | 20 | 5 |
| Sugandha | 115 | 20 | 5 |
| Jalalkathi | 125 | 20 | 5 |
| Total | 350 | 60 | 15 |

### 3.3. Variables and their measurement techniques

In a descriptive social research, selection and measurement of the variable is an important task. A variable is any characteristics which can assume varying or different values are successive individual‟s cases (Ezekiel and Fox, 1959). An organized research usually contains at least two identical elements i.e. Independent and dependent variable. An independent variable is the factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A dependent variable is the factor, which appears, disappears or varies as the experimenter introduces, removes or varies the independent variables (Townsend, 1953). According to the relevance of the research area, the researcher selected 8 characteristics of the respondents as the independent variables (e.g. age, educational qualification, family member, homestead size, current housing condition, current household assets, current sanitation system and knowledge on Agroforestry). On the other hand

contribution of homestead Agroforestry i.e. household income towards reducing poverty was the dependent variable. The following sections contain procedures of measurement of dependent and independent variables of the study.

### 3.3.1. Measurement of independent variables

The independent variables of the study were age, educational qualification, family member, homestead size, current housing condition, current household assets, current sanitation system and knowledge on Agroforestry. The procedure followed in measuring the independent variables have been discussed in the subsequent sections.

#### 3.3.1.1. Age

Age of the respondents was measured in terms of actual years from their date of birth to the time of interview, which was found on the basis of verbal response of the rural people (Azad, 2003). A score of one (1) was assigned for each year of one's age. This variable appears in item number one (1) in the interview schedule as presented in Appendix-A.

#### 3.3.1.2. Educational qualification

Education was measured by assigning score against successful years of schooling by a respondent. One score was given for passing each level in an educational institution (Amin, 2004). For example if a respondent passed the final examination of class five or equivalent examination, his education score was given five (5). Each illiterate respondent was given a score of zero (0). A person not knowing reading or writing but being able to sign only was given a score of 0.5. This variable appears in item number two (2) in the interview schedule as presented in Appendix-A.

#### 3.3.1.3. Family member

The family size was measured by the total number of members in the family of a respondent. The family members included family head and other dependent

members like husband/wife, brother and sister, parents, children etc. who lived and ate together. The total number of family members was considered as his family size score. If a respondent had five members in his/her family, his/her family size score was given as five (5) (Khan, 2004). This variable appears in item number three (3) in the interview schedule as presented in Appendix-A.

#### 3.3.1.4. Homestead farm size

Farm size of a respondent referred to the total area of land on which his family carried out farming operation, the area being in terms of full benefit to the family. The term refers to the cultivated area either owned by the respondent or cultivated on share cropping, lease or taking from other including homestead area.

#### 3.3.1.5 Current housing condition

Current housing condition was measured compared to 10 years before housing status. Housing condition was categorized into three viz. Not well maintained house, Tin, bamboo and well maintained house and d Brick, wood and galvanized iron house

#### 3.3.1.6 Current household asset

Current homestead asset condition was measured compared to 10 years before. Current homestead asset was categorized as low, medium and high.

#### 3.3.1.7 Sanitation condition

Sanitation condition was considered as compared to 10 years before sanitation condition. This condition was categorized into Chari and sanitary toilet

#### 3.3.1.8 Knowledge on Agroforestry

Knowledge on Agroforestry is a very important to study the household contribution to reduce poverty. It was measured under the category of low medium and high.

### 3.3.2. Measurement of Dependent Variable

The dependent variables in this study, was contribution of homestead Agroforestry towards reducing poverty. Here, household income was considered as main contribution of homestead Agroforestry towards reducing poverty.

### 3.4 Hypothesis

A null hypothesis states that there is no relationship between the concerned variables. If a null hypothesis is rejected on the basis of statistical test, it is concluded that there is a relationship between the concerned variables. However, following null hypotheses was formulated for the present study:

"There was no relationship between the selected characteristics of the farmers and Contribution of homestead Agroforestry i.e. household income towards reducing poverty"

The selected characteristics are: age, educational qualification, family member, homestead size, current housing condition, current household assets, current sanitation system and knowledge on Agroforestry.

### 3.5 Collection of Data

Data were collected by the researcher himself during 115 June 2017 to 15 December, 2017. To get valid pertinent information, the researcher made all possible efforts to explain the purpose of the study to the respondents. Interviews were conducted with the respondents in their homes and farms. While staring interview with respondent, the researcher look all possible care to establish rapport with him/her so that she/he did not feel hesitant or hesitate to furnish proper response to the questions and statements in the schedule. The questions were clearly explained wherever any respondent felt difficulty in understanding properly. The Sub-Assistant Agricultural Officer (SAAO), Agricultural officer, DAE rendered good cooperation in arranging appointments with the respondents.

### 3.6 Compilation of Data

After completion of field survey data from 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 schedules were transferred to a master sheet to facilitate tabulation. Tabulations and cross tabulations were done on the basis of categories developed by the investigator himself.

### 3.7 Categorization of the respondents

Categories were developed for describing each of the selected characteristics of the rural people. For the purpose, the respondents were classified into categories on the basis of obtained scores of knowledge on homestead Agroforestry. Nature of the data and mode of the categorization prevailing on the social system guided the researcher in developing categories in respect of selected characteristics.

### 3.8 Statistical analysis

Data collected from the respondents were analyzed and interpreted in accordance with the objectives of the study. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Sciences) computer program. Statistical measures as number, range, mean, standard deviation and rank order were used in describing the variables whenever applicable. In order to explore the contribution of homestead Agroforestry (i.e. household income ) towards reducing poverty performed by the respondents and their selected characteristics, Pearson‟s Product Moment Correlation Co-efficient (r) was used (Ray and Mondal, 2004).

