

**FARMERS PERCEPTION ABOUT CAUSES OF MONGA AND ADOPTION
OF AGROFORESTRY PRACTICES AS A REMEDIES OF MONGA IN
KURIGRAM DISTRICT**

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**FARMERS PERCEPTION ABOUT CAUSES OF MONGA AND ADOPTION
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KURIGRAM DISTRICT**

BY

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CERTIFICATE

*This is to certify that thesis entitled, “**FARMERS PERCEPTION ABOUT CAUSES OF MONGA AND ADOPTION OF AGROFORESTRY PRACTICES AS A REMEDIES OF MONGA IN KURIGRAM DISTRICT**” submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (M.S.) in AGROFORESTRY AND ENVIRONMENTAL SCIENCE**, embodies the result of a piece of bona-fide research work carried out by **RUBAIYA AKTER RIA**, Registration no. **14-05907** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

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

Dated: Dec 2021
Dhaka, Bangladesh

Dr. Md. Forhad Hossain
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Dedicated
To
My Beloved
Parents

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Abstract

Agroforestry practices is very important for socio-economic development in our country and also it contribute a great to combat Monga. The objective of this paper is to explore farmers perception about causes of Monga and adoption of agroforestry as a remedies of Monga and capacities to combat Monga at household level in the Kurigram district of Bangladesh. The agriculture based rural economy, extreme property, high percentage of landless, lack of sufficient caloric intake, unemployment of vast agricultural labor force etc. are the root causes of vulnerability to Monga in the northern region specifically Kurigram. Data were collected by random sampling method of 150 respondents from 781 farmers of 10 villages 5 upazilla under Kurigram district by using a pretested interview schedule during October 2019 to December 2019. Findings indicated that the highest portion of farmers had medium to low perception about causes of Monga and adoption of agroforestry practices. Out of 10 selected characteristics of respondents, annual income, effect of life on Monga had positive significance of perception about Monga. Also farming experience, organizational participation, effect of livelihood of farmers had significance about adoption of agroforestry practices. The rest of the variables namely: age, education, family, size, farm size, did not show any significant correlation with the perception about causes of Monga & adoption of agroforestry practices. Relation with causes of Monga and farmers perception is medium to low in char area and rural area than sadar area. High perception about causes of Monga in sadar area.

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LIST OF ABBREVIATIONS

| ABBREVIATION | ELLABORATION |
|------------------|---------------------------------------|
| AEZ | Agro-Ecological Zone |
| <i>Agric.</i> | Agriculture |
| <i>Agri.</i> | Agricultural |
| <i>Annu.</i> | Annual |
| <i>Appl.</i> | Applied |
| <i>Biol.</i> | Biology |
| <i>Chem.</i> | Chemistry |
| cm | Centi-meter |
| CV | Coefficient of Variance |
| <i>Dev.</i> | Development |
| <i>Ecol.</i> | Ecology |
| <i>Environ.</i> | Environmental |
| <i>et al.</i> | et alia (and others) |
| <i>Exptl.</i> | Experimental |
| g | Gram (s) |
| <i>i.e.</i> | that is |
| <i>J.</i> | Journal |
| kg | Kilogram (s) |
| LSD | Least Significant Difference |
| M.S. | Master of Science |
| m ² | Meter squares |
| mg | Milligram |
| <i>Nutr.</i> | Nutrition |
| <i>Physiol.</i> | Physiological |
| <i>Progress.</i> | Progressive |
| <i>Res.</i> | Research |
| SAU | Sher-e-Bangla Agricultural University |
| <i>Sci.</i> | Science |
| <i>Soc.</i> | Society |
| SRDI | Soil Resource Development |

| | |
|------------------------------|--------------------------------------|
| Institute t ha ⁻¹ | Ton per hectare |
| UNDP | United Nations Development Program |
| <i>Viz</i> | <i>videlicet</i> (L.), Namely |
| % | Percentage |
| @ | At the rate of |
| BBS | Bangladesh Bureau of Statistics |
| eds. | Editors |
| etc. | et cetera (and other similar things) |
| FAO | Food and Agricultural Organization |
| L. | Linnaeus |

CHAPTER 1

INTRODUCTION

Bangladesh is predominantly an agricultural country with an area of 147570 square kilometers. The total population of the country is 169.11 million with the annual growth rate of 1.37 percent. Population density of the country is 1140 persons per square kilometer. The country is supplying to meet the basic need to her population from its net cultivable land which is estimated around 8.77 million hectares of which about 2.27 million hectares of cultivable land are single cropped, 4.13 million hectares are double cropped area and 1.46 million hectares are triple cropped areas with a cropping intensity of around 190 percent (BBS, 2021). The country has been struggling hard to feed her increasing population as food shortage is her salient feature. To feed the burgeoning population is a dire necessity to increase crop production. Further, about 25 percent of the world's population or 200 million people are extremely hungry and their sheer survival is threatened by food insecurity, under consumption, malnourishment and hunger related diseases. In Bangladesh, about 25 percent (of 140 million) people are hardcore/ultra-poor and they face severe food insecurity every year. Of the total population, about 50 percent or more than 70 million people are living below the poverty line and around 35 million are estimated to belong to be hardcore poor.

Bangladesh is an agro-based poor country and her economy is primarily dependent on agriculture. About 84 percent of the total population live in rural areas and are directly or indirectly engaged in a wide range of agricultural activities. Peoples of northern Bangladesh mainly greater Rangpur are poor and underdeveloped than other parts of this country. It is restricted to the lean season preceding the aman harvest in the Bangla months of Ashwin and Kartik. Also, there is a second lean season before boro harvest. As this lean season is usually less severe, it might be called little Monga.

The lean season preceding the harvest of aman is strongly connected to paddy cultivation, as there are nearly no other crops being planted. The agricultural lean season directly affects the cultivators, who can be the owner of the fields or the people who cultivate it as sharecropping, lease or mortgage. The lean season, however, normally only turns into Monga for those who are doing marginal farming and have low capacities. The second directly affected group is the agricultural laborer's who work on the fields of others.

Like the agricultural laborer also the marginal farmers face Monga. Their financial assets reduce towards the harvest. They have to give successive inputs like seeds, fertilizer and they sometimes have to spend money for labor, as well, if they cannot manage to do all the work by themselves,

especially during transplantation. They receive the return for all their work not until after harvest. The financial resources of many marginal farmers are not enough to ensure the inputs for their crops and sufficient food for their families in the same time.

As the wage of agricultural labor is very low, they cannot save more earnings/money after meeting their daily needs, which they can use off-season. when they become jobless. In many cases price of various essentials has gone far beyond the purchasing power of low and middle earning groups. Some people are eating food items like arum, mach alu, weeds jungles, khud, etc. Rests are begging. Worst affected are the widows and the small children who have nowhere to go, suffer from diarrhea for eating unhygienic food.

Because of different natural hazards (flood, draught. etc.), agricultural production, especially rice production decreases and their working areas become limited. Then the economic conditions of the poor become deplorable. The ample number of landless peoples also the cause of high poverty in this region. The extreme result of poverty is mango (near famine).

In search of work a substantial number of boys and men migrate to cities during the Monga season. Women and children whose able-bodied male household members have migrated, are vulnerable and often cannot cover their basic needs. As social norms limit their mobility and engagement in the market economy, many women are confined to their homestead and deprived of from income earning opting. Many of them feel discriminated by their neighbors and family-in-laws (CARE, 2005).

Again, when any natural hazards (flood, draught etc.) happen, agricultural production, especially rice production decreases and their working areas become limited. Then their economic conditions become deplorable. The ample number of landless peoples also the cause of high poverty in this region. The extreme results of poverty are Monga (near famine). Despite Monga is an overwhelming silent disaster in the northern Bangladesh but yet it has not received proper and fruitful attention from the Government, Non-government and International Organizations (Elahi and Ara, 2008).

Farmers can benefit from Agroforestry technologies that give solutions to issue with soil productivity, product diversification and economic problems (Franzel and Scherr, 2002). Haque (1993) mentioned that agroforestry as a means to meet the dimensional needs of the rural people in terms of food, fuel, timber, construction materials, thereby helping them to lead a self-sustained life. It is estimated that about 80–82% of forest products annually in the country come from this agroforestry farming system (GOB, 1992).

Objectives of the Study

The specific objectives of the Study are:

- a) To study the socio-economic conditions of Monga affected people in the study
- b) To identify the causes of Monga and people's perception about them
- c) To assess the adoption of agroforestry practices as a remedy of Monga in the study area
- d) To make suggestions on the basis of the findings of the study which might be helpful for the GOs and NGOs fighting mango in the study area

CHAPTER 2

REVIEW OF LITERATURE

2.1 Monga in Bangladesh

Paul *et. al.* (2013) explored people's survival strategies and coping capacities to combat Monga at household level in the northern region of Bangladesh. The agriculture based rural economy, extreme poverty, high percentage of landless, lack of sufficient caloric intake, unemployment of vast agricultural labour force etc. are the root causes of vulnerability to Monga in the northern regions specifically few districts of greater Rangpur. Moreover, geographically this region is vulnerable to natural hazards such as floods and droughts. The past records of food shortages and famine reveal that the trend is still continuing in the Monga-prone areas. The present study found that the most vulnerable groups in the Monga-prone areas were agricultural wage labourers, landless and marginal farmers, female headed households, children, pregnant women and aged people. The present study also found that with a view to cope with the Monga, various coping strategies such as selling of labour with advance payment at cheap rate, borrowing of money, selling of assets, looking for work in other areas, dependency on relief, selling of field crops in advance at cheap rate etc. were adopted by the affected households. The present study also found that coping capacity was associated with household head's socio-economic status e.g. level of education, monthly income, types of occupation, etc. Vulnerability to Monga was higher for the illiterate and low-income groups than the educated and high-income groups. The present study argued that the policy makers of Government and NGOs should emphasize on enhancing of coping capacities of poor and marginalized groups through rural centric development, rural employment generation, maximum utilization of agricultural land, proper credit support and agro-based industrialization in the northern Bangladesh.

Sultana (2010) defined that the term 'Monga' is purely a local term which affects the people of northern Bangladesh regularly during a particular period of the year. A great deal of misconception and misinterpretation prevails among the academics in defining the Monga syndrome in northern Bangladesh. The misunderstanding of the Monga revolves mainly around famine condition, food security or insecurity based on a preconceived notion that hardly considers the characteristic connotation of the term as it prevails in the affected area. While attempting to explain the relation between Monga and migration this paper establishes the linkages between the Monga and poverty. This paper defines Monga and migration and emphasis that migration is the result of Monga and for

this migration people of North Bengal face some socio-economic consequences.

Rahman (2008) defined *Monga* as 'hunger and faminelike situation (that) prevails in north-western regions particularly during the lean season as the poorest do not have access to livelihoods and work'. They also emphasize it as seasonal chronic food shortage among the absolute poor in the selected northern districts of Bangladesh, which is one of the major indicators how acute poverty exists in the country.

Zug (2006) defined that *Monga* is seasonal food insecurity in ecologically vulnerable and economically weak parts of north-western Bangladesh, primarily caused by an employment and income deficit before *Aman* is harvested. It mainly affects those rural poor, who have an undiversified income that is directly or indirectly based on agriculture.

Hasan *et. al.* (2005) mentioned that during the Bangla months of Ashwin and Kartik (i.e. mid-September to mid-November) the marginal and landless farmers face an economic crisis. This stems from the lack of non-agricultural employment opportunities since it is the agricultural-inclined region. This incident is called the *Monga*, a near-famine situation results in severe food crisis for the people of the northern part of Bangladesh.

The Bangla month Ashwin and Kartik are off-season for the agricultural laborer's as they have no work after cultivating Amon paddy (The Bangladesh Observer, 11 October, 2005).

In North region, most of the distributaries and tributaries of Brahmaputra and Teesta basin creates a complex network and forms vast char areas, which is inaccessible to vehicle transport. After the flood water recedes, it leaves behind a vast tract of the damaged agriculture field. In this situation landless laborer's and marginal farmers-who face food shortage just before annual harvest- sell their labor I advance to big landowners (The Bangladesh Observer, 24 October, 2005).

During *Monga* period people do not have access to credit even from local money lenders as they have no significant asset to mortgage except their labor power, the only alternative left to these hapless millions of the north is to starve. This human tragedy in the northern districts has been occurring in a regular cycle every year (The Bangladesh Observer, 24 October, 2005).

