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**Programme:** Bachelor of Science in Forestry

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**Farmer's Attitude Towards Agroforestry in  
Jhenaidah District**

**SHAHRIAR ASHIK RABBI**

**Student ID. 100546**



**FORESTRY AND WOOD TECHNOLOGY DISCIPLINE  
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# Farmer's Attitude Towards Agroforestry in Jhenaidah District



**Course Title: Project Thesis**

**Course No.: FWT-4114**

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# **Farmer's Attitude Towards Agroforestry in Jhenaidah District**

**SHAHRIAR ASHIK RABBI**

*This thesis paper has been prepared and submitted for the partial fulfillment of the requirement of four-year Professional B.Sc. (Hon's) degree in Forestry and Wood Technology Discipline, Khulna University, Khulna, Bangladesh.*



**FORESTRY AND WOOD TECHNOLOGY DISCIPLINE**

**KHULNA UNIVERSITY**

**KHULNA**

**2014**

## Acknowledgement

At first, I am so much grateful to Almighty Allah and would like to thank Him for successfully completion of my BSC (thesis work).

I would like to express my sincere gratitude and profound appreciation to my respectable supervisor **Arifa Sharmin, Associate professor**, Forestry and Wood Technology Discipline, Khulna University, Khulna, for her continuous supervision, guidance, inspiration, valuable advice and thoughtful suggestion, continuous co-operation and constructive criticism during research period and providing useful books and papers in preparing and writing up this project thesis.

Then I must to thank to my respected beloved **Parents** to give me continuous encouragement, mental and economical support and lots of prayer for me

I like to thank to one of my University seniors of Soil Science Discipline **Koel Shaha** who is now working at NGO 'Unnoyon Dhara' in Jhinaidah for helping me in the field work by giving a lot of informations.

I also thank specially to my closest class mate and friend **Nurunnahar Sathi** for being with me during field survey and sharing her thinking, documents and updated information.

I am so grateful to all of my teachers, Forestry and wood technology Discipline, Khulna University, Khulna, for their valuable suggestions and encouragement.

I have to thank to all of my friends and well wishers as well for their support and encouragement.

Finally I am also grateful to the respondents of the study area for their valuable co-operation during collecting data.

**Shahriar Ashik Rabbi**



**DEDICATED**  
**TO**  
**MY RESPECTED AND BELOVED**  
**PARENTS**

## Abstract

Agroforestry has long been recognized sustainable development models throughout the world due to benefits they brings not only to the economy, society but also to the ecosystem. Agroforestry, now considered as a sustainable agricultural system, is being widely promoted all over the world especially in Bangladesh. This paper searches for the adoption of practicing of agriculture and forest specifically planting tree species, agricultural crops, pastures etc all together by the farmers of Jhenaidah District. The low proportion of forested land and continuous degradation of existing forest cover are serious threats to the sustainability of forestry. The main objective of this study was to investigate and analyze the farmer's attitude toward's agroforestry, the reasons for adoption of agroforestry by farmers and the problems being faced by them in district Jhenaidah. A sample of 102 respondents selected on availability was interviewed through a semi-structured interview schedule individually. Agroforestry is becoming popular in Jhenaidah district. Middle aged farmars (36-50) (42.7%) are interested in Agroforestry practice than traditional practice. The adoption of Younger (26-35) 23.95% farmers are increasing day by day, since they have had more schooling than the older generation or perhaps have been exposed to new ideas as migrant. Primary studied people (59.27%) are the major portion of the area. But others who studied more have better interest in agroforestry. The farmers (23.53%, they taken lease from other people) who have no own land they are not interested in Agroforestry. Paddy, Coconut tree, supari are the best combination. Above 80% respondents have taken positively agroforestry practice, but they have not got enough training skill or facility but just inherit idea from the supirior. If they get this facility, they are more interested in agroforestry practice. Finally we have found that most of the farmer's (94.12%) have positive attitude towards Agroforestry. So there should creat more facility, encouraging program and convenient environment for agroforestry system by the Govt. as well as NGO.



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## Chapter 1: Introduction

### 1.1. Background of the Study:

Bangladesh is a densely populated agricultural country in the world. The area of this country is about 56,977 square miles. Its population is about 160 million. The density of population is about 1018 per square kilometer which is so much rich in number. The per capita income is \$ 990(BBS, 2013).

The area of Bangladesh is very small in comparable to population. Its population growth rate is very high. So, increasing people create new pressure on the various limited resources like forest and land resources. The pressure on the land is increasing day by day. So we have to find new technology to produce more crops and forest products to fulfill our demand in this limited land. Agroforestry is the most suitable form of practice in this case. Agroforestry is the art and science of growing woody and non-woody plants together on the same unit of land for range of benefits (BBS, 2013).

Agroforestry is a sustainable management system for land that increases total production combines agricultural crops, tree crops, forests plants and / or animals. The forests of Bangladesh are too small to meet the demands of timber and firewood and to keep the sustainable environment at present. So, to meet the increasing demand of forest products and to save the environment and ecological balance, agroforestry can be an important system. It is very essential for Bangladesh to increase the forest resources through agroforestry system. We should solve all problems related to Agroforestry practice (Nair, P.K.R. 2006).

Agroforestry has long been recognized sustainable development models throughout the world due to benefits they brings not only to the economy, society but also to the ecosystem. (Thanh, 2005 )

So ultimately agroforestry can be a great solution. Agroforestry systems are most extensive in developing countries where approximately 1.2 billion poor people depend directly on a variety of agroforestry products and services (IPCC, 2000). In the five sub-Sahara African case studies in Franzel and Scherr (2002), agroforestry is shown to have potential to increase farm incomes and solve difficult environmental problems. It is financially more profitable to local farmers in comparison with traditional cultivation, beside its other economic and social

benefits. Thus, it can be a potential alternative cultivation practice that helps to enhance poverty reduction and transition to permanent cultivation (Mai, 1999).

Agroforestry is becoming an important land use in Bangladesh. Gradually here the farmers are adopting agroforestry widely. It has potential to complement the products and services of desired form forests. There are wide spread practice of Agroforestry in Jhenaidah district. Farmers have adopted agroforestry in large scale because of high income, suitable use of land and space, erosion control and protection, crop diversification and risk reduction.

### **1.2. Justification of the Study:**

Land is the most valuable and scarce resource in the country. The per capita land holding is very merge. Hence, scientific and proper utilization of every inches of land is very much essential for national interest. Agroforestry is a sustainable management system for land that increases total production; combine agricultural crops, tree crops, forests plants and animals. AF system provides notable contribution to sustainable agricultural production because of their potentiality to meet economic, social, ecological and institutional conditions for sustainable livelihoods (Nair, P.K.R. 2006).

As the land limitation there is no scope to increase the forest land and agricultural land. In these circumstances, traditional land use pattern should be converted into sustainable land uses, which will permit maintenance of productivity combined with conservation of the resource. So multilayer use of land and the use of same land for many purposes at the same timeshould be developed, for example Agroforestry is one of the farming system. Agroforestry is a sustainable management system for land increasing total production.

Agroforestry may be the best tool to poverty alleviation as well as minimize the pressure on natural forest & may be best potential land use system for sustainable livelihoods in Bangladesh. Agroforestry systems are most extensive in developing countries where approximately 1.2 billion poor people depend directly on a variety of agroforestry products and services (IPCC, 2000).

Jhenaidah is one of the high lands in Bangladesh. The estimate terrain elevation above sea level is 8 metres. Besides there is satisfactory amount of precipitation every year. So it is so

vulnerable for the agroforestry system and a big amount people of this area are directly or indirectly attached with agricultural. But what is their perception over agroforestry is not clear and it is much important to find out this for the further development of agriculture as well as forestry. Besides, earlier there was no such study happened over this concept. As for this; the area is much suitable to study and analyze the perception, attitude and thinking of the farmers towards agroforestry.

### **1.3. Objectives of the study:**

- ❖ To identify the major Agroforestry practices in Jhenaidah district.
- ❖ To know farmer's attitude (intention or view point) and perception (realization or appreciation) about their practice.



## Chapter 2: Literature review

### 2.1. Agroforestry:

Agroforestry is a very efficient land use system in which agricultural crops, forest trees and / or animals are produced in the same unit of land at the same time. It is a part of social forestry.

The theoretical base for agroforestry comes from ecology, via agroecology. From this perspective, agroforestry is one of the three principal land-use sciences. The other two are agriculture and forestry. The term agroforestry was coined in the Philippines (Raintree, 1993). Many scientists define 'agroforestry' from various directions. Some important definitions are referred here.

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components (Lundgren and Raintree, 1982).

According to Bene *et al.*, (1977 ), agroforestry is a sustainable management system for land that increases total production, combines agricultural crops, tree crops and forest plants and / animals simultaneously or sequentially and applies management practices that are compatible with the cultural patterns of the local population.

Young (1989) defines agroforestry as a collective name for land use system in which woody perennials (trees, shrubs etc.) are grown in association with herbaceous plants (crops, pastures) and /or livestock in a spatial arrangement, a rotation or both and in which there are both ecological and economic interactions between the tree and non-tree components of the system.

Agroforestry is a land use that involves the deliberate retention, introduction or mixture of trees or other woody perennials in crop/animal production fields to benefit from the resultant ecological and economical interactions (Nair, 1984).

Agroforestry has long been recognized sustainable development models throughout the world due to benefits they brings not only to the economy, society but also to the ecosystem.

## **2.2. Characteristics of agroforestry:**

- ❖ Multiple plant components at least one of which must be a woody perennial component of the system either ecological and/or economical.
- ❖ A high level of interaction (economic and biophysical) between the woody and non-woody components.
- ❖ Usually multiple products often of different categories (e.g. food, fodder, fuel wood).
- ❖ The cycle of an Agroforestry system is always more than one year.
- ❖ The most simple Agroforestry system is more complex, ecological and economically than a mono-cropping system. (Hasanuzzaman, M, 2009).

## **2.3. Attributes of Agroforestry:**

There are three attributes which all Agroforestry system posses. These are (Hasanuzzaman, 2009)

### **❖ Productivity:**

Most, if not all Agroforestry aim to maintain or increase production (of preferred commodities) as well as productivity (of the land). Agroforestry can improve productivity yields of associated crops, reduction of cropping systems inputs and increased labour efficiency.

### **❖ Sustainability:**

By conserving the production potential of the resources based, mainly through the beneficial effects of woody perennials on soils, Agroforestry can achieve and indefinitely maintain and fertility goals.

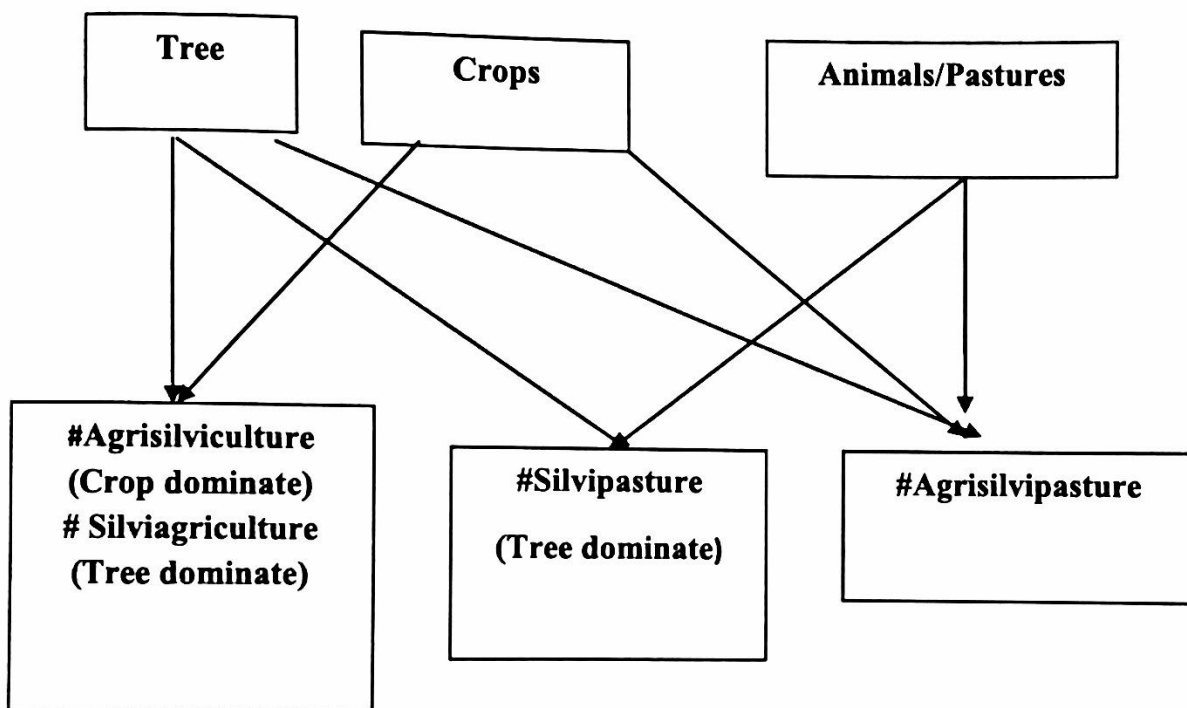
### **❖ Adoptability:**

The word “Adopt” here means accept and it may be distinguished from another commonly used word adapt, which implies “modify” or “change”. Agroforestry has already been accepted by the farming community. However, the implication here is that improved or new Agroforestry techniques that are introduced into new areas should also conform to local farming practice.