Throughout the study, five percent (0.05) level of significance was used as the basis for rejecting any null hypothesis. If the computed value of (r) was equal to or greater than the tabulated value of (r) at the designated level of significance

for the relevant degree of freedom, the null hypothesis was rejected and it was concluded that there was significant relationship between the concerned variable. Whenever the computed value of (r) was found to be smaller than the tabulated value of (r) at the designated level of significance for the relevant degrees of freedom, the null hypothesis could be rejected. Hence, it was concluded that there was no relationship between the concerned variables.

# CHAPTER IV

# RESULTS AND DISCUSSION

This chapter deals with the results and discussion of present research work. Necessary explanations and appropriate interpretations have also been made showing possible and logical basis of the findings. However, for convenience of the discussions, the findings are systematically presented under different sections, headings and tables.

## 4.1 Selected characteristics of the respondents

The selected characteristics of the respondents were classified into two phases *viz*. managed Agroforestry and unmanaged Agroforestry and population number for managed and unmanaged Agroforestry was 25 and 35 respectively. Those people who maintain their homestead production was termed as managed Agroforestry and those who do not maintain were termed as unmanaged Agroforestry.

### 4.1.1. Age

Age of the respondents varied from 33 to 62 years, the average being 47.04 years with the standard deviation of 8.05 for managed Agroforestry practicing by farmers (Table 4.1). Again, for unmanaged Agroforestry practicing by farmers, age of the respondents varied from 31 to 66 years, the average being 44.46 years with the standard deviation of 9.76 (Table 4.1).

According to their age, the respondents were classified into three categories as "young aged" (up to 35 years), "middle aged" (36- 50 years) and "old aged" (above 50 years). The distribution of the farmers according to their age is shown in Table 4.1.

Table 4.1. Distribution of the farmers according to their age regarding managed and unmanaged Agroforestry

| Categories | Managed (N=25) | | | | Unmanaged (N=35) | | | |
|---|---|---|---|---|---|---|---|---|
| | Respondents | | Mean | SD | Respondents | | Mean | SD |
| | No. | Percent | | | No. | Percent | | |
| Young age (< 35 years) | 2 | 8 | 47.04 | 8.05 | 8 | 22.9 | 44.46 | 9.79 |
| Middle age (36-50 years) | 14 | 56 | | | 18 | 51.4 | | |
| Old age (> 50 years) | 9 | 36 | | | 9 | 25.7 | | |
| Total | 25 | 100 | | | 35 | 100 | | |

Age is one of the most vital factors concerning to one's livelihood. Data represented in Table 4.1 indicate that near about half (47.04 and 51.40 percent for managed and unmanaged Agroforestry, respectively) of the respondents were middle aged as compared to young and old. This seems logical because heads of the farm families were selected as respondent. With the increase in age they find few alternatives for livelihood except farming activities in parents" farm thus become committed in agricultural activities. This lead to understanding that homestead Agroforestry contribution (annual income) to reduce poverty would reflected more by the middle-aged group in the present study. Therefore, extension agencies should compensate a clear concentration to the middle-aged farmers for more income from homestead Agroforestry.

### 4.1.2. Education

Education level of the respondents ranged from 0.5-14 and 0.5-10 for managed and unmanaged Agroforestry, respectively in accordance with year of schooling. The average education score of the respondents was 7.98 and 3.04 with a standard deviation of 3.87 and 2.83 for managed and unmanaged Agroforestry, respectively (Table 4.2). On the basis of their level of education, the farmers were classified into four categories as shown in Table 4.2.

Table 4.2. Distribution of the farmers according to their level of education regarding managed and unmanaged Agroforestry

| Categories | Score range (schooling years) | Managed (N=25) | | | | Unmanaged (N=35) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Respondents | | Mean | SD | Respondents | | Mean | SD |
| | | No. | Percent | | | No. | Percent | | |
| Can sign only | 0.5 | 3 | 12 | 7.98 | 3.87 | 17 | 48.6 | 3.04 | 2.83 |
| Primary | 1-5 | 4 | 16 | | | 14 | 40.0 | | |
| Secondary | 6-10 | 12 | 48 | | | 4 | 11.4 | | |
| Above secondary | > 10 | 6 | 24 | | | 0 | 0 | | |
| Total | | 25 | 100 | | | 35 | 100 | | |

Data shown in the Table 4.2 indicated that majority of the farmers (48%) had secondary level of education under managed homestead Agroforestry where majority of the farmers (40%) had primary level of education under unmanaged homestead Agroforestry compared to other levels of education. About 24% farmers had above secondary level of education under managed homestead Agroforestry where no farmers had above secondary level of education under unmanaged homestead Agroforestry.

People that have a higher education are more likely to express their positive attitudes towards change in livelihood program, and they also require more information about the production process and method through reading leaflets, booklets, books and other printed materials in this case.

Education helps the farmers to expand their outlook and spread out mental horizon by helping them to develop favorable attitude, correct perception and knowledge about systematic functional activities. Comparatively educated person is relatively more responsive to the technology and new innovations.

The findings of this study, however, indicate that about 88 percent of the farmers under unmanaged Agroforestry were could sign or primary level of education

which is supposed to face a great difficulty in practicing managed homestead Agroforestry. Such consideration indicates the need for improving literacy level among the farmers for practicing managed homestead Agroforestry to produce more income to reduce poverty. So, motivational program should be arranged to make farmers‟ attention in practicing managed homestead Agroforestry.

### 4.1.3. Family Size

The average number of family members was 5.68 and 5.42 for managed and unmanaged Agroforestry, respectively with standard deviation of 1.18 and 0.85, respectively (Table 4.3). Based on the family size the respondents were classified into three categories as small, medium and large family as shown in Table 4.3.