Experts as well as government and NGO officials today suggested planned promotion of farm activities in char lands and other barren areas of the district to bring about a permanent solution to the seasonal job crisis known as 'Monga', reports BSS (The Bangladesh Observer, 11 December, 2005). They also said large scale cultivation of maize, vegetables and fruits, raring poultry birds,

cows and goats' side by side with massive afforestation in the vast barren char lands may be the best choices under the NCDP and other programs driving out the menace of Monga from the region.

RDRS in association with BIRRI carried out an experiment on BIRRI 33 aman variety of rice in its own center during last few aman seasons with their research findings. They claimed that Monga might be eliminated in the northern districts through cultivating BIRRI 33 aman rice. These will increase more job to the jobless agriculture laborer's, specially the landless laborers. (The Bangladesh Observer, 11 December 2005).

Ahmed (2003) stated that the Bangla month Ashwin and Kartik are off season for the agricultural laborer's as they have no work after cultivating Amon paddy. For this seasonal unemployment, their purchasing capacity become very low. As a result, they failure to buy food and other basic needs. The only alternatives left to these hopeless millions of people of the north is to starve. This human tragedy in the northern districts is called Monga. Beethi (2005) obtained similar type of findings in her respective studies.

According to Ahmed (2003), most of the people in north Bengal is inefficient and illiterate. So, they have low opportunity to work other sector without agriculture. It seemed that the attraction of family member is more in peoples of northern region than other parts of Bangladesh. More or less the attitude of peoples is barrier for geographical mobility of labor.

Haider (2001) says that the causes for becoming extreme poor include river erosion, land redistribution and family break-up, flood, bad habit of household heads and inherited poverty.

Rahman (2001) suggests the following strategies to combat the poverty. These are: (1) Good-governance is need at first. Corruption must be eradicated. Corruption and no poverty cannot run together. (2) Decentralization is a must for education of poverty, (3) Poor are to be organized, (4) Economic safety of the poor should be assured.

Akter (2000) in his study found that 60.83% of rural women under RDRS exhibited medium participation in health and sanitation program, while 25.83% and 13.33% had high participation and low participation respectively.

Nawaz (2000) says that the main causes of poverty in Bangladesh are: Scarcity of land, lack of skills, malnutrition, lack of access to the means of production and resources, with a resultant lack of scope for economic activity and employment, vulnerability to repeated natural disasters and unequal distribution of productive assets, especially land.

BBS (1999) reveals that the number of poor populations in urban area was 49.70% and in rural area was 47.10% below absolute poverty line in 1995-96. At that same time, the population below extremely poverty line was 27.30% in urban area and 24.60% in rural area in 1999, the national level percent of population under poverty line reduced to 44.70% from 47.10% of 1996 estimation.

Afser (1994) reveals that among the poor people the ration of female poor and male poor was 6:4. That means female is the most poverty-stricken portion of the society.

Alam (1993) says relative poverty is considered as a relative deprivation of income emerging from unequal distribution of resources.

Sen (1987) stated that poverty is of course a matter of deprivation. He again said that poverty and inequality relate closely to each other, but they are distinct concepts and neither subsumes the other.

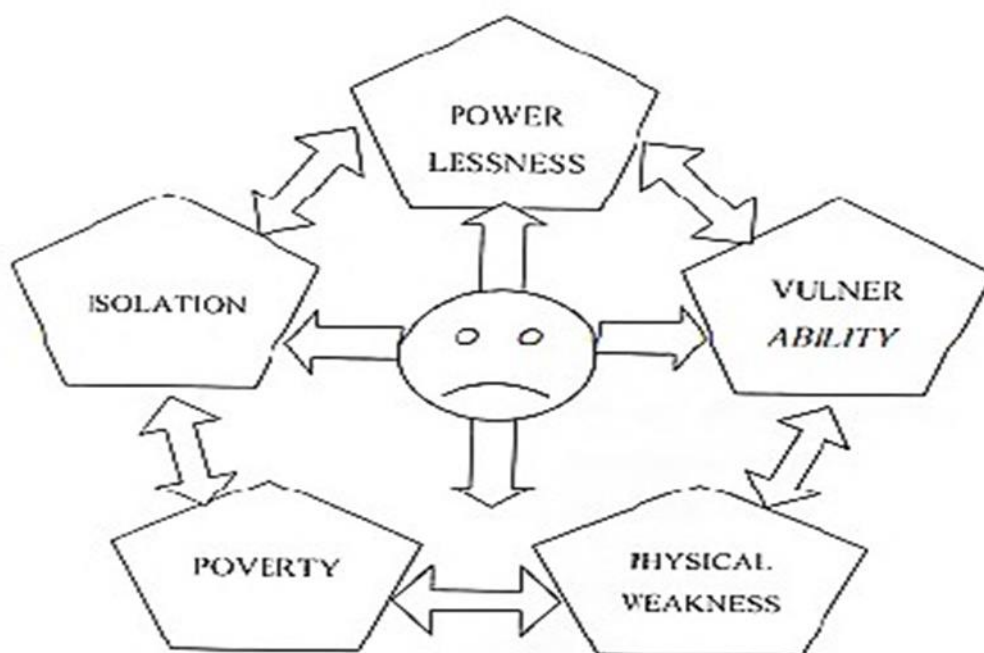


Figure 2.1: The deprivation trap

Source: Kashem, 2004 adapted from Chambers, 1983

Chambers (1983) termed poverty as an interlinked and integrated concept, which involves cluster of disadvantages. According to him poor people are perceived to suffer many forms of deprivation, which lead to lack of income and wealth but also social inferiority, physical weakness, disability and sickness, vulnerability, physical and social isolation, powerlessness and humiliation. He termed all these as a deprivation trap (Fig. 2.1).

2.2 Impact of agroforestry

Islam *et al.* (2021) conducted an experiment where the objective of the study was to assess the economic, social and environmental outcomes of two important traditional agroforestry systems (TAS) in Bangladesh. In the tropics, products and services provided by the TAS support the basic needs and promote the livelihood of millions of rural people. However, the outcomes and mitigation of TAS, in particular, the social and environmental issues are not systematically addressed. This study reports results on prospective analyses using the Date palm and Jackfruit-based TAS practiced in the Jashore and Mymensingh districts of Bangladesh. The results revealed that the TAS enhanced farm productivity and the benefit–cost ratio of both systems was much higher than the general agricultural practices in Bangladesh. The TAS also improved resilience of rural farmers through more efficient water utilization, enhancing soil fertility, improving microclimate, controlling pests and diseases and diversifying products. At the same time, the farmers' problems were neglected due to the absence of farmers' platforms, and also trade-offs may arise; thus, the social aspects of the TAS farmers had not developed equally. Therefore, the study would recommend minimizing the trade-offs through enhancing the conservation strategies at farmers' levels to make the TAS more viable and sustainable land-use practices.

Riyadh *et al.* (2021) evaluated the potentiality of agroforestry practices as climate smart agriculture to mitigate climate change impacts. Geographical position makes Bangladesh globally as one of the most vulnerable countries to climate change. It is observed that climate change has become a burning issue jeopardizing the agricultural production in the country. Considering the issue, adoption of climate smart agriculture (CSA) is indispensable for mitigating climate change by reducing emissions, capturing the atmospheric carbon and storing it in biomass and soil. Agroforestry has traditionally contributed to climate resilience in Bangladesh by integrating trees and/or crops into different land use practices. Agroforestry systems enhance resilience to climate change through increasing tree cover, carbon sequestration, increasing production, reducing threats to associated crops, creating favourable microclimate to support associated crops, reducing harvest pressure on natural forests, conserving biodiversity and cycling nutrients. Globally 23 countries recognize agroforestry as a mitigation priority, whereas 29 as an adaptation priority. Bangladesh has potential to expand agroforestry practices to mitigate climate change and boost food security. From socioeconomic and ecological point of views as well, agroforestry offers strong potential to evolve climate smart agricultural practices supporting food security, and adaptation and mitigation. Agroforestry practices should increase in climate vulnerable agroecosystems of Bangladesh.

Sheikh *et al.* (2021) conducted the present research work with a view to know agroforestry practice and to find out the potentialities of agroforestry based on sustainability. The systematic Agroforestry practice is being popular day by day in Monirampur Upazilla of Jessore district of Bangladesh. Multistage sampling technique method by using semi-structured questionnaires was followed in the field survey to collect data and information in the year of 2014–2016 from 140 respondents in Monirampur Upazilla of Jessore district in Bangladesh to fulfil the purpose of the research. The results showed that most of the respondents are middle aged (45%), education level is primary (32%) with medium size family (54%) and 74% of the respondents are involved in agriculture. Communication exposure is very low (70%) with low organizational participation (55%). The results illustrated that the respondents preferred homestead agroforestry (55%) as their major land use practice followed by livestock under tree cover (16%), tree crop association (13%), boundary plantation (9%) and woodlot agroforestry (7%) in the research area. Besides, 80% respondents get all benefits (environmental, social, economic, and biological) followed by economic benefit directly (10%), social benefit directly (5%), environmental benefit directly (3%), and biological benefit directly (2%). Most of them (90%) get security, employment generation and household income which accelerate their livelihood pattern. Majority respondents (64%) showed more favourable attitudes, 29% respondents showed favourable attitudes, only 7% showed neutral attitudes and no one shows negative attitudes towards agroforestry. Housing condition, proper sanitation, and asset possessions before practicing agroforestry were 40%, 77% and 35% respectively and after practicing agroforestry that changed condition are 75%, 100% and 60% which revealed that peoples are benefitted due to practice of agroforestry. The result also revealed that majority primary educated respondents are involved in agriculture with medium size family mostly practiced mixed agroforestry around homestead along with livestock under tree cover, tree crop association, boundary plantation, woodlot agroforestry through possessing more favourable attitudes which ensures environmental, social, economic, biological benefits, enhance livelihood pattern, security, employment, household income etc. But communication exposure and organizational participation should be increased to adopt more technique and technology. Thus, agroforestry improves the proper utilization of resources; enhance environmentally friendly, socio-economic sustainable production system and livelihood which is socially reasonable and economically feasible through diversification of input and output which reflects that agroforestry is a sustainable system in Bangladesh.

Islam (2019) reported that increasing land use pattern, positive perception towards Social Forestry especially employment opportunity for female, fuel wood facilities and selection of economically viable species accelerate to change the livelihood as alternate pattern and also increase socio-

economic condition directly or indirectly in coastal belt of Sundarbans and that is why agroforestry is an integral part of that coastal region.

Kamruzzaman *et. al.* (2018) carried out the study on agroforestry at Madhupur upazilla under Tangail district to identify the different agroforestry practices and determine the profitability of mostly practiced agroforestry system. The important practices are Akashmoni-Pineapple-Ginger, Akashmoni- Pineapple-Aroid and Jackfruit-Pineapple-Aroid. Primary data were collected from 120 farmers from four villages under Madhupur Upazilla of Tangail district. Per hectare total return was the highest in case of Akashmoni-Pineapple- Ginger practice Tk. 3446300 followed by Akashmoni-Pineapple-Aroid practice Tk. 3180400 and Jackfruit-Pineapple-Aroid practice Tk. 2470790. Inter temporal budget for Jackfruit-Pineapple-Aroid agroforestry production system for 20 years explained that the cash flow in the 1st year was negative but it became positive from second year and it continued in subsequent years. Sensitivity Analysis shows that Jackfruit-Pineapple-Aroid agroforestry system for 20 years was sensible to increment and reduction of cost and gross returns. On the basis of farmers' opinion, the major problems for different agroforestry systems were jackfruit borer, low price of pineapple, high price of inputs, attack of bat and squirrel on jackfruit and hedgehog on pineapple.

Sharmin *et. al.* (2018) focused their study mainly on exploring perception of farmers towards agroforestry practices and identifying the demographic factors influencing agroforestry adoption in Faridpur district. Field survey was conducted during November–December, 2016 using semi structured questionnaire. Multi-stage random sampling was used to select upazillas, unions and villages. Snowball purposive sampling was applied to select 84 respondents in total for the questionnaire survey. Chi-square was used to test variables at 5% level of significance. Homestead agroforestry was found to be the most common agroforestry practice (39.28%), followed by fruit-based agroforestry (21.42%), woodlot plantation (13.09%) and so on. 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. On the contrary, 34.52% opined that agroforestry practices decrease cash crops production, 17.85% of the respondents stated agroforestry as a difficult 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. On the other hand, 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. The study suggested raising awareness regarding the benefits of agroforestry practices as well as providing technical assistance.