## 2.4. Components of Agroforestry

There are major components in Agroforestry systems, these are:

- Tree or woody perennials
- Crops
- Animals



**Fig:-2.1: Components of Agroforestry. (Hassanuzzaman, 2009)**

Agrisilviculture actually means the aggregation of crop cultivation and tree plantation cultivation where crop producing is dominant. Silviagriculture is the same process but here tree plantation is dominant. On the other hand, silvipasture is the combination of tree plantation and pasture cultivation where tree plantation is given more importance. Finally, Agrisilvipasture is the union of agriculture, tree plantation and pasture cultivation. The production of woody perennials combined with annuals and pastures is referred Agrisilvopastural system. (Anon, 2008)

## **2.5. Classifications of Agroforestry:**

Young (1989), the specialists of ICRAF, explained eleven types of agroforestry depending on the time and position of production of the components. Those are described in below-

1. Agro-silviculture
2. Agro-silvipasture
3. Aqua-silviculture
4. Alley cropping
5. Agriculture under tree cover
6. Livestock under tree cover
7. Alternative agroforestry
8. Aqua-forestry
9. Entomo-forestry
10. Homestead agroforestry
11. Cropland agroforestry

Nair (1985) classified the agroforestry systems on the basis of structure, function, socioeconomic and ecological status as the following.

### **2.5.1. Structural Classification:**

Structure refers to composition, stratification and dimension of the crop. On the basis of structure, Agroforestry systems classified into two categories:

1. Nature of components
2. Arrangement of components.

The classification of the agroforestry systems on the basis of the nature of composition is widely recognized and several workers have classified agroforestry systems on basis of composition into the followings (Hassanuzzaman, 2009)

- I. Agrisilvicultural systems.
- II. Silvopastoral systems.
- III. Agrosilvopastoral systems and
- IV. Multipurpose tree plantation systems or other systems.



- **Agrisilvicultural systems:**

The production system of agricultural crops and forests trees in the same land at the same time is called agrisilvicultural system.

- **Silvopastural systems:**

The silvipastural system means a land management system in which forests are managed for the production of wood as well as for rearing of domesticated animals (King, 1979).

- **Agrosilvopastural systems:**

In this system, agricultural crops, trees are produced with animals in the same piece of land. For examples, the Aman paddy is grown in the mango garden in Rajshahi and Dinajpur. After harvesting the paddy, the people sowed the kolai for fodder and their cattle are grazed in this garden. This system is a combination of the agrisilviculture and silvopasture systems.

- **Multipurpose tree plantation systems:**

The system in which forest tree species are produced and managed to produce not only wood but also leaves and/or fruits that are suitable for food and / or fodder.

### **2.5.2. Functional Classification:**

Agroforestry system produce not only various products but also perform various functions.

According to these functions, agroforestry can be classified as the following. (Anon, 2008)

- Productive agroforestry systems
- Protective agroforestry systems
- Multipurpose agroforestry

### **2.5.3. Socioeconomic Basis:**

It refers to the level of inputs of management (low input, high input) or intensity or scale of management and commercial goals. Based on this agroforestry can be classified into-(Anon, 2008)

1. Subsistence
2. Commercial
3. Intermediate

#### **2.5.4. Ecological basis:**

It refers to the environmental condition and ecological suitability of systems, based on the assumption that certain types of systems can be more appropriate for certain ecological conditions; i.e., there can be separate sets of agroforestry systems for arid and semiarid lands, tropical highlands, lowland humid tropics, etc. (Nair-1985)

The agroforestry systems on the basis of climate may be as the following types-

- Tropical
- Subtropical
- Temperate
- Sub-alpine and alpine

On the basis of moisture condition, each of these groups can be subdivided into the followings-

- Wet
- Moist and
- Dry

#### **2.6. Types of Agroforestry Systems:**

##### **I) Agrisilvicultural Systems**

In this system, agricultural crops are intercropped with tree crops in the interspace between the trees. Under this system agricultural crops can be grown upto two years under protective irrigated condition and under rainfed farming upto four years. The crops can be grown profitably upto the above said period beyond which it is uneconomical to grow grain crops. However fodder crops, shade loving crops and shallow rooted crops can be grown economically. Wider spacing is adopted without sacrificing tree population for easy cultural operation and to get more sunlight to the intercrop. Performance of the tree crops is better in this system when compared to monoculture. (Anon, 2008).

## **II) Silvopastoral Systems:**

The production of woody plants combined with pasture is referred to Silvopasture system. The trees and shrubs may be used primarily to produce fodder for livestock or they may be grown for timber, fuelwood, and fruit or to improve the soil. (Anon, 2008)

This system is classified in to three categorized (Anon, 2008)

- a) Protein bank
- b) Live fence of fodder trees and hedges
- c) Trees and shrubs on pasture

### **a) Protein bank:**

In this Silvopastoral system, various multipurpose trees (protein rich trees) are planted in or around farmlands and range lands for cut and carry fodder production to meet the feed requirement of livestock during the fodder deficit period in winter. (Anon, 2008)

Example: *Acacia nilotica*, *Albizia lebbeck*, *Azadirachta indica*, *Leucaena leucocephala*, *Gliricidia sepium*, *Sesbania grandiflora*

### **b) Livefence of fodder trees and hedges:**

In this system, various fodder trees and hedges are planted as live fence to protect the property from stray animals or other biotic influences. (Anon, 2008)

Example: *Gliricidia sepium*, *Sesbania grandiflora*, *Erythrina sp*, *Acacia sp*.

### **c) Trees and shrubs on pasture:**

In this system, various tree and shrub species are scattered irregularly or arranged according to some systemic pattern to supplement forage production. (Anon, 2008)

Example: *Acacia nilotica*, *Acacia leucophloea*, *Tamarindus indica*, *Azadirachta indica*.

## **III) Agrosilvopastoral Systems**

The production of woody perennials combined with annuals and pastures is referred Agrisilvopastural system. (Anon, 2008)

This system is grouped into two categories. (Anon, 2008)

- a) Home gardens
- b) Woody hedgerows for browse, mulch, green manure and soil conservation

### **a) Home gardens**

This system is found extensively in high rainfall areas in tropical South and South East Asia. This practice finds expression in the states of Kerala and Tamil Nadu with humid tropical climates where coconut is the main crop. Many species of trees, bushes, vegetables and other herbaceous plants are grown in dense and in random or spatial and temporal arrangements. Most home gardens also support a variety of animals. Fodder grass and legumes are also grown to meet the fodder requirement of cattle. In India, every homestead has around 0.20 to 0.50 ha land for personal production (Anon, 2008).

Home gardens represent land use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and livestock within the compounds of individual houses. The whole tree- crop- animal units are being intensively managed by family labour. Home gardens can also be called as Multitier system or Multitier cropping. Home gardens are highly productive, sustainable and very practicable. Food production is primary function of most home gardens. (Anon, 2008)

#### **Choice of species: (Anon, 2008)**

**i) Woody species:** *Anacardium occidentale*, *Artocarpus heterophyllus*, *Citrus spp*, *Psidium guajava*, *Mangifera indica*, *Azadirachta indica*, *Cocus nucifera* etc.

**ii) Herbaceous species:** *Bhendi*, *Onion*, *cabbage*, *Pumpkin*, *Sweet potato*, *Banana*, *Beans*, etc.

### **b) Woody Hedgerows:**

In this system various woody hedges, especially fast growing and coppicing fodder shrubs and trees are planted for the purpose of browse, mulch, green manure, soil conservation etc. The following species viz., *Erythrina sp*, *Leucaena leucocephala*, *Sesbania grandiflora* are generally used.

## **IV) Other Systems**

**a) Apiculture with trees:** In this system various honey (nectar) producing trees frequently visited by honeybees are planted on the boundary of the agricultural fields. (Anon, 2008)



**b) Aquaforestry:** In this system various trees and shrubs preferred by fish are planted on the boundary and around fish ponds. Tree leaves are used as feed for fish. (Anon, 2008). The main role of this system is fish production and bund stabilization around fish ponds. It may called Aquaforestry or aquasilviculture.

**c) Mixed wood lots:** In this system, special location specific multipurpose trees (MPTs) are grown mixed or separately planted for various purposes such as wood, fodder, soil conservation, soil reclamation etc. (Anon, 2008).

## **2.7. Possible impacts of Agroforestry**

- Controlling poverty through increase income by higher production of agroforestry products for home consumption and market.
- Food security by restoring farm soil fertility for food crops and production of fruits, vegetables, nuts and edible oils.
- Empowerment to women farmers and other less-advantaged rural residents whose rights to land are insecure through better negotiations.
- Reducing deforestation and pressure on forest by providing fuelwood grown on farms.
- Improving soil health of the farm through ameliorated micro-climate and nutrition level. (Anon, 2011)

## **2.8. History of Agroforestry in Bangladesh:**

This was the first agroforestry program started by the Forest department under social forestry program. Betagi and pomora are the two village of Rangunia Thana of Chittagong district. This were two denuded ( devoid of trees ) hill were the Govt. rehabilitate families who encroached forest land with a view to plant trees along with the provision of cultivation of agricultural crops in the allotted land for each family. Initially the program was started with the participation of 70 families of Betagi village in 1979. Then it was expanded in Pomora village in khas land and protected forestland. Then 235 families 83 in Betagi and 152 in Pomora village has been rehabilitated in those two villages. (Hassanuzzaman, 2009)

**In mid 80s** on farm research division (OFRD) in BARI was established where agroforestry as a land use system were evaluated and its potential and essentiality in our farming system has been judged.

**In 1987**, Bangladesh Forest Research institute (BFRI) was conducted agroforestry research works inlchamoti in Rangunia. Fashiakhali of Dulahazra and Salna of Gazipur with a view to maximize the productivity of the Govt. forest land.

**In 1988**, the institute of forestry in Chittagong University introduced the course of agroforestry in its curricula for the degree of B.SC (hons) in forestry.

**In 1988**, Village and Farm Forestry Program (VFFP) were initiated under the guidance of Prof. Abdul Haque (The professor of Crops Botany) with financial assistance of Swiss Agency for Development and Cooperation (SDC). This program deals with the exploration of feasibility of implementing of agroforestry works in different areas in to the country. This program actually helped in establishing Agroforestry department in the Bangladesh Agricultural University.

**In 1990**, giant NGOs like BRAC, PROSHIKA, SDC and others started agroforestry works in the country.

**In 1990**, Department of Agroforestry and Environment in IPISA was established now Banghabondhu Sheikh Mujibar Rahman Agricultural University (BSMRAU) often MS in Agroforestry.

**In 1996**, Department of Agroforestry was established by the indefatigable works of Prof. Abdul Haque. With the incorporation of courses of agroforestry for the undergraduate students of the faculty of Agriculture, the agroforestry movement gained momentum. In the newly established department he (Prof. Adbul Haque) was the founder head.

**In 1997**, the National Agroforestry Working Group was formed by the active initiation of the personnel engaged in the Bangladesh Agricultural Research Council (BRAC).

**In 1998**, first National Agroforestry Workshop was held at BRAC organized by NAWG during 21-25 June.

In 2000, The Swiss Agency for Development and Cooperation (SDC) initiated its Sustainable Land Use Programme in the late 1980's and in 2000 handed over the programme to HELVETAS Swiss Intercooperation for implementation.

In 2004, the programme, active in the North and South-Western parts of Bangladesh, developed a successful nursery model in order to reduce poverty by promoting agroforestry.

In 2005, the programme expanded to the whole country under the new name of AFIP: Agroforestry Improvement Partnership. In order to ensure quality planting material (QPM) of timber, fruit and medicinal plant species, the AFIP project collaborated with national level research and extension organizations.

## **2.9. Agroforestry System Practiced in Bangladesh:**

An Agroforestry Practice denotes a distinctive arrangement of components in space and time (Nair, 1993). Examples of Agroforestry practices are Tree home gardens, woodlot, Boundary planting, live fences, alley Cropping, Planting crop combinations, etc.

### **2.9.1. Homestead agroforestry**

Homestead agroforestry consisting of an assemblage of plants which includes trees, shrubs, and herbaceous plants, growing in or adjacent to a homestead or home compound, has a long tradition in the study site. These are planted and maintained by members of the household with their products intended primarily for household consumption; they have considerable ornamental value and provide shade to people and animals. (Sourovi ,Z, Salah Uddin. S, and Masato.k 2010).