Table 4.3. Distribution of the farmers according to their family size regarding managed and unmanaged Agroforestry

| Categories | Score range | Managed (N=25) | | | | Unmanaged (N=35) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Respondents | | Mean | SD | Respondents | | Mean | SD |
| | | No. | Percent | | | No. | Percent | | |
| Small family | Up to 3 | 0 | 0 | 5.68 | 1.18 | 0 | 0 | 5.42 | 0.85 |
| Medium family | 4-6 | 20 | 80 | | | 32 | 91.4 | | |
| Large family | Above 6 | 5 | 20 | | | 3 | 8.6 | | |
| Total | | 25 | 100 | | | 35 | 100 | | |

Data furnished in the Table 4.3 indicated that the highest proportion (80 percent) of the respondents had medium family size consisting of 4 to 6 members, while 20% of the respondents belonged to the category of large family under managed Agroforestry. Similarly, the highest proportion (91.4 percent) of the farmers had medium family size consisting of 4 to 6 members, while 8.6% of the respondents belonged to the category of large family under unmanaged Agroforestry. Data

indicated that the average family size (5.6) of the respondents in the study area is nearest to the national average of 4.92 (BBS, 2009).

### 4.1.4. Homestead farm Size

The average homestead farm size of the respondents was 31.72 katha and 20.86 katha for managed and unmanaged Agroforestry, respectively with standard deviation of 14.78 and 9.84, respectively (Table 4.4). On the basis of their farm size, the farmers were classified into three categories followed by DAE (1999) as shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their homestead farm size regarding managed and unmanaged Agroforestry

| Categories | Score range | Managed (N=25) | | | | Unmanaged (N=35) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Respondents | | Mean | SD | Respondents | | Mean | SD |
| | | No. | Percent | | | No. | Percent | | |
| Marginal | 10-20 katha | 5 | 20 | 31.72 | 14.78 | 25 | 71.4 | 20.86 | 9.84 |
| Small | 20-30 katha | 12 | 48 | | | 7 | 20.0 | | |
| Medium | > 30 katha | 8 | 32 | | | 3 | 8.6 | | |
| Total | | 25 | 100 | | | 35 | 100 | | |

Data presented in the Table 4.4 demonstrated that the highest proportion (48 percent) of the farmers had small homestead farm compared to 20% having marginal farm and only 32% had medium farm under managed Agroforestry. Similarly, the highest proportion (71.4 percent) of the farmers had marginal homestead farm compared to 20% having small farm and only 8.6% had medium farm under unmanaged Agroforestry. The findings indicated that overwhelming majority (80 percent) of the farmers had marginal to small homestead farm size.

Size of the farm is highly related with achieving income. It contributes to gross and net income. Most of the people of Bangladesh inhabit in the rural areas and majority of them have small income from small operational land. Many of them

in rural area are without sufficient skill and knowledge on homestead production. This is a great treat for achieving sufficient income to reduce poverty. Therefore government extension agencies and NGO"s should pay attention to take steps for marginal and small homestead farm holders on the priority basis. The extension agencies will not able to give them land but can easily train them up on modern agricultural technology related to managed homestead Agroforestry.

### 4.1.5 Knowledge on homestead production system

The average knowledge on homestead production system score of the farmers was 2.48 and 1.06 against the possible range of 0 – 3 having standard deviation of 0.51 and 0.24 for managed and unmanaged Agroforestry, respectively (Table 4.5).

On the basis of knowledge scores, the respondents were classified into three categories namely, low knowledge, medium knowledge and high knowledge. The distribution of the respondents according to their knowledge on homestead Agroforestry is given in Table 4.5.

Table 4.5. Distribution of the farmers according to their knowledge on homestead production system regarding managed and unmanaged Agroforestry

| Categories | Score | Managed (N=25) | | | | Unmanaged (N=35) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Respondents | | Mean | SD | Respondents | | Mean | SD |
| | | No. | Percent | | | No. | Percent | | |
| Low or no | 1 | 0 | 0 | 2.48 | 0.51 | 33 | 94.3 | 1.06 | 0.24 |
| Medium | 2 | 13 | 52 | | | 2 | 5.70 | | |
| High | 3 | 12 | 48 | | | 0 | 0 | | |
| Total | | 25 | 100 | | | 35 | 100 | | |

Data of Table 4.5 shows that 52 percent of the farmers felt in medium knowledge category followed by 48 percent in high knowledge category and no farmers were in low or no knowledge category under managed Agroforestry. Similarly, about 94.3 percent of the farmers felt in no or low knowledge category followed

by 5.70 percent in medium knowledge category and no farmers were in high knowledge category under unmanaged Agroforestry.

Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding systemic homestead production. It is act or state of understanding; clear perception of fact or truth, that helps an individual to foresee the consequence he may have to face in future. It makes individuals to become rational and conscious about related field. To perform optimum production and income from homestead product, farmers should have adequate knowledge on different aspects of production.

### 4.1.6 Housing condition

According to the scoring of housing condition, it is categorized into three levels as not well Maintained house, Tin, bamboo and well maintained house and Brick, wood and galvanized iron house (Table 4.6).

Under managed Agroforestry 52% farmers live in Tin, bamboo and well maintained house and 48% farmers live in brick, wood and galvanized iron house and no farmers live in not well maintained housing condition at present, where at 10 years ago, 36% farmers were lived in Not well Maintained house and 64% were lived in Tin, bamboo and well maintained house and no farmers lived in Brick, wood and galvanized iron house (Table 4.6).

Similarly, under unmanaged Agroforestry 34.3% farmers live in Tin, bamboo and well maintained house and 5.7% farmers live in Brick, wood and galvanized iron house and 60% farmers live in not well maintained housing condition at present, whereas at 10 years ago, 88.6% farmers lived in Not well Maintained house and 11.4% lived in Tin, bamboo and well maintained house and no farmers lived in Brick, wood and galvanized iron house (Table 4.6).