Islam *et al.* (2008) conducted the study was during March to June 2007 at three Upazila like Godagari from Rajshahi, Nachole from Chapai Nawabgonj and Porsha from Naogaon district in Bangladesh of Barind tracts to assess the impact of the intensive afforestation project on Barind area. As against a target of 5.0 lakh fruit saplings, 20.0 lac forest saplings and 25 nurseries, the project achieved its goal by planting 111.2 and 108.4 percent fruit and forest saplings respectively and established 100 percent nursery. The project encouraged the farmers to grow tree in crop field and in around homestead and about 52 percent them are now growing trees in crop field and in near homestead. Afforestation project increased fruit, timber and fuel wood production; improved fragile environment by creating favorable climatic condition by providing shade, decreasing temperature and desertification process and controlling soil erosion. They mentioned that barind area encompasses a part of greater districts of Rajshahi, Dinajpur, Rangpur and Bogura covering 8400 sq. km. The area was considered as an ecologically fragile zone with extremely low vegetative cover. There was practically no tree cover except in the homestead. The basic problem of the Barind area was the fragile environment and unstable ecosystem. Ecological deterioration had been a long and gradual process in this region. Evidence of desertification was noticeable in the dry and bare soil condition of the Barind tract during prolonged dry season. The Barind Multipurpose Development Authority successfully implemented the intensive afforestation project during July 1997 to June 2004. The implementation of the Intensive afforestation project in Barind area has created mass awareness and socio-economic benefit among the local people.

Atangana *et al.* (2014) and Nair (1993) described that agroforestry is a term used to define land-use systems that combine agricultural and silvicultural practices to produce food, wood, and other products.

Rahman (2012) opined that agroforestry can be the most effective way to reduce deforestation in Bangladesh which could bring ‘win-win’ solutions to meet both environment and development objectives.

Hanif *et al.* (2010) and Nair (1993) described that agroforestry is a dynamic ecologically based natural resources management system that through the integration of trees and sustains production for increased social, economic and environmental benefits for land users at all levels.

Atangana *et al.* (2014), Nair (1993) and Leakey (2014) observed that agroforestry has also been gaining recognition as a tool for reducing poverty, improving food self-sufficiency for farmers, and increasing the productivity and income for small scale farmers.

Bargali *et al.* (2009) and Thanh (2005) stated that agroforestry can be recognized as potential solution to meet the needs of the society as well as sustainable development models due to its benefits not only to the economy and society but also to the ecosystem.

Mercer (2004) observed that farmers invest in agroforestry practice only if the expected gains from this practice are higher than the alternatives for the use of their resources. Households tend to invest in uncertain and unproven technologies when they have more risk capital available in terms of land, labor, capital etc.

Chowdhury (2001) Carried out a study to determine the impact of afforestation program as perceived by the farmers of Barind regions of Rajshahi district. However, the specific objectives of the research were i) to identify the extent of afforestation program implemented by BMDA (Barind Multipurpose Development Authority), ii) to find out the opinion of the farmers regarding changes in ecological upgradation, physio-chemical properties of the soil and on human interest aspects due to afforestation, iii) to explore relationship between the impact of afforestation as perceived by the farmers and their ten selected characteristics and iv) to find out the problems as observed by the farmers regarding afforestation programs of BMDA. One randomly selected village of Paba upazilla under the district of Rajshahi was the study area. Data were collected from 92 randomly selected respondents of the survey area using personal interview schedule. Three fourth of the respondents showed medium to high favorable perception regarding the benefits of afforestation through improvement of ecological status of the regions. The trend of plantation was found in increasing order in surveying areas. Majority of the respondents opined that afforestation had moderate to highly positive effect on ecological, physio- chemical properties of the soil and on human interest aspects of the BMDA plantation areas. Only a few respondents opined against less positive effect of afforestation of BMDA. Chi-square analysis indicated that the characteristics of the farmers such as education and annual income had positive significant relationship with the farm size category of the farmers. The age, family size, irrigation potentiality, non-locality behavior and environmental awareness had non-significant relationship with the farm size category of the farmers. Correlation analysis indicated that the characteristic of the farmer such as organizational participation and training participation had positive significant relationship with the impact of afforestation as perceived by the farmers. The education, farm size, irrigation potentially of the farmers had non-significant relation while age, family size, annual income and non-localize behavior showed negative relationship with the impact of afforestation as perceived by the farmers. The environmental awareness showed negatively significant relationship with the impact of afforestation as perceived by the farmers. The most important problems as cited by the respondents

according to priority were, "afforestation creates muddy and swampy condition of roads during rainy season of the year" and " a budge shade of big trees reduce the production of crops of the lands near the road side." The solutions of the problems suggested by the respondents was " preparation of the pakka roads in the project area" and "some of the big branches may be removed from the trees lying near the crop fields".

Sanchez (1995) and Scherr (1992) concluded that agroforestry systems may provide efficient, productive, and/or sustainable land use but doesn't matter unless and until they are adopted and maintained over longer period of time in national and international level.

Franzel and Scherr (2002) described that farmers can benefit from agroforestry technologies that give solutions to issues with soil productivity, product diversification, and economic problems.

Haque (1993) mentioned that agroforestry as a means to meet the dimensional needs of the rural people in terms of food, fuel, timber, construction materials, thereby helping them to lead a self-sustained life.

GOB (1992) estimated that about 80–82% of forest products produced annually in the country come from this agroforestry farming system.

2.3 Relationship on the selected characteristics of the farmers with their perception

Van dalen (1973) explained his observation regarding sensation and perception. He states that sensation is the immediate result of a stimulus to the sense organs. This information is not useful unless it is interpreted. Perception is the art of linking what is sensed with some parts of experience to give the sensation meaning. Meanings are in minds rather in the objects themselves. Hence, when looking at the same objects everyone does not see the same thing. Perceptions may relatively simple or highly complex. They may involve a single sense organ or several senses.

Above review clearly indicates that a study, on *Monga* is very limited, especially in KURIGRAM district which is one of the most *Monga* prone areas of northern Bangladesh. So, this study was undertaken to know the peoples' perception about causes and remedies of *Monga* in the study area considering its importance for planner. researcher and development worker of country and abroad.

Fardous (2002) observed that farming experience of the farmers had significant relationship with their perception of VFFP towards sustainable forestry development.

Majdyan (1996) found that farming experience had insignificant negative relationship with their perception of effectiveness of the selected communication media.

Sayed (2003) in his study found that cosmopolitans of the farmers had significant positive relationship with their perception of benefit from using manure towards INM for sustainable crop production.

Hossain (2000) observed no relationship between cosmopolitans and their perception of Binadhan-6.

Fardous (2002) in his study observed non-significant relationship exists between cosmopolitans of the farmers and their perception of VFFP towards sustainable crop production.

Kabir (2002) also found non-significant relationship exists between cosmopolitans of the farmers and their perception of BIADP towards environmental upgradation in his study.

Alam (2001) conducted a study to determine the farmers perception of Binamoog5 as a summer crop and found that cosmopolitans of the farmers had a positive relationship with their perception of Binamoog-5.

Sayed (2003) found significant positive relationship between extension contact of farmers and their perception of benefits from using manure towards INM for sustainable crop production. Similar finding was observed by Alam (2001).

Kabir (2002) in his study reported that communication exposure had significant relationship with their perception of environmental up gradation.

Fardous (2002) conducted a study and found that significant relationship between communication exposure and perception of the respondents of VFFP towards sustainable forestry development.

Islam (2001) in his study found that no relationship between communication behavior and their perception of the impact of non-formal education on agricultural development.

Hossain (1999) conducted a study and reported no relationship between media exposure and perception on environment.

Sarkar (1999) studied on perception regarding environmental degradation due to the use of agro-chemicals. He found that there was a significant relationship between media exposure and perception of environmental degradation.

Sayed (2003) conducted a study and found that organizational participation had no significant effects on their perception of benefit from using manure towards INM for sustainable crop production. Similar finding was found by Islam (2001) in his study.

Fardous (2002) reported that organizational participation had significant positive relationship with their perception of village and farm forestry program towards sustainable forestry development. Chowdhury (2001) found a significant relationship between organizational participation and the impact of afforestation as perceived by the farmers.

Alam (2001) conducted a study to determine farmer’s perception of Binamoog-5 as a summer crop. He observed that organizational participation of the farmers had a positive relationship with their perception of Binamoog-5.

Ravindra (1980) observed that social participation of the poultry farmers had positive relationship with their perception of recommended poultry management practices of utility of bio-gas plant.

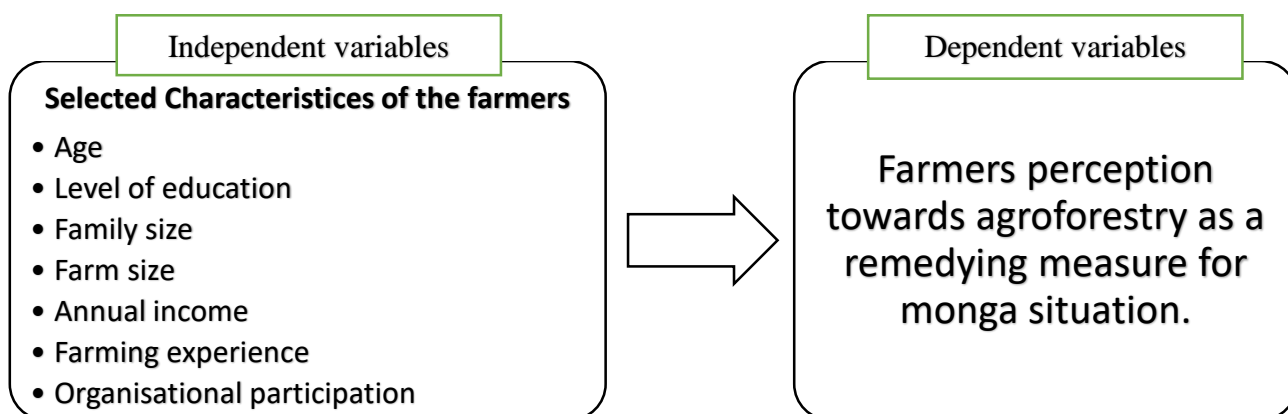


Figure 2.2: A conceptual framework of the study

The contribution between the experimental variables and the main focus of the study can be clearly delineated with the help of conceptual framework of the study. The researcher tried to ascertain the adoption of agroforestry for remedying Monga of Kurigram district as the main focus of the study. It was conceptualized in the research that the adoption of agroforestry may reduce the effect of Monga in the Kurigram district by the interacting forces of many socio- economic and others characteristics of the farmers. To make the process conspicuously interpretable a conceptual framework has been presented in a schematic Figure 2.2.

CHAPTER 3

MATERIALS AND METHODS

Methodological issues followed in conducting the study have been presented in this chapter. These issues are the foundation on which the research process rests upon. The methods and operational procedures followed in conducting the study e.g., selection of study area, sampling procedure, instrumentation, operationalization of variables, statistical test used, all are presented in this chapter sequentially.

3.1 The locale of the Study

The study was conducted in Kurigram district under Rangpur division at 10 villages in 5 Upazilla namely Kurigram sadar, Ulipur, Rajarhat, Bhurungamari and Chilmari. One village in each union and two unions in each Upazilla are considered as the locale of this study. The site of Bhurungamari are at the north, the site of Kurigram Sadar are at the middle, the site of Chilmari are at the south and other two are at the east of Kurigram district. Agriculture was the major occupation of the people in the study area. The location of the study area is shown in Figure 1, Figure 2 and Figure 3.

3.2 Population and Sample

53% peoples of the study area were landless and marginal, 1% peoples were large farmers service holders and businessmen. An up to date list of all the farmers of the selected villages was prepared with the help of local leaders and relatives with the help of RDRS personnel. Thus, 781 farmers of the 10 selected villages constituted the population of the study. After listing the population of those 10 villages, respondents were then selected at the rate of 20% following simple random method.

