# LIVELIHOOD SECURITY OF WOMEN FARMERS IN NATORE DISTRICT

**FARJANA TASNIM**

**DEPARTMENT OF AGRICULTURAL EXTENSION & INFORMATION SYSTEM**

**SHER-E-BANGLA AGRICULTURAL UNIVERSITY**

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**LIVELIHOOD SECURITY OF WOMEN FARMERS IN NATORE DISTRICT**

**BY**

**FARJANA TASNIM**

**Reg. No. 15-07011**

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**APPROVED BY:**

| | |
|---|---|
| **(Dr. Ranjan Roy)** | **( Md. Mahbubul Alam, Ph.D)** |
| Supervisor | Co-Supervisor |
| Associate Professor | Associate Professor |
| Dept. of Agril. Ext. and Info. System | Dept. of Agril. Ext. and Info. System |
| Sher-e-Bangla Agricultural University | Sher-e-Bangla Agricultural University |

**Md. Mahbubul Alam, Ph.D**

Associate Professor & Chairman Examination Committee

Dept. of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University

**Department of Agricultural Extension and Information System**
**Sher-e-Bangla Agricultural University**
**Sher-e-Bangla Nagar,**
**Dhaka-1207, Bangladesh**

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## CERTIFICATE

This is to certify that the thesis entitled **"LIVELIHOOD SECURITY OF WOMEN FARMERS IN NATORE DISTRICT"** submitted to the department of Agricultural Extension and Information System, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka in partial fulfillment of the requirements for the degree of Master of Science (M.S.) in Agricultural Extension, embodies the result of a piece of bona fide research work carried out by **Farjana Tasnim, Registration No. 15-07011** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:…….
Dhaka, Bangladesh

**Dr. Ranjan Roy**
Supervisor
Department of Agricultural
Extension and Information System
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

# DEDICATION

**LOVINGLY DEDICATED TO MY PARENTS**

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**The Author**

## LIST OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES



## LIST OF APPENDIX

# ABBREVIATIONS

| | |
|---|---|
| GDP | Gross Domestic Product |
| IMF | International Monetary Fund |
| FAO | Food and Agriculture Organization |
| DFID | Department For International Development |
| NCBP | National Contaminant Bio monitoring Program |
| CLSI | Composite Livelihood Security Index |
| IFAD | International Fund for Agricultural Development |
| NGO | Non-government Organisation |
| CARE | Cooperative for Assistance and Relief Everywhere |
| SAAO | Sub-Assistant Agriculture Officer |
| CIG | Common Interest Group |
| OECD | Organization for Economic Co-operation and Development |
| CI | Composite Indicator |
| SPSS | Statistical Package for Social Sciences |

# LIVELIHOOD SECURITY OF WOMEN FARMERS IN NATORE DISTRICT

**FARJANA TASNIM**

## ABSTRACT

In the male dominated society women are in a disadvantageous position in Bangladesh. The total development hampers if the livelihood status of women is not be increased or remained as low as it nowadays. The objectives of the study were, therefore, to select and describe a set of important characteristics (or indicators) of women farmers that are collectively represent their livelihood security, to assess the livelihood security status and to determine key factors of improving livelihood security of women farmers. The livelihood security of women farmers was assessed by developing a composite livelihood security index (CLSI) consisting of 3 dimensions: social, economic and institutional. Indicators were selected by reviewing literature. Data were collected from six CIGs (Common Interest Groups) having 120 women farmers of six villages from three unions of Baraigram upazila under Natore district. The results revealed that about 64 percent of the respondents were able to secure their livelihood. Multiple regression analysis shows that the important contributing factors were education (0.672), health and sanitation (0.196), food availability (0.166) and institutional functions (0.155). The study concludes that the process of facilitating learning (e.g. formal education) is crucial for improving the livelihood security of women farmers. The study recommends livelihood security of women farmers can be enhanced by enhancing education, investing in health facilities and sanitation, achieving food security and increasing capacities of the local institutions like Union Parishad.

# CHAPTER I

# INTRODUCTION

## 1.1 General Background

Bangladesh is a developing country. Yet, almost one-third of total population lives in extreme poverty. In the last decade, the country has recorded GDP growth rate above 5% (BBS, 2017). According to IMF, Bangladesh's economy is the second fastest growing major economy of FY 2016-17 with a rate of 7.28%. Although three fifth of Bangladeshis are employed in agricultural sector in different rural area, their way of livelihood (i.e. means of securing the necessities of life) is also different. About 48% of the total population in Bangladesh is women and majority of them living in rural areas. The work of women in Bangladesh is mostly confined to the homestead due to cultural, religious and social restrictions. However, with the great decline of their socio-economic situation, rural women are breaking through the traditional norms and coming forward to participate in the development activities outside their homestead. Currently rural women in Bangladesh have an anchoring role in the management of their families as well as participation in different income generating activities like crop production, livestock and poultry rearing, aquaculture etc. (ADB, 2007; Al-Amin, 2008). They can play a vital role if they are properly involved in agricultural production and other income generating activities as well as decision making processes. Their active involvement in different income generating activities is considered essential for rapid economic development of the country and securing livelihood (i.e. adequate and sustainable access to income and resources to meet basic needs such as food, health facilities, educational opportunities, housing) of their family as well (Hoque and Itohara, 2009).

## 1.2 Statement of the Problem

In Bangladesh, about half of the total population is female and a majority of them, 80%, live in rural areas (Agricultural Diary, 2017). Among the rural women, about 43% are involved in the agricultural sector, and 70% are unpaid family labor (Khan et al., 2004). They constitute 42% of the total labor force (FAO, 2006). Most of the rural women have little opportunity to participate in intra-household, socio-economic and political decision-

making processes as well as very limited interaction with people outside of the home (Shekh, 2003; Parveen, 2005; Quisumng and Mcclafferty, 2006). These factors isolate women from development activities as well as from acquiring income, knowledge, skills, etc., which make it difficult for them to be economically and socially independent (DFID, 2000; Fakir, 2008). This vulnerable situation resulted in an overall dependency of women on their male kin. Women are often treated as burdens, while men are seen as assets to families. They suffer discrimination because of their sexual category, limited access to markets, scarce income earning opportunities, education and health care, leading to a lower level of well-being in the family that retards the developmental goals of the state. Poverty has engulfed rural women, and they face many challenges to achieve and maintain their livelihood. They are vulnerable to income shocks and their systems of livelihood are often so fragile and finely-balanced that a small misfortune can destabilize the households for many years. Rural women are most susceptible to hunger and food insecurity due to lack of productive assets and depend on irregular and low-paying, physically demanding daily wage labor (Halder and Mosley, 2004; Ahmed, et al., 2005; Matin et al., 2008). Thus, the low and irregular incomes, or both, have long term effects on rural women's livelihood security including adequate access to food, portable water, health facilities, educational opportunities, housing, time for community participation and social integration (Akter and Shanzidur, 2012; Lindenberg, 2002; Frankenberger et al., 2000; Chambers and Conway, 1992).

The total development of Bangladesh will undoubtedly be hampered if the livelihood status of women constituting about 50% of the country's population will not be increased or remained as low as it nowadays. In order to formulate suitable strategic measures for the improvement of the studied women's livelihood, this research focuses on socio-economic characteristics of women and their existing livelihood security.

### 1.3 Research Questions

This research has been conducted on assessing the livelihood security of rural women farmers. A number of research questions (RQ) have been developed under this research study.

RQ 1: What are the key characteristics (or indicators) of women farmers that represent their livelihood security?

RQ 2: What is the present livelihood condition of the rural women farmers?

RQ 3: How the indicators influence the livelihood security of rural women farmers?

### 1.4 Objectives of the Study

In order to answer the above the questions the following specific objectives were formulated that supposed provide proper direction to the study.

The objectives of this study are as follows:

i. To select key characteristics (or indicators) of women farmers that collectively represent their livelihood security,
ii. To assess livelihood security of women farmers, and
iii. To determine responsible factors for improving the livelihood security of women farmers.

### 1.5 Scope of the Study

The present study was designed to have an understanding the livelihood security of women farmers. From this study some scopes can be raised.

i. The findings of the study will in particular be applicable to the study of 6 villages of Baraigram upazila in Natore district. These findings may also be applicable to other locale of Bangladesh where socio-cultural, psychological and economic circumstances do not differ much than those of the study areas.
ii. The findings of the study may also be subsidiary to the field workers of extension service to enhance their action strategies.
iii. In academics, it may further help in conceptualizing the factors influences the livelihood security status of women farmers.

## 1.6 Justification of the Study

Numerous NGOs, GOs, and development organizations (DOs) have been working on improving livelihood status of rural women and several good examples of women's socioeconomic upliftments are available. Academic research on various issues such as women empowerment (Basu and Basu, 2001), rural women's food security (Sheheli, 2011), and self-dependency of rural women (Sheheli, 2011) can be found in the literature. However, it is difficult to find academic study on livelihood security of rural women in Bangladesh this study fulfills the research gaps. Livelihood security is defined as adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, and time for community participation and social integration). Livelihoods can bemade up of a range of on-farm and off-farm activities that together provide a variety of procurement strategies for food and cash. Thus, each household can have several possible sources of entitlement which constitute its livelihood. Entitlements include the rights, privileges and assets that a household has, and its position in the legal, political, and social fabric of society. According to Chambers and Conway (1992), 'a livelihood comprises of the capabilities, assets (stores, resources, claims and access) and activities required for a means of living'. A Livelihood is secure when it can cope with, recover from and adapt to socioeconomic stresses and shocks, enhance its capabilities and assets, and offer sustainable livelihood opportunities for the society as a whole, and which contributes net benefits to other livelihoods at the local and national levels and in the short and long term.

## 1.7 Assumption of the Study

An assumption is the supposition that an apparent fact or principle is true in the light of available evidence. The researcher had considered the following assumptions while undertaking the study.

i. The respondents are capable of giving proper answers to the questions contained in the interview schedule.
ii. Data collected by the researchers were biased free.

iii. The responses answered by the respondents were valid, acceptable and reliable.

iv. The researcher was well adjusted to herself with the social contiguous of the study area. Hence the collected data were free from favoritism.

v. The selected characteristics and livelihood security of women farmers of the study were normally and independently allotted with respected means and standard deviation.

## 1.8 Limitations of the Study

In order to conduct and complete this study in a meaningful and manageable way considering time, respondents, communication facilities and other necessary resources available to the researcher. Some limitations are necessary to impose as mentioned bellow-

i. The study was confined to only 6 villages of Baraigram upazila in Natore district which may fail to represent the actual scenario of the whole situation as people develop their strategies according to the concrete situation they face.

ii. It is difficult to get exact information as many of them are not more educated.

iii. Characteristics of women are many and varied, but only 10 characteristics were selected for investigating the relationship with the dependent variable of the study.

## 1.9 Definition of Different Terms

A number of terms, concepts, variables have been used throughout the study with specific meaning. In order to avoid the undesirable confusions of the meaning, these are defined and interpreted as follows-

- **Livelihood Security**

Household livelihood security is defined as adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration). Livelihoods can be made up of a range of on-farm and off-farm

activities which together provide a variety of procurement strategies for food and cash. Thus, each household can have several possible sources of entitlement which constitute its livelihood. These entitlements are based on the household's endowments and its position in the legal, political and social fabric of society (Nicoletti, 2000). Therefore, livelihoods are secure when households have secure ownership of, or access to, resources and income earning activities, including reserves and assets, to offset risks, ease shocks and meet contingencies (Sarah and Mehrul, 2004).