Table 4.6. Changing scenario of housing condition compared to 10 years ago regarding managed and unmanaged homestead Agroforestry

| Categories | Scoring | Managed (N=25) | | | | | Unmanaged (N=35) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Housing condition | | | | Change (%) | Housing condition | | | | Change (%) |
| | | At present | | 10 years ago | | | At present | | 10 years ago | | |
| | | No. | % | No. | % | | No. | % | No. | % | |
| Not well Maintained | 1 | 0 | 0 | 9 | 36 | 36 | 21 | 60 | 31 | 88.6 | 28.6 |
| Tin, bamboo and well maintained house | 2 | 13 | 52 | 16 | 64 | 12 | 12 | 34.3 | 4 | 11.4 | 22.9 |
| Brick, wood and galvanized iron house | 3 | 12 | 48 | 0 | 0 | 48 | 2 | 5.7 | 0 | 0 | 5.7 |
| Total | | 25 | 100 | 25 | 100 | - | 35 | 100 | 35 | 100 | - |

From the Table 4.6 it was found that changes in socio-economic condition regarding housing status, managed Agroforestry is in advance compared to unmanaged Agroforestry. So, it can be stated that managed Agroforestry contributed higher than unmanaged Agroforestry to reduce poverty.

### 4.1.7 Household assets

According to the scoring of household assets, it is categorized into three levels as low, medium and high (Table 4.7).

At present, under managed Agroforestry, 16% farmers had low household assets and 72% farmers had Medium level household assets and 12% farmers had High level household assets, where at 10 years ago, 88% farmers had low household assets and 12% farmers had Medium level household assets and no farmers had High level household assets (Table 4.7).

Similarly, at present, under unmanaged Agroforestry, 82.9% farmers had low household assets and 17.1% farmers had Medium level household assets and no farmers had High level household assets, whereas at 10 years ago, 100% farmers had low household assets (Table 4.7).

Table 4.7. Changing scenario of assets compared to 10 years ago in the study area regarding managed and unmanaged homestead Agroforestry

| Categories | Score range | Managed (N=25) | | | | | Unmanaged (N=35) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Asset | | | | Change (%) | Asset | | | | Change (%) |
| | | At present | | 10 years ago | | | At present | | 10 years ago | | |
| | | No. | % | No. | % | | No. | % | No. | % | |
| Low | <16 | 4 | 16 | 22 | 88 | 72 | 29 | 82.9 | 35 | 100 | 17.1 |
| Medium | 17-21 | 18 | 72 | 3 | 12 | 60 | 6 | 17.1 | 0 | 0 | 17.1 |
| High | >21 | 3 | 12 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 |
| Total | - | 25 | 100 | 25 | 100 | - | 35 | 100 | 35 | 100 | - |

From the Table 4.7 it was found that changes in socio-economic condition regarding household assets status, managed Agroforestry is in advance compared to unmanaged Agroforestry. So, it can be stated that managed Agroforestry contributed to obtain higher household assets than unmanaged Agroforestry to reduce poverty.

### 4.1.8 Sanitation

According to the scoring of sanitation system, it is categorized into two levels as Chari and Sanitary toilet (Table 4.8).

Table 4.8. Changing scenario of sanitary condition compared to 10 years ago regarding managed and unmanaged homestead Agroforestry

| Categories | Scoring | Managed (N=25) | | | | | Unmanaged (N=35) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sanitation | | | | Change (%) | Sanitation | | | | Change (%) |
| | | At present | | 10 years ago | | | At present | | 10 years ago | | |
| | | No. | % | No. | % | | No. | % | No. | % | |
| Chari | 1 | 0 | 0 | 8 | 32 | 32 | 13 | 37.1 | 29 | 82.9 | 69.8 |
| Sanitary toilet | 2 | 25 | 100 | 17 | 68 | 32 | 22 | 62.9 | 6 | 17.1 | 45.8 |
| Total | | 25 | 100 | 25 | 100 | | 35 | 100 | 35 | 100 | |

At present, under managed Agroforestry, 100% farmers has Sanitary toilet and no farmers has Chari system, where at 10 years ago, 32% farmers had Chari system sanitation and 68% farmers had Sanitary toilet (Table 4.8).

Similarly, at present, under unmanaged Agroforestry, 37.1% farmers has Chari system sanitation and 17.1% farmers has Sanitary toilet, where at 10 years ago, 69.8% farmers had Chari system sanitation and 45.8% farmers had Sanitary toilet (Table 4.8).

From the Table 4.8 it was found that changes in socio-economic condition regarding sanitation system, managed Agroforestry is in advance compared to unmanaged Agroforestry. So, it can be stated that managed Agroforestry contributed to obtained higher sanitation system than unmanaged Agroforestry.

## 4.2 Household annual income

The average household annual family income from homestead Agroforestry of the farmers was 433.88 thousand taka with standard deviation of 223.89 under managed Agroforestry (Table 4.9) where under unmanaged Agroforestry, the average household annual family income from homestead Agroforestry of the farmers was 223.89 thousand taka with standard deviation 66.13 (Table 4.9).

On the basis of annual family income from homestead Agroforestry, the farmers were categorized into three classes namely low, medium and high income categories shown in Table 4.9.

Table 4.9. Distribution of the homestead owner according to their household income From homestead Agroforestry regarding managed and unmanaged homestead Agroforestry system

| Categories | Score range (000‟) | Managed (N=25) | | | | Unmanaged (N=35) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Respondents | | Mean | SD | Respondents | | Mean | SD |
| | | No. | Percent | | | No. | Percent | | |
| Low | <200 | 0 | 0 | 433.88 | 91.29 | 8 | 22.9 | 223.89 | 66.13 |
| Medium | 200 - 400 | 12 | 48 | | | 27 | 77.1 | | |
| High | >400 | 13 | 52 | | | 0 | 0 | | |
| Total | | 25 | 100 | | | 35 | 100 | | |

Data shown in Table 4.9 presented that the highest proportion of the respondents (52 percent) had high annual family income while 48% of them had medium annual family income and no farmers had low family income from homestead Agroforestry under managed Agroforestry. Likewise, under unmanaged Agroforestry, 22.9 percent low annual family income while 77.1% of them had medium annual family income and no farmers had high family income from homestead Agroforestry.

Findings reveal that most of the respondents had medium to high annual family income in the selected study area. The gross annual family income of a farmer is an important indicator of how much he/she can invest in his farming. Generally higher income give confidence one’s integrity to achieve better routine and to show his/her individual better status in the society. The higher income increases the risk taking capacity of the farmers‟ towards managed Agroforestry. Farmers with low income generally invest less in their farms and most of them are interested to high return with low input. It is therefore, likely that in most of the cases successful production might be hampered with high synthetic inputs for better returns.

