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FARMERS' PERCEPTION AND ADOPTION OF AGROFORESTRY PRACTICES IN FARIDPUR DISTRICT

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DECLARATION

I hereby declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institutions. Information derived from the published and unpublished work of others has been acknowledged in the text and a list of references is given in the bibliography.

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Dedicated

To

My Beloved Parents

And

My Dear Sister

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ABSTRACT

This study mainly focused on investigating perception of farmers' towards agroforestry practices and identifying the demographic factors influencing agroforestry adoption. This study was conducted in Faridpur District during November-December, 2016 using semi-structured questionnaire. Multistage random sampling was applied to select 84 respondents in total for the questionnaire survey. In addition interviews and field observation was also carried out to obtain additional information. Chi-square was used to test variables at 5% level of significance. Homestead agroforestry is the most common agroforestry practice (39.28% of all respondents), followed by fruit-based agroforestry (21.42%), woodlot plantation (13.09%) and so on. The study results showed that farmers' have diverse perception of agroforestry practices in the study area. Agroforestry was perceived to increase farm productivity by 82.14% of the respondents, 73.8% opined that agroforestry increase household income, while 30.95% perceived it as a means to food security. But 34.52% opined that the practices decrease cash crops production, 17.85% of the respondents were of the opinion that agroforestry practice is difficult to practice. Chi-square test showed no significant association between the adoption of agroforestry practices and respondent's age ($P > 0.05$) or income range ($P > 0.05$) of the respondents. But there is a positive significant association between the adoption of agroforestry practices and educational level ($p< 0.05$) as well as the farm size ($p< 0.05$) of the respondents. Other significant factors affecting adoption of agroforestry practices such as lower production rate of agricultural crops, flooding during monsoon, labor shortage and market facilities were identified from farmers' interviews. The study suggests ensuring necessary education for the respondents, raising awareness regarding the benefits of agroforestry practices, providing technical assistance as well as agroforestry extension services.

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List of Abbreviation

Abbreviation	Full form
GDP	Gross Domestic Product
AFTA	Association for Temperate Agroforestry
FAO	Food and Agricultural Organization
BARC	Bangladesh Agricultural Research Council
UNFCCC	United Nations Framework Convention on Climate Change
BBS	Bangladesh Bureau of Statistics
CHT	Chittagong Hill Tracts

CHAPTER ONE

INTRODUCTION

1.1 Background

Agriculture remains the most important sector of Bangladeshi economy, contributing 19.6 percent to the national GDP and providing employment for 63 percent of the population. Agriculture in Bangladesh is heavily dependent on the weather, and the entire harvest can be wiped out in a matter of hours when cyclones hit the country (Nationsencyclopedia.com, 2017). Agroforestry systems are preferable to just food crop or pasture production systems as they are able to generate income from tree sales and carbon trading programmes, such as reducing emissions from deforestation and degradation schemes. The most effective way to reduce deforestation in Bangladesh is through agroforestry. It could bring 'win-win' solutions to meet both environment and development objectives (Rahman, 2014).

Farmers can benefit from agroforestry technologies that give solutions to issues with soil productivity, product diversification, and economic problems (Nair, 1996; Franzel and Scherr, 2002). A number of features of agroforestry, however, make analysis of its adoption unique and deserving of its own review. Adoption of agroforestry is considerably more complex than traditional agriculture because it usually requires establishing a new input-output mix of annuals, perennials, green manure, fodder and other components, combined with new conservation techniques such as contour hedgerows, alley cropping, and enriched fallows (Rafiq et al. 2000).

No matter how elegant, efficient, productive, and/or ecologically sustainable, agroforestry systems can contribute to sustainable land use only if they are adopted and maintained over long time periods (Raintree 1983; Scherr 1992; Sanchez 1995). Farmers will invest in agroforestry when the expected gains from the new system are higher than the alternatives for the use of their land, labor and capital. Early adopters will tend to be those relatively better-off households who have more risk capital available in terms of higher incomes or more resource endowments (land, labor, capital, experience, education) to allow investments in uncertain and unproven technologies (Mercer, 2004).

1.2 Objectives of the study

The main objective of this study was to investigate and analyze farmers' perceptions of different agroforestry practices and adoption of agroforestry practices in the study area. The specific objectives of the study were:

- To identify existing agroforestry practices in Faridpur District
- To assess farmers' perceptions of various agroforestry practices in the study area
- To determine the demographic factors influencing the adoption of agroforestry technologies in the study area.
- To identify the problems and constraints encountered by the farmers in practicing agroforestry.

1.3 Significance of Study

Bangladesh is a small thickly populated country. Because of high population density and shrinking natural resource base there is enormous pressure on the natural resources of the country. The people in general, with a low level of literacy are little aware of forest and environment. Such lack of awareness has definitely a negative impact on forestry in Bangladesh. The overall poor socioeconomic conditions of the people lead them to cut down trees on an unplanned manner. To combat these problems, forestry activities are to be strengthened through undertaking need-based priority research and development in this sector.

An in-depth understanding of farmers' perceptions, attitudes, and adoption of agroforestry is indispensable to formulate appropriate policies and management plans to sustain and maintain agroforestry practice in Faridpur District as well as all over the country. When Farmers perceive agroforestry well then they will acquire practical knowledge to help address their landuse problems as they benefit from the agroforestry practices. As a result, adoption of agroforestry practices will take place among the farmers. The present study is an attempt to investigate the diversity of farmers' perceptions regarding agroforestry practices and to identify the demographic factors affecting agroforestry adoption. This can act as a basis for suggestions of strategies for sustainable management of the agroforestry resources and improvement of the livelihoods of rural societies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Perception and adoption of Agroforestry

Research has been carried out on the adoption of agroforestry innovations in the tropics since the early 1990s. Mercer (2004) demonstrated that, 'Achieving the full promise of agroforestry requires a fundamental understanding of how and why farmers make long-term land-use decisions and applying this knowledge to the design, development, and 'marketing' of agroforestry innovations.'

Islam et al. (2015) suggested that, People's perceptions, attitudes and preferences in agroforestry have become fundamental elements of sustainable agroforestry management. This study examined the dimensions of people's perceptions about agroforestry values, attitudes towards agroforestry benefits and resources preferences in agroforestry and their socioeconomic determinants in the study area in Faridpur.

Farmers make decision to adopt a practice that seems most consistent and appropriate to achieve their goals or interests (Barlas et al., 2001). Farmers make those decisions after assessing different farm internal resources such as household composition, farm size and external conditions like incentive policies, and market prices (Fuglie and Kascak, 2001). Pattanayak et al., (2003) found that demographic characteristics, intra-household homogeneity, resource assets, market incentives, biophysical factors, risk and uncertainty were determinants for agroforestry adoption. Nouman et al. (2007) found that, farmers perceive that the trees are best sources of fuel, wood and fodder for their livestock. Even then these are not increasing because they compete with agricultural crops.

Sharmin and Rabbi (2016) demonstrated that, middle aged farmers (42.7%) were mostly interested in adopting agroforestry with traditional practice whereas young aged farmers (23.95%) appeared to practice it in a wide range.

Adedayo and Oluronke (2014) showed that 10% of the respondents opined that agroforestry practice is a scientific process that is difficult to practice, 62% perceived that it can improve farm productivity while 12% opined that the practice is not properly understood. Also found significant association between respondents' educational qualification and the adoption of agroforestry as well as a significant association between respondents; land ownership and the adoption of Agroforestry practices.

Wireko (2011) demonstrated that, the major socio-economic factors affecting farmers' decision to adopt agroforestry technologies include land tenure (42.3%), risk and uncertainty (20.6%), low level of education (28.0%) and market availability (9.1%).

Many researches have been carried out research on diversity and socio-economic benefits of agroforestry practices but there is a dire need to investigate the ideas regarding perception of agroforestry of the farmers. This study was conducted to get the information about the farmers' perception and factors which affect their adoption of agroforestry practices.