- **Education**

Education is referred to the ability of the respondents to read and write or having formal education received up to a certain standard. Education is measure on the basis of class a woman had passed from formal education institution.

- **Social Capital**

The network of relationship among people who live and work in a particular society enable that society to function effectively. The term generally refers to the resources, and the value of these resources, both tangible (public spaces, private property) and intangible (actors, human capital and people), the relationships among these resources, the impact that these relationships have on the resources involved in each relationships, and on larger groups.

- **Food Availability**

Food availability is when all people have sufficient quantities of food available on a consistent basis. Food availability is the supply side of food security. It is measured by the extent of food availability throughout the year.

- **Health and sanitation**

A state of complete physical, mental and social well-being is health. On the other hand sanitation is the provision of facilities and services for the safe disposal of urine and feces. These are measured by health status, ability to get health treatment and possession of toilet.

- **Pluriactivity**

Pluriactivity is the combination of agricultural and non-agricultural activities performed by the farmer or beneficiaries of farm household.

- **Access to Financial Institutions**

Access to finance is the ability of individuals or enterprises to obtain financial services, including credit, deposit, payment, insurance, and other risk management services. Accumulated evidence has shown that financial access promotes growth for enterprises through the provision of credit to both new and existing businesses. It benefits the economy in general by accelerating economic growth, intensifying competition, as well as boosting demand for labor.

- **Household Decision Making**

Participation in Household Decision Making refers to the participation of women in various household activities. It may be in Daily family expenditure, Increase in family income, Family saving, Education of the children, Family health care and treatment, Family planning, Marriage of children, Crop production etc.

- **Institutional Function**

Institutional functions offered and used in rural areas by farm and non-farm population of all income levels through a variety of formal, informal and semiformal institutional arrangements and diverse type of products and services, such as loans, deposits, insurance, and remittances. Rural finance includes agriculture finance and microfinance and is a sub sector of the larger financial sector.

- **Adequacy of Extension Services**

It refers to the adequate extension services provided by different extension service providers to do the farm work technologically.

- **Composite Livelihood Security Index (CLSI)**

A composite livelihood security index (CLSI) is a grouping of equations, indexes or other factors that are combined in a standardized way to provide a useful statistical measure of overall livelihood security performance over time.

# CHAPTER II

# REVIEW OF LITERATURE

A literature review is a text of reading the prior literature, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews are secondary sources, and do not report new or original experimental work.

To improve understanding, it seems necessary to at least review key terminology that will frequently be applied in this article. A number of attempts have been made to define livelihood security in the literature. For instance, livelihood security is said to be obtained if people can cope with and recover from shocks and stress, maintain or enhance their capabilities and assets, while not undermining the natural resource base of the area (Scoones, 1998).

There was serious dearth of literature with respect to research studies on this aspect. So, the directly related literatures were not readily available for this study. Some researchers addressed various aspects of the sustainable access to rural financial services and its effect on respondent group and suggesting strategies for their emancipation from socio-economic deprivations. A few of these studies relevant to this research are briefly discussed in this chapter under the following sections:

**Section 1:** Review of literature on livelihood security

**Section 2:** Review concerning the relationship between the selected characteristics of the respondents and their livelihood security

**Section 3:** Conceptual framework of the study

## 2.1 Review of Literature on Livelihood Security

Conceptually, 'Livelihood' denotes the means, activities, entitlements and assets by which people make a living. Making a living determines the existence of a person in society. The movable and immoveable things can also be included in this category. One can describe a 'livelihood' as a combination of the capabilities and resources people have (including social, human, financial, natural and material assets) and the activities they undertake in order to make a living and to attain their goals and aspirations (Chambers

and Conway, 1992). A livelihood is sustainable when people cope with and recover from shocks and crises (e.g. seasonal, environmental and economic) and can maintain or enhance their capability and assets both now and in the future, while not undermining the natural resource base.

Frankenberger and McCaston (2000) define household livelihood security as adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration). From the above definitions, sustainability and security seem to be used interchangeably, nevertheless with sustainability weighing more on the future, while security seems to be attributed both to the present and the future.

While Lindenberg (2002) views a livelihood as sustainable when people can cope with and recover from stress and shocks, maintain or enhance their capabilities and assets, and provide sustainable livelihood opportunities for the next generation, he does not provide a precise definition of livelihood security. Therefore a livelihood can be understood to be insecure in the short and long term, if it is not sustainable; and if it cannot withstand extreme events, such as natural disasters.

As explained by Frankenberger and McCaston (2000) the negative impacts of livelihood insecurity can be reduced by timely detection of where livelihood insecurity is likely to occur and by establishing contingency plans that can be implemented rapidly before a significant erosion of household assets occur and other erosive coping strategies are activated. Therefore the capacity to detect changes in livelihood security at an early stage and to respond promptly could considerably reduce the costs of dealing with a full-blown emergency.

Chambers and Conway, (1992) stated that different factors are defined as: natural / biological (i.e., land, water, common-property resources, flora, fauna); social (i.e., community, family, social networks); political (i.e., participation, empowerment-sometimes included in the social category); human (i.e., education, labor, health, nutrition); physical (i.e., roads, clinics, markets, schools, bridges); and economic (i.e.,

jobs, saving, credit) have effects on livelihood security. All these factors are important to meet the basic needs.

## 2.2 Review concerning the relationship between the selected characteristics of the respondents and their livelihood security

### 2.2.1 Education and livelihood security

This livelihood security indicator is comprised of several components, including the overall level of education of the household, gender differences in educational access, and the overall literacy rates of adults in the household (Sarah & Mehrul, 2004).

### 2.2.2 Social capital and livelihood security

Social capital is one of the capitals (social, human, financial, natural resource and physical capitals) of the asset pentagon of the sustainable livelihood framework (Carney, 1998).

Krishna (2002) argues that communities with high level of social capital produce superior outcomes in joint actions and communities with low social capital can be assisted to build up stocks of this resource, so that their performance will also improve over time.

### 2.2.3 Food availability and livelihood security

Most research on livelihood security has been centered on issues related to food insecurity, which was then linked to livelihood security (Frankenberger and McCaston, 1998; Lindenberg, 2002).

As food is considered to be only one of the priorities that people pursue, as well as the range of factors that determine why the poor take decisions and spread risk, in order to subsist in the short and long term, researchers have since the late 80s and early 90s developed concepts related to household livelihood security (Akter et al., 2012; Frankenberger and McCaston, 1998). These household livelihood security models have been known to allow for a broader and more comprehensive understanding of the relationships of poverty, malnutrition as well as the dynamic and complex strategies that the poor use to negotiate survival. Therefore, livelihood security today is looked upon as the constant requirements to balance food procurements as well as the satisfaction of

other basic material and non-material needs of individuals, households and/or communities.

From a household livelihood perspective, food security is a function of whether food is available on-farm or in the market, whether households have access to the food, and whether patterns of food utilization, including intra-household distribution, are such that the nutritional needs of all household members are met. In essence, a livelihood analysis of food security at the impact level assesses the quantity and quality of food available to households throughout the year and the distribution of food among all household members. Often, food security is effectively measured by a household's capacity to cope with stress periods, either seasonal or inter-annual (Sarah and Mehrul, 2004).

Similarly, FAO defined food security as existing when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. Also food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2013).

### 2.2.4 Health and sanitation and livelihood security

Several components of health security are considered to be critical in livelihood security assessment. The first is the frequency of illness among all household members. In highly vulnerable households, illness episodes can severely compromise the productiveness of family members, reducing already-low levels of incomes and production, thereby affecting food and nutritional security. The second component is access to primary health care. The health security of rural families is directly related to their level of access to appropriate medical care (Sarah and Mehrul, 2004).

### 2.2.5 Pluriactivity and livelihood security

Although economic security is intimately related to household livelihood security, the economic status of poor households is notoriously difficult to measure directly. Household income among poor families is often derived from multiple informal sources,

and labour is sometimes compensated in non-monetary units (such as food). (Sarah and Mehrul, 2004).

According to Hussein and Nelson (1998), economic security is the availability of a steady and reliable source of income to sustain daily living for oneself and one's family and to allow planning.

### 2.2.6 Market access and livelihood security

The relationship between livelihoods and access to market services is best explained by the theory of sustainable livelihood framework by Carney (1998) and DFID (2000). The approach is founded on a belief that people require a range of livelihood assets to achieve positive livelihood outcomes through several livelihood strategies in which marketing activities and other strategies like production and income activities are of great concern.

Most studies on market access reiterate that there are problems linked to price risk and uncertainty, difficulties of contract enforcement, insufficient numbers of middlemen, cost of putting small dispersed quantities of produce together, inability to meet standards (Dorward et al., 1998; Freeman and Silim, 2001; Kherallah and Kirsten, 2002; IFAD, 2003; IFAD, 2009).

Lack of access to markets has also resulted to high input costs, high transaction costs, and low price of output. The linkage between producers and market actors is also weak, thereby raising risks in production and marketing. This hampered the livelihood status of the producers (Lucila and Lapar, 2006).

### 2.2.7 Access to financial institutions and livelihood security

Rabbani et al. (2013) stated that the study indicates that more than 70% households take out loans, reduce household expenses and change eating habits to cope with the impact of salinity on rice production.

According to BBS (2011), farmers have very limited access to institutional credit because of collateral requirement. At present, only 27% of farmers receive institutional credit (BBS, 2011). The credit amount again is quite inadequate and not advanced in time. They are also not eligible for microcredit of NGOs that deal mainly with landless farmers.

### 2.2.8 Household decision making and livelihood security

In Bangladesh Khandker et al. (1998) found that program participation has positive impact on household income, production and employment particularly in rural non-farm sector and that the growth in self-employment was achieved at the expense of wage employment which implies an increase in rural wages.

### 2.2.9 Institutional functions and livelihood security

Uphoff and Louise (2006) showed rural local institutional functions or activities played a very important role in securing livelihood of rural people. Four functions of institutions such as- (i) information, (ii) direct provision, (iii) facilitated access and (iv)creating of favorable environments that enable rural people to maintain income generating activities in rural areas.

### 2.2.10 Adequacy of extension services and livelihood security

World Bank (2006) showed that the importance of extension agent in a study. They showed the role of extension services is very important to support sustainable agriculture.

Zhen et al. (2005) found in their study that most of the farmers are dissatisfied (50%) or even strongly dissatisfied (23%) with the present extension services and their agents. The lack of services, limited use of the services by the farmers, no participation of the farmers in general extension activities, an inadequate number of extension workers, the high commercial orientation of the services and the low working efficiency of the AEWs are considered by the farmers as the major reasons for the ineffectiveness of the services.

Allahyari (2009) explained the importance of extension services in maintaining good and sustainable agriculture practices. He stated that extension could play a key role in fostering sustainability in agriculture. Because today's agricultural extension must consider environmental implications, social issues and overall economic growth within the agriculture sector.

### 2.2.11 Composite Livelihood Security Index (CLSI)

CARE developed a set of multiple indicators to assess each of the eight livelihood security outcomes of the household livelihood security framework based on a reflective

workshop in Bangladesh. In this study, a suite of indicators from these recommended set were selected (CARE, 2004) which can be derived from the survey data to construct the livelihood security indices. It is worth mentioning that CARE has developed a composite livelihood security index (CLSI) selected sample household interviews by using a team of 10-12 persons spending about eight hours in a community (Lindenberg, 2002).