### 4.3 Sources of household income

Under the study, farmers showed their household income from different sources of homestead Agroforestry. Different vegetables, fruits, livestock and fisheries, firewood, dry leaves and timber etc. were considered as source of household income.

#### 4.3.1 Vegetable production (seasonal basis)

Here, production status of vegetables is presented with seasonal basis. Many types of vegetables are available here, among them lalshak, brinjal, bottle gourd, tomato, beans, green pepper and papaya are the main products which are considered as a major source of household income.

Table 4.10. Production status (amount) of vegetable regarding total production, consumption and sell

| Item (vegetables) | Production, consumption and selling status of vegetable (average) | | | | | |
|---|---|---|---|---|---|---|
| | Managed (N=25) | | | Unmanaged (N=35) | | |
| | Production | Consumption | Sell | Production | Consumption | Sell |
| Lalshak (kg) | 74 | 13 | 61 | 6 | 4 | 3 |
| Brinjal (kg) | 76 | 24 | 53 | 21 | 15 | 15 |
| Bottle gourd (pieces) | 341 | 61 | 280 | 34 | 18 | 23 |
| Tomato (kg) | 81 | 23 | 58 | 18 | 12 | 12 |
| Beans (kg) | 114 | 28 | 84 | 21 | 13 | 16 |
| Green pepper (kg) | 59 | 17 | 41 | 14 | 8 | 11 |
| Papaya (kg) | 100 | 14 | 86 | 12 | 9 | 3 |

Under the present study, it was found that production status of vegetable is higher where managed Agroforestry is present compared to unmanaged Agroforestry. Production of every products under managed Agroforestry was higher than unmanaged Agroforestry. So, it can be stated that homestead Agroforestry under managed system, was more productive which contributed to reduce poverty than that of unmanaged system of Agroforestry.

### 4.3.2 Livestock and fisheries production (daily basis)

Livestock and fisheries are important sources of household income (Table 4.11). Under the present study, data were collected on daily basis. It was observed that Chicken egg, Duck egg, Cow‟s milk , Goat and Fishes were the main component of livestock and fisheries. Per day production status may be contributed to reduce poverty. Here, it was also observed that managed homestead Agroforestry was more profitable than unmanaged Agroforestry because of higher production was achieved from managed Agroforestry.

Table 4.11. Production status (amount) of livestock and fisheries regarding total production, consumption and sell

| Item (livestock and fisheries) | Production, consumption and selling status of livestock and fisheries (average) | | | | | |
|---|---|---|---|---|---|---|
| | Managed (N=25) | | | Unmanaged (N=35) | | |
| | Production | Consump-tion | Sell | Production | Consump-tion | Sell |
| Chicken egg (pieces) | 16 | 3 | 13 | 5 | 2 | 3 |
| Duck egg (pieces) | 13 | 3 | 10 | 3 | 2 | 1 |
| Cow's milk (liter) | 5 | 1 | 4 | 1 | 1 | 0 |
| Goat (pieces) | 3 | -- | -- | 2 | -- | -- |
| Fishes (kg) | 534 | 62 | 471 | 32 | 22 | 10 |

### 4.3.3 Fruit production (Season basis)

Under the present study, Jackfruit, Mango, Coconut, Betel nut, Lemon, Palmyra palm, Jujube, Guava, Gab, Banana, Litchi and Sapota were found as the main fruit for homestead production and after consumption a considerable amount was sold for household income (Table 4.12). Income from fruits, was also a major source of household income which contributed to reduce poverty of farmers effectively.

Table 4.12. Production status (amount) of fruit regarding total production, consumption and sell

| Item (fruit) | Production, consumption and selling status of fruit (average) | | | | | |
|---|---|---|---|---|---|---|
| | Managed (N=25) | | | Unmanaged (N=35) | | |
| | Production | Consump -tion | Sell | Production | Consump -tion | Sell |
| Jackfruit (no.) | 195 | 43 | 152 | 41 | 18 | 23 |
| Mango (kg) | 142 | 38 | 104 | 27 | 20 | 7 |
| Coconut (no.) | 281 | 44 | 237 | 37 | 17 | 20 |
| Betel nut (kg) | 59 | 12 | 47 | 12 | 7 | 5 |
| Lemon (kg) | 161 | 22 | 139 | 8 | 6 | 2 |
| Palmyra palm (no.) | 128 | 37 | 91 | 23 | 17 | 6 |
| Jujube (kg) | 72 | 25 | 47 | 19 | 13 | 6 |
| Guava (kg) | 74 | 21 | 52 | 19 | 14 | 3 |
| Gab (kg) | 83 | 22 | 61 | 17 | 13 | 5 |
| Banana (Chora) | 92 | 19 | 73 | 17 | 13 | 4 |
| Litchi (no.) | 742 | 230 | 512 | 170 | 137 | 33 |
| Sapota (kg) | 69 | 24 | 45 | 17 | 11 | 6 |

Here, it was also observed that managed homestead Agroforestry regarding fruit production was more profitable than unmanaged Agroforestry because of higher production was achieved from managed Agroforestry.

### 4.3.4 Firewood, dry leaves and timber production (daily basis)

A considerable amount of cash was achieved from Firewood, Dry Leaves and Timber which were also important source of household income that also might be contributed to reduce poverty (Table 4.13). It was observed that managed homestead Agroforestry was more profitable than unmanaged Agroforestry regarding firewood, dry leaves and timber production.