2.2 Concepts of Agroforestry

Agroforestry is an integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, and sustainable land use systems. Agroforestry systems can be advantageous over conventional agricultural and forest production methods through increased productivity, economic benefits, social outcomes and the ecological goods and services provided. Biodiversity in agroforestry systems is typically higher than in conventional agricultural systems. Agroforestry incorporates at least several plant species into a given land area and creates a complex habitat that can support a wider variety of birds, insects, and other animals. Farmers adopt agroforestry practices for two reasons. They want to increase their economic stability and they want to improve the management of natural resources under their care (Umrani and Jain, 2010). By blending agriculture and forestry with conservation practices, agroforestry strives to optimize economic, environmental and social benefits. Intensive management of trees, non-timber forest crops, agricultural crops and animals on traditional forest and agricultural lands is the key to successful agroforestry. (A guide to agroforestry in BC, 2001)

2.3 Definitions of Agroforestry

According to Lundgren and Raintree (1982), agroforestry is 'a collective name for land-use systems, practices or technologies, where the woody perennials are deliberately integrated with agricultural crops and/or animals in the same land management unit, in some form of spatial arrangement or temporal sequence.'

AFTA (Association for Temperate Agroforestry) (1997) defines agroforestry as "an intensive land management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock."

Khasa (2001) has refined agroforestry, by defining agroforestry as a collective term for dynamic natural resource management systems, where woody perennials are integrated spatially and/or temporally with valuable herbaceous or woody crops (food, industrial, horticultural, forage, botanical, cover, decorative, handicraft) and/ or livestock, terrestrial and aquatic organisms, in order to diversify and sustain production to increase the wealth and well-being for land-users at all levels, depending on the ecological, socio-economic, political and cultural circumstances.

World Agroforestry Centre redefined agroforestry as: A dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels.

2.4 Classification of Agroforestry Systems

According to Nair (1987) agroforestry systems can be classified according to the following sets of criteria:

2.4.1 Classification of Agroforestry System on Structural Basis

The structure of a system can be defined in terms of its components and the expected role or function of each. In this system the type of component and their arrangement are important. Hence, on the basis of structure, **Agroforestry** systems can be grouped into two categories:

1. Nature of components and

2. Arrangement of component

2.4.1.1 Nature of Components

Based on the nature of components, (Tewari, 2008) **Agroforestry** systems can be classified into the following categories;

1. Agrisilvicultural systems

2. Silvopastoral systems

3. Agrosilvopastoral systems and 4. Other systems

1. Agrisilvicultural System (crops and trees including shrubs/vines and trees)

This system involves the conscious and deliberate use of land for the concurrent production of agricultural crops including tree crops and forest crops. Based on the nature of the components this system can be grouped into various forms.

(1) Improved fallow (2) Taungya system (3) Multispecies tree gardens (4) Alley cropping (Hedgerow intercropping) (5) Multipurpose trees and shrubs on farmland etc.

2. Silvopastoral System (trees + pasture and/or animals)

Silvopastoral systems are characterized by grazing livestock in wooded rangeland and incorporating trees in pastures for shade and timber. This system is classified into three categories:

1. Protein bank, 2. Living fence of fodder trees and hedges 3. Trees and shrubs on pasture

3. Agrosilvopastoral System, (trees + crops + pasture/animals)

Agrosilvopastoral System is the combination of Agrisilvicultural systems and Silvopastoral systems. This system has been grouped into two subgroups:

1. Home gardens 2. Woody hedgerows

Others:

1. Apiculture with Trees:
2. Aqua forestry
3. Multipurpose Wood Lots

2.4.1.2 Arrangement of components

The arrangement of components gives first priority to the plants even in Agroforestry systems involving animals. Such plant arrangements in multispecies combinations involve the dimensions of space and time.

- Spatial Arrangement
- Temporal Arrangement

Spatial Arrangement: Spatial arrangement of plants in an agroforestry mixture may result in dense mixed stands (as in home gardens) or in sparse mixed stands (as in most systems of trees in pastures).

Temporal Arrangement: Temporal arrangements of plants in Agroforestry may also take various forms. An extreme example is the conventional shifting cultivation cycles involving 2-4 years of cropping and more than 15 years of fallow cycle, when a selected woody species or mixtures of species may be planted. These temporal arrangements of components in agroforestry are termed coincident, concomitant, overlapping, separate and interpolated. (Tewari, 2008)

2.4.2 Functional Classification of Agroforestry Systems

2.4.2.1 Productive functions (producing one or more products):

i. Food, Fodder
ii. Fuelwood
iii. Other products

2.4.2.2 Protective functions of Agroforestry systems

i. Wind-break,
ii. Shelter-belt,
iii. Soil conservation
iv. Moisture conservation
v. Soil improvement
vi. Shade (for crop, animal and man) (Tewari, 2008)

2.4.3 Socioeconomic Classification of Agroforestry Systems

Based on such socioeconomic criteria as scale of production and level of technology input and management, agroforestry systems (Tewari, 2008) have been grouped into three categories:

2.4.3.1 Commercial Agroforestry systems

The term commercial is used whenever the scale of the production of the output is the major aim of the system. E.g. Commercial production of rubber with underplanting of food crops, pastures.

2.4.3.2 Intermediate Agroforestry systems

Intermediate systems are those between commercial and subsistence scale of production and management. E.g. Production of perennial cash crops and subsistence food crops

2.4.3.3 Subsistence Agroforestry systems

Subsistence Agroforestry systems are those wherein the use of land is directed towards satisfying basic needs and is managed mostly by the owner and his family.

2.4.4 Ecological Grouping of Agroforestry Systems

Agro-ecological zones' agroforestry systems have been grouped into the following categories:

2.4.4.1 Humid/sub-humid lowlands

Various types of agroforestry plant associations can be found in areas with a high human population, e.g., Plantation of crops with combinations and multilayer tree gardens

2.4.4.2 Semi-arid/arid lands

This region is characterized by rainfalls confined to 9-21 days in July-sept., 2-4 wet months, vapour pressure deficit ranging from 9 mb in January to 30 mb in April.

2.4.4.3 Highlands

Variable rainfall, degraded and shallow lands at high altitude to deep rich soils in valleys and great climatic variations are the features of highlands. Agroforestry has long encompassed many well-known land-use systems practices.

2.5 Common Agroforestry practices in Bangladesh

Agroforestry is widespread in all ecological and geographical regions of Indian subcontinent. The systems vary enormously in their structural complexity and species diversity, their productive and protective attributes and their socio-economic dimensions.

2.5.1 Homestead agroforestry

A homestead (homegarden) is an operational farm unit in which a number of tree species are raised along with livestock, poultry and/ or fish mainly for the purpose of satisfying the farmer's basic needs (Tewari, 2008). Homestead agroforestry practices have been described by Khaleque (1987) from Bangladesh, Nair and Sreedharan (1986) from Kerala, India, and Liyanage et al. (1985) from Sri Lanka. A typical homestead with a multitude of crops presents a multi-layer canopy configuration. The leaf canopies of the components are arranged in such a way that they occupy different vertical layers with the tallest component having foliage tolerant of strong light and high evaporation demand and shorter components having foliage requiring or tolerating shade and high humidity (Steppler and Nair, 1987).

2.5.2 Cropland agroforestry

Cropland agroforestry, a systematic land-use system of Bangladesh, is a combined cropping practice where trees are grown in crop fields in association with agricultural crops (FAO 2004). It is a distinct form of agroforestry which is primarily used for managing lands classified as agricultural lands. This system aims at production of enough food grain, timber, fodder, fruit, fuelwood and other products (Abedin et al. 1987; Rahman 2011 ;). Agriculture in Bangladesh is facing various natural hazards due to climate change and farmers loose large amount of crops almost in every year, whereas, woody perennials are capable of tolerating adverse climate (Hasanuzzaman et al. 2014a). Therefore, farmers plant suitable trees in crop fields as an insurance crop in case of a sudden crop failure or to support crops against environmental hazards and also to provide additional income from trees (Rahman and Alam 2007; BARC 1993).

2.5.3 Woodlot

In many parts, farmers grow trees in separate blocks as wood-lots along with agricultural fields. Now the practice is expanding fast due to shortage of fuel-wood and demand of poles or pulp-wood in industry. For example, bamboo poles are in great demand for paper mills. These days

wood-lots are being raised mostly on large farms due to increase of labour costs and labour management, lack of irrigation and risk of crop investments. Wood-lots of mahagoni, bamboo, acacia, Eucalyptus, *Leucaena leucocephala* and *Dalbergia sissoo* have become popular in many parts of the country (Tewari, 2008).