In this study, a composite set of livelihood security indices at the household level was developed by utilizing a set of indicators representing each of the livelihood security areas using an approach similar to Hahn, et al. (2009). A total of 33 security indicators were identified from the data set and broadly grouped them under five security areas: economic security, food security, health security, educational security and empowerment. Indicators are identified according to its relevance and it is assumed that each indictor carries equal weight and contributes to the overall HLS index (Lindenberg, 2002).

## 2.3 Conceptual Framework of the Study

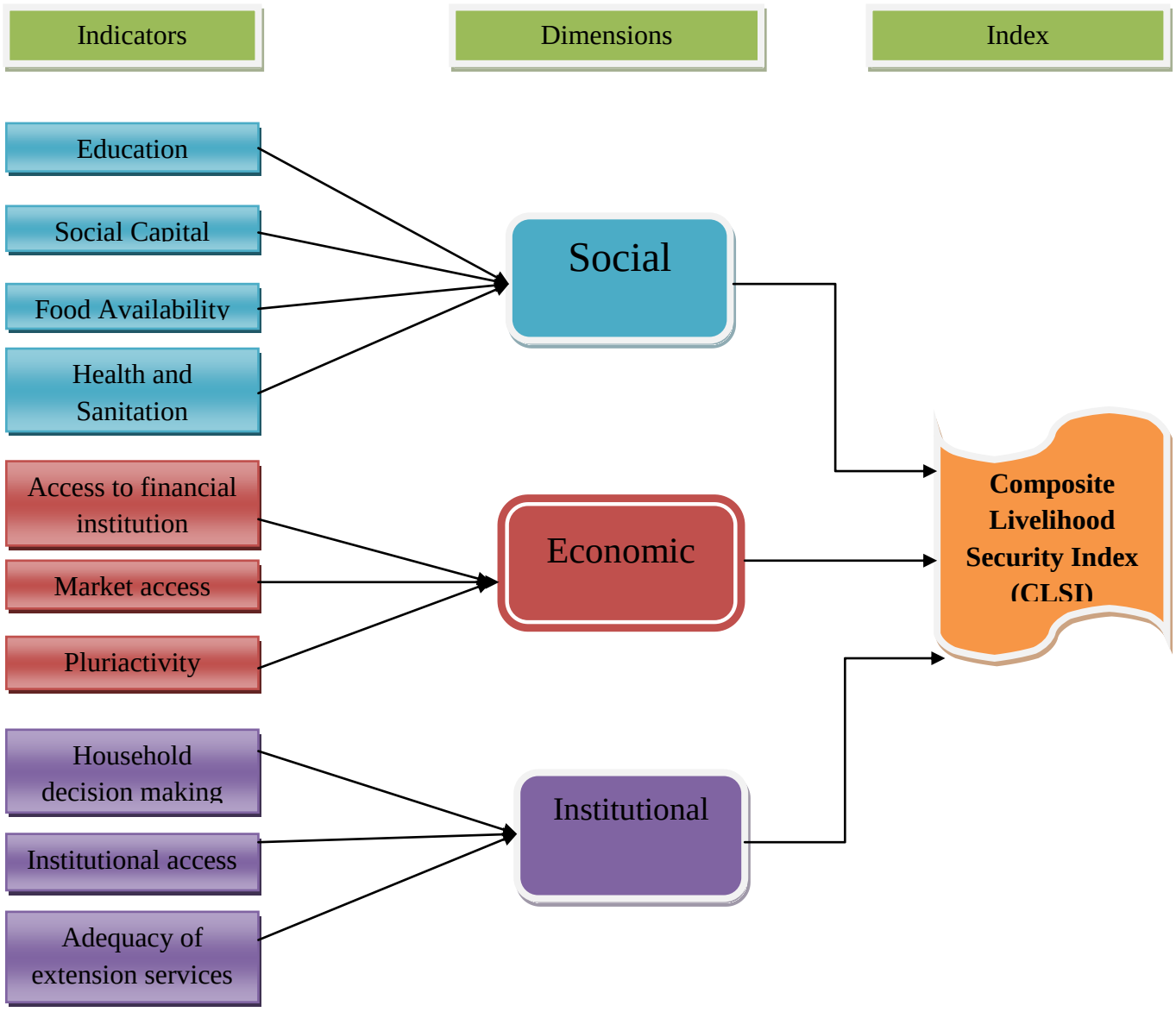


**Figure 2.1 Conceptual framework of assessing livelihood security of women farmers**

# CHAPTER III

# METHODOLOGY

Research is a systemic investigation for some pertinent information on a specific topic. Importance of methods and procedures in conducting any research can hardly be over emphasized. Keeping this in mind the researcher took utmost care for using proper methods in all aspects of this investigation. The methods and procedures used in conducting this research are presented below:

## 3.1 Locale of the Study

Baraigam upazila of Natore district was selected for three reasons: (i) easy communication, (ii) financial shortage and (iii) time limitation for conducting this study. Considering the limitations of the research with respective of time and other facilities, three out of seven unions were randomly selected. At the third stage, two villages from each of the three unions were randomly selected as the study area. The six selected villages were Ahmedpur and Katashkol from Majgaon union, Gopalpur and Gormati from Gopalpur union, and Chandi and Garfa from Chandi union of Baraigram upazila.

## 3.2 Population and Sample of the Study

This upazila consists of 7 unions. The upazila has 90 CIGs (Common Interested Groups) in these 7 unions maintaining homogeneity of members in each group i.e. male farmers and women farmers group. Out of 7 unions, 3 unions were selected randomly and from 3 unions 6 villages were selected randomly (i.e. 2 villages from each union). One CIG consists of 20 farmers. Each village has 3 CIGs: 2 male CIGs and 1 female CIG. Data were collected from 6 women CIGs from 6 villages selected by purposive random sampling method. Therefore, a total of 120 members of the CIGs constituted the population of the study. And the total population was taken as the sample of the study (Table 3.1).