Table 4.13. Production status (amount) of firewood, dry leaves and timber production regarding total production, consumption and sell

| Item (firewood, dry leaves and timber) | Production, consumption and selling status of firewood, dry leaves and timber production (average) | | | | | |
|---|---|---|---|---|---|---|
| | Managed (N=25) | | | Unmanaged (N=35) | | |
| | Production | Consump-tion | Sell | Production | Consumption | Sell |
| Firewood (kg) | 68 | 31 | 37 | 22 | 18 | 4 |
| Dry Leaves (kg) | 44 | 20 | 24 | 20 | 17 | 3 |
| Timber (Tk.) in year | 51000 | 13200 | 39000 | 19171 | 6912 | 12457 |

## 4.4. Relationship between the selected characteristics of the farmers and contribution of homestead Agroforestry i.e. household income towards reducing poverty

Co-efficient of correlation was computed in order to explore the relationship between the sleeted characteristics of the farmers and Contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

Table 4.14 was used for descriptive interpretation of meaning of (r)

Table 4.14. The meaning for (r) value

| (r) value | Meaning |
|---|---|
| 0.00 to0.19 | A very low correlation |
| 0.20 to 0.39 | A low correlation |
| 0.40 to 0.69 | A moderate correlation |
| 0.70 to 0.89 | A high correlation |
| 0.90 to 1.00 | A very high correlation |

Source: Cohen and Holliday (1982)

Pierson's Product Moment Co-efficient of Correlation (r) has been used to test the hypothesis concerning the relationship between two variables. Five percent and one percent level of probability were used as the basis of acceptance or rejection of a hypothesis. The Table value of (r)was calculated at (60-1) = 59 degrees of freedom. The summary of the results of the co-efficient of correlation indicating the relationships between the selected characteristics of the respondents and Contribution of homestead Agroforestry (i.e. household income) towards reducing poverty is shown in Table 4.15.

Table 4.15. Pearson's product moment co-efficient of correlation showing relationship between dependent and independent variables

| Dependent variables | Independent variables | Tabulated value at 59 df | | Values of coefficient of correlation |
|---|---|---|---|---|
| | | 0.05 levels | 0.01 levels | |
| Contribution of homestead Agroforestry i.e. household income towards reducing poverty | Age | 0.250 | 0.407 | $0.131^{NS}$ |
| | Educational qualification | | | 0.634** |
| | Family member | | | $0.246^{NS}$ |
| | Homestead size | | | 0.498** |
| | Current housing condition | | | 0.667** |
| | Current household assets | | | 0.585** |
| | Current sanitation system | | | 0.305* |
| | Knowledge on Agroforestry | | | 0.819** |

$^{NS}$ Not significant

** Correlation is significant at the 0.01 level

* Correlation is significant at the 0.05 level

### 4.4.1. Relationship between age of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.131 presented in Table 4.14. The relationship

showed a positive direction. The computed value of (r) (0.131) was found to be smaller than the tabulated value of (r) (0.250) with 59 degrees of freedom at 5% level of probability. The concerned null hypothesis was accepted. The coefficient of correlation between the concerned variable was not significant at 5% level of probability.

The finding implies that the age of the respondents had non-significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

### 4.4.2. Relationship between educational qualification of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.634 presented in Table 4.14. The relationship showed a positive direction. The computed value of (r) (0.634) was found to be greater than the tabulated value of (r) (0.407) with 59 degrees of freedom at 1% level of probability. The concerned null hypothesis was rejected. The coefficient of correlation between the concerned variable was significant at 1% level of probability. The finding implies that the education of the respondents had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. The finding is quite balanced because education helps to manage properly homestead production through gathering knowledge and experience easily.

### 4.4.3. Relationship between family member of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.246 presented in Table 4.14. The relationship showed a positive direction. The computed value of (r) (0.246) was found to be smaller than the tabulated value of (r) (0.250) with 59 degrees of freedom at 5%

level of probability. The concerned null hypothesis was accepted. The coefficient of correlation between the concerned variable was non-significant at 1% level of probability. The finding implies that the family member of the respondents had non-significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

### 4.3.4. Relationship between homestead size of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.498 presented in Table 4.14. The computed value of (r) (0.498) was found to be greater than the tabulated value of (r) (0.498) with 59 degrees of freedom at 1% level of probability. The concerned null hypothesis was rejected. The co-efficient of correlation between the concerned variable was significant at 1% level of probability. The finding implies that the homestead size of the respondents had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. The finding is quite rational because homestead production practice is relatively costly. Hence, large growers get more scope than the small growers as they can invest more money for homestead production.

### 4.3.5. Relationship between current housing condition of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.667 presented in Table 4.14. The relationship showed a positive direction. The computed value of (r) (0.667) was found to be greater than the tabulated value of (r) (0.407) with 59 degrees of freedom at 1% level of probability. The concerned null hypothesis was rejected. The coefficient of correlation between the concerned variable was significant at 1% level of probability. The finding implies that the current housing condition of the

respondents had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

### 4.3.6. Relationship between current household assets of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.585 presented in Table 4.14. The relationship showed a positive direction. The computed value of (r) (0.585) was greater than the tabulated value of (r) (0.407) with 59 degrees of freedom at 1% level of probability. The concerned null hypothesis was rejected. The co-efficient of correlation between the concerned variable was significant at 1% level of probability. The finding implies that the current household assets of the respondents had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

### 4.3.7. Relationship between current sanitation system of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.305 presented in Table 4.14. The relationship showed a positive direction. The computed value of (r) (0.305) was found to be greater than the tabulated value of (r) (0.250) with 59 degrees of freedom at 5% level of probability. The concerned null hypothesis was rejected. The coefficient of correlation between the concerned variable was significant at 5% level of probability. The finding implies that the current sanitation system of the respondents had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty.

### 4.3.8. Relationship between knowledge on Agroforestry of the respondents and contribution of homestead Agroforestry (i.e. household income) towards reducing poverty

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.819 presented in Table 4.14. The relationship showed a positive direction. The computed value of (r) (0.819) was found to be greater than the tabulated value of (r) (0.407) with 59 degrees of freedom at 1% level of probability. The concerned null hypothesis was rejected. The coefficient of correlation between the concerned variable was significant at 1% level of probability. The finding implies that the knowledge on Agroforestry of the respondents had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. In addition, the sign of the coefficient value indicates higher the knowledge on Agroforestry higher the contribution of homestead Agroforestry.