2.5.4 Boundary plantation

Border tree-planting as a form of agroforestry on lowland areas is gaining adherents for several reasons. With the rising prices of energy, including biomass energy, farmers are increasingly producing fuelwood for their own use and for sale instead of being dependent on kerosene or other non-wood fuels. Fast-growing, multipurpose trees are planted along property borders; they are lopped off periodically for fuelwood and their leaves are also harvested and used as fodder or as green manure. In addition, normal litter-fall serves as added green fertilizer for the food crops (Umrani and Jain, 2010).

2.5.5 Alley cropping

Alley cropping involves growing crops between trees planted in rows. The spacing between the rows is designed to accommodate the mature size of the trees while leaving room for the planned alley crops. When sun-loving plants like corn or some herbs will be alley cropped, the alleyways need to be wide enough to let in plenty of light even when the trees have matured. Alternatively, the cropping sequence can be planned to change as the trees growth decreases the available light. For example, soybeans or corn could be grown when the trees are very small; then, as the tree canopy closes, forages could be harvested for hay; finally, when the trees are fully grown and the ground is more shaded, grazing livestock or shade-tolerant crops like mushrooms or ornamental ferns could occupy the alleyways. (Umrani and Jain, 2010).

2.6 Importance of Agroforestry :

2.6.1 Productive Perspectives

If we compare the income generated from a forest, agricultural or agroforestry land managed system during a whole cycle of tree development, it can be seen that these profits not only vary because of the type of product obtained (tree and crop), but also because of the period of time when economic benefits are obtained within the different systems. When an exclusively

agricultural system, is established, initial costs are quickly absorbed, because of the benefit obtained from the crops and animals (wheat, barley, milk, wool, meat). However, when agroforestry practices are established, initial costs are usually more quickly recouped than from exclusively forestry land use. Land profit is increased as time progresses and as tree grows compared with exclusively agricultural use. (Mosquera-Losada et al. 2005)

2.6.2 Environmental Perspectives

The main environmental benefits which agroforestry systems deliver are the improvement of use of nutrients through the reduction of losses at a farm level (including erosion) but also by the enhancement of carbon sequestration, the reduction of fire risk and biodiversity enhancement. There is an acknowledgment of the importance of woodland grazing to improve biodiversity (Finck et al. 2002; Redecker et al. 2002) and regeneration (Mayer 2005; Smit et al. 2005; McEvoy et al. 2006) in forestry areas if an adequate animal stocking rate is used (Zingg and Kull 2005). Carbon sequestration by forests is an important environmental issue since the Kyoto protocol was adopted in 1997 (UNFCCC 1998).

2.6.3 Social Perspectives

Social benefits of agroforestry systems for owners and people in general are based on their productive and environmental advantages. Multi-output production (mushrooms, wool, meat, medicine, etc.) from a usually non-productive area is a major advantage, because it can complement the farm owner's rent and value of his land from afforested areas. From a broad social perspective, agroforestry practices allow a higher enjoyment of the countryside by the general public, because it increases amenity and helps to preserve traditional practices and rural culture. (A. Rigueiro-Rodríguez et al., 2009)

2.7 Constraints of Agroforestry

If the opportunities for agroforestry development are promising and the technical solutions are seemingly available, then one might think that the development of agroforestry would be fairly rapid. Since this has not been the case, it may be concluded that there are some formidable constraints and obstacles that prevent the realization of the potential benefits. Several reviewers (e.g., Long and Nair, 1991; Lassoie and Buck, 1991; Thomas, 1990) argue that a major

constraint is institutional: in most countries, either in the tropics, or in the temperate zone, land-use institutions focus exclusively and rather rigidly on long-established disciplines and activities (in this case, agriculture and forestry). Such organizations have generally been unable to direct agroforestry program development in the tropics (Lundgren, 1989). The lack of an adequate research base, and a network of researchers, extensionists, and practitioners, is another major constraint to agroforestry development. The reluctance of the academic community to encourage and reward interdisciplinary, applied research, and the lack of funds and infrastructure for conducting such research are major disincentives to scientists and laboratories interested in such fields. The advancement of agroforestry in the developed countries is further constrained by the organizational structure of extension services and agencies. At present, these organizations are oriented towards transferring technical information through extension staff who are highly trained in certain disciplines, but lack the skills, tools, and competence to address interdisciplinary issues (Lassoie et al., 1991).

2.8 Scope of Agroforestry in Bangladesh

Agroforestry is the most effective system from sustainable view point and is recognized worldwide as the best productive system from which rural poor can meet their requirement of food fuel fodder and other necessities. This has long been practiced by the farmers of Bangladesh in haphazard manner. The homestead of rural people is a unique feature of combination of trees, shrubs vegetables livestock animals and duck and poultry birds in association of trees of different multipurpose values. Estimated 16.7 million homestead of the country occupy about 0.3 million hectares of land which is increasingly sharply with the increase of population in now under traditional agroforestry practices. There is a great scope to the manager and develop these homesteads sound sustainable technologies. Because the homesteads are providing the lion share of biofuel requirement as well as fruit fodder timber and shelter for the rural people. Besides the homesteads, part of our cropper land (net cropper area is 8085 million hectare) 0.39 m ha current fallow land, 0.27 m ha cultivable waste land, 3.29 m ha land which is not available for cultivation and encroached forest areas in Madhupur sal forest. CHT forests along with the denuded hills of greater Chittagong region may bring under agroforestry system. Utilizing appropriate agroforestry technologies in these areas the overall production may be increased in many folds. (Hasanuzzaman, 2009)

CHAPTER THREE

MATERIALS AND METHODS

3.1 Selection of the Study Area

Faridpur district was selected purposively as study area. It was the first sampling unit. This area was suitable for the study due to time limitation and ease of data collection. An exploratory survey was conducted during November-December, 2016 to obtain information regarding the demographic profile of respondents, perception and adoption of the agroforestry practice etc.

3.1.1 General description of the Study Area

Faridpur is a district in central Bangladesh. It is a part of the Dhaka Division. Faridpur District has a population of over 1.7 million people and is situated on the banks of the Padma river (Lower Ganges) (Wikipedia, 2016). It is about 2072.72 sq km, located in between 23°17' and 23°40' north latitudes and in between 89°29' and 90°11' east longitudes. It is bounded by Rajbari and Manikganj districts on the north, Gopalganj district on the south, Dhaka, Munshiganj and Madaripur districts on the east, Narail and Magura districts on the west. (Banglapedia, 2016)

3.1.2 Demography

Total Population: 1756470; Male 893358, Female 863112; Religion: Muslim, 1576713, Hindu, 178354, Buddhist, 1073, Christian, 58 and others 370.Male to Female ratio: 105:100; Population density is 847 per square kilometer. (Banglapedia, 2016)

3.1.3 Meteorological Condition

The rainy season duration is June to October and the winter season duration is November to February. The annual average temperature in this area varies maximum 37.4 to minimum 8.6. The annual average rainfall is 1310 mm. (BBS, 2011).