Table 3.1. Distribution of the farmers along with number of sampled and reserved farmers

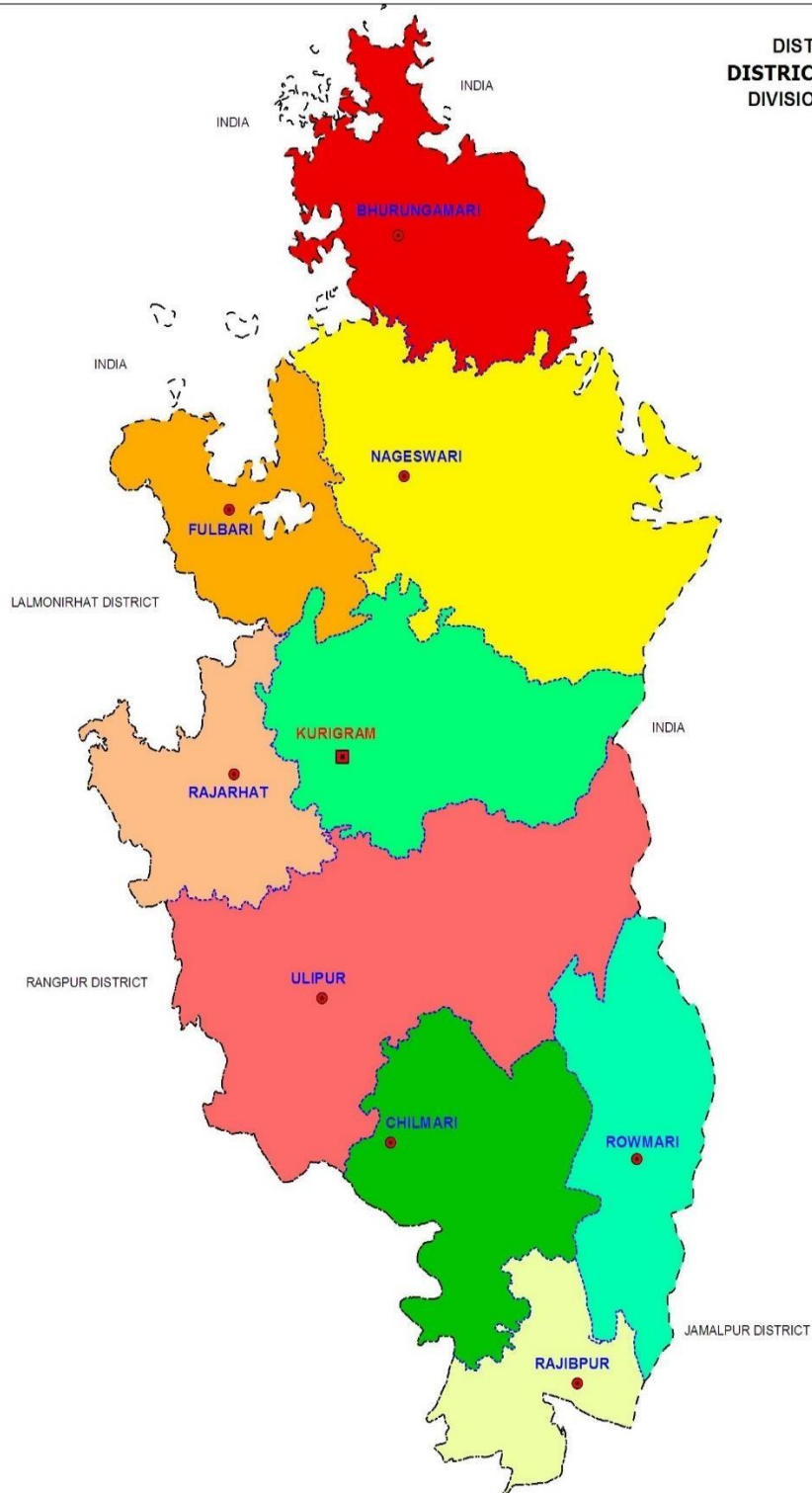
| District | Upazilla | Union | Selected village | Total number of respondents | | Reserved list |
|----------|--------------|-------------|------------------|-----------------------------|------------------|---------------|
| | | | | Population | Selected farmers | |
| Kurigram | Kurigram | Katalbari | Nutan char | 105 | 15 | 1 |
| | | Sadar | Balghacha | Muktaram | 95 | 15 |
| | Bhurungamari | Tilai | Konapara | 75 | 15 | 1 |
| | | Joymonirhat | Guchchagram | 83 | 15 | 1 |
| | Ulipur | Durghapur | Goraipeer | 65 | 15 | 1 |
| | | Pandul | Arjun | 72 | 15 | 1 |
| | Chilmari | Noyarhat | Shakhahati | 80 | 15 | 1 |
| | | Ranigonj | Ramna | 61 | 15 | 1 |
| | Rajarhat | Chinai | Debortal | 75 | 15 | 1 |
| | | Nazimkhan | Mistripara | 70 | 15 | 1 |
| | Total | | | 781 | 150 | 10 |

Thus, the sample size of the study was 150, but due to absence of some selected farmers during the data collection the researcher made a reserve list of 10 respondents. The distribution of the selected farmers along with reserve list of the selected 10 villages is shown in Table 3.1.

3.3 Variables and their Measurement

Measurement of variables constitute an important task of social research. Two types of variables were used in this study e.g., independent and dependent variable. Townsend (1953) defined an independent variable as that factor manipulated by the experiment in his attempt to ascertain its relationship to an observed phenomenon. He also defined a dependent variable as that factor which appears, disappears or varies as the experimenter introduces, removes or varies the independent variables. However, this section contains procedures for

**DISTRICT MAP
DISTRICT KURIGRAM
DIVISION RANGPUR**



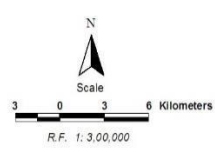
Administrative Boundary

- International Boundary
- Division Boundary
- District Boundary
- Upazila Boundary

Administrative HQs

- District HQ
- Upazila HQ

LEGEND



Disclaimer : Information / theme contained in this map sheet is only for internal use of Local Government Engineering Department. Information / theme of this map sheet is not authoritative for any other use.

Compiled from : SPOT Image 1989-90, Aerial Photograph 1983-84, Topographic Maps, Thana Maps, B.S.S and Field Checking 2008

Projection : Lambert's Conformal Conic

Data Source : GPS Field Survey 1999

PREPARED BY : GIS UNIT
LOCAL GOVERNMENT ENGINEERING DEPARTMENT

measurement of independent variables (age, level of education, family size, farm size, annual income, farming experience, cosmopolitans, socio-economic condition, effect of Monga on life) and dependent variables (perception about causes of Monga and adoption of agroforestry) of the study.

3.3.1 Measurement of independent variables

The operationalization of independent variables is discussed below:

3.3.1.1 Age

The age of a respondent was measured in terms of actual years from his birthday to the day of interview on the basis of his response. A score of one (1) was assigned to each year of age.

3.3.1.2 Level of education

Level of education was measured on the basis of ability of a respondent to read and write or formal education received up to a certain standard. A score of one was assigned for year of formal schooling completed by the respondent or same score was given for equivalent level of education. A score of 0.5 and zero (0) were given to the respondents who could sing only and who could not read and write, respectively.

3.3.1.3 Family size

Family size was measured by the total number of members in this family of a respondent. The members included the respondent, his wife, children, parents, brothers, sisters and others fully or partially depend on the respondent's income. A score of one (1) was assigned for each member of the family.

3.3.1.4 Farm size

Farm size of a respondent referred to the total area of land on which his family carried out farming operations. The area being in terms of full benefit to his family. It was measured in hectares for each respondent using the following formula:

$$FS = F_1 + F_2 + \frac{1}{2} (F_3 + F_4) + F_5 + F_6$$

Where, FS = Farm size

F1 = land under homestead

F2 = Own land under own cultivation F3 = Land taken from other as Bogra F4 = Land given to other as Bogra

F5 = Land taken from others on lease F6 = Others (Garden, fallow land etc.)

3.3.1.5 Annual income

The annual income of a respondent was measured on the basis of total yearly earning both from agriculture and non-agricultural sector (business, service, day labor etc.) earned by the respondent himself and by other family members. The income from agriculture and other sources of a respondent were added together to obtain his total annual income. The score of one (1) was assigned to each of Tk. 1000.

3.3.1.6 Organizational participation

Organizational participation of a respondent was measured on the basis of the nature of his/her involvement and duration of participation in different organizations. Organizational participation was operationalized by used the following formula:

Organizational participation score = $POM \times N1Y1 + PEMN2 \times Y2 + PEO \times N3 \times Y3$ Where,
POM = Participation as ordinary member

PEM = Participation as executive committee member PEO = Participation as executive office bearer

The scoring principles were as follows:

| Nature of Participation | Score assigned |
|--|----------------|
| No participation | 0 |
| Ordinary member | 1 |
| Executive committee member | 2 |
| Executive office bearer (President/secretary/treasurer etc.) | 3 |

Also, N1, N2 and N3 referred to the number of organizations to which a subject had been associated as an ordinary member, executive committee member and executive office bearer,

respectively and Y1, Y2 and Y3 referred to duration in years in the same order.

3.3.1.7 Effect of Monga on livelihood

Effect of Monga on livelihood score of a farmer was measured by in terms of effect of Monga on livelihood to their own social system. The farmers were asked to give their perception on the effect of Monga on livelihood. The four-point rating scale was used to measure the effect of Monga on livelihood. Scores are assigned as follows:

| Nature of effect | Scores assigned |
|--|------------------------|
| High effect of Monga on livelihood | 3 |
| Moderate effect of Monga on livelihood | 2 |
| Less effect of Monga on livelihood | 1 |
| No effect of Monga on livelihood | 0 |

Effect of Monga on livelihood scores of the respondent farmer could range from 0 to 45, where 0 indicating no effect and 45 indicating very high effect. Seasonal scarcity of employment and hence incomes leading to lack of access to food amongst rural poor families are the main cause of food insecurity at household level. Twice each year (in the month of September to November and April to May), the people of the study area regularly suffer from severe seasonal hardships, when household food availability and farm employment ceased. People of five districts i.e., Nilphamari, Rangpur, Kurigram, Lalmonirhat and Gaibandha under greater Rangpur region are severely affected by a famine-like situation called Monga every year during September-November. Extreme shrinkage in job opportunities for the landless agricultural laborers is the root cause for such a situation.

3.4 measurement of dependent variables

3.4.1 Causes of and Perception about Monga in the Study Area

Respondents were asked why they suffered from Monga every year. They also requested to express their identified causes as low, medium and high manner. According to their answers five major causes were found. These are:

- i. Lack of cultivable land
- ii. Natural calamities

- iii. Non-availability of working facilities at off farm sector
- iv. Lack of working facilities at agricultural sector due to natural calamities
- v. Lack of credit availability and also high interest rate of credit.
- vi. The causes are discussed below.

3.4.1.1 Lack of cultivable land

Cultivable land involves the land area under cultivation. It involves the following categories of land:

Cultivable waste land: It includes the land fit for cultivation but remains fallow. It involves the surroundings of house, schools, offices, colleges, mosques, madrasas, etc. yet to bring under cultivation.

Cultivated land: Cultivated land means where crops are grown through cultivation. It can be divided into two groups.

(I) **Current fallow land:** It includes the land which is normal!) under cultivation but due to some unfavorable circumstances like drought, excessive rainfall, flood, etc. has not been brought under cultivation in the census year.

(ii) **Net cropped area:** It is the actual cultivated area where crops are grown in one year. Net cropped area can be divided into three groups.

Single cropped area: the land which is used for raising only one crop in a year is called single cropped area.

Double cropped area: The land which is used for raising two crops in a year is called double cropped area. In Bangladesh it is increasing day by day.

Tripple cropped area: The land which is used for raising three crops in a year is called triple cropped area. In Bangladesh it is also increasing day by day.

Table 3.2 reveals that respondents perceived lack of cultivable land as a high cause of Monga by 11.11 percent in char area followed by 36.00 percent in rural area. Maximum of the respondents' perception about lack of cultivable land as a cause of Monga was low in char area and urban area (55.56 and 55.00 percent respectively). There found no one to mention

lack of cultivable land as a low cause of Monga in rural area while it was the ease as high cause in urban area. On an average, 15.56 percent respondents opined that lack of cultivable land was the most important (high) cause of Monga in the study area. It is quite evident from the table that the respondents under rural area were in efforts to increase cultivated land through various tenurial arrangements with view to having more productions for cultivating land, while the char and rural area didn't do that because of obvious reason. From the above discussion we can conclude that lack of cultivable land is the major cause of Monga in rural area than that of char and urban area under study.

Table 3.2. Lack of Cultivable Land

| Categories | Perception | | | Total |
|--------------|------------|------------|------------|----------|
| | High | Medium | Low | |
| Char area | 5 (11.11) | 15 (33.33) | 25 (55.56) | 45 (100) |
| Rural area | 9 (36) | 16 (64) | - | 25 (100) |
| Urban area | - | 9 (45) | 11 (55) | 20 (100) |
| Total | 14 (15.56) | 40 (44.44) | 36 (40) | 90 (100) |

Note: Figures within the parentheses indicate percentages of total Source: Field Survey, 2009

3.4.1.2 Natural calamities

Flood is one of the major causes of Monga in the study area. The floods in 2007 have caused displacement through the country causing a massive increase in poverty because people inundated by flood water cannot grow crops. The water that they live in also carries waterborne diseases that are curable but are still killing many people. When flood occurs the production in agricultural sector is not generally satisfactory. Respondents' medium perception about decrease of agricultural production due to natural calamities as a cause of occurring Monga occupied the highest percentage irrespective of areas under study. Considering all respondents together medium perception ranked the highest (70.00 percent) followed by low perception 22.22 percent and high perception 7.78 percent in the Monga area under study (Table 3.3). Natural calamity was not felt as very important cause of Monga in rural and urban areas under study. So maximum of the respondents in the study area thought above mentioned cause with medium perception.