# CHAPTER V

# SUMMARY, CONCLUSION AND RECOMMENDATION

## SUMMARY

The study was conducted among three villages *viz*. Balakdia, Sugandha and Jalolkathi under Jalolkathi upazila of Jalolkathi district to evaluate the contribution of homestead Agroforestry to reduce the poverty of respondents. The sample of 60 farmers was drawn from a population of 350. Data were collected during 15 June 2017 to 15 December, 2017 using a pretested interview schedule. A summary of the major findings is given below:

Average age of the respondents was 47.04 years and majority of the respondents (56%) were middle aged followed by 8% and 36% were young and old-aged respectively, under managed and unmanaged Agroforestry, average age of the respondents was 44.46 and majority of the respondents (51.4%) were middle aged followed by 22.9% and 25.6% were young and old-aged respectively under managed and unmanaged Agroforestry. The highest proportions (48%) of the farmers were in the secondary level. Primary, above secondary level and can sign only level of literacy found 16, 24 and 12 percent, respectively under managed Agroforestry. Under unmanaged Agroforestry, the highest proportions (48.6%) of the farmers were in can sign only level where the primary level and secondary found 40 and 11.4 percent, respectively. It means, a major portion of the respondents (55.45%) were illiterate or having education up to primary level. The highest proportion (80%) of the farmers had medium family size, while 20% belonged to the large family size under managed Agroforestry. Under unmanaged Agroforestry, the highest proportion (91.4%) of the farmers had medium family size, while 8.6% belonged to the large family size.

The highest proportion (48%) of the farmers had small homestead farm size, while 32% and 20% belonged to the medium farm and marginal farm, respectively under managed Agroforestry. Under unmanaged Agroforestry, the

highest proportion (71.4%) of the farmers had marginal homestead farm size, while 20% and 8.6% belonged to the small and medium farm, respectively. Homestead Agroforestry contributed to improve socio economic condition of the study area regarding changes in housing condition. But the highest changes was found from Not well Maintained house to Tin, bamboo and well maintained house condition and Tin, bamboo and well maintained house to Brick, wood and galvanized iron housing condition under managed Agroforestry. Similar trend was also found under managed Agroforestry but upgrading status was lower than managed Agroforestry.

Homestead Agroforestry contributed to increase homestead asset regarding up gradation of socio economic condition of the study area. But the highest increase of homestead asset was found under managed Agroforestry compared to unmanaged Agroforestry. Homestead Agroforestry contributed to upgrade sanitation system which also contributed to upgradation of socio economic condition of the study area. But the highest changes in sanitation system was found under managed Agroforestry compared to unmanaged Agroforestry. The Highest proportion (52%) of the respondents was in medium knowledge category followed by 48% in high knowledge category under managed Agroforestry. Under unmanaged Agroforestry, highest proportion (94.3%) of the respondents was in low or no knowledge category followed by 5.70% was in medium knowledge category. The highest proportion (52%) had high household income followed by 48% having medium income where 0% having low household family income under managed Agroforestry. Under unmanaged Agroforestry, the highest proportion (77.1%) had medium household income followed by 22.9% having low income where 0% having high household family income.

Under the study, farmers showed their household income from different sources of homestead Agroforestry. Different vegetables, fruits, livestock and fisheries,

firewood, dry leaves and timber etc. were considered as source of household income in the study area.

Correlation analysis indicates that educational qualification, homestead size, current housing condition, current household assets, current sanitation system and knowledge on homestead Agroforestry had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. Hence, the null hypotheses concerning these six variables were rejected by the researcher. On the other hand, age and family member of the farmers had no significant relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. Hence, the null hypotheses concerning these two variables were accepted by the researcher.

## CONCLUSION

1. Finding shows that majority of the farmers under managed Agroforestry had medium to high levels of knowledge on homestead production. Where, under unmanaged homestead Agroforestry, maximum respondents were under no or low knowledge on homestead production. Therefore, it can be concluded that knowledge on homestead production contributed to increase production which helps to reduce poverty.

2. Education of the farmers showed that there was significant relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. So, it may, therefore be concluded that formal education of the respondents had contribution to increase household income towards reducing poverty.

3. Farm size of the farmers had significant positive relationship contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. The farmers having large farms and being economically solvent always try to increase their household income, it may be concluded that the contribution of homestead Agroforestry (i.e. household income) towards reducing poverty is remarkable to the farmers having large farms.

4. Current housing condition, Current household assets and Current sanitation system had positive significant relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. It can be concluded that any attempt to increase the socioeconomic status of the farmers would be helpful to reduce poverty.

## RECOMMENDATION

Based on the findings and conclusions of the study, the following recommendations are presented:

i. Majority of the respondents had medium to high knowledge of education on Agroforestry production under managed Agroforestry where under unmanaged Agroforestry showed lower levels of education. Therefore, it may be recommended that attempts should be taken by Department of Agricultural Extension (DAE) and other extension providers to arrange training, motivational campaigning and provide effective technology to increasing homestead production.

ii. Farm size played important role for the farmers to increase their homestead production. Therefore, the Sub Assistant Agriculture Officer (SAAO) should motivate to increase household production through managed Agroforestry.

iii. Education of the respondent had significant positive relationship with contribution of homestead Agroforestry (i.e. household income) towards reducing poverty. Therefore it may be recommended that attempts should be taken to establish adult learning center to increase educational level as well as awareness on managed homestead Agroforestry.

iv. Extension agencies should realize the existing problems of homestead production and take necessary steps to minimize these problems.

Necessary inputs such as quality seeds, seedling, manure and fertilizers, safe protection measures against insect and pest to be made available to the respondents at right time and at fair prices.