3.1.4 Literacy rate

Average literacy rate is 40.9%; male 44.6%, female 37%. (Banglapedia, 2016)

3.1.5 Main sources of income

Agriculture 58.60%, non-agricultural labourer 2.88%, industry 1.07%, commerce 14.09%, transport and communication 4.58%, service 8.87%, construction 1.91%, religious service 0.19%, rent and remittance 1.50% and others 6.31%.(Banglapedia, 2016)

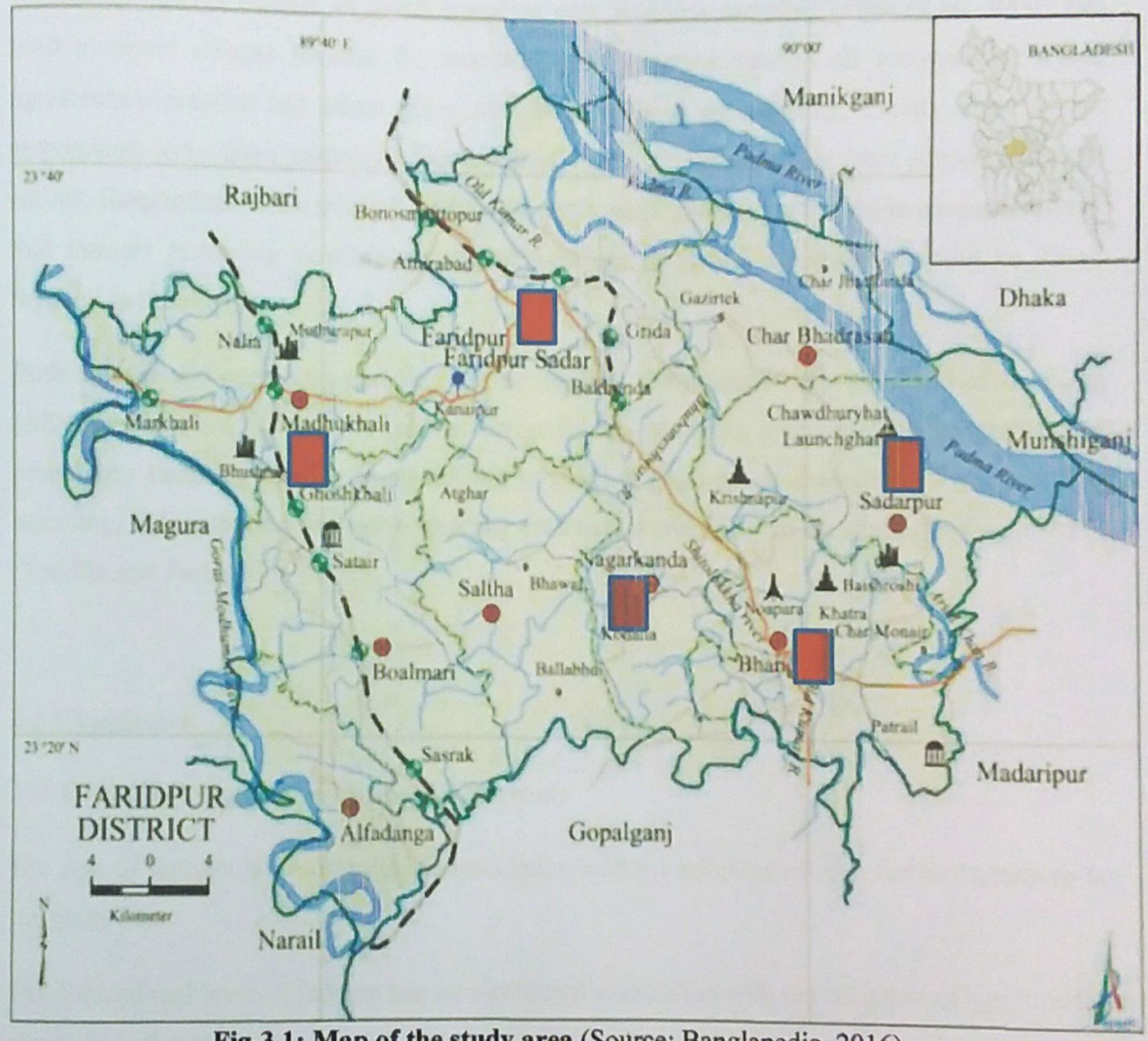

Fig-3.1: Map of the study area (Source: Banglapedia, 2016)

3.1.6 Main crops grown

Rice, wheat, jute, sugarcane, lentil (masur), mug, maize, pulse, potato, pepper, onion ,garlic, tomato, radish, bean, pumpkin, parble , cabbage, brinjal, lady's finger arum etc. Main fruits are mango, litchi, blackberry, papaya, guava, lime, lemon, jackfruit, banana etc. (Banglapedia, 2016)

3.2 Selection of respondents

Multi stage sampling was adopted in the selection of respondents. In this study five upazillas were selected randomly as second sampling unit and then two unions from each of the five upazillas were taken randomly as third sampling unit. Again two villages from each union were selected in random manner as fourth sampling unit. Random sampling (Zhen et al., 2006) was used to select villages because the reconnaissance survey identified all communities where agroforestry practice had taken place and those without agroforestry. Finally eight to ten respondents were taken purposively and total of eighty four respondents were contacted for the survey. Respondents were selected purposively as it was found during the reconnaissance survey that farmers practicing agroforestry and farmers not practicing agroforestry could be found together in the villages.

Both random and purposive sampling can be combined to produce a good method of sampling (Albertin and Nair, 2004). The random nature of this sampling procedure is characteristic of probability sampling and the small number of cases it generates is characteristic of purposive sampling. This sampling strategy is typically used to add credibility to the result of a larger study (Teddlie and Tashakkori, 2009).

3.3 Hypotheses

The following hypotheses were tested in the study.

Ho: Age of farmers has no significant association with the adoption of Agroforestry practices in the study area.

Ho: Educational level of farmers has no significant association with the adoption of agroforestry practices in the study area.

Ho: Farm size has no significant association with the adoption of agroforestry practices in the study area.

Ho: Farmers income range has no significant association with the adoption of agroforestry practices in the study area.

Table-3.1: Name of the sampling units in Faridpur District

Name of the district (1st sampling unit)	Name of the upazilla (2nd sampling unit)	Name of the union (3rd sampling unit)	Name of the village (4th sampling unit)
Faridpur	Faridpur Sadar	Kanaipur	Bhati Kanaipur
			Karimpur
		Krisnanagar	krisnanagar
			Maharajpur
	Madhukhali	Gajna	Raijadapur
			Deul-Mothurapur
		Madhukhali	Madhukhali Bazar
			Garakhola
	Nagarkanda	Talma	Manikdi
			Talma
		Ramnagar	Gopinathpur
			Ramnagar
	Bhanga	Manikdaha	Rajapur
			Sadipur
		Kaulibera	Poraron
			Pollibera
	Sadarpur	Char Bishnupur	Kacharidangi
			Char Chandpur
		Dheukhali	Char Kumaria
			Baburchar

3.4 Research instruments

Questionnaires, interviews and field observation methods were applied to collect detailed information on perception and the adoption of agroforestry technologies in the study area.

3.4.1 Reconnaissance survey

Before the actual data collection a questionnaire for farmers' survey was first pretested (Adedayo and Oluronke, 2014). For this purpose, the researcher visited ten (10) farmers from ten (10) different sub-locations randomly selected and some questionnaires were filled for piloting. Reconnaissance survey was conducted during October, 2016.Later, necessary amendments were made on the questionnaire.

3.4.2 Questionnaire survey

Rectified semi-structured questionnaire was used to obtain data on the demographic characteristics of the farmers. Data was obtained on farmers' household characteristics, occupational characteristics, perceptions of agroforestry and demographic factors that may influence farmers' decision of adopting agroforestry practices.

3.5 Data collection procedure

Two main sources were used to collect data, these were primary and secondary. Primary sources are original sources from which data were collected that have not been previously collected whiles secondary sources are containing data already collected and compiled for another purpose (Babbie, 1992).

3.5.1 Primary Data Collection

The instruments used for the primary data collection were questionnaires, interviews and field observations (Nzilu, 2015). A semi-structured questionnaire (Adedayo and Oluronke, 2014) was developed through a proper and consultative process, keeping in view the goals and objective of study. Data were collected by physical visit to the villages, interviewing the respondents and through field observation. Observations were made when field visits were carried out to observe farming practices. Field observation helped to get the overview of how farmers manage agroforestry technologies in the district.

3.5.2 Secondary Data Collection

The secondary sources of data were collected from Khulna University Library, Seminar Library, Journals, Books, Various publications, government department, extension officers, local leaders, published and unpublished reports, internet browsing etc.

3.6 Data analysis and presentation

Information gathered through observation is presented descriptively while field data collected using semi-structured questionnaires is presented in Microsoft Excel, 2010.The data collected was analyzed using descriptive statistics that include the use of percentages tables, column chart charts, pie charts etc.

Chi- square test (goodness of fit) was used (Adedayo and Oluronke, 2014) to test for the nature of association between adoption of Agroforestry practices and respondent's age, level of education, annual income and farm size. As individuals in the sample were classified into non-numerical categories it was assumed to be useful carrying out this test to evaluate the hypothesis about the population proportions (Gravetter and Wallnau, 2009).