Table 3.3. Decrease of Agricultural Production due to Natural Calamities

| Categories | Perception | Total |
|------------|------------|-------|
|------------|------------|-------|

| | High | Medium | Low | |
|------------|-------------|---------------|------------|----------|
| Char area | 7 (15.56) | 30 (66.67) | 8 (17.78) | 45 (100) |
| Rural area | - | 18 (72) | 7 (28) | 25 (100) |
| Urban area | - | 15 (75) | 5 (25) | 20 (100) |
| Total | 7 (7.78) | 63 (70) | 20 (22.22) | 90 (100) |

Note: Figures within the parentheses indicate percentages of total Source: Field Survey, 2009

3.4.1.3 Non-availability of working facilities at non-agricultural sector

Service, business, day labor and rickshaw pulling were found to be the important sources of non-farm income in the study area. Rural industries and services are of many kinds. But the usual types of it found in rural Bangladesh are:

Production of low quality and cheap varieties of goods meeting certain kinds of needs using locally available raw materials (for example, beedi-making, bamboo work and earthenware production)

Agro-processing such as rice milling and production of pulled rice

Transitional location of modern industry in rural areas that leads over time to these areas being absorbed as urban centers.

Availability of working facilities at non-agricultural sector was not adequate in the study area. Table 3.4 represents that a majority portion of respondents (42.22 percent of char, 44.00 percent of rural and 70.00 percent of urban) had high perception about non-availability of working facilities at non-agricultural sector as a cause of Monga. Considering all respondents' together lack of non-agricultural working facilities perceived as high by 45.56 percent followed by medium (41.11 percent) and low (13.33 percent) perception. Moreover, it was comparatively a very important cause in urban area as none of the respondent thought it with low perception.

Table 3.4. Non-availability of Working Facilities at Non-agricultural Sector

| Categories | Perception | | | Total |
|------------|------------|------------|------------|----------|
| | High | Medium | Low | |
| Char area | 19 (42.22) | 18 (40) | 8 (17.78) | 45 (100) |
| Rural area | 11 (44) | 10 (40) | 4 (16) | 25 (100) |
| Urban area | 14 (70) | 6 (30) | - | 20 (100) |
| Total | 41 (45.56) | 37 (41.11) | 12 (13.33) | 90 (100) |

Note: Figures within the parentheses indicate percentages of total Source: Field Survey, 2009

3.4.1.4 Lack of working facilities at agricultural sector

Natural calamity is any natural event which has an adverse socio-economic impact on the human being and its contracts earning opportunities in agricultural sector. Alternatively, it is a natural extreme event, like a cyclone. An earthquake or a flood, that is not caused by human being. These are naturally occurring phenomena that become hazardous due to the intervention of human infrastructure. Flood plays a vital role in creating Monga in the study area. Floods of Bangladesh can be divided into three categories:

a) Monsoon flood- Seasonal. increases slowly and decreases slowly, inundates vast areas and causes huge loss to the life and property.

Flash flood - Caused from sudden torrential flows following a brief inters rainstorm or the bursting of a natural or man-made dam or levee.

Tidal flood- Naturally of short duration with an height of 3 - 6m. prevents inland flood drainage.

High perception about lack of working facilities at agricultural sector as a cause of Monga dominated the respondents of char area while this was of medium perception in urban and rural areas (52.00 and 60.00 percent) respectively. Considering all respondents together medium perception occupied the highest position (55.56 percent) followed by low (24.44 percent) and high (20.00 percent) perception (Table 3.5).

As different natural calamities occur in char area more frequently. majority of respondents of this area reported the problem as high. So. to overcome this vulnerable situation especially in

char area. rehabilitation program should be undertaken and effectively implemented just after each natural calamity to maintain required working facilities in agricultural sector.

Table 3.5 Lack of Working Facilities at Agricultural Sector due to Natural calamities

| Categories | Perception | | | Total |
|------------|------------|------------|------------|----------|
| | High | Medium | Low | |
| Char area | 19 (42.12) | 15 (33.33) | 11 (24.45) | 45 (100) |
| Rural area | 5 (20) | 13 (52) | 7 (28) | 25 (100) |
| Urban area | - | 12 (60.00) | 8 (40.00) | 20 (100) |
| Total | 18 (20.00) | 50 (55.56) | 22 (24.44) | 90 (100) |

Note: Figures within the parentheses indicate percentages of total Source: Field Survey, 2009

3.4.1.5 Lack of credit availability and high interest rate

Lack of availability and high interest of credit was also a cause of occurring Monga. Most of the respondents of the study area were not financially solvent. They had to borrow money from different NGOs like Grameen Bank, ASA, BRAC, etc. In the study area the farmers reported that the interest rate on credit as compared to the bank loan was high. Moreover, credit was not available to them when they needed. This problem as a cause of Monga was of medium perception in all respondents irrespective of areas under study (Table 3.6). Moreover, it was not of low perception in urban area. Overall, 74.44 percent of respondents thought that unavailable credit and its high interest rate was a medium cause of occurring Monga followed by high (16.67 percent) low (8.89 percent) perception.

Table 3.6. Lack of Credit Availability and High Interest Rate

| Categories | Perception | | | Total |
|------------|------------|------------|-----------|----------|
| | High | Medium | Low | |
| Char area | 4 (8.89) | 35 (77.78) | 6 (13.33) | 45 (100) |
| Rural area | 5 (20) | 18 (72) | 2 (8.00) | 25 (100) |
| Urban area | 6 (30) | 14 (70) | - | 20 (100) |
| Total | 15 (16.67) | 67 (74.44) | 8 (8.89) | 90 (100) |

Note: Figures within the parentheses indicate percentages of total Source: Field Survey, 2009

3.4.2 Ranking of the Causes of Monga

An effort was made to rank the causes of Monga in the study area. In ranking, only highly perceived responses were considered. Table 3.7 shows that non-availability of working facilities in non-agricultural sector appeared to be the most important cause of Monga and ranked 1 as it was perceived highly by maximum (48.89 percent) of respondents. It was followed by lack of working facilities in agricultural sector, lack of cultivable land and unavailable credit and its high interest rate having rank of 2, 3 and 4. Decrease of agricultural production due to natural calamities ranked the last (5th) among the most important causes of Monga in the study area.

Table 3.7 Ranking of the Responses Regarding Perception about Causes of Monga

| Causes of Monga | Categories | | | Total | Rank order |
|---|-----------------|------------------|------------------|------------|------------|
| | Char area (no.) | Rural area (no.) | Urban area (no.) | | |
| Lack of cultivable land | 5 (11.11) | 9 (36) | - | 14 (15.56) | 3 |
| Decrease of agricultural production due to natural calamities | 7 (15.56) | - | - | 7 (7.78) | 5 |
| Non-availability of working facilities at non-agricultural sector | 19 (42.22) | 11 (44) | 14 (70) | 44 (48.89) | 1 |
| Lack of working facilities at agricultural sector | 19 (42.22) | 5 (20) | - | 24 (26.67) | 2 |
| Lack of credit availability and high interest rate | - | 5 (20) | 6 (30) | 11 (12.22) | 4 |

Note: Figures within the parentheses indicate percentages of total. Source: Field Survey, 2009

3.4.3 Perception about adoption of agroforestry

Perception about adoption of agroforestry scores of the farmers was measured on the basis nature of agroforestry system. The four-point rating scale was used to measure the adoption of agroforestry. Score are assigned as follows:

| Nature of adoption | Scores assigned |
|-----------------------------------|------------------------|
| High adoption of agroforestry | 3 |
| Moderate adoption of agroforestry | 2 |
| Less adoption of agroforestry | 1 |
| No at all | 0 |

Adoption of agroforestry scores of the respondent farmer could range from 0 to 50, where 0 indicating no perception and 50 indicating very high perception about adoption of agroforestry.

3.5 The Research Instrument

An interview schedule was prepared for data collection from the farmers to determine their perception about causes and remedies of Monga in Kurigram district to determine their selected characteristics and other relevant information to fulfill the objectives of the study. The questions and statements contained in the schedule were simple, direct and easily understandable by the respondents. The schedule contained both open and close form questions. The schedule was prepared in Bengali for understanding of the respondents. Prior to final data collection, the completely developed interview schedule was per-tested among 10 respondents of the Kurigram district. For this purpose, the village were randomly selected. Correction, alterations and adjustments were done in the schedule on the basis of the pre-test result. And this finalized schedule was used for data collection.

3.6 Data Collection Procedure

The researcher himself collected necessary data through personal interview schedule from the individual respondents during October, 2019 to December, 2019. The researcher first established rapport with the respondent and explained the objectives of the study clearly by using local language as far as possible. As a result, the respondent furnished proper response to the questions and the statements without hesitation.

3.7 Data Processing

At the end of data collection, data were compiled, tabulated and analyzed. The local units were converted into standard units. The qualitative data were transferred into quantitative data by appropriate scoring techniques. The responses of the respondents that were recorded in the interview schedule were transferred in to a master sheet for entering the data in the computer. The coded data were put into the computer for statistical analysis. The SPSS computer programmer was used for analysis of data. Various descriptive statistical measures such as range, frequency, number, percentage, mean, standard deviation and rank order were used for categorization and describing the variables. Chi-square (χ^2) test were used. Throughout the study five percent (0.05) and one percent (0.001) levels of probability were used as a basis of rejecting the null hypothesis. In case of Hi-square test, Cramm's V (Loether and McTavish, 1976) was computed to measure the strength of relationship whenever a significant difference was observed between any characteristic and perception. The value of V can range from 0 to 1.

During χ^2 computation, perception indices (PI) were calculated to see the differences in perception along the respondent's categories using the following formula:

$$\text{Perception Index (PI)} = P_1 \times 1 + P_m \times 2 + P_h \times 3$$

Where,

P_1 = Percentage of respondents having relatively low perception

P_m = Percentage of respondents having relatively moderate perception P_h = Percentage of respondents having relatively high perception

Perception index of a category could range from 100 to 300, where, 100 indicated low perception and 300 indicated high perception.

CHAPTER 4

RESULTS AND DISCUSSION

In this Chapter, the findings of the study and its interpretation are presented in two sections in accordance with the objectives of the study. Presentation has been made in two sections. The first section dealt with selected characteristics of the farmers and dealt with farmers' perception about causes of Monga and adoption of agroforestry. The 2nd section reveals the relationship between the selected characteristics of the farmers and their perception about causes of Monga and adoption of agroforestry.

4.1 Selected characteristics of the farmers

In the study, there were 10 selected characteristics of the farmers such as age, education, family size, farm size, annual income, farming experience, organizational participation, effect of life. The selected characteristics which were the independent variables of the study were investigated and the descriptions of each of the individual characteristics are presented in Table 4.1.

4.1.1 Age

The age score of the 'causes of Monga and adoption of agroforestry' farmers ranged from 26 to 65 with a mean and standard deviation of 44.21 and 10.02, respectively. Farmers were classified into three categories namely 'young (up to 30)', 'middle (31-50)' and 'old (above 50)' based on their observed age (Akter, 2007).

Data contained in the Table 4.1 indicated that the highest proportion of farmers participation in adoption practices belonged to middle aged category (53.33 %) followed by old (29.34 %) and young (17.33 %). Data also indicate that a total 82.67 % of the respondents were middle to old aged. The young and middle-aged farmers were generally tended to involve with different new innovations than the older.

4.1.2 Education

The level of education score of farmers ranged from 0 to 10 with a mean and standard deviation of 3.29 and 3.750, respectively. Based on the educational scores, farmers were classified into four categories such as illiterate (0), can sign only (0.5), primary

education (1 to 5) and secondary education (6 to 10) (Akter, 2007).

Table 4.1 indicated that farmers under 'illiterate' constitute the highest proportion (38.67%) compared to 28.00% primary education, 26.00% 'can sign only' and 7.33% secondary education each. The average literacy rate of the country is 74% (BBS, 2018). The people of the locality have more interest in education which is reflected in their literacy level because it is higher than the national literacy rate.