Homestead agroforestry exemplify all the agroforestry characteristics of:

- an intimate mix of diversified agricultural crops and multipurpose trees fulfils most of the basic needs of the local population;
- the multi-storeyed configuration and high species diversity help reduce the environmental deterioration commonly associated with monocultural production systems;
- Producing sustained yields in a resource-efficient way.

## **2.9.2. Cropland agroforestry**

Cropland agroforestry combines the production of agricultural crops and trees in the cropland through intercropping. Planting timber species on agricultural cropland at the same time is called cropland agroforestry. Agrisilviculture system denotes the concept of cropland Agroforestry. Agrisilviculture means, the use of land for the concurrent production of agricultural crops and forest crops. Agrisilviculture covers all systems in which land is used to produce both forest trees and agricultural crops, either simultaneously or alternately.(FAO, 1978).

### **2.9.2.1. Adoption Factors of Cropland agroforestry in Bangladesh:**

The following factors influence the adaptation of cropland agroforestry in Bangladesh (Haque, 1993).

- The most forest cover of the country is being depleted at the rate of about 10-15 thousands hectares per year.
- The scope of allocating more government land for forest is extremely limited.
- Per capita land in the country is very small and this is being reduced with the growth of population.
- More and more land is diverted to non forestry activities.
- Cropland Agroforestry is very effective method of involving landless people and the encroachers of the forest land and illegal exploiters of forest resources in the protection and management of the forest.
- Cropland agroforestry can stop further degradation of the foresters by maximizing the production and income.
- It can meet the multidimensional needs of the rural people for food, fuel, timber, construction materials, agricultural equipments, etc.
- It can improve the economic condition and the social status of the rural people.
- It can help the rural poor into self- sustained life style.

### **2.9.2.2. Types of Cropland Agroforestry:**

- **Boundary plantation (hedgerows):**

Boundary plantations combine perennial, preferably leguminous trees or shrubs, grown around an arable crop. During the cropping phase the trees are pruned and the prunings used

as green manure or mulch for the arable crop to improve the organic matter status of the soil and to provide nutrients, particularly nitrogen. Boundary plantations as windbreaks also protect crops. Commonly used trees are prickly acacia (*Acacia nilotica*), betel-nut (*Acacia catachu*), eucalypt (*Eucalyptus brassiana*) and rose wood (*Dalbergia sissoo*). Eucalypt and rose wood are fast growing trees with high timber values; prickly acacia and betel-nut also have high commercial values.

- Improved crop performance due to the addition of nutrients and organic matter to the soil/plant system;
- A reduction of the use of chemical fertilizers;
- An improvement in the physical nature of the soil environment
- On sloping land, the tree rows act as a physical barrier to soil and water movement, resulting in significant reductions in erosion losses (Paningbatan *et al.* 1989); and
- The provision of additional products such as forage, firewood or stakes.

- **Alley cropping:**

In this system, trees or crops are planted in contours in the slope lands. This system includes hedgerows and cash crops that are grown between hedgerows. Normally, the distance between hedgerows is around one meter depending on slope of the hill. Hedgerows are grown by improved the soil for the trees, simultaneously provided timber and other products for households.

This AF is often applied in slope land areas. There are some different models based on the proportion among the agricultural crops, perennial trees and livestock. This system offers various advantages, for instance, reducing the surface flow, supplying feed sources for livestock or humus to restore soil fertilizer. This system however needs higher technology, more capital and labor. (Thanh, M.V.2005 )

Multipurpose species – here, usually Mango (*Mangifera indica*) – trees are planted in rows. Paddy (*Oryza sativa*), wheat (*Triticum aestivum*), sugarcane (*Saccharum officinarum*), papaya (*Carica papaya*), banana (*Musa species*), ginger (*Zingiber officinale*), turmeric (*Curcuma domestica*) and different types of vegetables i.e., potato (*Solanum tuberosum*), bean (*Dolichos lablab*), datashak (*Amaranthus lividus*), lady's finger (*Abelmoschus esculentus*) are intercropped with the mango trees to provide a cash flow – particularly in the early years after the mangoes have been planted but have yet to yield. Paddy, wheat,



sugarcane, papaya and banana are intercropped in the early years, and then the shade tolerant ginger, turmeric and vegetables are commonly planted later.( RAHMAN. S. A *ET AL.*)

- **Woodlot:**

A wood lot is an Agroforestry practice where multipurpose woody perennials are planted and managed over time to produce fuel wood, poles, and stakes for climbing crops; food and animal components may be integrated into woodlots, especially during the initial establishment phase.( Nair, 1993). Depending upon the nature of the land and the purpose for which the woodlot is being established the selected plot of land is marked, lined and pegged at the recommended or required spacing and on marginal or degraded lands, a spacing of 1m x 1m is recommended to ensure early canopy closure, soil protection and weed suppression (Young.1997)

- **Live Fencing:**

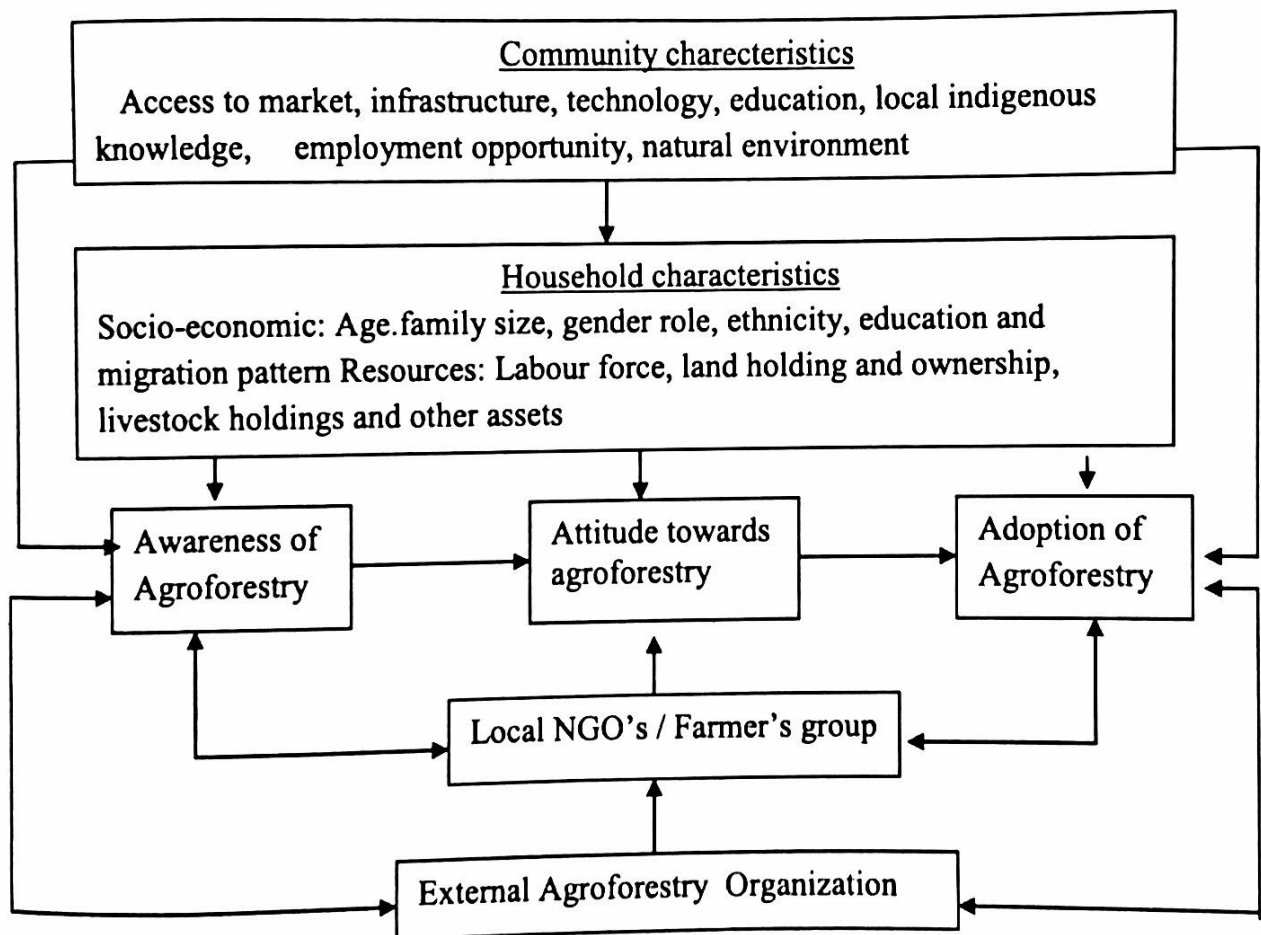
Live fences are permanent of trees or shrubs planted to define areas where general access is prevented such as around a compound homestead gardens/farms, pasture plots, or animal enclosures and they serve mainly as field boundaries to keep animals on the farm and off adjacent crop fields or farm areas (Nair, 1993; Torquebiau,1994).

- **Plantation Crop Combinations:**

A plantation crop combination is generally agrisilvicultural and the components are spatially mixed. This involves intensive plantations in association with multipurpose trees (Torquebiau,1994).Smallholder farmers are often limited by major production functions, land and capital and the farmer's objectives is not maximization of a single commodity (Nair,1993). In many such cases, especially in densely populated areas, farmers usually integrate annual crops and animal production with perennial crops, primarily to meet their food requirements It is for these innumerable smallholder areas that perennial crop associations and integrated land use practices are becoming increasingly important. Contrary to popular belief a substantial proportion of tropical- plantation crops is grown by smallholders as reviewed by Ruthenberg (1980),Nair(1983;1989) and Watson(1983).

## 2.10. Factors influencing farmer's adoption of Agroforestry:

Following Rogers (1983), agroforestry adoption can be described as a mental process, commonly known as the innovation-decision process, farmers go through a stage of being aware or knowledgeable of a new agroforestry technology, to forming positive or negative attitude towards agroforestry, and ultimately to deciding whether to adopt the technology or not. This process can be influenced by a wide variety of factors, including household factors (socioeconomic, resource-base, and outside contacts), community factors (access to extension, education, market, infrastructure, indigenous knowledge and ecological factors), and institutional factors (extension services, training and material support, through government and national/local NGOs). (Ramji P. *et al*, 2001)



**Fig: 2.2. Agroforestry adoption framework (Ramji Pet al, 2001)**

## 2.11. Limitations of agroforestry

### ➤ Environmental aspect

- Loss of organic matter, nutrients and damage of crops during tree harvesting: when the trees are harvested a huge loss of organic matter, nutrients and damage of crops occurred.
- Nutrient competition between trees and crops: trees and crops may compete with each other for nutrient and mineral.
- Moisture competition between trees and crops: In the semiarid and dry zones, this is possibly the most serious problem encountered in agroforestry.
- Production of substances which inhibit germination or growth: Some Eucalyptus species produce toxins which can inhibit the germination or growth of some annual herbs (Poore and Fries, 1985). It has also been suggested that the production of allelopathic substances by tree roots could present a problem in agroforestry, but there is little evidence of this.
- Host of insect and other pests: trees planted in the crops may attract the insect and birds which sometimes harmful for crops. They may be the hosts of different pests.

### ➤ Socio-economic aspect:

- Agroforestry is more complex practice.
- Required more labour inputs.
- Longer period required to get maturity of trees.
- Competition between trees and crops may reduce the production and thus income.

## 2.12. Likert Scale:

A Likert scale is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the Likert-type scale, even though the two are not synonymous. The scale is named after its inventor, psychologist Rensis Likert. Likert distinguished between a scale proper, which emerges from collective responses to a set of items (usually eight or more), and the format in which responses are scored along a range. Technically speaking, a Likert scale refers only to the former. The difference between these two concepts has to do with the distinction Likert made between the underlying phenomenon being investigated and the means of capturing

variation that point to the underlying phenomenon. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item. A scale can be created as the simple sum of questionnaire responses over the full range of the scale. In so doing, Likert scaling assumes that distances on each item are equal. Importantly, "All items are assumed to be replications of each other or in other words items are considered to be parallel instruments." (Wuensch, Karl L. (2005))

- **Likert Item:**

A Likert item is simply a statement which the respondent is asked to evaluate according to any kind of subjective or objective criteria; generally the level of agreement or disagreement is measured. It is considered symmetric or "balanced" because there are equal numbers of positive and negative positions. Often five ordered response levels are used, although many psychometricians advocate using seven or nine levels; a recent empirical study found that a items with five or seven levels may produce slightly higher mean scores relative to the highest possible attainable score, compared to those produced from the use of 10 levels, and this difference was statistically significant. ([http://en.wikipedia.org/wiki/Likert\\_scale](http://en.wikipedia.org/wiki/Likert_scale))

The format of a typical five-level Likert item, for example, could be:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree or neutral
4. Agree
5. Strongly

A sample of Likert Scale is given below-

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

**Fig: 2.3. Likert Scale**

- **Reporting on Likert Scale:**

The traditional way to report on a Likert scale is to sum the values of each selected option and create a score for each respondent. This score is then used to represent a particular trait (particularly when used for sociological or psychological research).