3.7 Limitations of the study

- Extensive field survey is very costly and fund was provided solely by the researcher, therefore carrying out extensive survey was not possible.
- Too much time is required to conduct extensive survey, which was not available.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Demographic features of the respondents

Demographic features of the respondents play an important role in determining their perception and attitude towards the adoption or rejection of new ideas (Ghauri and Qureshi, 1999). 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.

4.1.1 Age Distribution of Respondents

Age of the respondents has been classified into four classes. The classes are (1) Very young (18-25) years (2) Young (26-35 yrs.) (3) Middle-aged (36-50 yrs.) (4) Old (50+ yrs.). The study reveals that agroforestry is practiced more by farmers aged between 26-35 yrs. (47%, n= 37) and elderly farmers above 50 years (31%, n= 24).

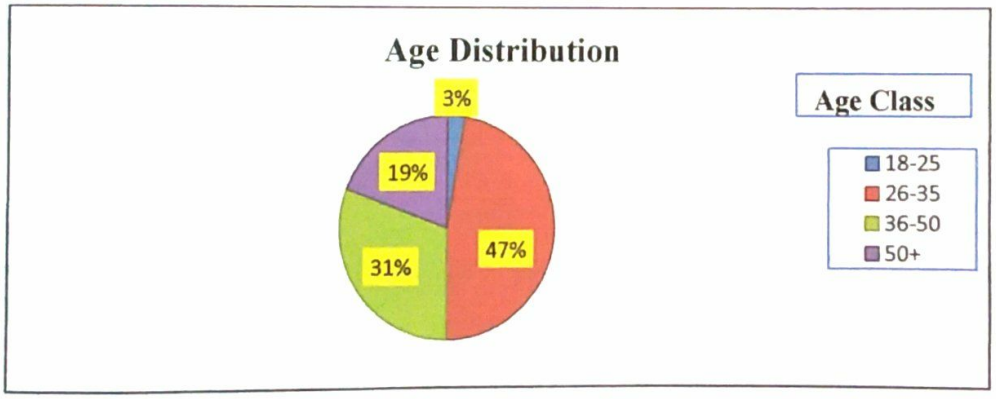

Fig-4.1: Age distribution of the respondents

4.1.2 Educational status of the respondents

Educational standard in study area is generally low. Study reveals that majority of the respondents (48.75%) had acquired secondary school education followed by primary school education (32.50%). However, a proportion of respondents (6.25%) had no formal education.

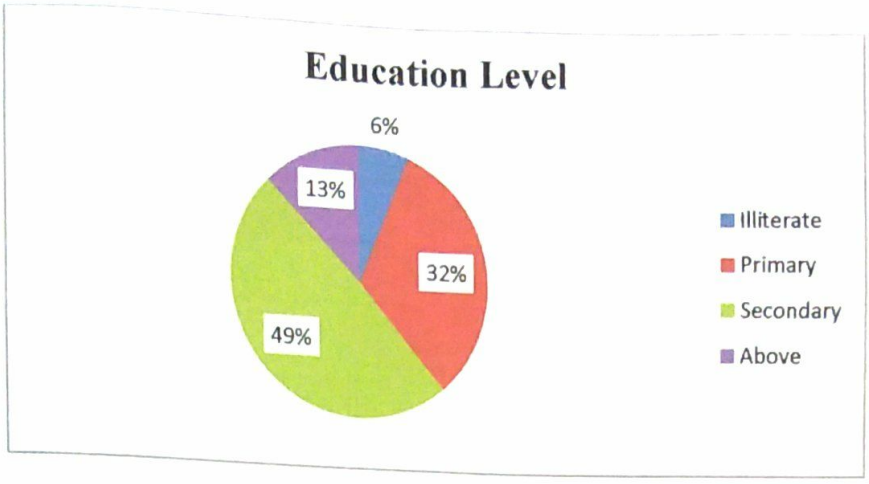

Fig-4.2: Education level of the respondents

4.1.3 Occupational status of the respondents

Respondents in the study area are mostly engaged in farming (58%) activities, a significant proportion of respondents (21%) involved in business. However, 11% of the respondents work for government and private sector while only 10% respondents are in other occupation.

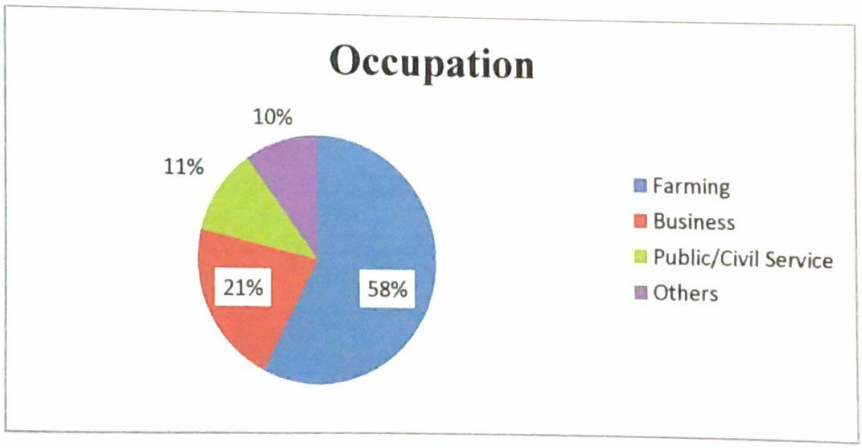

Fig-4.3: Occupation of the respondents

4.1.4 Income of the respondents

Income range of the respondents has been classified into four classes. The classes are (1) Low (upto 1,00,000 tk.) (2) Medium (1,00,001-2,00,000 tk.) (3) High (2,00,001-3,00,000 tk.) (4) Very High (Above 3,00,000 tk.). The study reveals that Agroforestry is practiced more by farmers whose income range is 1, 00,001-2,00,000 tk. (32%).

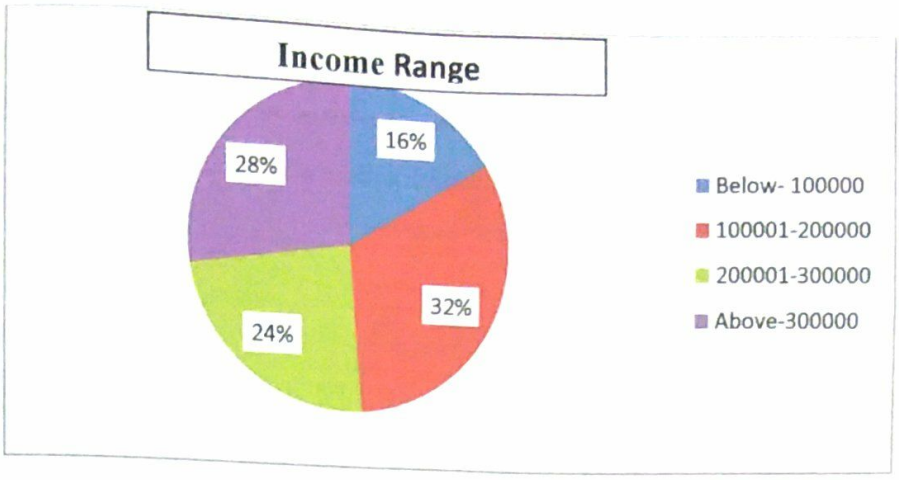

Fig-4.4: Income range of the respondents

4.1.5 Land Tenure within the Study Area

The respondents obtain land through family, purchase, and lease arrangements, tenancy. Majority (60%) of respondents obtained land through the family.