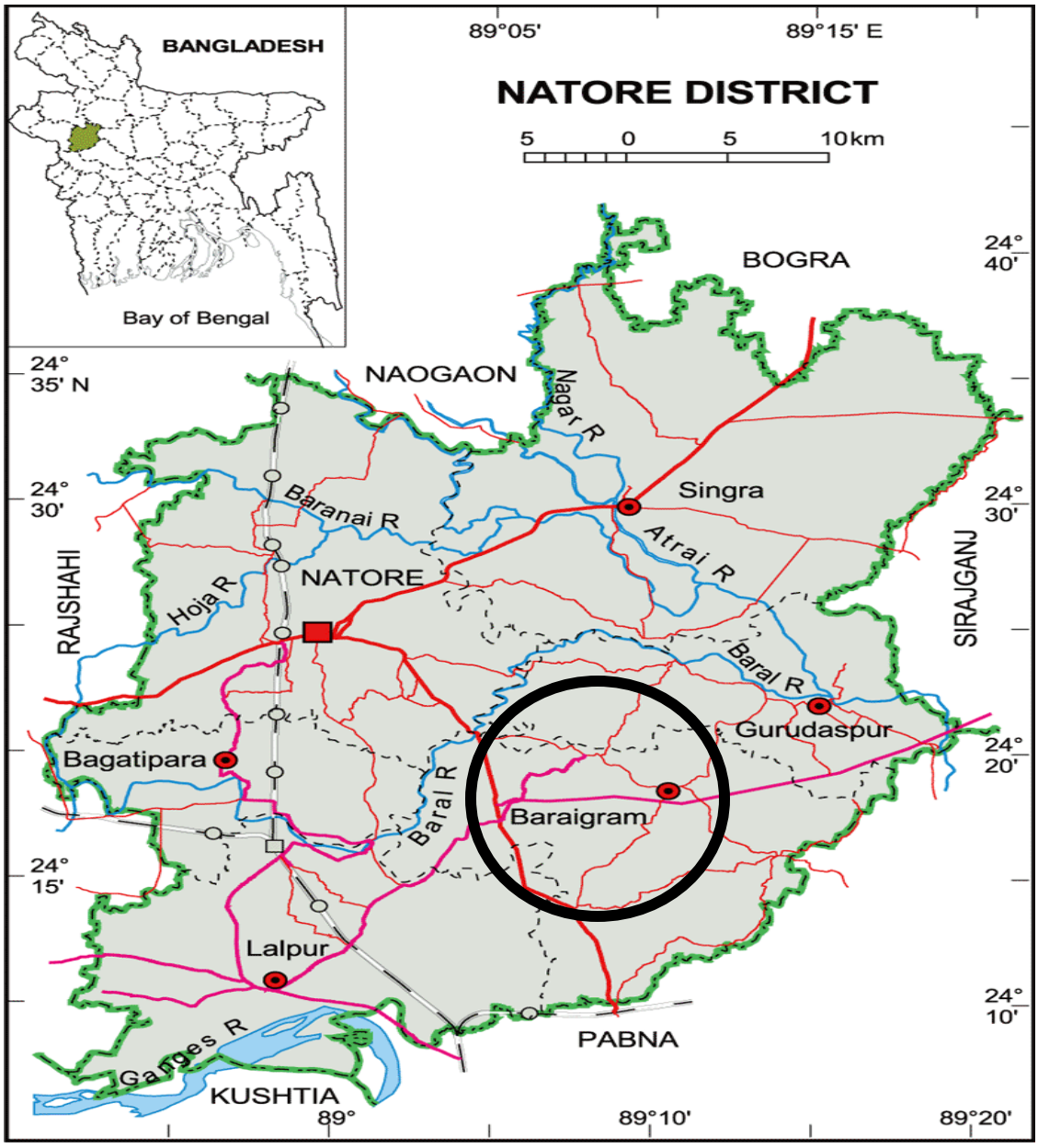


**Figure 3.1 Map of Natore district showing Baraigram upazila**

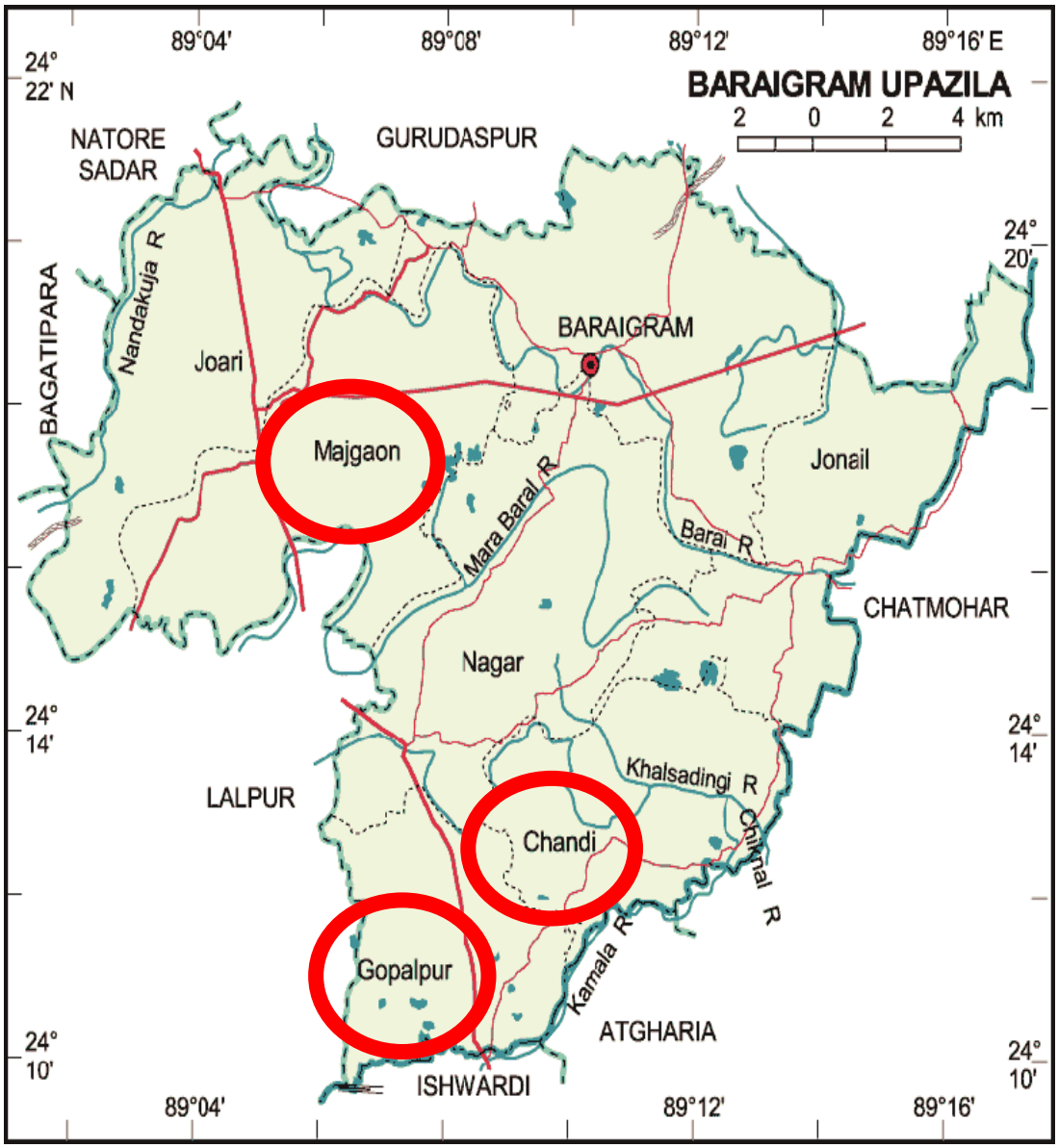


**Figure 3.2 Map of Baraigram upazila showing study area**

**Table 3.1 Population and sample of the study**

| Unions | Villages | Members of CIGs | Sample |
|---|---|---|---|
| Majgaon | Katashkol | 20 | 20 |
| | Ahmedpur | 20 | 20 |
| Gopalpur | Gormati | 20 | 20 |
| | Gopalpur | 20 | 20 |
| Chandi | Garfa | 20 | 20 |
| | Chandi | 20 | 20 |
| Total | | 120 | 120 |

### 3.3 Data Collection Instruments

An interview schedule was prepared for collection of data in accordance with the objectives of the study. The interview schedule contained both open and closed form of questions to obtain information regarding the problem confrontation by the farmers in tuberose cultivation. The questions were arranged systematically to understand easily by the farmers.

The draft interview schedule was prepared in English version and it was pretested among 20 farmers in the sample villages before preparing the final version for collecting the data for the main study. The pretest was helpful in identifying faulty questions and statements in the draft schedule. Necessary corrections, additions, alternations and rearrangements were made in the schedule on the basis of experience of the pre-test. The interview schedule was then finalized for collection of data. An English version of the interview schedule enclosed in Appendix-A.

### 3.4 Data Collection

Data were collected by the researcher herself. Interviews were conducted with the respondents in their homes during their ensured period. While starting interview with any respondents the researcher took all possible care to establish rapport with her so that she didn't feel hesitant or hostile to provide responses to the questions and statement in the schedule. Necessary steps were taken to explain the purpose of the study to the respondents and their answers were recorded sincerely. The questions were explained whenever any farmer felt difficulty in understanding them properly. The researcher in collecting data faced in serious problem. The total period of data collection took February.

### 3.5 Summarization, Tabulation and Analysis of Data

Collected data were checked and cross checked before transferring to the master sheets. These were classified, tabulated and analyze to accomplish the specific objectives of the study. Data were presented mostly in the tabular form, because it is simple in calculation, widely used and easy to understand. Some statistical measures like normalization, weighting and aggregation were calculated to arrive at meaningful conclusion.

#### 3.5.1 Three key steps of composite livelihood security index (CLSI) development

In general, indicators in a dataset are incommensurate with each other, and have different measurement units. Therefore, normalization is the best way to make them comparable. The method of normalization should be determined based on data properties and the aim of the index. The handbook on constructing CI discussed several normalization methods (OECD 2008). Considering the pros (e.g. simplicity) and cons (e.g. presence of outliers which were observations point that were distant from other observations) of various methods, this study used max-min normalization method.

There is no consensus on how to determine the appropriate weight for an indicator. Researchers continue to debate suitable methods for weighting variables. There is a dichotomy between the participatory (subjective) and statistical (objective) methods of weighting. In the literature, equal weighting is the method most commonly used.

Researchers (Munda, 2007; Bohringer *et al.*, 2007) have also criticized the participatory approaches of weighting for their ‘‘arbitrary’’ nature, as well as their inherent lack of statistical and empirical foundation. On the contrary, recommended that equal weighting should be the standard and that the application of other weighting method should be properly justified. Although composite indices are subject to subjectivity, the application of objective methods to calculate indicator weight is increasing. The main reasons for using subjective methods are their methodologically soundness, their transparent nature, their impartiality, and are thoroughly data-driven. From the policy perspective, these methods are inconsistent with the goal of CI (Munda 2007). Moreover, participatory methods do not fulfill the priorities of policy makers, who ultimately play the key role by investing on learning assessment. Keep in all consideration, this study used participatory approach method of weighting.

Aggregation deserves particular attention, since it influences ‘‘compensation’’ or ‘‘marginal rate of substitution’’ among indicators (Munda, 2007). The determination of the right method depends on the purpose of CI and the nature of the subject being measured (Nardo *et al.,* 2005) stressed that the aggregation employed should be strongly related to the method used to normalize the raw data. The condition for application of linear aggregation is that the sub-indicators should have the same measurement unit and further ambiguities due to the scale effects should have been neutralized. Geometric aggregation is suitable when sub-indicators are non-comparable and have strictly positive values in ratio-scale of measurement. Based on the data properties, this study used arithmetic average to combine indicators within the dimensions with a view to minimize measurement errors and capture inconsistencies.

#### 3.5.1.1 Normalization

Indicators should be normalized to render them comparable. Attention needs to be paid to extreme values as they may influence subsequent steps in the process of building composite indicator. Skewed data should also be identified and accounted for. Normalization is required prior to any data aggregation as the indicators in a data set often have different measurement units. A number of normalization methods exist (Munda, 2007).

Min-Max normalizes indicators to have an identical range [0, 1] by subtracting the minimum value and dividing by the range of the indicator values. However, extreme values/or outliers could distort the transformed indicator. On the other hand, Min-Max normalization could widen the range of indicators lying within a small interval, increasing the effect on the composite indicator more than the z-score transformation.

Indicators measured using a scale is normalized by applying the min-max method. This method transforms all values to scores ranging from 0 to 1by subtracting the minimum score and dividing it by the range of the indicator values. The following formula is used to apply min-max:

$$X_i\,(_{0\ to\ 1}) = \frac{X_i - X_{Min}}{X_{Max} - X_{Min}}$$

Where

$X_i$= represents the individual data point to be transformed,

$X_{Min}$= the lowest value for that indicator,

$X_{Max}$= the highest value for that indicator, and

$X_i$= 0 to1 the new value you wish to calculate, i.e. the normalized data point within the range of 0 to 1.

### 3.5.1.2 Weighting and aggregation

Indicators should be aggregated and weighted according to the underlying theoretical framework. Correlation and compensability issues among indicators need to considered and either be corrected for or treated as features of the phenomenon that need to retained in the analysis. The literature covers various aggregation methods, each with their strengths and weaknesses. For aggregating individual indicators into composite indicators, the Vulnerability Sourcebook recommends a method called ‘weighted arithmetic aggregation’. This is a common, simple and transparent aggregation procedure. Individual indicators are multiplied by their weights, summed and

subsequently divided by the sum of their weights to calculate the composite indicator (CI) of a vulnerability component, as indicated in the following,

$$CI = \frac{(I_1 * w_1 + I_2 * w_2 + \ldots In * w_n)}{\sum_{1}^{n} w}$$

Where, *CI* is the composite indicator, e.g. sensitivity, *I* is an individual indicator of a vulnerability component, e.g. land use, and *w* is the weight assigned to the indicator.

If equal weighting applies, indicators are simply summed and divided by the number of indicators. Assigning a weight of 2 (or 3) to one or more indicators implies that these indicators are twice (or three times) more important than indicators which retain a weighting of 1.

### 3.6 Indicator Generation

The literature states that indicators provide a tangible contribution to learning development by measuring progress of economical, ecological, and social issues. Moreover, these indicators help to diagnose problems and to understand their underlying causes, which assist in monitoring progress to determine whether goals and targets are met. In addition, several national and international bodies observe policy maker's indicator-based development activities and evaluate their transparency and accountability. In this con-text, developing an indicator raises many challenges. Therefore, indicator generation needs a holistic approach since indicators reflect multiple motivations, for instance, advocacy, management, assessment, and decision making.

Freebairn and King (2003) have proposed an approach for the generation of indicators, illustrating the significance of key-players in the indicator development process. Many studies (Monroy-Ortiz et al. 2009) reported developing an indicator by adopting a participatory approach that was fit-for-purpose, integrative, and comprehensive in terms of the efficiency and effectiveness in formulating learning-compatible development strategies.

Moreover, expert-led indicator development with active participation of local stakeholders is recognized for consolidative assessment (Roy and Chan, 2012). The work of provided not only good guidance for indicator development but also gave a fair direction for overall assessment. To start with, previous literature (e.g. Roy and Chan, 2012; Sheheli, 2011; Parveen, 2005; Sarah and Meherul, 2004) was reviewed and synthesized so as to obtain a potential set of indicators.