This is also quite useful for evaluating a respondent's opinion of important purchasing, product, or satisfaction features. The scores can be used to create a chart of the distribution of opinion across the population. For further analysis, you can cross tabulate the score mean with contributing factors. ([http://en.wikipedia.org/wiki/Likert\\_scale](http://en.wikipedia.org/wiki/Likert_scale))

- **When to Use Likert Scales:**

This is a very useful question type when you want to get an overall measurement of a particular topic, opinion, or experience and also collect specific data on contributing factors. Measuring the satisfaction (the trait) of a recent shopping experience is a common use.

We should not use this form of question (or at least we should not call it a Likert scale) when the items in the question are unrelated to each other, or when the options are not in the form of a scale. ([http://en.wikipedia.org/wiki/Likert\\_scale](http://en.wikipedia.org/wiki/Likert_scale))

- **Level of measurement:**

The five response categories are often believed to represent an Interval level of measurement. But this can only be the case if the intervals between the scale points correspond to empirical observations in a metric sense. Reips and Funke (2008) show that this criterion is much better met by a visual analogue scale. In fact, there may also appear phenomena which even question the ordinal scale level in Likert scales. For example, in a set of items A, B, C rated with a Likert scale circular relations like  $A > B$ ,  $B > C$  and  $C > A$  can appear. This violates the axiom of transitivity for the ordinal scale.

Even with rather large distortions of perceived distances between scale points, Likert-type items perform closely to scales that are perceived as equal intervals. So these items and other equal-appearing scales in questionnaires are robust to violations of the equal distance assumption many researchers believe are required for parametric statistical procedures and tests. ([http://en.wikipedia.org/wiki/Likert\\_scale](http://en.wikipedia.org/wiki/Likert_scale))



## Chapter 3: Description of the Study Area

### 3.1. Location and Area:

Jhenaidah was a former subdivision of Jessore district. It became a separate district in 1984. Jhenaidah is surrounded on the north by Kushtia and Rajbari districts, on the east by Magura district, on the south by Jessoredistrict and on the west by Chuadanga district and India. The total area of the district is 1,964.77 sq.km (758.60 sq. miles). The district lies between 23°13' and 23°46' North latitudes and between 88°42' and 89°23' East longitudes (BBS, 2013).



Fig: 3.1- Map of Jhenaidah District (Banglapedia, 2013)



◆ **Broad classification of the area:**

**Table 3.1: Area Classification**

(In sq. km.)

Upazila	Total area	Land area	Reserve forest	Riverine area
Harinakunda	227.54	222.96	0	4.58
Jhenaidah Sadar	470.11	467.86	0	2.25
Kaliganj	310.19	304.49	0	5.70
Kotchandpur	165.63	163.63	0	2.00
Mahespur	417.85	410	0	7.85
Shailkupa	373.43	362.01	0	11.42
<b>Total</b>	<b>1964.77</b>	<b>1930.97</b>	<b>0</b>	<b>33.80</b>

(Source: BBS- 2011)

In the table we see that there is not a single reserved area in Jhenaidah district. Here most of the area is land area (1930.97 sq. km) where there is 33.80 sq. km. is under riverine area.

**3.2. Administration:**

Jhenaidah subdivision was established in 1862 and was turned into a district in 1984. The district consists of 6 upazilas, 67 unions, 945 mauzas, 1144 villages, 6 paurashavas, 54 wards and 136 mahallas. The upazilas are Jhenaidah Sadar, Shailkupa, Kaliganj, Harinakunda, Kotchandpur and Maheshpur.

◆ Number of municipality, union, mauza, mahalla and village:

**Table 3.2: Number of municipality, union, mauza, mahalla and village**

Upazila	Municipality	Ward (PSA)	Mahalla	Union	Mauza	Village
Harinakundu	1	9	17	8	77	122
Jhenaidah Sadar	1	9	34	17	268	284
Kaliganj	1	9	20	1	18	198
Kotchandpur	1	9	25	5	81	79
Mahespur	1	9	16	12	150	196
Shaikupa	1	9	24	14	181	265
<b>Total</b>	<b>6</b>	<b>54</b>	<b>136</b>	<b>67</b>	<b>945</b>	<b>1144</b>

(Source: BBS- 2011)

In the table it shows that there are total 6 municipalities under which there are 54 wards, 136 mahalla, 67 unions, 945 mouzas and 1144 villages. These are the administrative units of Jhenaidah district.

### 3.3. Population:

Total population of the district is 17, 71,304(both male and female), among them total male is 8, 86,402 and female is 8, 84,902. The male-female sex ratio is about 100. The density of the area is 902 per sq. km. (BBS- 2011)

**Table 3.3: Upazila wise Population of Jhenaidah District**

Name	Status	Population census 2011-03-15
<u>Jhenaidah</u> (Jhenidah)	District (Zila)	1,771,304
<u>Harinakundu</u> (Harinākundu)	Subdistrict (Upazila)	197,723
<u>Jhenaidah Sadar</u> (Jhenida)	Subdistrict (Upazila)	455,932
<u>Kaliganj</u>	Subdistrict (Upazila)	282,366
<u>Kotchandpur</u> (Kot Chāndpur)	Subdistrict (Upazila)	141,121
<u>Maheshpur</u> (Mahespur)	Subdistrict (Upazila)	332,514
<u>Shailkupa</u>	Subdistrict (Upazila)	361,648

(Source: BBS- 2011)

♦ **Population Distribution:**

About 87.23% of the population lives in rural area and 12.77% are in urban area. (BBS-2011)

**3.4. Literacy:**

Total literacy of this district is 48.4 % (both male and female), of them male is 50.5% female is 46.3. In the following table it shows the literacy rate of the 6 upazila. Among them the highest rate is in Jhenaidah sadar upazila (51.8%), second highest is in Kotchandpur upazila (50.4%) and the least rate is in Harinakundu upazila (42.3%). The average literacy rate in Jhenaidah district is 48.4%.

(Source: BBS- 2011)

**Table 3.4: Literacy Rate (%) of the area**

<b>Upazila</b>	<b>Literacy Rate (%)</b>
Harinakundu	42.3
Jhenaidah Sadar	51.8
Kaliganj	52
Kotchandpur	50.4
Maheshpur	44.8
Shailkupa	44.7
<b>Average</b>	<b>48.4</b>

(Source: BBS- 2011)

### **3.5. Annual Average Temperature and Rainfall:**

The annual average temperature varies from maximum 37.1°C to minimum 11.2°C and the average annual rainfall 1467 mm. (Source: BBS- 2011)

### **3.6. Main Crops:**

Like other areas of our country there grows different common crops in Jhenaidah District. People generally grows paddy, jute, wheat, sugarcane and mustard seed, onion garlic and varieties of pulse and vegetables are the major crops of this district. (Source: BBS- 2011)

### **3.7. Main Fruits:**

Jhenaidah district is gifted with various fruits. Here everywhere in the district specially around the home people are interested in growing several delicious fruits. Some also grows fruit commercially. Some major fruits are mango, jackfruit, banana, guava, sofeda, lemons, olive, papaw, litchi, coconut, dates, palm etc. (Source: BBS- 2011)

### **3.8. Main Export Items:**

From jhenaidah several crops are exported. Paddy, jute, banana, onion, garlic, betel leaf and date molasses are main export items of this district. (Source: BBS- 2011)

### 3.9. Agro-Economic Situation:

The economy of Jhenaidah district is predominantly agricultural. Out of total 385,860 holdings of the district, 66.50 % holdings are farms that produce varieties of crops namely local and HYV paddy, jute, sugarcane, wheat, vegetables, spices, pulses, oilseeds and other minor crops. Various fruits like mango, banana, jackfruit, guava, coconut, etc are grown. Varieties of fish are caught from rivers, flowing channels and even from paddy fields during rainy seasons. Besides crops livestock and poultry, fishery and handloom spinning and weaving are the main sources of household income. (Source: BBS- 2011)

### 3.10. Flora and Fauna

#### ◆ Flora:

Jhenaidah district lies in the highest and driest part of Moribund Delta with a high proportion of sandy ridges. The soil of this area is matial (clayey), stiff and hard loam. Various kinds of agricultural crops are grown in the district. Rice is the dominant crop. Aman covers the largest area followed by boro and aus. Gur made date-palms is the main cash crop. Gram, masur, jute, sugarcane and mango are the other main cash crops. Vegetables, spices, barley, mash, mustard, khesari, sesame, linseed etc. are also grown.

The village homesteads are usually covered by the dense and lush green foliage of a wide variety of trees, shrubs and thickets of bamboos and bananas. Fruit trees like mango, jack fruit, date-palm, coconut and betelnut are commonly found in the vicinity of the village dwellings. Mangoes grow abundantly throughout the greater Jessore district, but Maheshpur, Kaliganj and Kotchandpur upazilas of the Jhenaidah district produce better varieties. The western half of Jessore and Jhenaidah districts have numerous groves of date-plan. In fact, date-palm is extensively cultivated particularly in the Kaliganj and Kotchandpur upazila of the Jhenaidah district. (Source: BBS- 2011)

#### ◆ Fauna:

Some common wild species are common house rat, jackal, jungle cat, ud-biral, kola badur, dura kathbirali, common mongoose etc. Few birds are commonly seen in both rural and urban areas. These are charui, crow bhat salik, kali pencha and bulbuli. Other common birds include machranga, kaththokra, tila ghughu, botkol, babui, tuntuni, robin, lalchil, choto fingei, holdey, dahuk etc. Besides there are a lot of snakes are found throughout the district. The rivers, lakes, ponds, marsh land etc contains a huge kinds and quantity of fishes. (Source: BBS- 2011)

## Chapter 4 - Materials and Methods

### 4.1. Materials and Methods:

The study was conducted at Jhenaidah district of Bangladesh during May 2014. An exploratory survey was conducted in Jhenaidah district to explore information regarding the demographic profile of respondents, annual income of respondents, and cultivation practice, attitude, perception and thinking towards agroforestry practice.

#### 4.1.1. Selection of the study area:

During the study a multistage random sampling technique was adopted. Jhenaidah district was selected purposively as the study area. Four upazila are namely- 1. Jhenaidah Sadar, 2. Kaligonj, 3. Shailkupa, 4. Kotchandpur were selected randomly. These are first sampling unit. Then again from each upazila two unions were selected randomly as second sampling unit. On such way, two villages from each union (except 4 No. Niamotpur as there were found more respondents and collected data from 3 villages) were selected as third sampling unit randomly. From each village more or less five to seven (in accordance with availability) respondents were selected. A total of 102 respondents participated in the face-to-face interview. All the sampling units are shown in the Table 4.1.

#### 4.1.2. Selection of the respondents:

In total about 102 respondents (each respondent was selected randomly) were selected for the survey. A detailed socio-economic survey was conducted to assess educational status, land status, livelihood, and interest in agroforestry, necessity, occupation and income. Respondents are selected randomly from villages.

#### 4.1.3 Data collection Process:

The main focus and target was on collecting data of farmer's perception, attitude, interest and thinking over agroforestry in Jhenaidah district. Primary data were collected from the field survey questionnaire. There was direct face to face formal and informal conversation and interrogation with the existing farmers.



**Table 4.1: All sampling units in Jhenaidah District.**

Name of the District	Name of the Upazila (First sampling unit)	Name of the Unions (Second sampling unit)	Name of the Villages (Third sampling unit)
Jhenaidah	Jhenaidah Sadar	Kumrabaria	Defolbarri
			Ramnagar
		Ganna	Kalohati
			Kutidurgapur
	Kaligonj	4 No. Niamotpur	Mostobapur
			Mohessorchandra
			Dapna
		Durgapur	Shingdoho
			Alaipur
	Shailkupa	Dudhsor	Dudhsor
			Tripurakandi
		Umedpur	Krishnapur
			Bisnupur
	Kotchandpur	Kotchandpur Pourosova	Solemanpur
			Rudropur
		Elangi	Elangi
Gurrpara			

#### **4.1.3.1. Questionnaire survey:**

In order to obtain relevant information, the interview schedule was carefully designed keeping in mind the objective of the study. The formal survey of each union was carried out by using the semi structured questionnaire by the author. The questions were written in English; although they were asked in Bengali language.

The questionnaire was covered on:

- Demographic profile of respondents,
- Present Agroforestry status.
- Farmer's attitude towards agroforestry.
- Problems about agroforestry practice.
- Their demand for agroforestry practice.

#### **4.1.4. Procedure of data collection:**

In order to fulfill the objectives set out for this study; a relevant information and literature were collected from the two following two sources:

##### **4.1.4.1 Primary data collection:**

The primary data were collected by conducting a survey work with a well prepared structured questionnaire. For these reason, the interviewers were selected randomly. It is also done by physical visit to the villages and then interviewing the respondents. In it informal discussions with the villagers of the target areas also included.