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## APPENDICES

Appendix I. English version of the questionnaire of the study on "Contribution Of Homestead Agroforestry Practice Towards Reducing Poverty Of Jalokathi District"

**Department of Agroforestry and Environmental Science**
**Sher-e-Bangla Agricultural University**
**Sher-e-Bangla Nagar, Dhaka -1207**

**Date: ----------** **Sample No: ----------**

**Name:** ----------
**Village:** ----------
**Union :** ----------
**Thana:** ----------
**Mobile:** ----------

**Please answer the following question:**

1. **Gender?**
   **a) Male** **b) Female**
   **Family Member: Boy: ----- Girl: ------ Wife: -------- Husband: ---------**

2. **Age?**
   **a)** Below 30 Years
   **b)** Between 30-40 Years
   **c)** Between 40-50 Years
   **d)** Above 50 Years

3. **Do you have any knowledge about Homestead Agroforestry?**
   **a)** Not at all
   **b)** Little bit
   **c)** Yes
4. **Do you manage your homestead Agroforestry?**
   **a)** Yes
   **b)** No

5. **Educational qualification?**

**a)** Illiterate
**b)** Can sign only
**c)** Primary
**d)** High school
f) HSC
g) Graduate
h) Masters

**6. Homestead size?**

**a)** 10-20 Katha
**b)** 20-30 Katha
**c)** More than 30 katha

**7. Annual household income?**

**a)** 1 lakh
**b)** 1-2 lakh
**c)** 2-3 lakh
**d)** Above 3-5 lakh
**e)** Above 5 lakh

**8. What is your current housing condition?**

**a)** Not well maintained
**b)** Tin, bamboo and well maintained house
**c)** Brick, wood and galvanized iron house

**9. What was your housing condition before 10 years ago?**

**a)** Not well maintained
**b)** Tin, bamboo and well maintained house
**c)** Brick, wood and galvanized iron house

**10. Which type of sanitary do you use (current)?**

**a)** Chari
**b)** Sanitary toilet

**11. Which type of sanitary did you use (10 years ago)?**

**a)** Chari
**b)** Sanitary toilet

**12) Assets (current)?**

a) Bicycle
b) Motorcycle
c) Van
d) Rickshaw

e) Tube well
f) Cow
g) Goat

**13) Assets (10 years ago)?**

a) Bicycle
b) Motorcycle
c) Van
d) Rickshaw
e) Tube well
f) Cow
g) Goat

**14. Vegetables production (kg in season)?**

| Vegetables | Total amount | Consumption | Sell | Price |
|---|---|---|---|---|
| Lalsak | | | | |
| Brinjal | | | | |
| Bottle gourd | | | | |
| Tomato | | | | |
| Beans | | | | |
| Green pepper | | | | |
| Papaya | | | | |
| Okra | | | | |
| Kalmisak | | | | |

**16. Timber production per Year (in taka)?**

| Total | Consumption | Sell | Price |
|---|---|---|---|
| | | | |

**17. Eggs production per day (in number)?**

| Item | Number | Total amount | Consumption | Sell | Price |
|---|---|---|---|---|---|
| **Chicken** | | | | | |
| **Duck** | | | | | |

**19. Fishes production per year (in kg)?**

| Total Amount | Consumption | Sell | Price |
|---|---|---|---|
| | | | |

**20. Milk production per day (in liter)?**

| Item | Number | Total amount | Consumption | Sell | Price |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Cows** | | | | | |
| **Goat** | | | | | |

**21. Firewood production per day (in taka)?**

| Total Amount | Consumption | Sell | Price |
|---|---|---|---|
| | | | |

**22. Fruit production (seasonal basis)?**

| Item( Fruit) | Production | Consumption | Sell |
|---|---|---|---|
| Jackfruit (number) | | | |
| Mango (kg) | | | |
| Coconut (number) | | | |
| Betel nut (kg) | | | |
| Lemon (kg) | | | |
| Palmyra palm (number) | | | |
| Jujube (kg) | | | |
| Guava (kg) | | | |
| Gab (kg) | | | |
| Banana (Chora) | | | |
| Litchi (number) | | | |
| Sapota (kg) | | | |

**23. Dry leaves production (daily basis)?**

| Total Amount | Consumption | Sell | Price |
|---|---|---|---|
| | | | |

**Thanks for your cooperation ……**

Appendix II: Correlation matrix

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | -0.024 | 0.214 | -0.049 | 0.028 | 0.1 | 0.105 | -0.067 | 0.131 |
| B | -0.024 | 1 | 0.026 | .401(**) | .735(**) | .634(**) | .370(**) | .352(**) | .634(**) |
| C | 0.214 | 0.026 | 1 | 0.088 | 0.11 | 0.13 | 0.085 | 0.12 | 0.246 |
| DD | -0.049 | .401(**) | 0.088 | 1 | .442(**) | .522(**) | .416(**) | .337(**) | .498(**) |
| E | 0.028 | .735(**) | 0.11 | .442(**) | 1 | .732(**) | .627(**) | .432(**) | .819(**) |
| F | 0.1 | .634(**) | 0.13 | .522(**) | .732(**) | 1 | .559(**) | .517(**) | .667(**) |
| H | 0.105 | .370(**) | 0.085 | .416(**) | .627(**) | .559(**) | 1 | .382(**) | .585(**) |
| H | -0.067 | .352(**) | 0.12 | .337(**) | .432(**) | .517(**) | .382(**) | 1 | .308(*) |
| I | 0.131 | .634(**) | 0.246 | .498(**) | .819(**) | .667(**) | .585(**) | .308(*) | 1 |

A = Age, B = Educational qualification, C = Family member, D = Homestead size, E = Knowledge on Agroforestry, F = Current housing Condition, G = Current assets, H = Current sanitation system and I = Household income from homestead Agroforestry

Appendix III. Sample data collection from the village people (some pictorial view)

**Plate 1. Data collection sample 1**

**Plate 2. Data collection sample 2**

**Plate 3. Data collection sample 3**

**Plate 4. Data collection sample 4**

**Plate 5. Data collection sample 5**

**Plate 6. Data collection sample 6**

**Plate 7. Data collection sample 7**


**Plate 8. Data collection sample 8**