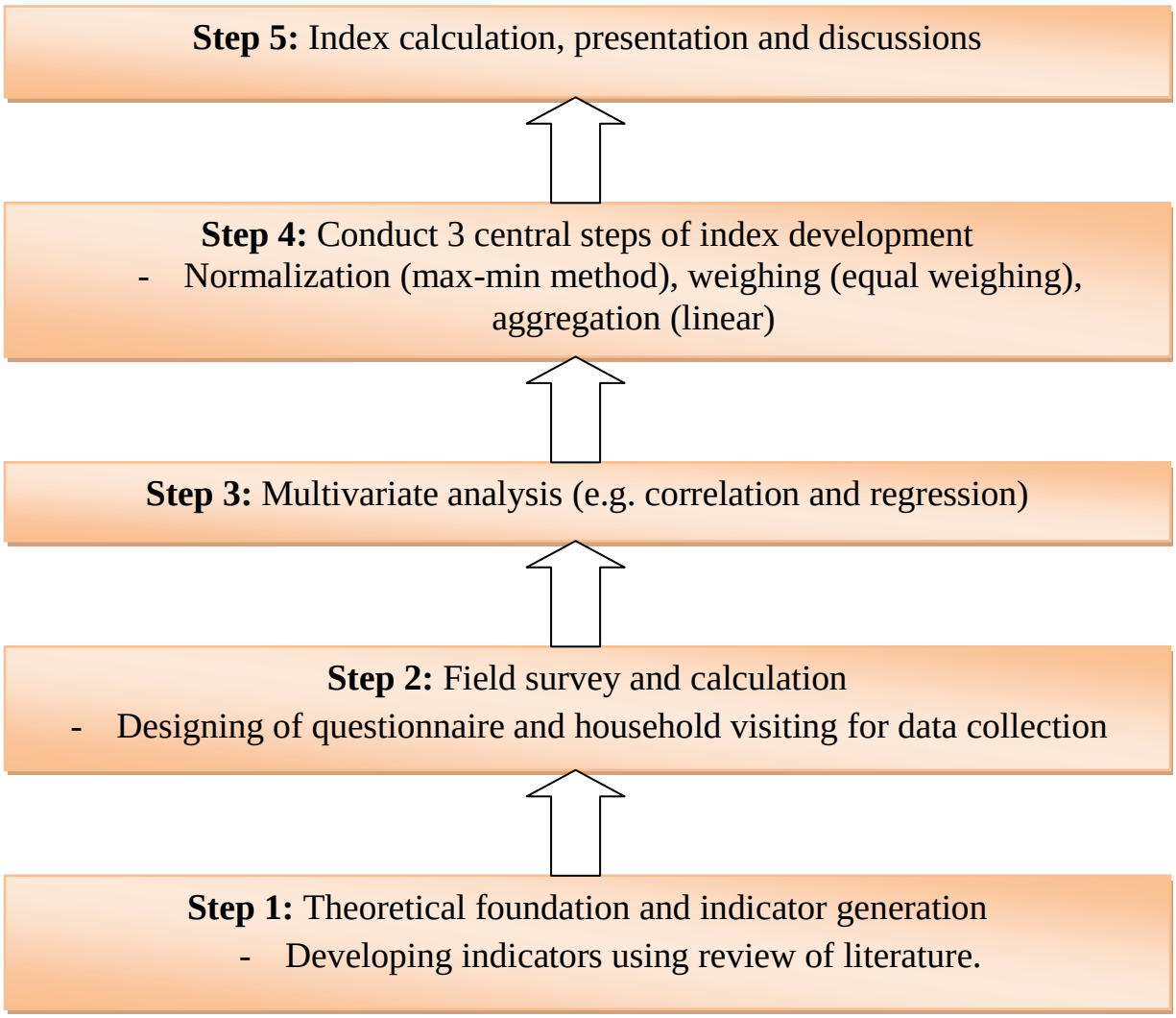


**Figure 3.6 Methodology employed for the construction of the composite livelihood security index (CLSI) in the study**

### 3.7 Indicators Selection

Measurements of indicators constitute an important task of social research. This section contains procedures for measurement of indicators and development of composite livelihood security index (CLSI) of the study. The composite livelihood security index (CLSI) is made up of 10 indicators and their specific measures, which are organized under the three dimension of learning: Social, Economic, and Institutional. There indicators were developed based on literature review and discussion with research supervisor. The operationalization of indicators is shown below:

### 3.8 Measurement of Variables

In this study, an indicator-based procedure is used to assess livelihood security of women farmers in Natore district; supported by descriptive data obtained by various types of primary and secondary data. Measurement of the selected indicators or variables is an important part of the study. Measurement should be in line with the objectives of the study. The researcher went through some procedures to measure the variables. The measurement procedures followed for measuring each of the variables are presented below:

#### 3.8.1 Measurement of independent variables

The selected characteristics of the women farmers constituted the independent variables of the study. To keep the research within the manageable sphere, 10 independent variables were selected for the study. The procedures followed in measuring the independent characteristics are briefly discussed below:

##### 3.8.1.1 Education

Education was measured in terms of years of schooling completed by an individual in educational institutions. One score was assigned for each class passed by a farmer. The person who does not read and write was scored 0. If a respondent passed the final examination of class IX in the school, his education score was taken as 9; if a respondent had education outside the school and if the level of education was thought to be equivalent to that of class four, then his education score was taken as 4.

### 3.8.1.2 Social capital

Involvements in organizations, number of contacts, and confidence level in some organizations (Roy et al., 2012). There are two types of question were asked to the respondents as follows:

A. How many organizations are you a member of and its frequency of contact? Yes / No. A score of one (1) was assigned for answer Yes and score of zero (0) was assigned for answer No. Number of contacts: 3 = weekly contact; 2 = monthly contact; 1 = yearly contact.

B. How much confidence do you have in the following institutions?

Confidence level: 4 = a great deal; 3 = quite a lot; 2 = no opinion; 1 = not very much; and 0 = none at all.

### 3.8.1.3 Food availability

Food availability is when all people have sufficient quantities of food available on a consistent basis. Food availability is the supply side of food security. It is measured by the extent of food availability throughout the year. (Zeller et. al., 2001)

| **Categories** | **Score** |
|---|---|
| Adequate | 3 |
| Moderately Adequate | 2 |
| Inadequate | 1 |

Scores were assigned for these opinions as 1, 2 and 3 respectively. The total score of food availability respondent was computed by adding her scores for all the 12 months. Thus, the food availability could range from 12 to 36.

### 3.8.1.4 Health and sanitation

This indicator defines how much respondents aware about health (FAO, 2015). There were 3 items of questions frequently asked to the respondents. The total participation score of a respondent was computed by adding her scores for all the three items.

A. Used categories health status

| Items | Score |
|---|---|
| Good | 3 |
| Short term illness | 2 |
| Disabled | 1 |

A respondent was asked to indicate her opinion about her health status with a three point scaling as disabled, short term illness and good. Scores were assigned for these opinions as 1, 2 and 3.

B. Ability to get health treatment

| Ability to take health treatment | Score |
|---|---|
| Frequently | 2 |
| Seldom | 1 |
| Not at all | 0 |

Scores were assigned for these opinions as 0, 1 and 2 respectively. The total score of ability to take health treatment respondent was computed by adding her scores for all the eight items. Thus, the ability to take health treatment could range from 0 to 16.

C. Possession of a toilet

| Possession of a toilet | Score |
|---|---|
| Having own toilet | 2 |
| Using other people's toilet | 1 |
| Having no access to toilet | 0 |

Scores were assigned for these opinions as 0, 1 and 2 respectively. The total score of a possession of a toilet respondent was computed by adding her scores for all the three items.

### 3.8.1.5 Pluriactivity

Pluriactivity means family income sources other than farming. For examples; do you have any income source other than agriculture? 1= yes; 0 = No.

If yes, then involvement in each activity signifies 1 point.

#### 3.8.1.6 Market access

Market access refers to the capability of an individual to sell goods and services in the market (FAO, 2015). There are two categories of market access: buying and selling. For each category: 1= yes; 0= no. If yes, then for the open question right answer (product name) receives 1 point (max).

#### 3.8.1.7 Access to financial institutions

Access to financial institutions refers to the support received by the respondent. It is measured based on different financial sources. In this case, 2= Sustained access, 1= Intermittent access and 0= No access. Then it was determined by adding up all the scores for all the responses of the items of that respondent. Access to financial institution could range from 0 to 6.

#### 3.8.1.8 Household decision making

Household decision making means who in your family usually has the final say for making decisions (FAO, 2015). Applied categories are:

| Categories | Score |
|---|---|
| Completely | 2 |
| A little | 1 |
| Not at all | 0 |

Each question had a predetermined assigned score from 0 to 34.

#### 3.8.1.9 Institutional functions

Institutional functions refer to the involvement by the respondent. It is measured based on different statement. In this case, 4= a great deal, 3= quite a lot, 2= no opinion, 1= not very much and 0= not at all. Then it was determined by adding up all the scores for all the responses of the items of that respondent. Institutional functions could range from 0 to 28.

#### 3.8.1.10 Adequacy of extension services

This indicator was quantized by asking the extent of extension contact made by the respondent to personnel, and vice versa in the last year. Scores of the responses are assigned as 0, 1, 2, 3 respectively. Where, 3 = 4 times and above; 2 = 2–3 times; 1 = one time; and 0 = no visit. Its score could range from 0 to 6.

### 3.9 Data Processing and Analysis

#### 3.9.1 Processing of data

After completion of field survey, data from all the interview schedules were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. In this process, all responses in the interview schedule were given numerical coded values. Local units were converted into standard units and qualitative data were converted into quantitative data by assigning suitable scores whenever necessary. The responses of the questions in the interview schedule were transferred to a master sheet to facilitate tabulation. Then, for describing the different characteristics and their use of technologies, the respondents were classified into several categories.

#### 3.9.2 Analysis of data

The analysis was performed using SPSS (Statistical Package for Social Sciences) computer package. Descriptive analyses such as range, number, percentage, mean, standard deviation were used whenever possible. Pearson's Product Moment Coefficient of Correlation (r) was used in the order to explore the relationship between the concerned variables.

# CHAPTER IV

# RESULTS AND DISCUSSION

The findings of this study and their logical interpretations have been systematically presented in different sections of this chapter. Data obtained from respondents by interview were measured, analyzed, tabulated and statistically treated according to the objectives of the study.

## 4.1 Characteristics of Selected Indicators of the Respondents

Behavior of an individual is determined to a large extent by one's personal indicator. There were various indicators of the respondent that might have consequence to develop composite livelihood index. But in this study, ten indicators of them were selected as variables, which included their education, social capital, food availability, health and sanitation, annual family income, market access, access to financial institution, household decision making, institutional functions and adequacy of extension services on composite livelihood index that might be greatly influenced the assessment of livelihood security of women farmers of Baraigram upazila of Natore district.

### 4.1.1 Education

The level of educational scores of the farmers ranged from 0 to 16 with a mean and standard deviation of 4.04 and 3.69, respectively. Based on the educational scores, the respondents were classified into five categories such as illiterate (0), can sign only (0.5), primary education (1 to 5), secondary education (6 to 10), above secondary (above 10) as shown in Table 4.1.

**Table 4.1 Distribution of the farmers according to their level of education**

| Category | Range (School years) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Illiterate | 0 | 0-16 | 19 | 15.8 | 4.04 | 3.69 |
| Can sign only | 0.5 | | 22 | 18.3 | | |
| Primary education | 1-5 | | 37 | 30.8 | | |
| Secondary education | 6-10 | | 39 | 32.5 | | |
| Above secondary | > 10 | | 3 | 2.5 | | |
| Total | | | 120 | 100 | | |

It was found that respondents under secondary education category constituted the highest proportion (32.5 percent) followed by primary education (30.8 percent). On the other hand, the lowest 2.5 percent in above secondary category followed by illiterate category (15.8 percent) and can sign only category (18.3 percent).

### 4.1.2 Social capital

Social capital of the respondents ranged from 25 to 37 with the mean and standard deviation of 31.04 and 2.78, respectively. According to social capital the respondents were classified into three categories (Mean ± Standard Deviation) namely low, medium and high category as shown in Table 4.2.

**Table 4.2 Distribution of the respondents according to their social capital**

| Category | Range (score) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low | ≤ 29 | 25-37 | 46 | 38.3 | 31.04 | 2.78 |
| Medium | 30-33 | | 38 | 31.7 | | |
| High | > 33 | | 36 | 30 | | |
| Total | | | 120 | 100 | | |

It was found that the low category indicated the highest (38.3 percent) social capital followed by the medium category (31.04 percent). Only 30.0 percent respondents had high access of social capital.