##### **4.1.4.2. Secondary data collection:**

The secondary sources of data including books, journals, various publications of Government, institutions and other organizations, articles of local and national newspapers and other research papers on same or similar issues have been used for data collection. In addition to this, internet has also been used as secondary source of data collection. Besides from the following places data was collected-

- Khulna University Library.
- Seminar Library; Forestry and Wood Technology, Khulna University.
- Bangladesh Bureau of Statistic office, Jhenaidah.
- Regional Forest Office, Kaligonj.

- Upazila Krishi Offices or relevant Upazila.
- Unnoyon Dhara NGO Office, Jhenaidah.
- Internet.

#### **4.1.5. Data processing and Analysis:**

The surveyed data were converted into frequencies and percentages forms. After collecting information from primary and secondary sources, data are processed and analyzed by following steps:

- i. Reviewed of collected data and information
- ii. Discarded of unnecessary parts of the information and data
- iii. Sorted of revised data and information
- iv. Analyzed for easy explanation

#### **4.1.6. Report writing:**

After successful completion of primary data analysis and arrangement of all primary and secondary information, then a draft final report was prepared and it was finalized after some necessary correction.

#### **4.2. Likert Scale:**

A Likert scale is a psychometric scale commonly involved in research that employs questionnaires. The scale is named after its inventor, psychologist Rensis Likert. Likert distinguished between a scale proper, which emerges from collective responses to a set of items (usually eight or more), and the format in which responses are scored along a range.

The format of a typical five-level Likert item, for example, could be:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree or neutral
4. Agree
5. Strongly

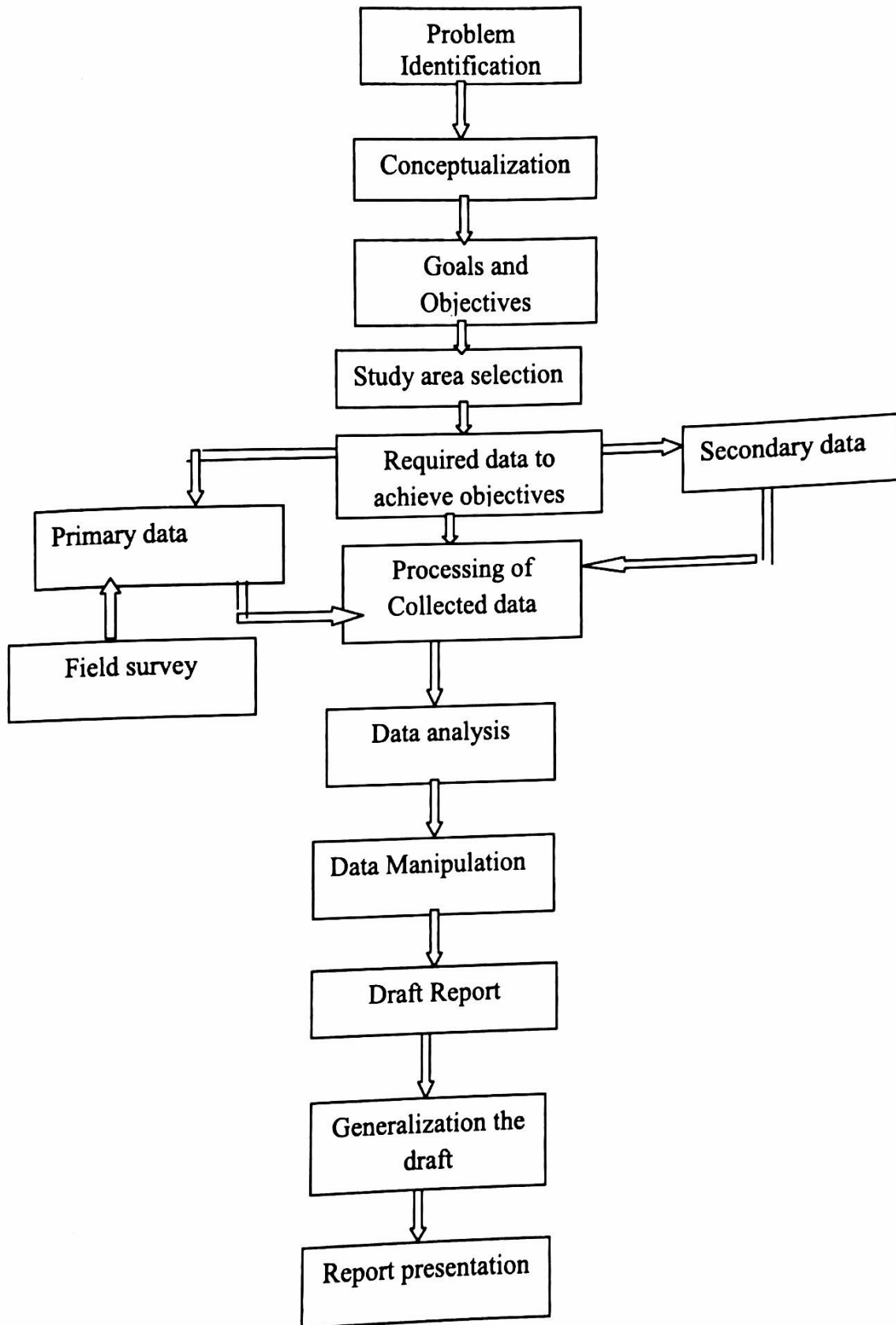
A sample of Likert Scale is given below-

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

The traditional way to report on a Likert scale is to sum the values of each selected option and create a score for each respondent. This score is then used to represent a particular trait (particularly when used for sociological or psychological research). (Wuensch, Karl L. (2005).

#### **4.3. Limitation of the study:**

- Extensive survey is costly and time consuming.
- The number of the respondents was rather small in the study, so only simple statistical tools could be applied for the analysis of data.



**Fig-4.1. Flow chart of Methodology**

## Chapter 5: Result and Discussion

### 5.1 Socio-economic characteristics of the respondents:

Firstly this discussion shows the demographic description of the respondent. Here their attitude and perception in Agroforestry is our main focus. The biographical characteristics include age, education, land holding pattern etc and occupation, income etc are the economic characteristics. Both these characters show the socio-economic phenomenon. Different studies revealed that the socio-economic characteristics had much influence on the adoption behavior regarding new practices (Jamal, 2005). FAO (1989) reported that the innovators and early adopters were those who were higher in their socio-economic status than those who were lower in their socio-economic status. On the following basis now we are analyzing their socio-economic characteristics.

#### 5.1.1. Gender Distribution of the respondents:

There are both types of respondents. The percentage of the respondents in order to gender is expressed by the following graph.

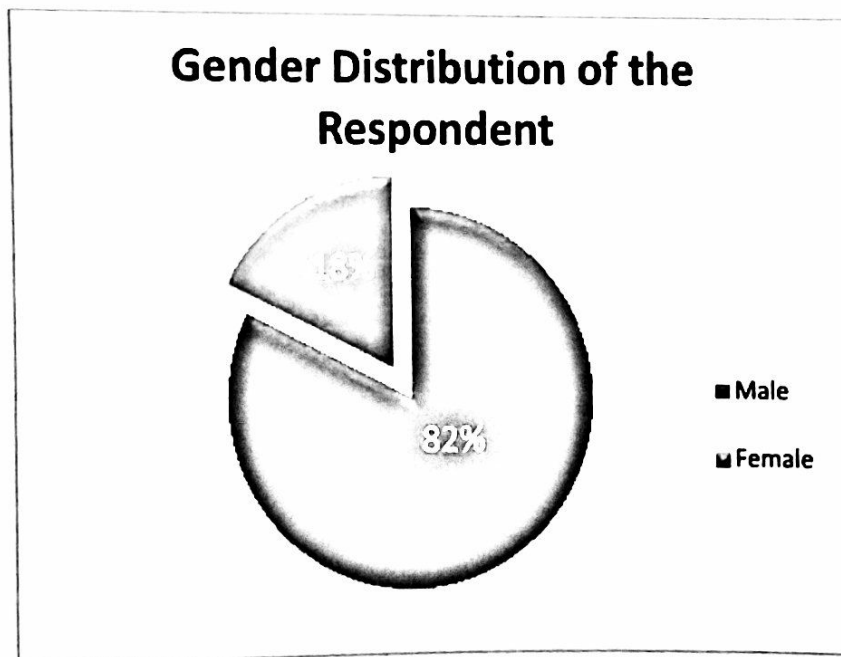


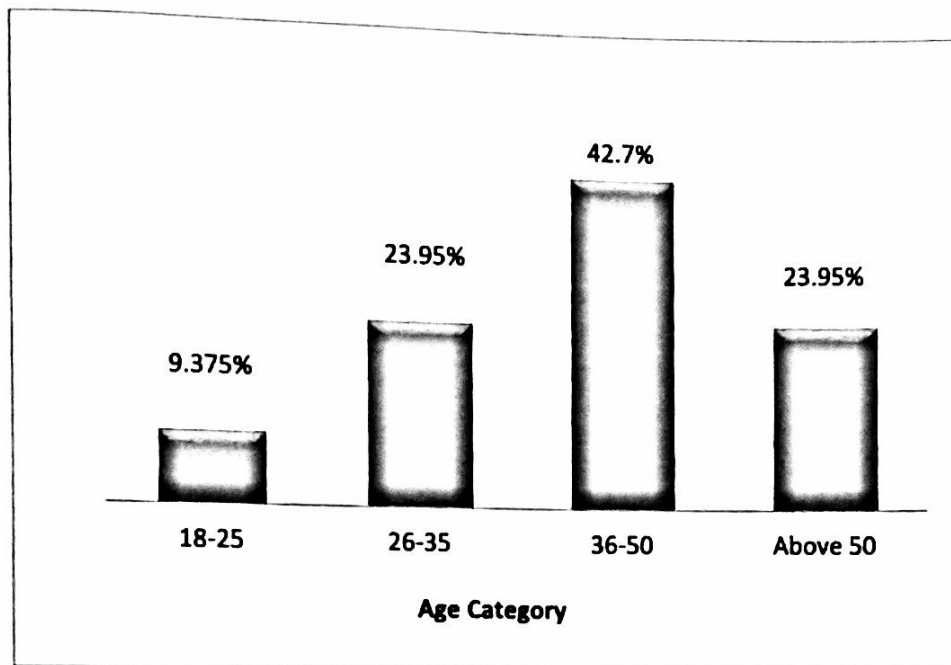
Fig-5.1. Gender Distribution of the respondents

The graph shows that most of the respondents (82%) are male. Here comparatively little percentage (18%) of respondents is female. It indicates male are quite active in outside profession specially farming.



### 5.1.2. Age Distribution of Respondents:

Here the following graph shows the age distribution of the respondents. We can easily understand that the age of the respondents divided into four categories. Major respondents (42.7%) were middle aged.

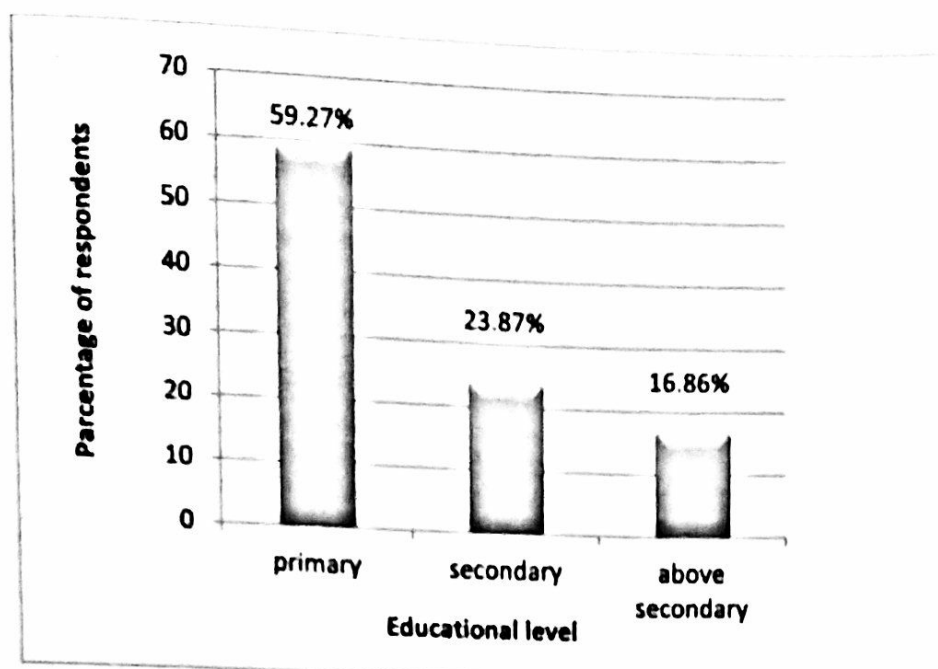


**Fig-5.2 Age distribution of Respondents**

From the graph we get that the highest percentage (42.7%) of respondents is 36-50 aged range people. That is they are the main decision making person of their family. Then the second highest percentage respondents are 23.95% who are both in 26-35 and above 50 range people. Very little percentage (9.375%) of the respondents is in 18-25 range.

