

# **EXPLORING THE DETERMINANTS OF MILK PRODUCTION IN SMALLHOLDER DAIRY FARMING**

**A Thesis**

**By**

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**CERTIFICATE**

This is to certify that the thesis entitled “**Exploring the Determinants of Milk Production in Smallholder Dairy Farming**” submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension and Information System**, embodies the result of a piece of bona fide research work carried out by **Sadia Afroze Mitu**, Registration No. **18-09086** 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, received during the course of this investigation has been duly acknowledged.**

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*DEDICATED  
TO  
MY BELOVED  
Parents*

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# **EXPLORING THE DETERMINANTS OF MILK PRODUCTION IN SMALLHOLDER DAIRY FARMING**

## **ABSTRACT**

The objectives of this study were to describe the selected characteristics of the smallholder dairy farmers, to determine the average yield of milk production in small scale dairy farming and to identify the contribution of the farmers selected characteristics to the milk production of their rearing cows. The study was conducted in four villages of two unions under Bhandaria upazila of Pirojpur district. A total of 93 smallholder dairy farmers were selected randomly from a population of 229 dairy farmers. Data were collected from the dairy farmers during the period of 27th December, 2019 to 12th February, 2020 by using an interview schedule. Multiple regression coefficient was used to examine the contribution of the selected factors of the smallholder dairy farmers. The majority (48.3 percent) of the dairy farmers belonged to medium production category followed by low production (36.6 percent) and high production (15.1 percent). Among the respondents, a total of 84.9 percent respondents had low to medium production performance. Seventy point three percent ( $R^2 = 0.703$ ) of the variation in the respondents' milk production performance can be attributed to their age, education, farm size, annual family income, training in cattle rearing, extension media contact, experience in dairy farming, time spends in cattle rearing, cattle herd size, farmers knowledge on milk production and number of milking cow. Multiple regressions exposed that number of milking cow, farmer's knowledge on milk production, cattle herd size and training in cattle rearing were significant contributing factors. Based on the findings of the study, it is concluded that smallholder dairy farmer's individual milk production performance is low but there is an ample scope to increase milk production considering these significant factors by the personnel of DLS.

# CHAPTER 1

## INTRODUCTION

### 1.1 General Background

Bangladesh is an agriculture-based country and majority of its population live in the rural areas. Most of the rural farmers are engaged in cow rearing as their integrated farming. Dairy farming also supports substantial employment in production, processing and marketing (Michal 1991).

Livestock is an important socio-economic component of agriculture and accounts for 17.2 percent of the total Gross Domestic Product (BBS, 2014). Livestock sub-sector contributes 35 to 40 percent alone to the overall agriculture sector. This contribution is about 7-8 percent of the total GDP, among which around 1.53 percent from the animal husbandry (Ministry of fisheries and livestock 2019). Most of the rural households are engaged in livestock production which contributes a large share of the smallholder and landless farmers' livelihoods. Most poor rural households raise livestock which provide power for cropping, transport, threshing and oilseed crushing; manure, as source of fertilizer and fuel; a ready source of cash, as well as dairy and meat for consumption. Livestock provides business opportunities for smallholders.

The Livestock and Dairy Development Project aims to improve livestock and dairy production in Bangladesh so that the country can meet growing demand for egg, meat and milk and thereby improve the nutritional intake of its citizens (World Bank, 2019). According to DLS (2018), Bangladesh produces 9.4 million tons of milk (against the requirement of 15.04 million tons) in a year and according to International Farm Comparison Network (IFCN), total milk production in Bangladesh stands at 8.08 million tones. This implies that Bangladesh produces only 63 percent of the total requirement (while as per IFCN it is 54 percent) as per BBS (2018), Bangladesh imports 0.11 million tons of milk.

However, dairy cattle in Bangladesh have been used as the dual-purpose animal. The primary purpose has been using the cattle for agricultural operation and the secondary purpose has been to get some milk for home consumption and selling for some cash income. Maximum cattle are non-descriptive type, which do not belong to any specific breed and termed as indigenous cattle. These animals are kept mainly in the stall with limited grazing on the roadside, embankment slope, fallow land and paddy straw are their staple food. Husbandry practices and health care of these animals are poor (Jabbar and Raha, 1984). The average

milk production of local cows is very low and it varies between 300 to 400 liters per lactation period of 180 to 240 days (BBS, 2018).

Although there are several small, medium and semi-large dairy farms in the northern region of Bangladesh, there is no established dairy farm in Pirojpur district of the southern region. In descent the farmers here are following traditional way for cattle rearing. So, they cannot bring any change in the way of their life. Their socio-economic condition is too much poor. For this, they cannot take proper management system such as feeding, breeding, housing sanitation, disease control and prevention during cattle rearing. Here, milk production is considered as a by-product. Sometimes milk is also use for calf feeding, when milk production is not enough for home consumption or marketing. Their milk production is not enough of marketing, so the condition of marketing facility and system in Pirojpur district are not develop. But milk is considered as an ideal and a complete food for human health all over the world. The priority of milk in the diet is widely recognized and it has a very high elasticity of demand as compared to other food items (Jabbar, 1983). Thus, for promoting the interest of both products and consumers the need for encouraging milk supplies to fulfill increasing demand is an urgent need for the day. Large quantity of the milk is produced by the rural households and majority of them have one or two dairy cows which are used for both milk production and draught purposes.