4.1.3 Family size

The score of family size of the farmers ranged from 3 to 13 with a mean and standard deviation of 6.44 and 2.168, respectively. Family size of farmers were classified into three categories namely 'small (2-4)', 'medium (5-7)' and 'Large (above 7)' based on their observed family size (Akter, 2007).

Table 4.1 indicated that size of the highest proportion of family fell under medium category (44.33 %) followed by large (28.00 %) and small (28.67%). Data also indicate that a total 72.33 % respondent belongs to the group of medium to large family group. Data indicate that the average family size (6.44) was higher than the national average of 5.10 (BBS, 2018). The farmers with large family member have more economic pressure, whereas, the medium and small families have less agricultural labour than the large families.

Table 4.1. Descriptive statistics of the selected characteristics of the farmers

| Characteristics | Measuring Unit | Observed range | Categories | Farmers | |
|----------------------------------|-------------------|----------------|----------------------------|---------|-------|
| | | | | No. | % |
| Age | Year | 26-65 | Young (up to 35) | 26 | 17.33 |
| | | | Middle (36-50) | 80 | 53.33 |
| | | | Old (above 50) | 44 | 29.34 |
| Education | Year of schooling | 0-10 | Illiterate (0) | 58 | 38.67 |
| | | | Can sign only (0.5) | 39 | 26.00 |
| | | | Primary education (1-5) | 42 | 28.00 |
| | | | Secondary education (6-10) | 11 | 7.33 |
| Family size | Score | 3-13 | Small family (2-4) | 43 | 28.67 |
| | | | Medium family (5-7) | 65 | 44.33 |
| | | | Large family (>7) | 42 | 28.00 |
| Farm size | Hectare | 0.01-3 | Small farm (0.01-1) | 49 | 32.67 |
| | | | Medium farm (1.01-3.00) | 57 | 38.00 |
| | | | Large farm (> 3.00) | 44 | 29.33 |
| Annual income | '000' taka | 40-245 | Low income (1-75) | 55 | 36.67 |
| | | | Medium income (76-125) | 56 | 37.33 |
| | | | High income (> 125) | 39 | 26.00 |
| Farming experience | Year | 2-45 | Low (up to 15) | 72 | 48.00 |
| | | | Medium (16-30) | 60 | 40.00 |
| | | | High (above 30) | 18 | 12.00 |
| Organizational participation | Score | 1-35 | Low (1-15) | 58 | 38.67 |
| | | | Medium (16-30) | 83 | 55.33 |
| | | | High (above 30) | 9 | 6.00 |
| Effect of Monga on livelihood | Score | 6-42 | Low (1-15) | 22 | 14.67 |
| | | | Medium (16-30) | 99 | 66.00 |
| | | | High (above 30) | 29 | 19.33 |
| Perception about Causes of Monga | Score | 10-53 | Low perception (1-24) | 12 | 8.00 |
| | | | Medium perception (25-48) | 52 | 34.67 |
| | | | High perception (above 48) | 86 | 57.33 |
| Adoption of agroforestry | Score | 12-46 | Low adoption (1-20) | 96 | 64.00 |
| | | | Medium adoption (21-40) | 38 | 25.33 |
| | | | High adoption (above 40) | 16 | 10.67 |

4.1.4 Farm size

Farm size of the farmers ranged from 0.01 to 3 ha the mean being 2.15 and SD 0.808. According to the farm size holding of the respondents, they were classified into three categories (as indicated by DAE, 1999).

Data presented in Table 4.1 reveal that majority (38.00%) of the farmer had medium farm, 32.67 % had small farm and 29.33 % had small farm. This may indicate that the socio-economic levels of the farmers in the study area are poorer than a typical farming community of Bangladesh.

4.1.5 Annul income

The score of annual income by famers ranged from 40 to 245 with a mean and standard deviation of 108.79 and 41.716, respectively. Based on the annual income, the respondents were classified into three categories namely 'low income (1-75)', 'medium contact (76-125)' and 'high contact (above 125)' (Akter, 2007).

Table 4.1 indicated that the famers belonged to medium income category constituted the highest proportion (37.33 %) followed by low income (36.67 %) and high income (26.00 %). The average annual income of the respondents was 1,08,790 taka which is about annual income lower than national average (2,00,000 taka) (BBS, 2018). The results indicate that the famers annual income was low to medium.

4.1.6 Farming experience

Farming experience scores of the farmers ranged from 2 to 45 with mean of 12.23 and standard deviation of 12.16. On the basis of their farming experience score the respondents were classified into three categories.

The Table 4.1 shows that the majority (48.00 %) of the respondents had low farming experience as compared to 40.00 % of them who had medium and 12.00

% had high level of farming experience.

4.1.7 Organizational participation

The score of organizational participation by 'causes of Monga and adoption of agroforestry' farmers ranged from the possible range of 1-35 with a mean and standard deviation of 16.67 and 7.491, respectively. Based on the organizational participation, the respondents were classified into three categories namely 'low participation (1-15)', 'medium participation (16-30)' and 'high participation (above 30)'.

Table 4.1 indicated that the farmers belonged to medium participation category constituted the highest proportion (55.33%) followed by low participation (38.67%) and high participation (6.00%). The results indicate that the farmers visit different area with minimum frequency although they have low to medium organizational participation.

4.1.8 Effect of Monga on livelihood

The effect of Monga on livelihood scores of the farmers ranged from 6 to 42 with a mean and standard deviation of 26.24 and 4.45, respectively.

Data contained in the Table 4.1 showed that most (66.00 %) of the respondents had moderate effect, while 19.33% of them had high effect and 14.67% of them had less effect of Monga on their livelihood.

4.1.9 Perception about causes of Monga

The perception about causes of Monga scores of the farmers ranged from 10 to 53, the mean and SD were 32.52 and 20.629, respectively.

Data contained in the Table 4.1 showed that most of the respondents (57.33%) had high perception about causes of Monga while 8.00 % of them had low and 34.67 of them had moderate perception about causes of Monga.

4.1.10 Adoption of agroforestry

The score of adoption of agroforestry on the farmers ranged from 12 to 46 with a mean and standard deviation of 21.63 and 14.664, respectively. Adoption of agroforestry on farmers were classified into three categories namely 'low adoption (1-20)', 'medium adoption (21-40)' and 'high adoption (above 40)'.

Data contained in the Table 4.1 showed that most of the respondents (64.00 %) had low adoption while 10.67 % of them had high and 25.33 % of them had moderate adoption of agroforestry.

4.2 Agroforestry practices in the study area

There are various types of agroforestry practices in Kurigram district. The study area mainly covers the following types of agroforestry practices with some other minor types. From Table 4.2 showed that 37.33% of the respondents had homestead agroforestry followed by 30.00 % to fruit-based agroforestry, 22.67% to boundary plantation, 6.67% to cropland agroforestry and 3.33% to fish farm agroforestry.

Table 4.2. Adoption of agroforestry practice by respondents in the study area

| Agroforestry Systems | No. of respondents | % of respondents |
|-----------------------------|---------------------------|-------------------------|
| Homestead Agroforestry | 56 | 37.33 |
| Cropland Agroforestry | 10 | 6.67 |
| Fruit-based Agroforestry | 45 | 30.00 |
| Boundary Plantation | 34 | 22.67 |
| Fish farm Agroforestry | 5 | 3.33 |

4.3 Farmers perception of agroforestry practices in the study area

Majority of the respondents in the study area were aware of the positive impact of agroforestry practices. The respondents were aware of the economic and productive benefits of agroforestry practices and had favorable perception towards those practices. Perception of agroforestry practices from Figure 4 indicated that the productive values (68.00 %) were considered most important among majority of the respondents. Because they understood agroforestry as a means to meeting their basic needs in terms of fuel wood, fruits, fodder, timber, vegetables etc. Similarly, a significant proportion (77.33 %) of the respondents realized the economic aspects as most important.

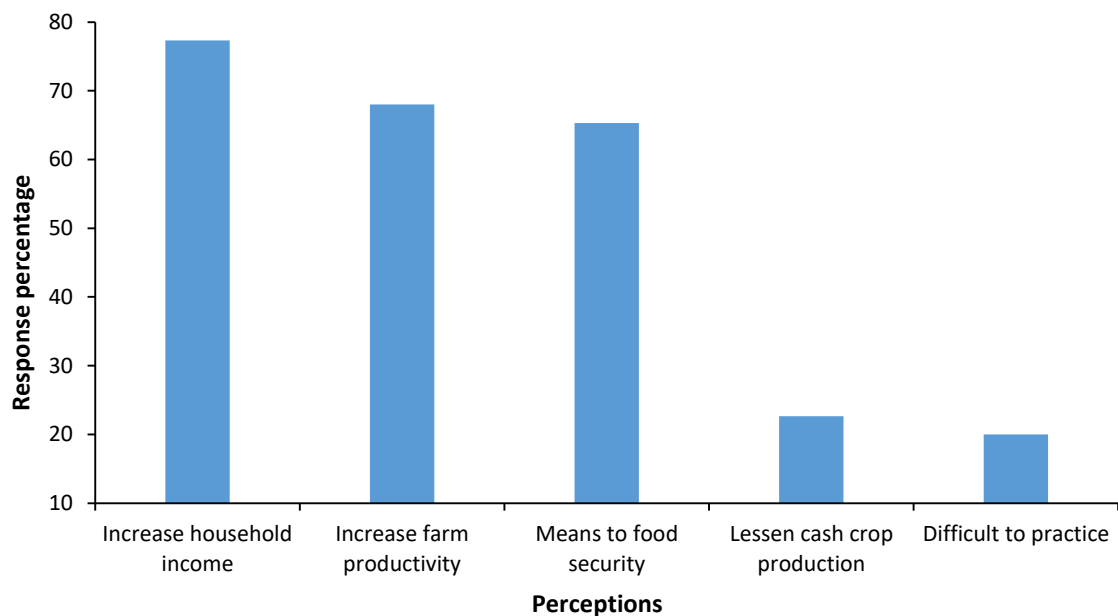


Figure 4. Farmers perception of agroforestry practices

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, respondents opined agroforestry is difficult (20.00 %) to practice this is an indication of lack of knowledge. Besides, some of the surveyed farmers (22.67 %) opined that crop yields are reduced when trees are grown in the fields.

4.4 Trees and agricultural crops in the existing agroforestry system

Various tree species as well as agricultural crops were found in the farmlands of the respondents. The Table 4.3 shows the crops in the agroforestry farmlands. Mahogany, raintree, sissoo, neem, mango, jackfruit, rose apple, coconut, palm- tree etc. were found in the study area. On the other hand, papaya, turmeric, banana, eggplant, peas, jute, mustard, lentil etc. cash crops were grown in their fields.

Table 4.3. Tree and crop found in the existing agroforestry

| Practices | Tree species found | Agricultural crops found |
|--------------------------|--|---|
| Homestead Agroforestry | <i>Mangifera indica</i> , <i>Artocarpus heterophyllus</i> , <i>Syzygium cumini</i> , <i>Cocos nucifera</i> , <i>Azadirachta indica</i> , <i>Swietenia macrophylla</i> , <i>Manilkara zapota</i> , <i>Areca catechu</i> , <i>Citrus maxima</i> | <i>Basella alba</i> , <i>Lagenaria siceraria</i> , <i>Typhonium trilobatum</i> , <i>Cucurbita moschata</i> , <i>Benincasa hispida</i> , <i>Vigna sesquipedalis</i> , <i>Carica papaya</i> |
| Cropland Agroforestry | <i>Phoenix sylvestris</i> , <i>Borassus flabellifer</i> , <i>Acacia auriculiformis</i> , <i>Mangifera indica</i> , <i>Swietenia macrophylla</i> , <i>Citrus limon</i> | <i>Corchorus capsularis</i> , <i>Momordica charantia</i> , <i>Amaranthus lividus</i> , <i>Solanum melongena</i> , <i>Pisum sativum</i> |
| Fruit-based Agroforestry | <i>Mangifera indica</i> , <i>Manilkara zapota</i> , <i>Citrus limon</i> , <i>Psidium guajava</i> , <i>Litchi chinensis</i> | <i>Zingiber officinale</i> , <i>Curcuma longa</i> , <i>Brassica nigra</i> , <i>Lens culinaris</i> , <i>Vigna unguiculata</i> |
| Boundary Plantation | <i>Phoenix sylvestris</i> , <i>Borassus flabellifer</i> , <i>Cocos nucifera</i> , <i>Swietenia macrophylla</i> , <i>Samanea saman</i> | <i>Carica papaya</i> , <i>Musa sapientum</i> , <i>Moringa oleifera</i> , <i>Basella alba</i> |
| Fish farm Agroforestry | <i>Mangifera indica</i> , <i>Litchi chinensis</i> , <i>Psidium guajava</i> , <i>Azadirachta indica</i> | <i>Lablab niger</i> , <i>Basella alba</i> , <i>Vigna sesquipedalis</i> |

4.5 Farmers adoption of agroforestry practices in the study area

Agroforestry can provide the next step in sustainable agriculture by promoting and implementing integrated, biodiverse processes (Wilson and Lovell, 2016). However, the success of agroforestry practices is determined by the level of adoption of agroforestry by the farmers. This study revealed that, fruit-based agroforestry has been adopted by 82.33 % of the respective respondents followed by homestead agroforestry (71.93%), boundary plantation (59.53%) and so on (Figure 5). Adoption percentage was measured according to the respective practice. Here, average adoption percentage of agroforestry practice was 63.51%.