### 5.1.3. Level of Farmer's Education:

As agroforestry techniques are include with modern method and materials; literacy, in this regard, plays a vital role for the success in this aspect. The high level of literacy rate would result in increase of Agroforestry technology. According to Tripp (1993), education is an important socio-economic variable that may make a farmer more receptive to advice from an extension agency or more able to deal with technical recommendation that requires a certain level of literacy.



**Fig-5.3. Education level of the respondents**

The graph indicates that a majority of the respondents (59.27%) studied primary level. Here primary level assumed that the respondent who have studied between class-I to class-V. About 23.87% respondents have studied secondary level which is assumed from class-VI to SSC examination. The least percentage (16.86%) respondents have studied above secondary level.

#### **5.1.4. Size of land holding:**

The land holding size was categorized in three groups i.e., land less, less than 1 acres and more than 1 acre. The land, which the respondents own and manage, was asked.

**Table 5.1 Size of land holding**

Size of Land Holdings (In acre)	No. of Farmers	Percentage of respondents
Landless (Taken lease)	24	23.53%
Less than 1 acre	43	42.16%
More than 1 acre	35	34.31%

The data given in table 5.2 indicated that mostly the respondents (42.7%) are small farmers having land holding less than 1 acre, (23.95%) respondents are landless (taken lease) and (35.41%) respondents are more than 1 acre. These results show that mostly the respondents (42.7%) in the study area have small land holding (<1 acre). The respondents (35.41%) are more interested to grow cereals/trees for their domestic use and cash crops.

### 5.1.5. Occupation:

Though this thesis study is mainly dependent on farmers; the respondents are various in occupations. Among all the respondents some people have mixed profession along with cultivation. There are businessmen, teacher, job holder, administrative services i.e. Member, chairman, handicraft production (tent industry), tailor etc. But point to indicate that most of them are farmer.

**Table 5.2 Occupation of the respondents**

<b>Occupation of the respondents</b>	<b>Number of respondent</b>
<b>Farmer</b>	<b>82</b>
<b>Administrative service</b>	<b>2</b>
<b>Teacher</b>	<b>3</b>
<b>Business</b>	<b>4</b>
<b>Vermi compost producer</b>	<b>7</b>
<b>Tailor</b>	<b>1</b>
<b>Tent industry</b>	<b>2</b>
<b>Job holder</b>	<b>1</b>

The table shows the variety of occupation of the respondents. It clearly indicates that most of them (80.39%) are confined in only farming. There are also some other occupations but in a little number.

### 5.1.6. Income:

Income is a vital characteristic for measuring socio-economic consequence. Income talks about the family status and working pattern or occupation of a farmer. Here is the annual income of the respondents which shows the economic status of them.

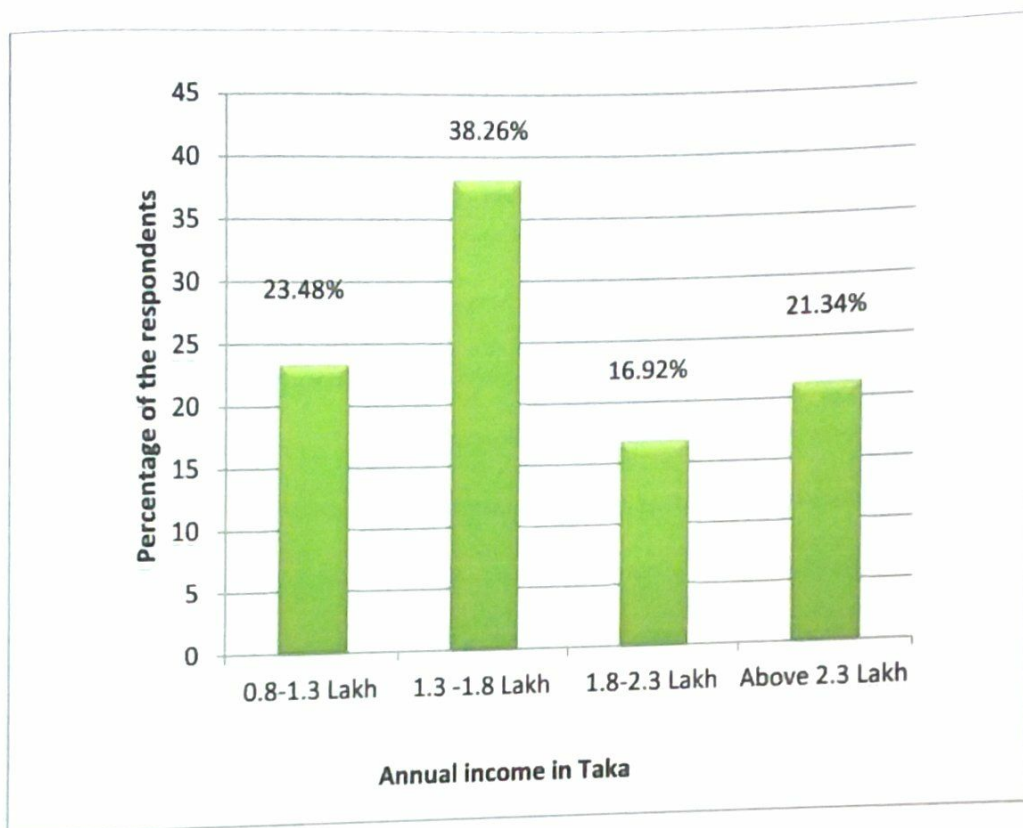


Fig-5.4. Annual income of the respondents

The graph is expressing the annual income of the respondents. Here the income amount is ranged in four categories. The highest percentage (38.26%) is from 1.3-1.8 Lakh who are actually the medium farmers and the lowest percentage (16.92%) is in 1.8-2.3 Lakh. Above 2.3 lakh, which is the highest range, they are 21.34%.

### 5.2. Land Tenureship:

The land tenureship (Fig- 5.3) shows that 50% respondents have own land. 32.29% respondents take land leased from others which is known as borga system. 17.71% respondents both have own land and give land to another people by Borga system. By this study we know that the people (50%) who have own land for agricultural practice, they are interested in Agroforestry practice. But who have no own land (28%) they are not interested in Agroforestry practice. The people (32.29%) who have no own land; they cultivate on in Agroforestry practice.



other's land; they think no need to do permanent or semi permanent practice on other's land. They practice traditional monoculture, cereal crops etc.

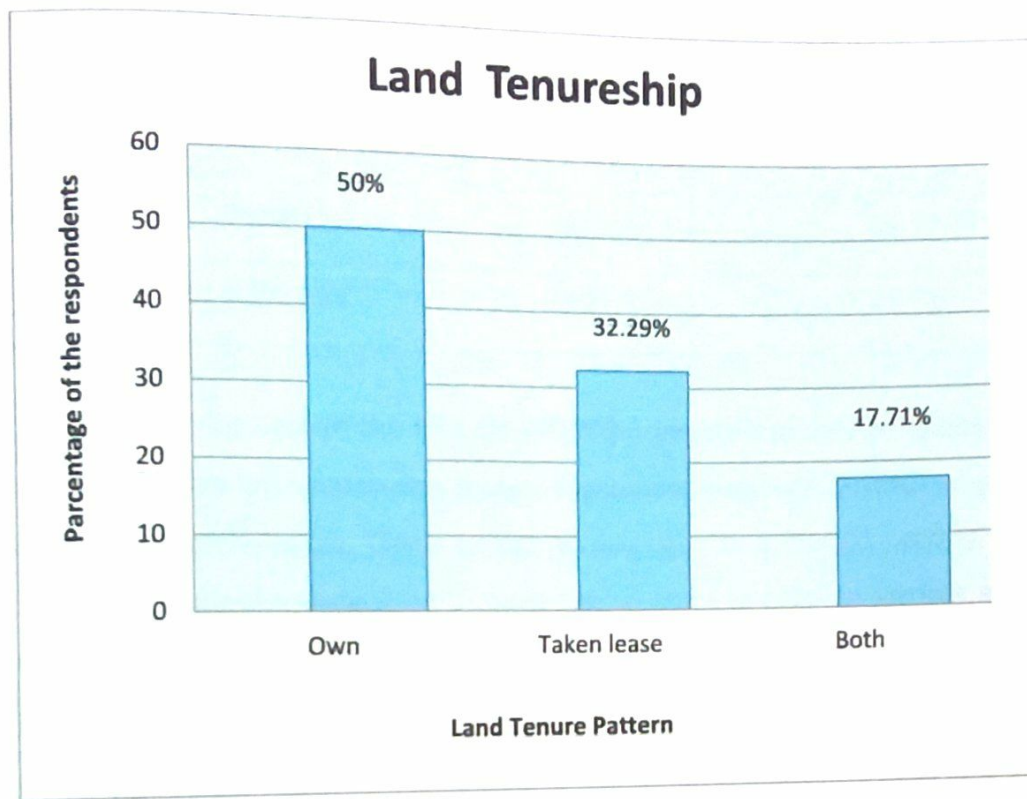


Fig-5.5. Land Tenureship of the respondents

### 5.3. Agricultural and Agroforestry land use system in Jhenaidah District:

#### 5.3.1. Land use system and the type of crops Cultivated in the study area:

The land use systems in the study area include crop production and Horticulture. Agroforestry practices undertaken by farmers in the study area include boundary plantation, mixed cropping etc. (Table-5.4). The annual crops cultivated in the land use system included papaya, banana, Mango, jackfruit, coconut, paddy, jute, sugarcane, wheat, mustard oil seed, potato, supari, maize, betel leaf, masur dal, mug dal, til, brinjal, lal shak, bean, cucumber, onion, corolla, etc. The trees in the land use system included mango, jackfruit, citrus sp, date, coconut tree, mehagani, kul, rain tree, kadam, gamar, sisso, nim, bamboo, etc.

**Table-5.3. Types of crops grown in the study area**

Type of crops	No of farmers	Percentage of farmers
Annual crops	41	40.20
Annual crop + Tree	26	25.50
Annual crop + Pasture	21	20.59
Annual Crop + Tree + Pasture	14	13.73

Table-5.3 presents that about half of the farmers (40.20%) largely depends on annual crop production. In consideration of agroforestry system significant number (25.50%) of user is involved in agri-silvicultural system. Other system is practiced in a limited portion. Most farmers had desire and generally depend on to grow annual crops in order to provide annual household consumption. They also wanted to increase income by incorporating trees. By this study we found that, people are interested in pasture culture (20.59%) with annual crop because immediate high cash return.

**Table 5.4: Types of annual crop used in agroforestry practice**

Local Name	Scientific Name
Potato	<i>Solanum tuberosum</i>
Paddy	<i>Oryza sativa</i>
Wheat	<i>Triticum aestivum</i>
Masur	<i>Lens esculenta</i>
Mustard	<i>Brassica spp</i>
Bean	<i>Lablab purpureus</i>
Brinjal	<i>Solanum melongena</i>
Sugarcane	<i>Saccharum officinarum</i>
Jute	<i>Corchorus olitorius</i>



### 5.3.2. Agroforestry Practice:

Through the study we found that most of the people learned agroforestry inheritantly. That is they found the way to practice agroforestry from their superiors. The people of the study area have a tradition of practicing Agroforestry practice; recently their practices have been reinforced by the need for socio-economic and environmental sustainability. Three common Agroforestry types were found in the study area.

A. Homestead Agroforestry practice

B. Cropland Agroforestry Practice

- a. Boundary Plantation
- b. Mixed Cropping
- c. Agrisilviculture
- d. Agri-silvo-pastural
- e. Woodlot

C. Monoculture practice

#### A. Homestead Agroforestry:

The most and widely practiced system of agroforestry in this area is homestead agroforestry. About every home there is homegarden. Homegardens, mixed plantings of annual, tree crops and pasture around dwelling area, are a common type of multistory agroforestry system.



**Pic- 5.1: Homestead Agroforestry in Jhenaidah District (Field survey 2014)**

Multistory means that there are at least two layers of plants growing to different heights in the system. In homegardens, the lowest level often consists of vegetables or root crops; the second level includes fast-growing trees or crops such as bananas, spices, and cacao; a third higher level may consist of large trees that provide fruit, timber and shade. Homegardens also provide a pleasant shaded living area. Many farmers already grow multipurpose trees in their homegardens for flowers, fruits, and seeds, trees, fish, agricultural crops, cattle, etc. In the study area almost 100% farmers practice homegarden traditionally.

### **B. Cropland Agroforestry:**

Cropland Agroforestry combines the production of agricultural crops and trees in the cropland through intercropping. Three cropland Agroforestry types were found in the study area.

- **Boundary Plantations:**

Boundary plantations combine perennial, preferably leguminous trees or shrubs grown around an arable crop. Boundary plantations as windbreaks also protect crops. Timber trees planted along boundaries spaced at 6m x 6m or 5m x 5m to reduce excessive shading of annual crops, while for fruits trees 4m x 4m is ideal and trees for fuel wood can be planted at 3m x 3m.