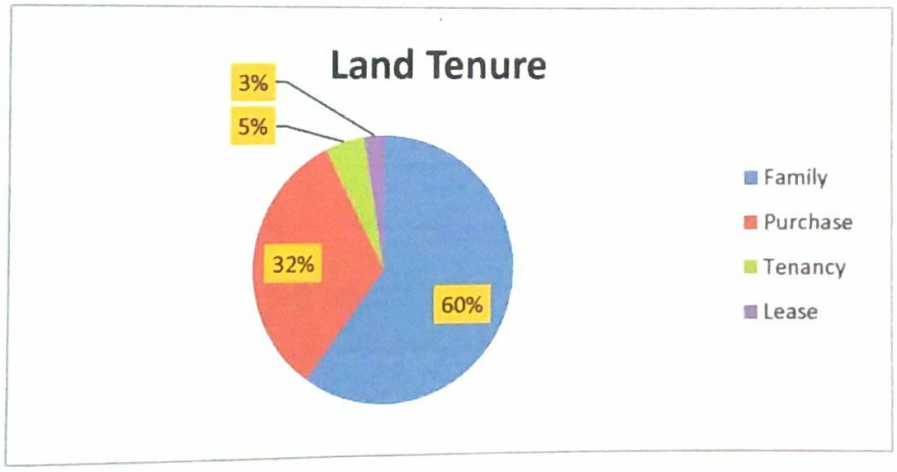

Fig-4.5: Land Tenure of the respondents

Purchase (32%) was identified as the second most mode of land acquisition in the District, its use for agroforestry activities was observed to be high. Some of the respondents also obtained their land through tenancy (5%) and very few of them obtained their land on lease (3%).

4.1.6 Farm size of the respondents in the study area

Farmers with large farm sizes could invest resources in new technologies and get better returns, which encourage adoption of conservation technologies (Cramb et al., 1999). This is because farmers may not risk accepting new technologies because of the small size of their farms.

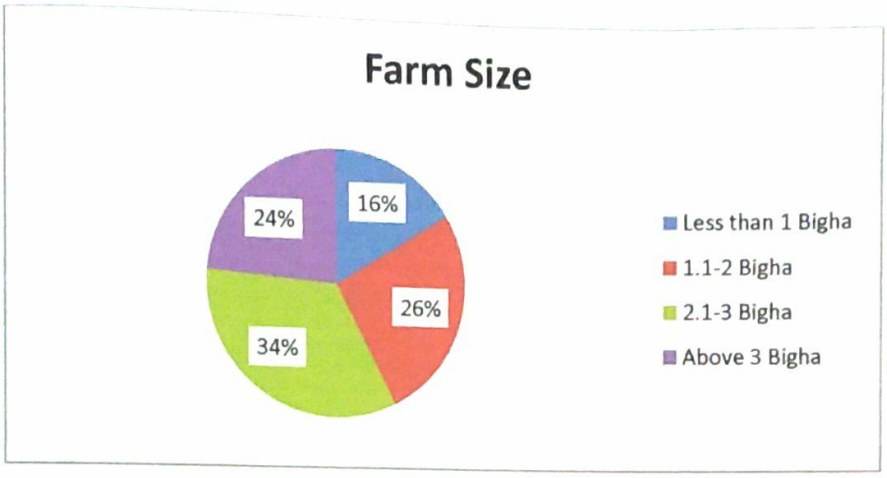

Fig-4.6: Farm size of the respondents

The result shows that majority (34%) of the respondents had farm sizes between 2.1-3 bigha whiles few respondents (24%) had above 3 bigha.

4.2 Agroforestry practices in the study area

There are various types of agroforestry practices in Faridpur district. The study area mainly covers the following types of agroforestry practices with some other minor types.

- Homestead Agroforestry
- Cropland Agroforestry
- Fruit-based Agroforestry
- Boundary plantation
- Woodlot
- Fish Farm Agroforestry

Table- 4.1: Agroforestry Practice by Respondents in the Study Area

Agroforestry Systems	No. of Respondents	Percentage of Respondents
Homestead Agroforestry	33	39.28%
Cropland Agroforestry	10	11.9%
Fruit-based Agroforestry	18	21.42%
Boundary Plantation	8	9.52%
Woodlot Plantation	11	13.09%
Fish farm Agroforestry	4	4.76%

4.2.1 Homestead Agroforestry

The cultivation of different plants around homesteads is a very common practice being followed by the farmers in the study area. Majority (39.28%) of the respondents practice homestead agroforestry in the study area. Farmers combine multi-purpose trees, shrubs, fruits, bamboos, palms and medicinal plants which grow with a very high productivity. The majority of the species were used as fruit and food (45%) followed by medicinal plants (38.71%), firewood (32.26%), and timber (29%). Existing plant species have moderately high biodiversity.

Fig-4.7: Homestead Agroforestry (Field Survey, 2016)

4.2.2 Cropland Agroforestry

In the study area 11.9% of the respondents are practicing cropland agroforestry. Various types of tree species are found growing in association with agriculture crops in the croplands of the study area. In these practice, agricultural crops are intercropped with tree crops in the interspace between the trees. Under this system agricultural crops can be grown upto two to five years under protective irrigated condition. 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. Performance of the tree crops is better in this system when compared to monoculture.

Fig-4.8: Cropland Agroforestry (Field Survey, 2016)

4.2.3 Boundary plantation

Trees are being planted on the edges of property, agricultural fields, pastures, roads or any other place in the study area. About 9.52% of the respondents have planted trees on their land boundaries in the study area. Trees such as mehgoni, raintree, tal ,khejur etc. are being planted on the household boundaries. This trees act as soil stabilizer and combat against natural calamities to save life and properties of farmers.

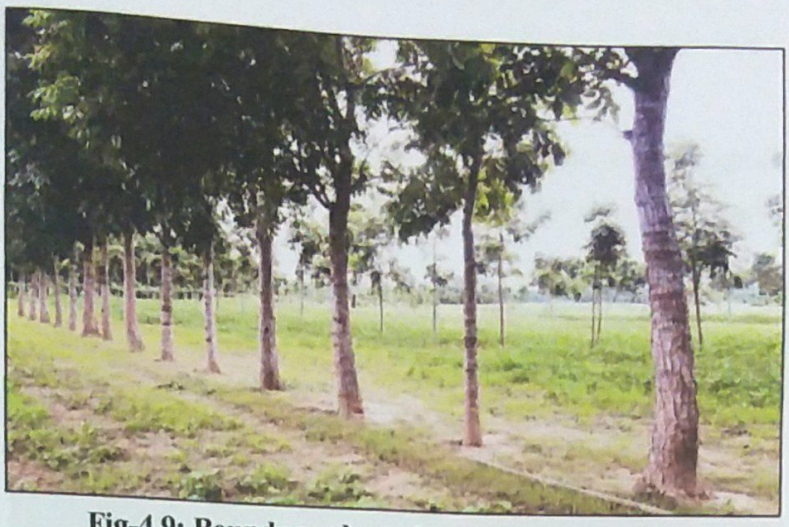

Fig-4.9: Boundary plantation (Field Survey, 2016)

4.2.4 Fruit-based Agroforestry

A significant proportion (21.42%) of the respondents practice fruit-based agroforestry. Fruit trees grown on farmlands for their non-timber forest products such as fruits, nuts, and spices etc. are considered as a sustainable farming system throughout the world. Farmers prefer fruit-producing species to other trees for on-farm planting all over the study area and appreciate the dual contributions of food for consumption and the potential for income generation.

Fig-4.10: Fruit-based Agroforestry (From left: Mango, Sofeda) (Field Survey, 2016)

4.2.5 Woodlot

A significant proportion (13.09%) of the respondents practice woodlot agroforestry. Various types of trees such as mehgoni, raintree, sissoo, koroi, lombu etc. are commonly planted in the woodlots of the respondents in the study area.

Fig-4.11: Woodlot (Field Survey, 2016)

4.2.6 Fish farm Agroforestry

Fish farm agroforestry is not very popular practice in the study area. Small proportions (4.76%) of farmers are practicing fish farm agroforestry. This strategy has become a favorable livelihood opportunity to sustainably augment fishers' income and, at the same time, contribute to tree component increment. Farmers' in the study area practices fish farm agroforestry in their farmland and get benefitted.