### 4.1.3 Food availability

The scores of food availability of the respondents ranged from 22 to 31 a mean and standard deviation were 25.60 and 2.93, respectively. On the basis of food availability, the respondents were classified into three categories (Mean ± Standard Deviation) namely low, medium and high availability of food as shown in Table 4.3.

**Table 4.3 Distribution of the respondents according to their food availability**

| Category | Range (score) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low | ≤ 23 | 22-31 | 39 | 32.5 | 25.60 | 2.93 |
| Medium | 24-27 | | 45 | 37.5 | | |
| High | > 27 | | 36 | 30 | | |
| Total | | | 120 | 100 | | |

Data revealed that the highest respondents had medium food availability (37.5 percent), while the lowest food availability in high category (30 percent) followed by low (32.5.7 percent). Overwhelming majority (70 percent) respondent had low to medium food availability.

### 4.1.4 Health and sanitation

Health and Sanitation of the respondents ranged from 18 to 26. The mean and standard deviation were 21.98 and 2.13, respectively. Bases on access of sanitation and health, the respondents were categorized into three classes (Mean ± Standard Deviation) namely less effective, effective and very effective access as shown in Table 4.4.

**Table 4.4 Distribution of the respondents according to their health and sanitation**

| Category | Range (score) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Less effective | ≤ 19 | 18-26 | 14 | 11.7 | 21.98 | 2.13 |
| Effective | 20-23 | | 76 | 63.3 | | |
| Very effective | > 23 | | 30 | 25 | | |
| Total | | | 120 | 100 | | |

The observed data showed that most of respondents (63.3 percent) had effective access while 25 and 11.7 percent of them had very effective and less effective of the health and sanitation.

### 4.1.5 Pluriactivity

Score of pluriactivity of women respondents ranged from 0 to 5 (possible score was unknown) with mean and standard deviation of 2.30 and 1.08, respectively. On the basis of the scores, the respondents were classified into three categories (Mean ± Standard Deviation) namely low, medium and high pluriactivity as shown in Table 4.5.

**Table 4.5 Distribution of the respondents according to their pluriactivity**

| Category | Range (year) | | Beneficiaries | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low pluriactivity | ≤1 | 0-5 | 26 | 21.7 | 2.30 | 1.08 |
| Medium pluriactivity | 2-3 | | 80 | 66.6 | | |
| High pluriactivity | >3 | | 14 | 11.7 | | |
| Total | | | 120 | 100 | | |

It revealed that the majority (66.7 percent) of the women farmers were in medium pluriactivity category, whereas only 11.7 percent in high pluriactivity category followed by 21.7 percent in low pluriactivity category. The findings of the present study showed that around 88.1 percent of the women respondents in the study area had low to medium pluriactivity.

### 4.1.6 Market access

Access to market score of the farmers ranged from 9 to 15 (possible score was unknown) with a mean and standard deviation of 11.66 and 1.47, respectively. Based on the market access score, the respondents were classified into three categories (Mean ± Standard Deviation) namely no market access, medium market access and high market access as shown in Table 4.6.

**Table 4.6 Distribution of the respondents according to access to market access**

| Category | Range (score) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| No market access | ≤10 | 9-15 | 10 | 8.3 | 11.66 | 1.47 |
| Medium market access | 11-12 | | 75 | 62.5 | | |
| High market access | >12 | | 35 | 29.2 | | |
| Total | | | 120 | 100 | | |

Table indicated that the highest proportion (62.5 percent) of the farmers had medium market access compared to 29.2 percent in high market access and 8.3 percent in no market access category respectively and the lowest proportion (21.3 percent) had no market access.

### 4.1.7 Access to financial institution

Access to financial institution score of the farmers ranged from 2 to 5 (possible score was 0-6) with a mean and standard deviation of 3.65 and 0.82, respectively. On the basis of access to financial institution, the farmers were classified into three categories (Mean ± Standard Deviation) viz. low, medium and high access to financial institution as shown in Table 4.7.

**Table 4.7 Distribution of the respondents according to their access to financial institution**

| Categories | Range (Score) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low Access | Up to 2 | 2-5 | 8 | 6.7 | 3.65 | 0.82 |
| Medium Access | 3-4 | | 84 | 78.3 | | |
| High Access | Above 4 | | 18 | 15 | | |
| Total | | | 120 | 100 | | |

Data revealed that farmers having medium access to financial institution constitute the highest proportion (78.3 percent), while the lowest proportion in access to financial institution were low (6.7 percent) followed by high access to financial institution (15 percent). Overwhelming majority (92.3 percent) farmers have medium to high of access to financial institution.

### 4.1.8 Household decision making

Household decision making scores of the farmers ranged from 18 to 28 (possible score was 0- 34). The mean and standard deviation were 22.08 and 2.28, respectively. Based on the household decision making scores, the respondents were classified into three categories (Mean ± Standard Deviation) namely low, medium and high participation in decision making as shown in Table 4.8.

**Table 4.8 Distribution of the respondents according to their household decision making**

| Category | Range | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low participation | ≤ 20 | 18-28 | 34 | 28.3 | 22.08 | 2.28 |
| Medium participation | 21-24 | | 60 | 50 | | |
| High participation | ≥ 24 | | 26 | 21.7 | | |
| Total | | | 120 | 100 | | |

Data presented in the table revealed that 50 percent of the respondents had medium participation in household decision making, 21.7 percent had high participation and 28.3 percent had low participation in household decision making. Thus, an overwhelming majority (50.0%) of the respondents had medium participation. Participation in household decision making of the respondents was definitely affected by the education and knowledge of the respondents because it helped to enhance the eagerness to be acquainted with new makes decision.

### 4.1.9 Institutional functions

The score of institutional functions of the farmers ranged from 16 to 24 (possible score was 0-28) with a mean and standard deviation of 19.43 and 2.16, respectively. On the basis of institutional function, the farmers were classified into three categories (Mean ± Standard Deviation) viz. low, medium and high functions as shown in Table 4.9.

**Table 4.9 Distribution of the respondents according to their institutional functions**

| Categories | Range (score) | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low | Up to 17 | 16-24 | 26 | 21.7 | 19.43 | 2.16 |
| Medium | 18-21 | | 71 | 59.1 | | |
| High | Above 21 | | 23 | 19.2 | | |
| Total | | | 120 | 100 | | |

Data revealed that farmers had medium institutional function constituted the highest proportion (59.1percent), while the lowest proportion in high function (19.2percent). Respondents were (21.7 percent) in low institutional functions.

### 4.1.10 Adequacy of extension services

The score of extension services of the farmers ranged from 3 to 6 (possible score was unknown) with a mean and standard deviation of 4.11 and 0.72, respectively. On the basis of extension services, the farmers were classified into three categories (Mean ± Standard Deviation) viz. low, medium and high services as shown in Table 4.10.

**Table 4.10 Distribution of the respondents according to their extension services**

| Categories | Range (Score) | | Respondents' | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Low | Up to 3 | 3-6 | 24 | 20 | 4.11 | 0.72 |
| Medium | 3-4 | | 60 | 50 | | |
| High | Above 4 | | 36 | 30 | | |
| Total | | | 120 | 100 | | |

Data revealed that farmers had medium extension services constituted the highest proportion (60 percent), while the lowest proportion in low services (20 percent). Respondents were (30 percent) in high extension services.

## 4.2 Characteristics of Composite Livelihood Security Index (CLSI)

Composite livelihood index was made up of 10 indicators and specific measures which were organized under the 3 dimensions: social dimension, economic dimension and institutional dimension. Each of these 10 indicators represented a different facet in Bangladesh. It was measured by computing scores according to extent of livelihood with each of 10 selected indicators. Composite index by developing indicators scored varied from 16.26 to 91.50 with the mean and standard deviation of 43.86 and 17.81, respectively. On the basis of composite index scores, the respondents were classified into three categories (Mean ± Standard Deviation) namely less secure, secure and very secure of composite livelihood index as shown in Table 4.11.

**Table 4.11 Distribution of the respondents according to composite livelihood security index**

| Category | Range | | Respondents | | Mean | SD |
|---|---|---|---|---|---|---|
| | Score | Observed | Number | Percent | | |
| Less secure | ≤ 26 | 16.26-91.50 | 21 | 17.7 | 43.86 | 17.81 |
| Secure | 27-60 | | 77 | 64 | | |
| Very secure | ≥ 60 | | 22 | 18.3 | | |
| Total | | | 120 | 100 | | |

Table indicated that among the respondents, the highest 64 percent women were to the group of secure livelihood and the lowest percentage 17.7 percent in less secure followed by very secure (18.3 percent) by the women to develop composite livelihood indicator. Among the respondents most of the women (82.3percent) had secure livelihood to very secure livelihood in composite livelihood index with an average of CLSI (43.86 percent).

### 4.3 Pearson's Correlation Coefficients for the Index and its Dimensions

In order to access internal consistency of CLSI, the dimensions and livelihood index were observed. Pearson Product Moment Correlation analysis was shown in the Table 4.12.

**Table 4.12 Pearson's correlation coefficients for the index and its dimensions**

| | Dimensions | | |
|---|---|---|---|
| | Social | Economic | Institutional |
| Composite livelihood security index | .721(**) (p= 0.000) | .741(**) (p= 0.000) | .772(**) (p= 0.000) |
| Dimensions | | | |
| Social | 1 | | |
| Economic | .476(**) (p= 0.000) | 1 | |
| Institutional | .469(**) (p= 0.000) | .457(**) (p= 0.000) | 1 |

** Significant at 0.01 level

#### 4.3.1 Relationship between social dimensions and economic dimensions

The computed correlation coefficient (r) between the two dimensions of indicators in study group gave direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r (0.476) was significant at 1 percent level of probability.

Based on the above observations, the researcher found that the social dimensions had significant relationship to the economic dimension of the respondents in the study group.

### 4.3.2 Relationship between social dimensions and institutional dimensions

To determine the relationship between social dimensions and institutional dimensions among the respondents the computed correlation coefficient (r) between the two dimensions of the indicators in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r (0.469) was significant at 1 percent level of probability.

Based on the above observations, the researcher indicated that social dimensions had significant relationship with institutional dimensions of the respondents in the study group.

### 4.3.3 Relationship between social dimensions and composite livelihood security index (CLSI)

To determine the relationship between social dimensions and composite livelihood index among the respondents the computed correlation coefficient (r) between the dimension and the CLSI of indicators in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r (0.721) was significant at 1 percent level of probability.

Based on the above observations, the researcher said that a coefficient of $r = .721$, $p < .01$ indicated that livelihood to social and CLSI had positive and highly significant relationships, so as social dimensions increased, the CLSI increased by a proportionate amount.

### 4.3.4 Relationship between economic dimensions and institutional dimensions

To determine the relationship between economic dimensions and institutional dimensions among the respondents the computed correlation coefficient (r) between the two dimensions of the indicators in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r (0.457) was significant at 1 percent level of probability.

Based on the above observations, a coefficient of $r = .457$, $p < .01$ indicated that economic dimensions and institutional dimensions had positive and highly significant relationships, so as economic dimensions increased, institutional dimensions increased by a proportionate amount.

### 4.3.5 Relationship between economic dimensions and composite livelihood security index

To determine the relationship between economic dimensions and CLSI among the respondents the computed correlation coefficient (r) between the two dimensions of indicators in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r (0.741) was significant at 1 percent level of probability.