**Pic-5.2: Boundary plantation in Jhenaidah District (Field survey 2014)**



Commonly used trees for boundary plantation are Babla, Supari, Date, Coconut, Rain tree, Mahagoni, Palm are grown along field boundaries or bunds of paddy, wheat fields. Babla and Mahagani also have high commercial values. Boundary plantations are so popular in the study area for their benefits. Farmer's perception and my observation (41% respondents) Supari, Date with paddy are the best combination for boundary plantation in Jhenaidah district.

- **Mixed Cropping**

Mixed Cropping constitutes one of the main agricultural land use practice in the study area. Most of the farmers (61%) contain various annual crops, which is commonly referred to as Mixed Cropping system. These farms grow various annual crops, which are simultaneously grown on the same unit plot. In the study area legumes, vegetables along with sugarcane and paddy are the common practice in mixed cropping system.



**Pic-5.3: Mixed Cropping in Jhenaidah district (Field survey 2014)**

These farmers have a multi – cropping system and provide farm stability, and he efficiency in the use of land and labour, as well as ensure annual security. Another thing is to be noted that betel-leaf is so much practiced cultivation in Jhenaidah. Here with it different types of vegetables are cultivated. This type of betel-leaf farm gives good cash, nutrition and also fuel from its fence.

- **Woodlot:**

Woodlot plantation is another most common agroforestry practice in Jhenaidah district. Woodlot plantation is nothing but the segmentary plantation of commercial trees in the crop

land or along with cropland. A wood lot is an Agroforestry practice where multipurpose woody perennials are planted and managed over time to produce fuel wood, poles, and stakes for climbing crops; food and animal components may be integrated into woodlots, especially during the initial establishment phase (Nair, 1993).



**Pic-5.4: Woodlot plantation in Jhenaidah District (Field survey 2014)**

Mainly the MPT's species are preferable in this system. The major woodlot species in Jhenaidah district are like Mehagani, Rain tree, Babla, Gamar, Ipilipil, Eucalyptus, Akashmoni etc. About 32% respondents were or are now practicing Woodlot plantation because of its rapid large amount cash return.



**Table-5.5. Type of Crops Grown in the study area:**

<b>Agroforestry Practice</b>	<b>Types of trees</b>	<b>Types of crops</b>	<b>Pasture</b>
Boundary plantation	Khejur, Coconut, Babla, Akasmoni, Mahagoni, Neem, Rain tree	Paddy, Jute, Wheat, Papaya, Banana, Halud.	X
Mixed Cropping	Supari, Coconut, Mahagoni, Sajina, Khejur, Tal, Jam, Kamrang, Neem, Jackfruit, etc.	Rice, Maize, Kachu, Halud, Banana, Ginger, Tomatoes, Cabbage and Marich etc.	Cow, Goat, Buffelo, Swan.
Monoculture	X	Aman Paddy, Boro Paddy.	X
Agrisilvicultural Systems	Supari, Coconut, Mahagoni, Sajina, Khejur, Tal, Jam, Kamrang, Neem, Jackfruit, etc.	Rice, Maize, Kachu, Halud, Banana, Ginger, Tomatoes, Cabbage and Marich etc.	X
Homegarden	Supari, Coconut, Mahagoni, Sajina, Khejur, Tal, Jam, Kamrang, Neem, Jackfruit etc.	Different vegetables.	Cow, Goat, Buffalos, Swan, Duck, Hen, Hogg, Pigeon, Ram etc.
Woodlot	Mahagani, Akashmoni, Sisso, Raintree, Teak etc.	X	X

#### 5.4. Perception of Farmers on Agroforestry system:

Perception is a way of seeing, understanding and interpreting about something, it is the deeper natural understanding and awareness that usual. In other word, perception is the ability see, hear or understand. In this thesis paper, perception indicates that the farmer's awareness and understanding about the Agroforestry systems in Jhenaidah district.

Perceptions about Agroforestry in the villages were diverse. The farmers of Jhenaidah district practices Agroforestry traditionally within their agricultural cropland as well as their homestead. They perceived that the practice is done for their own satisfaction and household consumption. In the study area farmers thinks positively about Agroforestry systems. They perceived that the Agroforestry does not hamper their traditional Agricultural system and it has a great role in managing, space utilization and recreational role. They perceived that the tree has more important role in terms of production. The villagers meet their demands of wood, firewood and other forest products from their village forest.

The farmers also perceived that Agroforestry is more profitable and less risky, that other agricultural options. Aside from the tree species, the advantage of Agroforestry is the early return from non timber crops that are interplant with the trees and also other main reason for perceived the system because of the multiple benefits the farmers gain from the crop-tree combination. In field survey it was found that the farmers think "Though trees in cropland cause some damage of crops like shade problem, leaf fall problem, nutrition problem; it returns a good smart money together in one time but quite a long time later."

It can be the good example about the farmer's perception of Agroforestry in Jhenaidah district. They perceived that the Agroforestry does not hamper their traditional Agricultural system and it has a great role in managing, space utilization and recreational role.

On the other hand a few farmers are not willingly to perceive the Agroforestry systems because of the main reasons are lack of capital, lack of interest, lack of knowledge on Agroforestry systems, long term in profit earning, land of technical assistance, do not have suitable land for this cultivation practice, probability of risks and unstable market price for Agroforestry product.

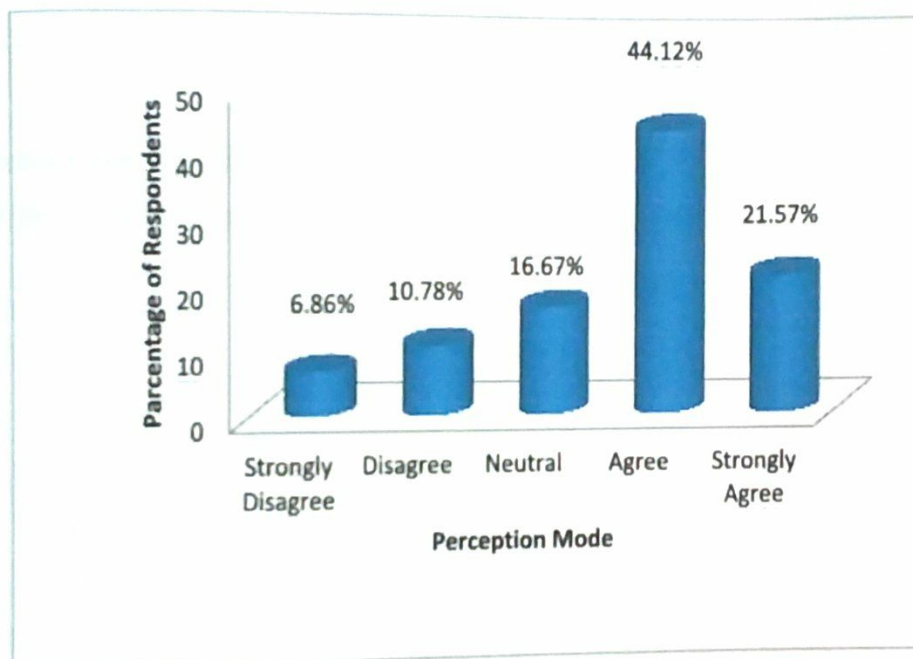
So ultimately the perception of farmer's can be expressed by following Likert Scale. On the average Likert Scale shows the following result 4 that is agree.



**Table-5.6. Farmer's perception on Agroforestry in Likert Scale**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

These results were encouraging, which showed that the farmers were realizing the importance of trees, crop and pasture to meet their demand of protein, timber, fuel wood, fodder requirements and increase the capital formation. Finally we found majority of farmers 44.12% had shown positive perception about agroforestry.



**Fig: 5.6. Farmer's perception on Agroforestry**

The graph shows the perception of the respondents on agroforestry. Here 44.12% respondents are agreed, 21.57% respondents are strongly agreed on agroforestry practices which is positive in position.

#### **5.5. Farmer's Attitude towards agroforestry:**

The results revealed that majority of the farmers had 'favorable' attitude towards agroforestry. The farmers of Jhenaidah in general had favorable to more favorable attitude towards agroforestry. But they showed slight different attitude in term of homestead and cropland. This attitude is expressed in Likert Scale followingly.

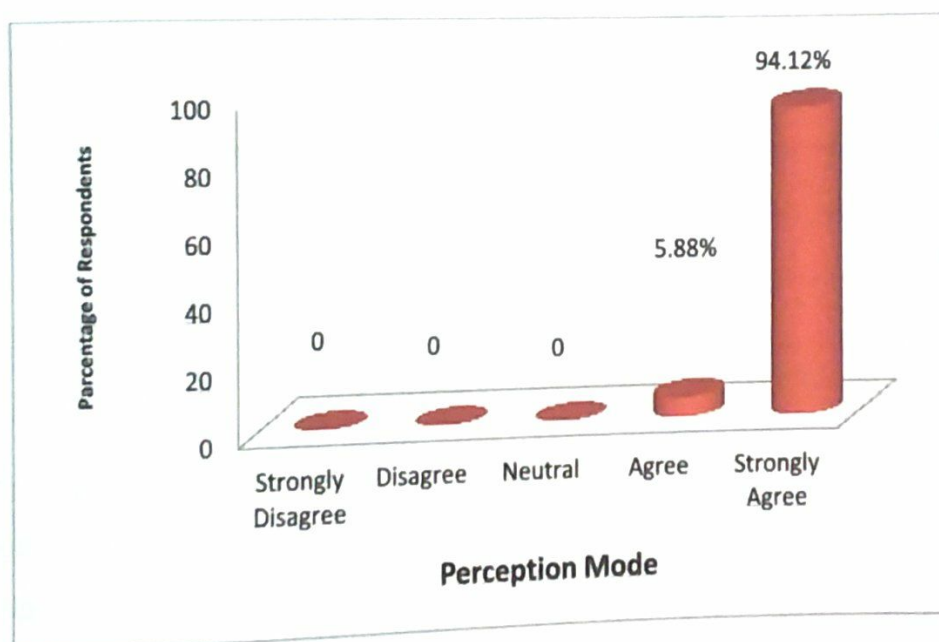
### 5.5.1. For Homestead:

As homestead agroforestry is traditionally practiced system and it has been practicing science a long time ago the farmers are eagerly positive on this. Besides they get different extra benefits from this system like protein, food from cattle, fuel, fodder, vegetables and also cash from these.

**Table-5.7. Farmer's attitude for homestead in Likert Scale**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

For the homestead the farmers of Jhenaidah district showed so much positive thinking and attitude. 94.12% of the farmers strongly agreed with homestead agroforestry.



**Fig: 5.7. Farmer's perception on Agroforestry in Homestead**

### 5.5.2. For Cropland:

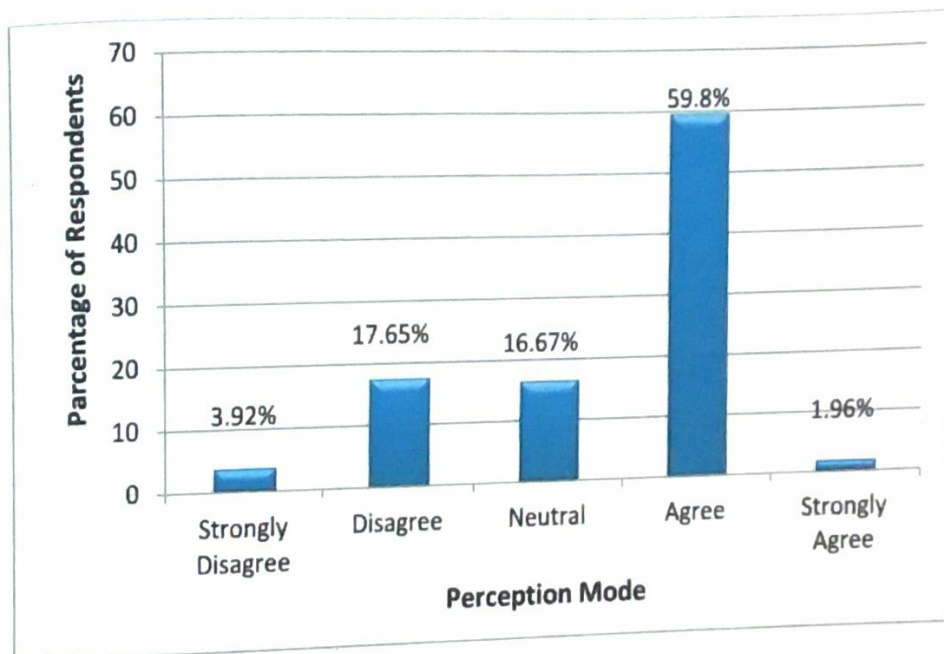
In our country generally croplands are being used for more likely only for crop cultivation. Trees in cropland are kind of new here. So there might take some more time to acquaint with this type of system.



**Table-5.8. Farmer's attitude for cropland in Likert Scale**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

So For the cropland agroforestry the farmers of Jhenaidah district showed a little less interest than the homestead. Most of them are quite positive in this regard. They are agreed with this.