Fig-4.12: Fish farm Agroforestry (Field Survey, 2016)

Table-4.2: Plant species found in the farmland

Agroforestry Practice	Tree species found	Crop species found
Homestead Agroforestry	*Mangifera indica, Artocarpus heterophyllus, Syzygium cumini, Cocos nucifera, Azadirachta indica, Swietenia macrophylla, Manilkara zapota, Areca catechu, Citrus maxima etc.*	*Basella alba, Lagenaria siceraria, Typhonicum trilobatum, Cucurbita moschata, Benincasa hispida, Vigna sesquipedalis, Carica papaya, etc.*
Cropland Agroforestry	*Phoenix sylvestris, Borassus flabellifer, acacia auriculiformis, Mangifera indica, Swietenia macrophylla, Citrus limon etc.*	*Corchorus capsularies, Momordica charantia, Amaranthus lividus, Solanum melongena, Pisum sativum, etc.*
Fruit-based Agroforestry	*Mangifera indica, Manilkara zapota,, Citrus limon, Psidium guajava, Litchi chinensis etc.*	*Zingiber officinale, Curcuma longa, Brassica nigra, Lens culinaris, Vigna unguiculata, etc*
Boundary plantation	*Phoenix sylvestris, Borassus flabellifer, Cocos nucifera, Swietenia macrophylla, Samanea saman etc.*	*Carica papaya, Musa sapientum, Moringa oleifera, Basella alba etc.*
Woodlot	*Swietenia macrophylla, Samanea saman, Dalbergia sissoo, Albizia lebbeck etc.*	×
Fish farm agroforestry	*Mangifera indica, Litchi chinensis, Psidium guajava, Azadirachta indica etc*	*Lablab niger, Basella alba, Vigna sesquipedalis etc.*

4.3 Farmers' perception of agroforestry practices in the study area

OXFORD DICTIONARY defines "Perception" as "The way in which something is regarded, understood, or interpreted" (Stevenson, 2010). Majority of the respondents in the study area are aware of the positive impact of agroforestry practices. The respondents were aware of the economic and productive benefits of agroforestry practices and had favourable perception towards those practices. They believe that agro-forestry practices increases productivity although difficult to practice. Respondents in the study area perceived that planting of trees on their farmland will increase the overall output of the farmland.

Table 4.3: Farmers perception of agroforestry practice in Faridpur District

Perceptions	Response Frequency	Response Percentage (%)
Increase farm productivity	69	82.14
Increase household income	62	73.80
Food security	26	30.95
Decrease cash crops production	29	34.52
Difficult to practice	15	17.85

N. B. Some respondents stated more than one reason.

Table-4.3: Farmers' perception of agroforestry practices in the study area shows that, 82.14% perceived that agroforestry increases farm productivity, 73.8% opined that agroforestry increase household income while 30.95% perceived it as a means to food security. But 34.52% opined that the practice lessen cash crops production, 17.85% of the respondents were of the opinion that agroforestry practice is a scientific practice that is difficult to practice.

This may be due to the fact that a significant proportion of the respondents have started to get benefits from the agroforestry practices in the study area. Perception of the agroforestry practices indicated that the productive values (82.14%) were considered most important among majority of the respondents. Because they understood agroforestry as meeting their basic needs in terms of fuel wood, fruits, fodder, timber, vegetables etc. Similarly, a significant proportion (73.80%) of the respondents realized the economic aspects as most important. This is because agroforestry increased family income, employment opportunities, decreased farm expenditure etc. Farmers' perceived some protective roles of agroforestry such as soil conservation, erosion control, flood control etc.

It is noteworthy that agroforestry is difficult (17.85%) to practice this is an indication of lack of knowledge, which may be due to the problem of no access to agricultural extension officers and other concerned authorities which has limited their information about agroforestry practices and as such limited their knowledge and perception about agroforestry innovations. In contrast, some of the surveyed farmers opined that crop yields are reduced when trees are grown in the fields.

However, the reduction in crop yield might not be significant up to certain age of the trees. The effects of trees on the crops depend on many factors like density, age and planting configuration of the tree species (BARC 1993). However, such yield loss is supplemented by the yield of fruit, fuel wood, juice and wood etc. Moreover, some agriculture crops like *Curcuma longa* (Holud), *Pisum sativum* (Motor) and *Lathyrus sativus* (Khesari) are well grown under trees and that's why farmers are willing to adopt these mixing land-use systems for maximizing the production and to sustain their livelihood.

Mango was found as the most preferred timber producing species among the available species in the homesteads of the study area while Mehgoni was estimated as the most preferred species among the available species in the woodlots of the respondents. Furthermore, a significant proportion of farmers' plant fruit trees inside and on the edge of the croplands such as mango, litchi, sofeda, lemon etc.

Table – 4.4: Beneficial and Harmful Characteristics perceived by Respondents

Agroforestry Practices	Beneficial Characteristics	Harmful Characteristics
Homestead Agroforestry	▪ Household consumption (81%) ▪ Easy to manage as near to houses (43%) ▪ Protection from natural calamities (28%) ▪ Multiple products (67%)	o Large trees may fall above house during storm (37%)
Cropland Agroforestry	o Avoid single crop failure (60%) o Profitable in the long run (40%) o Provide cash in a continuous basis (30%)	▪ Crops may not grow well after several years. (50%) ▪ Some plants may affect tree growth (e.g. banana) (30%)
Fruit-based Agroforestry	▪ Very productive system (72.13%) ▪ Higher economic return per year (77.7%) ▪ Some fruit trees tolerate drought (22%) ▪ Some crops can be grown after the ▪ tree canopy closes (28%)	o Fruit trees will not live long (e.g. 10-12 years) (22%) o Pest attack (16%) o Higher initial investment (34%)
Boundary Plantation	o Fencing (62.5%) o Soil stabilization (62.5%)	▪ May hamper adjacent crops (37.5%)
Woodlot	▪ Regular management is not required (54%) ▪ Less labor required (37%) ▪ Big amount of cash at a time (72%) ▪ Acts a farmers bank in the future (27%)	o Farmers' have to wait for a long time (72%) o Higher initial input required (63%)
Fish farm Agroforestry	o Productive integrated system (25%) o Diversified products (50%) o Soil conservation (50%)	▪ Leaf fall into the water (50%) ▪ Shade problem (25%)

4.4 Farmers' adoption of agroforestry practices in the study area

Agroforestry has a way of instituting sustainable agricultural development (Akinbile et al.). However, the success of agroforestry practices is determined by the level of adoption of agroforestry by the farmers.

Table-4.5: Adoption of agroforestry practices in the study area

Agroforestry Practices	No. of Respondents	Adoption Frequency	Adoption Percentage
Homestead Agroforestry	33	23	69.70
Cropland Agroforestry	10	6	60.0
Fruit-based Agroforestry	18	14	77.78
Boundary Plantation	8	5	62.5
Woodlot	11	4	36.37
Fish farm Agroforestry	4	2	50.0
Total / Average	**84**	**54**	**64.28**

Table-4.5 showed that, on an average significant proportion of farmers (64.28%) have adopted Agroforestry practice while 35.72% did not adopt the practice. The main reason for high level of adoption was may be because of multiple benefits the farmers gain from the crop-tree combination and also because agroforestry has been an age- long practice among the local farmers not only in the study area but also all over the country.

4.4.1 Demographic factors and adoption of agroforestry practices

Table 4.6 showed the association between Socio-economic factors and adoption of agroforestry practices in the study area. Chi-square value (7.185) shows no significant (P = 0.066) association between respondents' age and the adoption of agroforestry practices. This result is in line with Odera et al. (2000) who found that age does not affect the adoption of agroforestry. Respondents

of different age classes are involved in agroforestry practice. However in the study area most of the farmers that are involved in agroforestry practices are above 30 years of age.

Table-4.6: Demographic factors and adoption of agroforestry practices

Factors	Categories	Adoption Frequency	Adoption Percentage	Chi-square Value	P-value
Age (years)	Very young (18-25 yrs.)	7	12.96%		
	Young (26-35 yrs.)	20	37.03%		
	Middle-aged (36-50 yrs.)	16	29.62%	7.185	0.066
	Old (50+ yrs.)	11	20.37%		
Education Level	Illiterate	3	5.56%		
	Primary	18	33.34%		
	Secondary	26	48.14%	24.37	0.00002
	Above	7	12.96%		
Annual income (taka)	Low (upto 1,00,000 tk.)	8	14.81%		
	Medium (1,00,001-1,50,000 tk.)	19	35.18%		
	High (1,50,001-2,00,000 tk.)	13	24.07%%	4.519	0.211
	Very High (Above 2,00,000 tk)	14	25.92%		
Farm size (acre)	Small (upto 1 Bigha)	11	20.37%		
	Medium (1.1-2 Bigha)	25	46.29%	14.593	0.002
	Large (2.1-3 Bigha)	12	22.22%		
	Very Large (Above 3 Bigha)	6	11.11%		

Chi-square value (24.37) from the table 4.6 showed a positive significant (P=0.00002) association between the education level of the respondent and their awareness about the agroforestry practices. Data clearly indicated that educated farmers had more awareness and they are very keen to adopt agroforestry practices as compare to illiterate farmers. When farmers are

educated they have better access to information and innovations which help farmers to quickly adopt new technology. However, this finding supports Mekoya et al., (2008) that agroforestry technologies are knowledge intensive and therefore require enough education in the adoption process.