Based on the above observations, coefficient of $r = .741$, $p < .01$ indicated that economic dimensions and CLSI had positive and highly significant relationships, so as economic dimensions increased, the CLSI increased by a proportionate amount.

### 4.3.6 Relationship between institutional dimensions and composite livelihood security index

To determine the relationship between institutional dimensions and CLSI among the respondents the computed correlation coefficient (r) between the livelihood to institutional and CLSI of indicators in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r (0.772) was significant at 1 percent level of probability.

Based on the above observations, a coefficient of $r = .772$, $p < .01$ indicated that institutional dimensions and CLSI had positive and highly significant relationships, so as institutional dimensions increased, the CLSI increased by a proportionate amount.

## 4.4 Pearson's Correlation Coefficients between the Dimensions and the Underlying Indicators

To observe internal consistency of the developed index, the relationships among the indicators, index and dimensions of assessment of livelihood security of women farmers in Natore district were shown in the Table 4.13.

**Table 4.13 Pearson's correlation coefficients between the index/dimensions and the Underlying indicators**

| Dimension | Indicator | Desired direction | Correlation with | |
|---|---|---|---|---|
| | | | Index | Dimension |
| Social | Education | + | 0.549(**) | 0.570(**) |
| | Social capital | + | 0.486(**) | 0.607(**) |
| | Food availability | + | 0.405(**) | 0.453(**) |
| | Health and sanitation | | 0.364(**) | 0.394(**) |
| Economic | Pluriactivity | + | 0.424(**) | 0.604(**) |
| | Market access | + | 0.500(**) | 0.488(**) |
| | Access to financial institution | + | 0.589(**) | 0.703(**) |
| Institutional | Household decision making | + | 0.445(**) | 0.490(**) |
| | Institutional functions | + | 0.528(**) | 0.555(**) |
| | Adequacy of extension services | + | 0.443(**) | 0.658(**) |

** Significant at 0.01 level

A coefficient of +1 indicates that the two variables are perfectly positively correlated, so as one variable increases, the other increased by a proportionate amount. Conversely, a coefficient of -1 indicates a perfect negative relationship: if one variable increases, the other decreases by a proportionate amount. To determine the relationship between livelihood indicators and index among the respondents, the computed correlation coefficient (r) between the two dimensions of the indicators in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r was significant at 1 percent level of probability.

On the same case the relationship between livelihood indicators and dimensions among the respondents, the computed correlation coefficient (r) between them in study group gives direction to the following observations:

Firstly, the relationship showed a positive trend and secondly, the value of r was significant at 1 percent level of probability.

Based on the above observations, the researcher said conclusion that livelihood indicators, dimensions and CLSI had significant relationship in the study group. This means that the more secure livelihood to individuals of the respondents in study group the more was livelihood status to live with dignity. A coefficient of *r* value, $p < .01$ indicates that livelihood indicators, CLSI and dimensions have positive and highly significant relationships, so as livelihood indicator increases, the CLSI and dimensions increases by a proportionate amount.

### 4.5 Factors Related to Assessment of Livelihood Security of Women Farmers

To estimate contribution of indicators to composite livelihood security index (CLSI), multiple regression analysis was employed. Results were presented in Table 4.14.

**Table 4.14 Multiple regression coefficients of contributing factors related to Livelihood security of women farmers in Natore district**

| Developed indicator | Indicators | Beta | *p* | $R^2$ | Adj. $R^2$ | F | *p* |
|---|---|---|---|---|---|---|---|
| Composite livelihood index | Education | .672 | .000** | .772 | .770 | 231.44 | .000** |
| | Social capital | .101 | .004** | | | | |
| | Food availability | .166 | .000** | | | | |
| | Health and sanitation | .196 | .009** | | | | |
| | Pluriactivity | -.015 | .487 | | | | |
| | Market access | .017 | .653 | | | | |
| | Access to financial institution | .109 | .000** | | | | |
| | Household decision making | .063 | .356 | | | | |
| | Institutional functions | .155 | .000** | | | | |
| | Adequacy of extension services | .045 | .162 | | | | |

** Significant at p < 0.01;  * Significant at p < 0.05;

Table 4.14 shows that there was a significant contribution of respondents: education, social capital, food availability, health and sanitation, access to financial institution and institutional functions. Based on standardized coefficients ($\beta$), education, social capital, food availability, health and sanitation, market access, access to financial institution and institutional functions were the most important contributing factors (significant at the 1% level of significance).

The value of $R^2$ is a measure of how of the variability in the composite index is accounted for by the selected indicators. So, the value $R^2$=0.772 means that selected indicators accounts for 77% of the variation in composite index.

**Education** (*standardized* $\beta$= .672): The coefficient indicates that as education increases by one unit, the amount of index of livelihood security of women farmers increase by .672 units. This interpretation is true only if the effects of other indicators are held constant.

**Health and sanitation** (*standardized* $\beta$ = .196): This value indicates that health and sanitation increases by one standard deviation, index of livelihood security of women farmers increases by 0.196 standard deviations. This interpretation is true only if the effects of others indicator are held constant.

**Food availability** (*standardized* $\beta$ = .166): The standardized coefficient indicates that as the food availability increases by one standard deviation (one unit), the value of index increase by .166standard deviations. This interpretation is true only if the affects others indicator are held constant.

**Institutional functions** (*standardized* $\beta$ = .155): This value indicates that institutional function increased by one standard deviation, index of livelihood security of women farmers increase by 0.155 standard deviations. This interpretation is true only if the effects of others indicator are held constant.

**Access to financial institution** (*standardized* $\beta$ = .109): This value indicates that access to financial institution increases by one standard deviation, index of livelihood security of women farmers increases by 0.109 standard deviations. This interpretation is true only if the effects of others indicator are held constant.

**Social capital** (*standardized β*= .101): The standardized value indicates that as the amount of social capital (multiple jobs) in the respondents increases by one, the value of composite index increase by .101units. This interpretation is true only if the effects of other indicators are held constant.

The most important part of the table 4.14 is the *F*-ratio and the associated significance value of that *F*-ratio. For these data, *F* is 252.12, which is significant at $p < .001$ (because the value in the column labeled *Sig.* is less than .001). This result tells us that there is less than a 0.1% chance that an *F*-ratio this large would happen. Therefore, we can say the regression model results in significantly better prediction of index of livelihood security of women farmers. The F ratio is 252.12 which is highly significance ($p<.001$). This ratio indicates that the regression model significantly improved the ability to predict the outcome variable (i.e. CI).

# CHAPTER V

# SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study was to assess the livelihood security of women farmers of Natore District. So, the study was conducted in purposively selected upazila namely Baraigam under Natore district. Six villages from three Unions namely Ahmedpur, Katashkol, Gopalpur, Gormati, Chandi and Garfa were randomly selected as the locale of the study. A total of 120 respondents constituted the sample of the study. A well-structured interview schedule was developed based on objectives of the study for collecting information. The indicators were: education, social capital, food availability, health and sanitation, pluriactivity, market access, access to financial institution, household decision making, institutional functions and adequacy of extension services. The entire process of collecting data took place during February, 2018. Various statistical measures such as frequency, percentage, mean and standard deviation were used in describing data. In order to estimate the contribution of the selected indictors of respondents to assess their sustainability in agriculture, correlation coefficient (r) and multiple regression analysis (B) were used. The major findings of the study are summarized below:

## 5.1 Major Findings of the Study

### 5.1.1 Selected characteristics of the respondents

**Education:** The level of educational scores of the women farmers ranged from 0 to 16 with a mean and standard deviation of 4.02 and 3.69 respectively. Respondent under secondary education category constitute the highest proportion (32.5 percent) followed by primary education (30.8 percent). On the other hand, the lowest 2.5 percent above secondary category followed by illiterate category (15.8 percent) and can sign only category (18.3 percent).

**Social capital:** The 38.3 percent of the respondents had less social capital and 30.0 percent had high social capital category.

**Food availability:** Food availability scores of the respondents ranged from 22 to 31 with an average of 25.60 where the highest proportion of the respondents had medium (37.5%) level of food availability, while few had low and high food availability with 32.5% and 30.0% respectively.

**Pluriactivity:** The medium category of the respondents constituted the highest proportion (66.6 percent), whereas high pluriactivity category was lowest proportion (11.7 percent) in the study sample.

**Market access:** The highest proportion (62.5 percent) of the respondents had medium market access and lowest (8.3 percent) in no market access category.

**Health and sanitation:** The highest proportion (63.3 percent) of the respondents had effective access and lowest access was (11.7 percent) of them having less effective access of health and sanitation.

**Access to financial institution:** Highest (78.4 percent) of the respondents had medium access to financial institution and the lowest (6.7 percent) had low access to financial institution.

**Household decision making:** The highest proportion (50.0 percent) of the respondents had medium participation and the lowest (21.7 percent) had high participation in household decision making.

**Institutional functions:** Highest (59.1 percent) of the respondents had medium institutional functions and the lowest (19.2 percent) had high institutional functions.

**Adequacy of extension services:** Adequacy of extension services scores of the respondents ranged from 3 to 6 with an average of 4.11 where majority of the respondents (50%) in the study area had medium access to extension services where 20.0% of the respondents had low access and 30.0% had high adequacy of extension services.

### 5.1.2 Composite livelihood security index (CLSI)

The 43.86 percent of the respondents had secure livelihood, 18.3 percent had very secure livelihood and the lowest 17.7 percent had less secure livelihood. From developing procedure of CLSI, we were got the average score of CLSI (43.86 percent). Thus it is called around 64 percent of respondents have secure livelihood.

### 5.1.3 Relationships among the selected dimensions and developed Composite livelihood security index (CLSI)

i. There was a highly significant positive relationship between social and economic dimensions of the respondents.

ii. There was a highly significant positive relationship between social and institutional dimensions of the respondents.

iii. There was a highly significant positive relationship between social and CLSI among the respondents.

iv. There was a highly significant positive relationship between economic and institutional dimensions of the respondents.

v. There was a highly significant positive relationship between economic dimensions and CLSI among the respondents.

vi. There was a highly significant positive relationship between institutional and CLSI among the respondents.

### 5.1.4 Relationships among the selected indicators, dimensions and developed composite livelihood security index (CLSI)

i. There was a highly significant positive relationship among selected indicators and their dimensions.

ii. There was a highly significant positive relationship between selected indicators and developed CLSI.

### 5.1.5 Factors related to the assessment of livelihood security of women farmers

There was a significant contribution of respondents' education, health and sanitation, food availability, institutional functions, access to financial institution and social capital. From these indicators 77.2percent ($R^2$ = 0.772) of the variation in the respondents changed constraints faced by the respondents in assessment of livelihood security was attributed to their indicators.

## 5.2 Conclusions

The findings and relevant facts revealed during the course of the research work prompted the researcher to draw following conclusions:

i. From developing procedure of CLSI, the average score of CLSI were 43.86 percent. And from the categorizations it may be concluded that about 64 percent of respondents have secure livelihood.
ii. In the result of dimension level of livelihood security, highest result obtained from social dimension which means that social factors contribute the highest for livelihood security.
iii. Respondent's education, health and sanitation, food availability and social capital had significant contribution to the livelihood security of the respondents. It may be concluded that livelihood security is likely to be influenced by the respondent's education, health and sanitation, food availability and social capital.
iv. Regression analysis revealed that Respondent's access to financial institutions and institutional functions had significant contribution to the livelihood security of the respondents. It may be concluded that livelihood security is likely to be influenced by the respondent's access to financial institutions and institutional access.