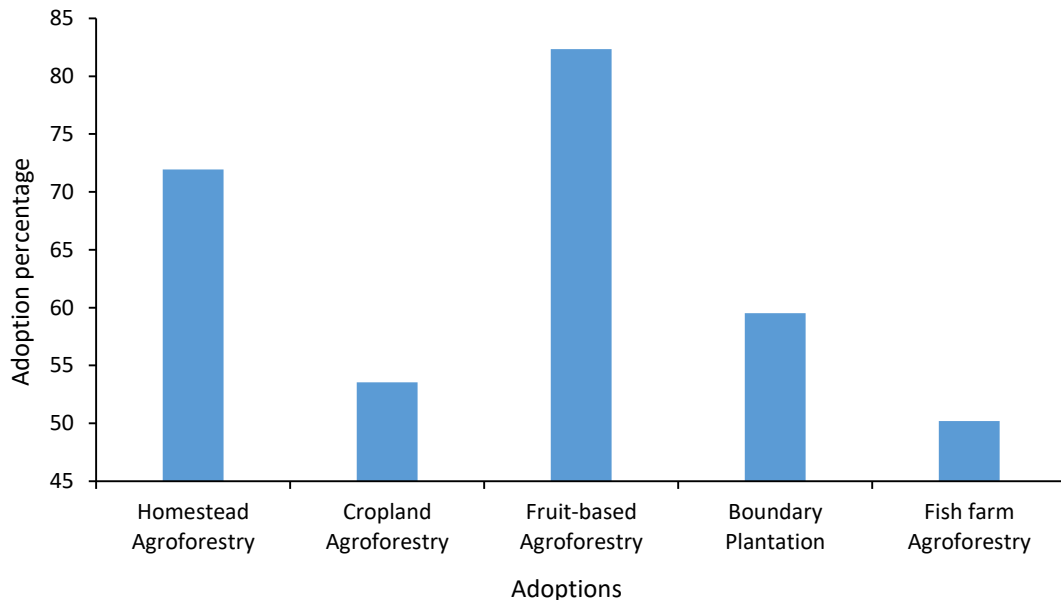


Figure 5. Farmers adoption of agroforestry practices in the study area

Findings showed that, on an average significant proportion of farmers (63.51 %) have adopted Agroforestry practice while 36.49 % did not adopt the practice. The main reason for high level of adoption was may be because of multiple benefits gained by the farmers from the crop-tree combination and also because agroforestry has been an age-old practice among the local farmers not only in the study area but also in number of districts in the country.

4.6 Relationship between selected characteristics of the farmers and perception about causes of Monga and adoption of agroforestry

Relationships of selected characteristics of the farmers with their perception about causes of Monga and adoption of agroforestry have been presented here. The characteristics as stated earlier were farmers' age, education, family size, farm size, annual income, farming experience, organizational participation and effect of Monga on livelihood. These relationships were examined by Chi-square test. Five percent (0.05) level and one percent (0.01) level of significance was used as the basis for rejection of any null hypothesis. In case of Chi-square test, Cramm's V (Loether and McTavish, 1976: 197) was computed to measure the strength of relationship whenever a significant relationship was observed between any characters and perception.

Table 4.4. Relationship between selected characteristics of the farmers and perception about causes of Monga

| Dependent variable | Independent variable | Computed χ^2 value | df | Tabulated value | |
|----------------------------------|------------------------------|-------------------------|----|-----------------|------------|
| | | | | 0.05 level | 0.01 level |
| Perception about causes of Monga | Age | 5.172 ^{NS} | 3 | 10.37 | 15.734 |
| | Education | 8.926 ^{NS} | 6 | 17.28 | 21.05 |
| | Family size | 6.392 ^{NS} | 3 | 10.37 | 15.734 |
| | Farm size | 2.753 ^{NS} | 3 | 10.37 | 15.734 |
| | Annual income | 8.993* | 4 | 14.67 | 16.81 |
| | Farming experience | 2.442 ^{NS} | 3 | 10.37 | 15.734 |
| | Organizational participation | 10.73 ^{NS} | 3 | 10.37 | 15.734 |
| | Effect of life | 60.72** | 6 | 17.28 | 21.05 |

NS = Non-significant

*= Significant at P<0.05 level of probability

**= Significant at P<0.01 level of probability

This findings showed that Annual income & effect of life is significantly affected farmers daily life so perception about causes of Monga is high.

Table 4.5. Relationship between selected characteristics of the farmers and adoption of agroforestry

| Dependent variable | Independent variable | Computed χ^2 value | df | Tabulated value | |
|--------------------------|---------------------------------|-------------------------|----|-----------------|------------|
| | | | | 0.05 level | 0.01 level |
| Adoption of agroforestry | Age | 2.665 ^{NS} | 20 | 4.89 | 9.63 |
| | Education | 2.265 ^{NS} | 35 | 7.49 | 11.67 |
| | Family size | 0.504 ^{NS} | 25 | 4.89 | 9.63 |
| | Farm size | 1.015 ^{NS} | 28 | 4.89 | 9.63 |
| | Annual income | 0.760 ^{NS} | 40 | 7.49 | 11.67 |
| | Farming experience | 0.333 ^{**} | 20 | 4.89 | 9.63 |
| | Organizational participation | 0.751 [*] | 25 | 4.89 | 9.63 |
| | Effect on livelihood of farmers | 2.955 [*] | 45 | 9.47 | 13.28 |

NS = Non-significant

*= Significant at P<0.05 level of probability

**= Significant at P<0.01 level of probability.

The result of Chi-square (χ^2) test analysis between perception of the farmers with their selected characteristics have been presented in Table 4 and Table 5.

Contingency Table were set-up for computing Chi-square. In Computing Chi- square tables in addition to the actual frequency distribution of farmers in each cell, their expected frequencies were also determined. All these calculations have not been shown in the Chi-square Table. In some cases, cells were merged in order to avoid expected frequencies (less than 5) in the cells. Number distributions of the farmers were used for computing Chi-squares; however, percentage distributions have been used during discussion.this findings showed that farmers experience,organizational participation,effect on livelihood of farmers are significantly increases adoption of agroforestry practices.

4.7 Causes of and perception about *Monga* in the study area

Respondents were asked why they suffered from *Monga* every year. They also requested to express their identified causes as low, medium and high manner. According to their answers five major causes were found. These were: lack of cultivable land, natural calamities, non-availability of working facilities at off farm sector, lack of working facilities at agricultural sector due to natural calamities and lack of credit availability and also high interest rate of credit. Table 2 reveals that respondents perceived lack of cultivable land as a high cause of *Monga* by 11.11 percent in Char area followed by 36.00 percent in rural area. Maximum of the respondents' perception about lack of cultivable land as a cause of *Monga* was low in Char area and urban area (55.56 and 55.00 percent, respectively). No one was found to mention lack of cultivable land as a low cause of perception of *Monga* in rural area while it was the case as high cause of perception in urban area. On an average, 15.56 percent respondents opined that lack of cultivable land was the most important (high) cause of *Monga* in the study area. It is quite evident from the table that the respondents under rural area were in efforts to increase the size of cultivable land through various tenurial arrangements with a view to having more productions, while the Char and urban area didn't do that because of lack of cultivable land in those areas. Moreover, it was comparatively a very important cause in rural area as none of the respondent thought it with low perception. Respondents' medium perception about decrease of agricultural production due to natural calamities as a cause of occurring *Monga* occupied the highest percentage irrespective of areas under study. Considering all respondents together medium perception ranked the highest (70.00 percent) followed by low perception 22.22 percent and high perception 7.78 percent in the *Monga* area under study (Table 2). Natural calamity was not felt as very important cause of *Monga* in rural and urban areas under study. So, majority of the respondents in the study area thought above mentioned cause with medium perception.

Table 4.6 Causes of and perception about *Monga* Respondents, (%)

| Causes | Categories | Perception | | | Total |
|--|------------|------------|------------|------------|----------|
| | | High | Medium | Low | |
| 1. Lack of cultivable land | Char area | 5 (11.11) | 15 (33.33) | 25 (55.56) | 45 (100) |
| | Rural area | 9 (36.00) | 16 (64.00) | - | 25 (100) |
| | Urban area | - | 9 (45.00) | 11 (55.00) | 20 (100) |
| | Total | 14 (15.56) | 40 (44.44) | 36 (40.00) | 90 (100) |
| 2. Natural calamities | Char area | 7 (15.56) | 30 (66.67) | 8 (17.78) | 45 (100) |
| | Rural area | - | 18 (72.00) | 7 (28.00) | 25 (100) |
| | Urban area | - | 15 (75.00) | 5 (25.00) | 20 (100) |
| | Total | 7 (7.78) | 63 (70) | 20 (22.22) | 90 (100) |
| 3. Non-availability of working facilities at non-agricultural sector | Char area | 19 (42.22) | 18 (40.00) | 8 (17.78) | 45 (100) |
| | Rural area | 11 (44.00) | 10 (40.00) | 4 (16.00) | 25 (100) |
| | Urban area | 14 (70.00) | 6 (30.00) | - | 20 (100) |
| | Total | 41 (45.56) | 37 (41.11) | 12 (13.33) | 90 (100) |
| 4. Lack of working facilities at agricultural sector due to natural calamities | Char area | 19 (42.22) | 15 (33.33) | 11 (24.45) | 45 (100) |
| | Rural area | 5 (20.00) | 13 (52.00) | 7 (28.00) | 25 (100) |
| | Urban area | - | 12 (60.00) | 8 (40.00) | 20 (100) |
| | Total | 18 (20.00) | 50 (55.56) | 22 (24.44) | 90 (100) |
| 5. Lack of credit availability and also high interest rate of credit | Char area | 4 (8.89) | 35 (77.78) | 6 (13.33) | 45 (100) |
| | Rural area | 5 (20.00) | 18 (72.00) | 2 (8.00) | 25 (100) |
| | Urban area | 6 (30.00) | 14 (70.00) | - | 20 (100) |
| | Total | 15 (16.67) | 67 (74.44) | 8 (8.89) | 90 (100) |

Note: Figures within the parentheses indicate percentages of total. Source: Field Survey, 2021.

Service, business, day labour and van/rickshaw pulling were found to be the important sources of nonfarm income in the study area. Rural industries and services are of many kinds. But the usual types of it found in rural Bangladesh are as follows: (i) Production of low quality and cheap varieties of goods meeting certain kinds of needs using locally available raw materials (for example, beedi-making, bamboo work and earthenware production) (ii) Agro-processing such as rice milling and production of puffed rice (iii) Transitional location of modern industry in rural areas that leads over time to these areas being absorbed as urban centres. Availability of working facilities at non-agricultural sector was not adequate in the study area. Table 2 represents that a major portion of respondents (42.22 percent of Char, 44.00 percent of rural and 70.00 percent of urban) had high perception about non-availability of working facilities at non-agricultural sector as a cause of *Monga*. Considering all respondents together, lack of non-agricultural working facilities was perceived as high by 45.56 percent followed by medium (41.11 percent) and low (13.33

percent) perception. Moreover, it was comparatively a very important cause in urban area as none of the respondent thought it with low perception.