Farmers' income range is classified into four categories. They have various income ranges to lead their life. However, from table 4.6 Chi-square value (4.519) indicated respondents income is not significant (P=0.211) and therefore does not seem to affect the adoption of agroforestry in the study area.

Again, Chi- square value (14.593) from table 4.6 also shows that there is significant association (p=0.002) between respondents farm size and the adoption of agroforestry practices in the districts of the study area. Data revealed that large landholding farmers had more interest as compare to small farmers. Similar findings were given by Amsalu and Graaff (2007) that in Ethiopia farmers with large farm sizes are more likely to invest in soil conservation measures as the farmers can take more risks, including relatively high investment, and survive crop failure.

Lower production rate of agricultural crops was stated as a significant (40%) reason for planting trees on the croplands. Farmers' integrate trees and agro crops on the same piece of land avoid uncertainty of agricultural crops production rate.

Respondents stated that flood water comes and destroys the agricultural crops in the rainy season in some areas. Therefore, they don't want to waste their valuable resources and reluctant to cultivate agricultural crops solely.

A large number of labors have been shifted outside the country in search of works thus giving rise to the labor shortage to cultivate agricultural crops. As agricultural crops requires a remarkable number of labor force this labor shortage may be a reason for stopping agricultural crops cultivation alone and practicing Agroforestry thereby adopting it.

Market facilities (88%) for agroforestry products were satisfactory to the farmers. Farmers stated clearly that they can sell their products without any significant difficulties which improve their living conditions and reduce poverty.

4.5 Problems and constraints faced by respondents in practicing agroforestry

The findings suggests that majority of the farmers are not practicing agroforestry because of inadequate land as well as no knowledge of agroforestry because of low level of education on agroforestry technologies. A question was asked to report about the constraints and problems being faced by the respondents in the adoption process of agroforestry. The following table gives an indication on their opinion.

Table- 4.7: Problems faced by respondents in practicing agroforestry

Problems / constraints	Frequency	Percentage
Limited farmland	62	73.80%
Lack of education	41	48.8%
Lack of capital	13	15.47%
Unawareness	27	32.14%
Lack of technical assistance	32	38.09%

N. B. Some respondents stated more than one problem

A significant proportion of the respondents i.e., 68.8% were not willing to grow trees due to competition of trees grown on farmland along with agricultural crops for shade, water and nutrients competition and degradation of land. Some farmers don't have sufficient capital resources such as land and technical knowhow to make this practice effective. They reported that unawareness, technical assistance as the main obstacles to the adoption of agroforestry.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The purpose of this study research was to find how farmers' perceive and what factors determine the adoption of Agroforestry practices in Faridpur district. The study revealed that significant proportion of respondents (82.14% on the average) perceives agroforestry as a practice that can improve farm productivity and overall income in comparison to monoculture. In spite of this, 34.52% perceived it as methods that lessen cash crops production while some of them (17.85%) perceived it as a scientific method that is difficult to practice. Therefore, all the farmers in the study area did not adopted agroforestry practice.

The findings showed that there is no significant association between the age and adoption of agroforestry practices of respondents as well as respondents' income range and the in the study area. However, study revealed positive significant association between respondents' farm size and the adoption of agroforestry practices in the study area. Again, result showed positive significant relation between the level of education and adoption of agroforestry in the study area.

This study concludes that the farmers were not adopting agroforestry mainly due to lack of awareness about the tree benefits and their concern with the comparison of trees and agricultural crops. A majority of the farmers were not educated; therefore they considered that the trees compete with agricultural crops and degrade the land by taking up all water and nutrients. No formal projects were running here to increase the knowledge of farmers to change their farming attitude towards agroforestry. Small farm size ranked highest among all these problems followed by lack of technical knowhow and low level of education. They lack coordination with forest department for technical assistance and guidance to grow trees on their farmlands. The extension staff was not paying much attention and consideration to new farming practices.

Finally, it can be concluded that the successful adoption of agroforestry to raise farm productivity and overall income of the respondents in the district would depend on adequate education and technical supports as well as the efficient use farmlands of all types of landholders.

5.2 Recommendations

Based on the findings of study, the following recommendations may be useful.

- Awareness and objective oriented information regarding the economic benefits of the trees should be disseminated widely to farmers through extension departments, media and press etc.
- Necessary education has to be given to respondents to promote adoption of agroforestry technologies in the district.
- Farmlands of the large-sized landholders must be cultivated with proper agroforestry design while lands of the small-sized landholders need to be cultivated with efficiently.
- The government should initiate such projects especially for the capacity building of the farmers and equip them with the new farming techniques through training.
- They should provide technical guidance to the farmers about suitable tree species grown on agricultural land with agricultural crops, their sillvicultural operations and tree management practices along with free supply of seeds and seedlings for the better adoption of agroforestry.

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APPENDIX

Questionnaire for the field survey for the study of "Farmers' Perception and Adoption of Agroforestry practices in Faridpur district"

(This questionnaire will be used only for the research purpose for the completion of Bachelor Degree from Forestry and Wood Technology Discipline, Khulna University.)

Date: ..... Serial no: .....

Village: ..... Union: .....

Upazilla: ..... District: .....

A. General information of the respondent:

1. Name of the respondent: .....

Gender		Age (Years)	Educational level			Total no. of family member	Total income per year (Taka)
Male	Female		Primary	Secondary	Higher secondary		

B. Information about Agroforestry practices:

i. What is the approximate total area of land that you manage in acres? .....

ii. Which of the following best describes the tenure of your farm?

1. Owner-occupied 2. Tenant 3. Both

iii. What type of Agroforestry you practice on your farm?

1. Cropland Agroforestry 2. Homestead Agroforestry 3. Woodlot 4. Others

iv. How trees are growing on your land?.....naturally / planted

v. Tree species you planted on your farmland:

a) ..... b) ..... c).....

d).....e).....f).....

vi. Crop/vegetables/fish/others species you plant on your farmland (if any):

a) ..... b) ..... c) .....

d) ..... e) ..... f) .....

vii. No. of agro crops you cultivate each year: .....

viii. How long are you practicing agroforestry on your land?.....months / years

ix. Sources of seedling / planting material: a) raised b) purchased

x. Why planting trees in cropland / homestead / other land use? :

- .....
- .....
- .....
- .....

xi. Criteria for species selection: :

- .....
- .....
- .....
- .....

xii. Do you think crop / vegetables / fish production is influenced by perennial plants?

a) Yes b) No; if yes, reasons?

Reasons	Remarks
Physical obstruction	
Soil quality	
Others	

xiii. What types of product you obtain from trees?

1. Fuelwood 2. Timber 3. Fodder 4. Fruits 5. Cash 6. Others

xiv. What is your perception of agroforestry practice?

Perceptions	**Response**
Increase farm productivity	
Increase household income	
Difficult to practice	
Decrease cash crops production	
Food security	

xv. Do you get assistance from government or any organization?

a) Yes b) No

xvi. Do you need assistance from government or any organization? a) Yes b) No

If yes, what kind of assistances:

1. Seedling 2.Capital 3.Technical 4.Others

xvii. Market facilities : Excellent / Good / Poor

xviii. What problems you faced practicing agroforestry?

.....

.....

.....

xix. Did you adopt agroforestry practice or will you adopt it in near future?

1. Yes 2. No

xx. What factors influence / encourage you to plant trees in your farm?

.....

.....

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xxi. Suggestions / Recommendations :

- .....
- .....
- .....
- .....