## 5.3 Recommendations

On the basis of findings of the study, some recommendations were kept forward. Recommendations have been divided into two sub sections as: recommendations for policy implication and recommendation for further studies.

### 5.3.1 Recommendations for policy implication

i. The study indicated that education enabled them to secure their livelihood by enhancing their knowledge and perception about the way of uplifting their life. To increase their livelihood security status government should arrange non-formal education for the women.

ii. Social capital was an important contributing factor to livelihood security of the women farmers. Therefore, it is recommended that the concerned authorities (GO and NGOs) should work with the farmers and prioritize the social capital factor which influences livelihood security of women farmers.

iii. Food availability had significant contribution with livelihood security of the farmers. That means higher the food availability for the farmers, higher the increase in the level of livelihood security of the women farmers. Hence, priority should be given by NGOs and other concerned to provide information on importance of different food nutrients to maintain health and to revive strength on continuous basis.

iv. Health and sanitation of the farmers had positive significant contribution with their livelihood security of the women farmers. So, it is strictly recommended that, the relevant organizations such as Upazila Health Complex, NGOs and other public and private organizations should take necessary actions to provide information on health and sanitation on continuous basis.

v. Access to financial institution had significant positive contribution with livelihood security of the women farmers. Therefore, government should come up with the facilities to provide them financial supports from different organizations.

vi. Institutional functions had significant positive contribution with livelihood security of the women farmers. Therefore, the information about institutional functions needs to be disseminated on a wider scale, for instance through farmer training programs with the help of these institutions.

### 5.3.2 Recommendations for further research

A small piece of study cannot provide all the information for proper understanding and determination of coastal agricultural sustainability. On the basis of the scope and limitations of the present study and observations made by the researcher, the following recommendations were made for further study:

i. This study was conducted in 6 villages from three Unions of Baraigam upazila under Natore district. Findings of the study need verification by similar research in other areas of Bangladesh.

ii. This study investigated the effects of ten personal and socio-economic characteristics of the women farmers on their livelihood security. Therefore, it is recommended that further study should be conducted involving other related characteristics of the women farmers.

iii. Livelihood security of women farmers may be determined by using other ways and methods which may be used in conducting further research.

iv. In the study only ten indicators were taken into consideration to determine livelihood security of women farmers but by taking other indicators similar research efforts may be done at other locations.

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**APPENDIX-A**

(English version of the interview schedule)

**Department of Agricultural Extension and Information System**

Sher-E-Bangla Agricultural University

Dhaka-1207

***An interview schedule for a research study entitled***

**Livelihood Security of Women Farmers in Natore District**

**SL.NO. ……**

Name of the respondent:

Age:

Village:

Upazila:

District:

(Please answer the following questions. Your information will be used for academic research purposes)

**1. Education**

| **Level of education** | |
|---|---|
| i. Illiterate (0) | |
| ii. Only can sign (0.5) | |
| iii. Primary Education (1-5) | |
| iv. Secondary Education (6-10) | |
| v. Higher (>10) | |

## 2. Social Capital

How many organizations are you a member of and its frequency of contact?

| Name of the Organizations | Member | | No. of Contact | | |
|---|---|---|---|---|---|
| | Yes (1) | No (0) | Week (3) | Month (2) | Year (1) |
| Farmers group | | | | | |
| NGOs | | | | | |
| Co-operatives (Credit/Financial) | | | | | |
| Clubs (e.g. FFS, IPM, CFS) | | | | | |
| Religious group | | | | | |
| Village Associations | | | | | |
| Political groups | | | | | |

How much confidence do you have in the following institutions?

| Institutions | None at all (0) | Not very much (1) | No opinion (2) | Quite a lot (3) | A great deal (4) |
|---|---|---|---|---|---|
| Upazila Agriculture Office | | | | | |
| Local Administration (Union Parishad) | | | | | |
| Other Govt. organizations (e.g. BRDB, social welfare) | | | | | |
| Input dealers | | | | | |

## 3. Food Availability:

| Months | Food Availability | | |
|---|---|---|---|
| | Inadequate (1) | Moderately adequate (2) | Adequate (3) |
| April (*Chaitra-Baishakh*) | | | |
| May *(Baishakh-Jaistha)* | | | |
| June (*Jaishtha-Ashar*) | | | |
| July (*Ashar-Srabon)* | | | |

| | | | |
|---|---|---|---|
| August (*Srabon-Vadra*) | | | |
| September (*Vadra-Ashwin*) | | | |
| October (*Ashwin-Kartik*) | | | |
| November (*Kartik-Agrahaon*) | | | |
| December *(Agrahaon-Poush)* | | | |
| January (*Poush-Magh*) | | | |
| February (*Magh-Falgun)* | | | |
| March (*Falgun-Chaitra)* | | | |

**4. Health and sanitation:**

Health status:

| **Category** | |
|---|---|
| i. Disabled (1) | |
| ii. Short term illness (2) | |
| iii. Good (3) | |

Ability to get health treatment:

| Health treatment providers | Ability to take health treatment | | |
|---|---|---|---|
| | Not at all (0) | Seldom (1) | Frequently (2) |
| i. Village treatment | | | |
| ii. Self treatment (traditional) | | | |
| iii. Kabiraz (herbal medicines and sacred text) | | | |
| iv. Homeopath | | | |
| v. Village doctor | | | |
| vi. General health practitioner | | | |
| vii. Community clinic | | | |
| viii. Visit doctor in GO hospital (MBBS) | | | |

Possession of a toilet:

| | |
|---|---|
| i. Having no access to a toilet (0) | |
| ii. Using other people's toilet (1) | |
| iii. Having own toilet (2) | |

**5. Pluriactivity**

Do you have any income source other than agriculture? Yes….. [ ] (1) No….. [ ] (0)

If Yes, then answer the following …….

a. Government job [ ] b. Private Job [ ] c. Business [ ] d. Seasonal business [ ]

e. Labor to mill/factory/other house [ ] e. Other (specify) ……

**6. Marketing Access**

**i. Buying**

| Sl. No. | Item | Yes (1) | No (0) | | Please specify |
|---|---|---|---|---|---|
| 1. | Do you buy directly from producers? | | | If yes, for which products? | |
| 2. | Do you have any vegetal product, which you can only access from one available seller? | | | If yes, which crops? | |
| 3. | Are there animal produces, which you can only access from one available seller? | | | If yes, which products? | |
| 4. | Do you have any agreement or binding documents with the seller or provider? | | | If yes, describe your contract or agreement with the buyer | |

**ii. Selling**

| Sl. No. | Item | Yes (1) | No (0) | | Please specify |
|---|---|---|---|---|---|
| 1. | Last year did you sell any of your crops/livestock/seeds? | | | If yes, which one? | |
| 2. | Do you sell/trade some of those products directly to customers? | | | If yes, for which products? | |
| 3. | Do you have any product with only one available buyer? | | | If yes, which products? | |
| 4. | Do you have any agreement or binding documents with the buyer? | | | If yes, please elaborate what kind of agreement? | |

**7. Access to Financial Institution:**

| Name of different institutions | No access (0) | Intermittent access (1) | Certain access (2) |
|---|---|---|---|
| Public institutions (banks, PKSF) | | | |
| Private (Mahajan) | | | |
| NGOs | | | |

**8. Household Decision Making:**

| Category | Area of Decisions | Not at all (0) | A little (1) | Completely (2) |
|---|---|---|---|---|
| Agriculture | i. Production process | | | |
| | ii. Selection of variety and inputs | | | |
| | iii. Post-harvest | | | |
| | iv. Marketing | | | |
| | v. Tenure aspects | | | |
| | vi. Homestead vegetable | | | |

| | | | | |
|---|---|---|---|---|
| | garden | | | |
| | vii. Seed preservation and storage | | | |
| Livestock, poultry | i. Rearing | | | |
| | ii. Health care | | | |
| | iii. Sales | | | |
| Household management | i. Family income and expenditure | | | |
| | ii. Family saving | | | |
| | iii. Sanitation and safe water | | | |
| | iv. Health care | | | |
| | v. Education | | | |
| | vi. Purchase of assets | | | |
| | vii. Membership of NGOs | | | |

**9. Institutional Functions (Union Parishad)**

| Category | Statement | None at all (0) | Not very much (1) | No opinion (2) | Quite a lot (3) | A great deal (4) |
|---|---|---|---|---|---|---|
| Commitment | i. If these institutions are committed to help the women farmers? | | | | | |
| | ii. If these institutions are followed the rules of supporting the women farmers properly? | | | | | |
| | i. If there is any coordination between the works of the institutions and the women farmers? | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Coordination | ii. If the functions of these institutions are credible? | | | | | |
| Co-operation | i. If these institutions are cooperated with the women farmers? | | | | | |
| | ii. If the women farmers are cooperated with these institutions properly? | | | | | |
| | iii. If the political group of this area is cooperated with these institutional functions? | | | | | |

**10. Adequacy of Extension Services**

| Query | Extent of extension contact in the past year | | | |
|---|---|---|---|---|
| | No Visit (0) | Once (1) | 2 to 3 times (2) | 4 & above (3) |
| Extension officers visit to the farmers | | | | |
| Farmers visits to the extension officers | | | | |
| Others (specify) | | | | |

Thank you for your nice cooperation.

…….....

Date and Signature of the interviewer

## APPENDIX B

| Dependent Variable Value for Regression (CLSI Index X 100) | | | |
|---|---|---|---|
| 27.99 | 25.16 | 29.97 | 42.03 |
| 34.01 | 62.82 | 52.86 | 51.47 |
| 19.94 | 16.30 | 33.07 | 54.22 |
| 57.70 | 32.19 | 39.59 | 28.34 |
| 24.92 | 52.18 | 29.92 | 45.72 |
| 78.67 | 39.47 | 42.34 | 34.79 |
| 39.66 | 20.23 | 62.79 | 36.58 |
| 49.56 | 18.87 | 56.85 | 52.30 |
| 62.61 | 79.84 | 51.98 | 72.97 |
| 20.85 | 52.06 | 18.35 | 57.27 |
| 47.77 | 91.50 | 48.46 | 62.17 |
| 36.88 | 17.48 | 39.59 | 17.48 |
| 26.41 | 73.72 | 32.66 | 46.74 |
| 49.91 | 20.98 | 43.86 | 19.63 |
| 30.67 | 16.26 | 42.13 | 29.80 |
| 26.36 | 64.62 | 42.19 | 59.41 |
| 40.42 | 48.35 | 54.17 | 63.14 |
| 26.71 | 77.20 | 29.31 | 51.37 |
| 19.14 | 20.90 | 16.33 | 48.40 |
| 46.43 | 26.57 | 58.52 | 30.84 |
| 53.97 | 84.67 | 66.88 | 43.00 |
| 76.77 | 36.95 | 80.85 | 34.55 |
| 26.41 | 77.90 | 43.49 | 42.24 |
| 57.26 | 25.14 | 43.80 | 35.77 |
| 27.89 | 65.71 | 45.50 | 63.63 |
| 31.50 | 24.56 | 42.54 | 55.53 |
| 42.02 | 58.45 | 42.64 | 38.03 |
| 32.75 | 60.68 | 32.75 | 62.55 |
| 78.82 | 25.23 | 49.38 | 20.75 |
| 20.19 | 45.61 | 57.38 | 57.48 |