**Fig: 5.8. Farmer's perception on Agroforestry in Cropland**

From the above graph we find that majority of the respondent (59.8%) are in positive side with agroforestry practice on cropland. But there also exist some disagreement with this. Some of them (17.65%) are not interested in this. 16.67% respondents had no comments in this regard.

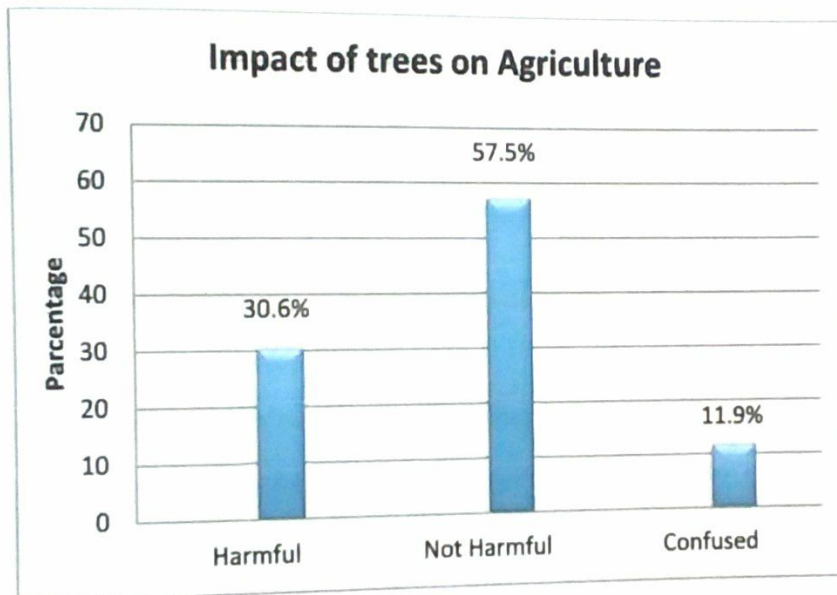
**5.6. Impact of Trees on Agricultural crops:**

Farmer's perception on Agroforestry is positive. Most of the respondents (57.5%) said that trees dose not harmful for agricultural crops, it have a great role in managing and space utilization on land 30.2% respondents said that trees are harmful for agricultural practice because of some managing problem. In Likert Scale the impact can be shown following-

**Table-5.9. Farmer's perception for Impact of Trees on Agricultural crops in Likert Scale**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

On the following graph the percentage of farmer's perception on impact of trees on agricultural land are given. Here most of the people (57.5%) have concept that trees are not harmful in cropland rather it helps to produce quality product. On the other hand 30.6% people think that trees have significant disturbance on crop which reduce the production and rise possibility for crop failure and pathogenic attack.



**Fig-5.9: Impact of trees on agricultural crops.**

**5.7. Reasons for planting trees on farmlands:**

Most of the respondents 57.5% gave reason to grow trees on their farmlands for high cash return from timber, produce fodder for their livestock and fuel wood to grow trees to fulfill their combustion needs, while other respondents gave reasons to meet shelter or shade requirements for their crops and livestock and timber were also reasons to plant trees. Some also mentioned that trees in farmland also work as living fence which save the crops from destroying by the cattle or other wild animal. These percentages may overlapping because of respondents have multiple reasons.



### 5.8. Reasons for not planting trees on farmlands:

Some of the farmers showed negative effect for planting trees on farmland. They mentioned the following reasons for not planting trees on farmland.

- ✚ Tree shade problem
- ✚ Possibility of crop failure
- ✚ Reduction of crop production
- ✚ Pathogenic dispersal
- ✚ Reduction of soil quality
- ✚ Reduction of soil nutrition
- ✚ Management problem
- ✚ Leaf fall problem

### 5.9. Problems and suggestion faced by respondents in agroforestry practice:

The respondents were asked to report about the problems, being faced by them in the adoption of agroforestry. Their main responses are mentioned in the following table.

**Table: 5.10. Problems and suggestions from the respondents**

<b>Problems faced by the Respondents</b>	<b>Suggestion by the Respondents</b>
Lack of education	Launching awareness campaigns
Lack of technical skills	Arranging training
Limited capital	Organizing workshops
Improper technical assistance	Providing technical assistance
Lack of interest	Establishing marketing points
Lack of co-ordination of GO's and NGO's	Provide easy loan
Marketing and transportation facilities	Co-operation of the Agricultural officer
Lack of proper planning	Publicity in mass media
Sometimes watering problem	

## Chapter 6: Recommendations and Conclusion

### 6.1. Recommendations:

From the direct observations of the field survey the following recommendation can be followed-

- There should generate well accepted easy interest-free loan for the farmers.
- Different training and workshops are needed to be arranged regarding agroforestry.
- Setting up information channels about market for products; Setting up groups or consumption cooperatives to avoid being paid at low price.
- Government and non Government organizations should come forward with Agroforestry development programs through field visiting and providing technical assistance.
- Create awareness in the target audience about agroforestry technologies showing short stage drama, documentary etc. live and through mass media.



## 6.2. Conclusion:

Agroforestry is becoming an important land use in Bangladesh. Gradually here the farmers are adopting agroforestry widely. It has potential to complement the products and services of desired form forests. There are wide spread practice of Agroforestry in Jhenaidah district. Farmers have adopted agroforestry in large scale because of high income, suitable use of land and space, erosion control and protection, crop diversification and risk reduction.

Since the findings of the study pointed out that there is a scope for improving the perception level and creating more favourable attitude of farmers towards agroforestry, development functionaries can intensify their efforts to achieve the increased perception and attitude level of farmers. It was found that there was a big gap in full adoption of all recommended agroforestry practices. In order to bridge this, development agencies should further intensify the extension activities to motivate and adopt all the practices. The agroforestry has brought improvement in socio-economic and ecological conditions of farmers by generating employment, increasing family income, enhancing the crop diversity and reducing dependency on natural forest. Therefore, development agencies can use the success story of agroforestry to stimulate other farmers to attain both natural resource and socio-economic sustainability.

Agroforestry is becoming popular in Jhenaidah district. Middle aged farmers (36-50) (42.7%) are interested in Agroforestry practice than traditional practice. The adoption of Younger (26-35) 23.95% farmers are increasing day by day, since they have had more schooling than the older generation or perhaps have been exposed to new ideas as migrant. Primary studied people (59.27%) are the major portion of the area. But others who studied more have better interest in agroforestry. The farmers (23.53%, they taken lease from other people) who have no own land they are not interested in Agroforestry. Paddy, Coconut tree, supari are the best combination. Above 80% respondents have taken positively agroforestry practice, but they have not got enough training skill or facility but just inherit idea from the superior. If they get this facility, they are more interested in agroforestry practice. Finally we have found that most of the farmer's (94.12%) have positive attitude towards Agroforestry. So there should creat more facility, encouraging program and convenient environment for agroforestry system by the Govt. as well as NGO.

## References:

- Nair, P.K.R. (1983) Agroforestry with coconut and other tropical plantation crops In Huxley, P.A. (ed) plant reaserch and Agroforestry, pp 79-102. ICRAF, Nairobi, Kenya.
- Nair, P.K.R (1985) Classification of Agroforestry systems. *Agroforestry systems* 3:97-128
- Nair, P.K.R (1989) *Agroforestry systems in Tropics* Kluwer, Dordrecht, The Netherlands.
- Nair, P.K.R (1993) *An introduction to Agroforestry*; pp 13-155, ICRAF/Kluwers Academic Publishers, Dordrecht, The Netherlands.
- Young, A. (1997) *Agroforestry for Soil conservation* CAB International, ICRAF.
- Anon, (2008) Tanu Agritech Portal, Tamilnadu Agricultural University.  
(<http://www.cvpd.org/juniorexpert01.php>)
- Anon, (2011) <http://en.wikipedia.org/wiki/Agroforestry>,
- Bangladesh Bureau of Statistics (BBS) (2011), *Statistical Pocket Book of Bangladesh*.
- Caveness, F.A., Kurtz, W.B., (1993) Agroforestry adoption and risk perception by farmers in Senegal. *Agroforestry Systems* 2, 11–25.
- FAO. (1989) *Agricultural extension a reference manual*, Food and Agriculture Organization of United Nations, Rome, Italy.
- Franzel S. and Scherr S.J. (2002) Introduction. Pp.1–11 in Franzel S. and Scherr S.J. (eds). *Trees on the Farm: Assessing the Adoption Potential of Agroforestry Practices in Africa*. CABI, Wallingford
- Hoekstra D (1983). *The Use of Economics in Agroforestry*, Working Paper No. 2, ICRAF, Nairobi.  
<http://www.hasanuzzaman.webs.com>, Accessed on 01.10.2014
- IPCC (Intergovernmental Panel on Climate change) (2000) *Land-use, land-use change and forestry. Special Report*. Cambridge University Press, Cambridge.
- Lundgren, B. O. (1987) ICRAF's first ten years. *Agroforestry systems* 5: 197-217
- Jamal, N. (2005) *An investigation into the adoption of recommended livestock production practices by rural women in district Faisalabad*. M.Sc. (Hons) Thesis, University of Agriculture, Faisalabad- Pakistan.

Ruthenberg, H. (1980) *Farming systems in Tropics*, 2nd ed. Oxford University Press, London, UK.

Sourov, Z., Salah Uddin, S., and Masato, K. (2010) *The Open Forest Science Journal*, (2010) 3, 38-44, Structure and Diversity of Homegarden Agroforestry in Thakurgaon District, Bangladesh

Tejwani, K. G. and Lai, C. K. (1992). *Asia-pacific agroforestry profiles, agroforestry systems research and development in the Asia-Pacific region. Asia Pacific agroforestry network (APAN) field document no. 1. Bogor, Indonesia. pp. 34-40.*

Torquebiau, E. (1994) *Agroforestry Research for Integrated Land Use: An introduction to the concept of Agroforestry*, pp 26-51, ICRAF, Nairobi, Kenya.

Thanh, M. V. (2005) *Center for Agricultural Research and Ecological Studies Hanoi Agricultural University.*

Tripp, R. (1993) *Adoption of agroforestry technology: A guide for survey Desi CIMMYT. Mexico.*

Ramji P. N., Khem R. S., Gopal B. T., 2001 *Adoption of agroforestry in the hills of Nepal: a logistic regression analysis.*

Likert, Rensis (1932). "A Technique for the Measurement of Attitudes". *Archives of Psychology* 140: 1-55.

[http://en.wikipedia.org/wiki/Likert\\_scale](http://en.wikipedia.org/wiki/Likert_scale) accessed on 18.09.2014.

## Appendix-1

### Questionnaire for the field survey

#### Farmer's Attitude Towards Agroforestry in Jhenaidah District

(Only for research purpose)

Date:

Survey No: 1

#### Part-A: General Information

##### General information about the respondent:

1. Name of the respondent:
2. Village of the respondent:
3. Union of the respondent:
4. Demographic & Socio-economic profile:

Age	Sex	Educational Qualification	Family member	Income (Yr.) Gher Land Tk.	Income (Yr.) Cropland Tk.	Income (Yr.) Homestead Tk.	Expenditure (Yr.) Tk.	Saving (Yr.) Tk.

#### Part-B: Agroforestry Information

1. Size of farm:
2. Type of the Farm land
  - a. Own land under cultivation
  - b. Own land given to others on lease (barga) system
  - c. Area taken from others on lease (barga) system
  - d. Area given to others on lease
  - e. Cultivated area taken as lease from others
  - f.
1. Does he practice AFG?
  - a) Yes
  - b) No

4. if yes; why?

Ans:

2. from where he got interested in AGF?

a) By Article b)from neighbor c)Training d)NGO

6. Does he get any support from GO's or NGO's ?

a) Yes b) No

7. Is it beneficial for your family?

a) Yes b) No

8. what are the component of AGF you practice?

Ans:

9. Benefit from the farm:

Ans:

A. Homestead:

B. Cropland:

10. Per year benefit from AGF:

Wood	Fuel	Fodder	Crop	Fruit	Cattle

11. Component Composition of AGF:

A. Homstead:

B. Cropland:

12. Type of tree species:

Wood	Fuel	Fodder	Fast Growing	MPTS	Fruit

13. Problems faced in AGF:

Ans:

14. Financial Backup for AGF:

a)Bank b)Money lenders c) Personal savings d)others

**Part C: Attitude on AGF (Likert Scale)**

1. Attitude on AGF:

A. Homestead:

Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
1	2	3	4	5

B. Cropland:

Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
1	2	3	4	5



2. Perception in AGF:

Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
1	2	3	4	5

3. Impact of trees on AGF:

Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
1	2	3	4	5

4.

Topic	Agree	Strongly Agree	Disagree
Increased soil fertility			
Increased farm income			
Reduced chances of complete crop failure			
Maintained/improved surrounding condition			
AF should be adopted in your locality			

5. Impact of trees on Agricultural crops

- a. Harmful    b. Not harmful    c. Confused

6. Do you have any suggestion?