Natural calamity is any natural event which has an adverse socio-economic impact on the human being and its contracts earning opportunities in agricultural sector. Alternatively, it is a natural extreme event, like a cyclone, an earthquake or a flood, that is not caused by human being. These are naturally occurring phenomena that become hazardous due to the intervention of human infrastructure. Flood plays a vital role in creating *Monga* in the study area. High perception about lack of working facilities at agricultural sector as a cause of *Monga* dominated the respondents of Char area while this was of medium perception in urban and rural areas (52.00 and 60.00 percent), respectively. Considering all respondents together, medium perception occupied the highest position (55.56 percent) followed by low (24.44 percent) and high (20.00 percent) perception (Table 2). As different natural calamities occur in Char area more frequently, majority of the respondents of this area reported the problem as high. Therefore, to overcome this vulnerable situation especially in Char area, rehabilitation program should be undertaken and effectively implemented just after each natural calamity to maintain required working facilities in agricultural sector. Lack of availability along with high interest of credit was also a cause of occurring *Monga*. Most of the respondents of the study area were not financially solvent. They had to borrow money from different NGOs like Grameen Bank, ASA, BRAC, etc. In the study area, the farmers reported that the interest rate on credit as compared to the bank loan was higher. Moreover, credit was not available to them when it is needed. This problem as a cause of *Monga* which was found as medium perception in all respondents irrespective of areas under study (Table 2). Moreover, it was not of low perception in urban area. Overall, 74.44 percent of respondents thought that unavailability of credit and its high interest rate was a medium cause of occurring *Monga* followed by high (16.67 percent) and low (8.89 percent) perception.

4.8 Ranking of the causes of *Monga*

An effort was made to rank the causes of *Monga* in the study area where highly perceived responses were considered. Table 3 shows that non-availability of working facilities in non-agricultural sector was appeared to be the most important cause of *Monga* and ranked 1 as it was perceived highly by 48.89 percent of respondents. It was followed by lack of working facilities in agricultural sector, lack of cultivable land and unavailable credit and its high interest rate having rank of 2, 3 and 4, respectively. Decrease of agricultural production due

to natural calamities ranked the last (5th) among the most important causes of *Monga* in the study area.

Table 4.7. Ranking of the responses regarding perception about causes of *Monga* Respondents, (%)

| Causes of Monga | Categories | | | Total | Rank order |
|--|-----------------|------------------|------------------|------------|------------|
| | Char area (no.) | Rural area (no.) | Urban area (no.) | | |
| Lack of cultivable land | 5 (11.11) | 9 (36) | - | 14 (15.56) | 3 |
| Decrease of agricultural production due to natural calamities | 7 (15.56) | - | - | 7 (7.78) | 5 |
| Non-availability of working facilities at non- agricultural sector | 19 (42.22) | 11 (44) | 14 (70) | 44 (48.89) | 1 |
| Lack of working facilities at agricultural sector | 19 (42.22) | 5 (20) | - | 24 (26.67) | 2 |
| Lack of credit availability and high interest rate of credit | - | 5 (20) | 6 (30) | 11 (12.22) | 4 |

Note: Figures within the parentheses indicate percentages of total.

Source: Field Survey, 2021

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

SUMMARY

The study was conducted in Kurigram district under Rangpur division at 10 villages in 5 Upazilla namely Kurigram sadar, Ulipur, Rajarhat, Bhurungamari and Chilmari. One village in each union and two unions in each Upazilla are considered as the locale of this study. The site of Bhurungamari are at the north, the site of Kurigram Sadar are at the middle, the site of Chilmari are at the south and other two are at the east of Kurigram district. Agriculture was the major occupation of the people in the study area. The independent variables were: age, level of education, family size, farm size, annual income, farming experience and organizational participation. Data collection was started from October 2019 and completed in December 2019. Various statistical measures such as frequency counts, percentage distribution, mean and standard deviation were used in describing data. In order to estimate the contribution of the selected characteristics of the respondents to their perception towards adoption of agroforestry practices as a remedy of Monga, multiple regression analysis was used. The major findings of the study are summarized

The highest proportion (53.33%) of the respondents was in middle aged category, compared to (29.34%) and (17.33%) of them being old and young aged category, respectively.

Illiterate constituted the highest proportion (38.67%) and the lowest (7.33%) in secondary education.

The highest proportion of family fell under medium category (44.33%) and the lowest proportion of family was in large (28.00%) category.

Majority of the farmer (38.00%) had medium farm and 29.33% of farmer had small farm.

The famers belonged to medium income category constituted the highest proportion (37.33%) and the lowest proportion was constituted by high income (26.00%) category.

The majority (48.00%) of the respondents had low farming experience and only 12.00% had high level of farming experience.

The most elevated extent (55.33%) of the respondents had medium participation while (38.67%) had low participation and (6.00%) had high organizational participation.

Most of the respondents (57.33%) had high perception about causes of Monga while 8.00 % of them had low and 34.67 % of them had moderate perception about causes of Monga.

Farming experience, organizational participation and effect of life had significant positive contribution to their perception towards adoption of agroforestry as a remedy measure of Monga.

Characteristics of the farmers like age, education, family size, farm size, and annual family income, had no contribution to their perception towards adoption of agroforestry as a remedy measure of Monga

Conclusions:

majority (57.33%) of the respondents had high to moderately agreed perception towards causes of Monga at the study area. Still there is a scope to improve farmers perception through annual income & effect of life.

Annual income and effect of Monga on livelihood of the respondents had a significant contribution to the farmers perception towards causes of Monga in the study area, consequently Annual income and effect on livelihood of the farmers helps to make favourable perception towards causes of Monga in the study area which ultimately helps the farmers to follow coping strategies.

Farming experience, Organizational participation and effect of Monga on livelihood of farmers had a significant contribution to the farmer's adoption of agroforestry as a remedy measure of Monga in the study area, consequently. Maximum (48.00%) of the respondents had low farming experience as compared to 40.00% and 12.00% having medium and high farming experience, respectively. 55.33% of total respondents had medium participation with different organization followed by 38.67% with low participation and 6.00% had high organizational participation.

Causes of Monga is high in char area and rural area than urban area in kurigram district. Relation with perception about causes of Monga is medium to low in char area, rural area & urban area that also influence farmers to increase adoption of agroforestry practices to combat Monga in the study area.

Recommendations

On the basis of the observation and conclusions drawn from the findings of the study following recommendation is made:

i. Organizational participation had the highest contribution to the farmers' perception towards causes of Monga in Kurigram district. Therefore, it was recommended that steps should be taken by the different government and non- government organizations like DAE and others to maximize individual, involvement with organization. In order to increase organizational participation of farmers, some incentives like cultural activities, food programmed and logistic support etc. should be done.

ii. Extension media contact increases farmers diversified knowledge and make them able to cope with adverse situations. So, policies should be taken to engage farmer's with diversified extension media to broaden their outlook and to develop favourable perception towards adoption of agroforestry as a remedy measure of Monga. GOs and NGOs can also play a vital role in this regard.

iii. Majority (57.33%) of the farmers of the study area had high knowledge on perception causes of Monga in Kurigram district. So, to increase knowledge on perception towards causes of Monga, expert experienced trainer is prerequisite. Department of Agricultural Extension (DAE) along with experts NGOs representatives, different social media and mass media can play a key role in this regard.

A single research work is very inadequate to have in-depth understanding of the farmers' perception towards causes of Monga and adoption of agroforestry as a remedy measure of Monga in Kurigram district. Further studies should be undertaken covering more dimensions of the same issue. Therefore, the following suggestions are made for further research work:

i. The present study was conducted in Kurigram district. It is recommended that similar studies should be conducted in other Monga prone areas of the country.

ii. This study investigated the relationship of only nine characteristics of the farmers with their perception on causes of Monga. Therefore, it is recommended that further study should be conducted with other independent and dependent variables.

iii. In this research the author conducted his survey in all category farmers who were affected by Monga. So, further study can be taken with specific farmer group or/and compare among these group.

iv. Researcher will have opportunity or scope to identify the factors causing hindrance towards adopting of agroforestry as a remedy measure of Monga in Monga prone areas including Kurigram.

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APPENDICES

Appendix 1. The english version of the study questionnaire on “farmers' perception about causes of Monga and adoption of agroforestry practices as a remedy of Monga in kurigram district”.

Department of agroforestry and environmental science

Sher-e- bangla agriculture university

Sher-e- bangla nagar, dhaka-1207

Date:.....

Sample no:.....

Name.....

Village:.....

Union:.....

Thana:.....

Mobile:.....

Please answer the following questions

1. Gender?

a) Male

b) female

family member: boy..... Girl..... Wife.....husband.....

2. Age?

a) Below 30 years

b) between 30 to 40 years

c) between 40 to 50 years

d) above 50 years

3. do you have any knowledge about Monga and agroforestry practices?

a) Not at all

b) little bit

c) yes

4. Do you have a perception of the causes of manga and its remedies?

a) yes

b) no

5. Educational qualification?

- a) Illiterate
- b) Can provide signature only
- c) primary
- d) high school
- e) hsc
- f) graduate
- g) masters

6. Farm size?

- a) 1-acre
- b) 5-acre
- c) 10-acre

7. Annual income?

- a) 30000
- b) 60000
- c) 100000
- d) 150000
- e) 200000

8. What is the current socio economic condition?

- a) Not well-maintained
- b) Tin, bamboo and well-maintained house
- c) brick, wood and galvanized iron house

9. What was your social-economic condition 10 years ago?

- a) Not well-maintained
- b) Tin, bamboo and well-maintained house
- c) brick, wood and galvanized iron house

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

- a) Chari
- b) Sanitary toilet

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

- a) Chari
- b) Sanitary toilet

12. Assets (current)?

- a) Bicycle
- b) motorcycle
- c) Rickshaw
- d) van
- e) Tube well
- f) Cow

g) Goat

13. Assets (10 years ago)?

- a) Bicycle
- b) motorcycle
- c) Rickshaw
- d) van
- e) Tube well
- f) Cow
- g) Goat

14. Vegetable production (kg in season)?

Vegetables total amount consumption share price

- a) Lalshak
- b) Brinjal
- c) Bottle gourd
- d) Tomato
- e) Beans
- f) Green pepper
- g) Papaya
- h) Okra
- i) Kalmisak

16. Timber production per year (in taka)?

| Total consumption | Sell | Price |
|-------------------|------|-------|
| | | |

17. Fishes production per year (in kg)?

Total amount consumption sale price

| Total consumption | Sell | Price |
|-------------------|------|-------|
| | | |

19. Fruit production (season basis)?

| Item | Production | Consumption | Sell |
|------|------------|-------------|------|
| | | | |
| | | | |
| | | | |
| | | | |

| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

20. Dry leaves production (daily basis)?

| | | |
|-------------------|------|-------|
| Total consumption | Sell | Price |
| | | |

21. Causes of Monga?

a) Lack of cultivable Land

| Categories | Perception | | | Total |
|------------|------------|--------|-----|-------|
| | High | Medium | Low | |
| Char area | | | | |
| Rural area | | | | |
| Urban area | | | | |
| Total | | | | |

b) Decrease of Agricultural Production due to natural calamities.

| Categories | Perception | | | Total |
|------------|------------|--------|-----|-------|
| | High | Medium | Low | |
| Char area | | | | |
| Rural area | | | | |
| Urban area | | | | |
| Total | | | | |

c) Non availability of Working Facilities at Nonagricultural Sector.

| Categories | Perception | | | Total |
|------------|------------|--------|-----|-------|
| | High | Medium | Low | |
| Char area | | | | |
| Rural area | | | | |
| Urban area | | | | |
| Total | | | | |

d) Lack of Working facilities at Agricultural Sector due to Natural calamities.

| Categories | Perception | | | Total |
|------------|------------|--------|-----|-------|
| | High | Medium | Low | |
| | | | | |

| | | | | |
|------------|--|--|--|--|
| Char area | | | | |
| Rural area | | | | |
| Urban area | | | | |
| Total | | | | |

e) Lack of Credit Availability and High Interest Rate.

| Categories | Perception | | | Total |
|------------|------------|--------|-----|-------|
| | High | Medium | Low | |
| Char area | | | | |
| Rural area | | | | |
| Urban area | | | | |
| Total | | | | |

22. Adoption of agroforestry practice by respondents in the study area

| Agroforestry system | No. Of respondents | Percentage of respondents |
|--------------------------|--------------------|---------------------------|
| Homestead agroforestry | | |
| cropland agroforestry | | |
| fruit based agroforestry | | |
| boundary plantation | | |
| fish farm agroforestry | | |

23. Beneficial and harmful characteristics persecuted by respondent

| Agroforestry practices | | beneficial features |
|--------------------------|--|---------------------|
| Homestead agroforestry | | |
| cropland agroforestry | | |
| fruit based agroforestry | | |
| boundary plantation | | |
| fish farm agroforestry | | |

24. Distribution of the farmers along with the number of sample and reserved farmers.

| Upozila | Union | Selected villages | Total number of respondents | | Reserved list |
|----------------|-------|-------------------|-----------------------------|------------------|---------------|
| | | | Population | Selected farmers | |
| Kurigram sadar | | | | | |
| Ulipur | | | | | |
| Rajarhat | | | | | |
| Bhrungamari | | | | | |
| Total | | | | | |

Thanks for your cooperation