In Bangladesh there are some milk pocket areas where dairy farming has been traditionally an important and major component of mixed farming system but Pirojpur district is not covered those milk pocket areas. These areas are particularly located in Pabna, Sirajgonj, Mymensingh, Munsiganj, Rangpur, Chittagong, Magura and Dinajpur district. (Goni M.D., Miah A.G, 2001) There are some large farmers in this area, who keep dairy cows only for milk production. Total contribution of agriculture sector in GDP at constant price is about 20.60 percent in 2008-09 (Economic Review, 2009) of which livestock sub sector contributes 2.73 percent. Jabbar and Green (1983) performed a survey in Mymensingh district and observed that milk production was 1.42 liter per cow not used in ploughing, 1.21 liter per cow used in ploughing. The importance of broad-based research work on dairy industry is therefore necessary. Bangladesh produces 94.06 lakh metric ton (LMT) milk against the annual requirement of 150.29 LMT (BBS, 2018) and the deficiency is about 56.23 LMT. Consumption of milk in Bangladesh among the SAARC countries is the least (55 ml/h/day) as stated by Joshi (2007).

## **1.2 Statement of the Problem**

Smallholder dairy farming plays an important role in meeting the milk demand of such a large number of people in Bangladesh. But due to the lack of husbandry practice and raw milk marketing, the amount of milk production of smallholder dairy farming is less than our demand. Although Department of Livestock Services (DLS) is trying hard to increase the milk production in the country practically the result is not satisfactory. It is recommended that an adult person requires at least 250 ml milk every day. But our availability is only about 158.19 ml/h/d. This indicates that we are in shortage of milk. Total milk production of the country is 94.06 LMT/year but our requirement is about 150.29 LMT/year (BBS, 2018). If smallholder dairy farmers can be encouraged to produce milk, then the milk production deficit can be filled to some extent.

In view of the above background and facts, the present study was undertaken with the title “Exploring the Determinants of Milk Production in Smallholder Dairy Farming”. The study aimed at providing information regarding the following queries:

1. What are the characteristics of the smallholder dairy farmers?
2. How is the cattle milk production performance in smallholder dairy farming?
3. Is there contribution of the farmer’s selected characteristics to the milk production of their cow?

## **1.3 Specific Objectives**

1. To describe the selected characteristics of the smallholder dairy farmers. The characteristics are:
  - a. Age
  - b. Education
  - c. Farm size
  - d. Annual family income
  - e. Training in cattle rearing
  - f. Extension media contact
  - g. Length of experience in dairy farming
  - h. Time spends in cattle rearing per day
  - i. Cattle herd size
  - j. Farmers knowledge on milk production
  - k. Number of milking cow
2. To determine the average yield of milk production in small scale dairy farming.

3. To identify the contribution of the farmers selected characteristics to the milk production of their rearing cows.

#### **1.4 Justification of the Study**

The study is to determine the average yield of milk production of the smallholder dairy farming. Now government and non-government organizations are currently putting effort and allocating resources for production-oriented research and increase the milk production in the rural smallholder dairy farmer. So, determine the average milk production in the smallholder dairy farming is necessary. Considering the above findings, the researcher became interested to undertake a study the contribution of smallholder dairy farmer's characteristics on milk production.

#### **1.5 Assumptions of the Study**

The researcher had the following assumptions in mind while undertaking this study:

1. The selected respondents were competent enough to reply the queries made by the researcher.
2. The responses furnished by the respondents were valid and reliable.
3. Information furnished by the respondents included in the sample was the representative opinion of the whole population of the study area.
4. The researcher who acted as interviewer was well adjusted to social and environment condition of the study area. Hence, the data collected from the respondents were free from bias.
5. All the data concerning the variables of the study were normally and independently distributed.

#### **1.6 Limitations of the Study**

In order to make the study manageable and meaningful from the point of view of research, it was necessary to impose some limitations as stated below:

1. The study was confined to two selected unions of Bhandaria upazila under Pirojpur district.
2. The characteristics of dairy farmers in the study area were many and varied but only eleven characteristics were selected for investigation in this study as stated in the objectives.
3. The researcher relied on the data furnished by the dairy farmers from their memory during interview.

4. For some cases, the researcher faced unexpected interference from the over interested side-talkers while collecting data from the target populations. However, the researcher tried to overcome the problem as far as possible with sufficient tact and skill.

### **1.7 Definition of Related Terms**

The terms which have been frequently used throughout the research work are defined and interpreted below:

#### **Livestock**

The term livestock is used to designate of poultry, goat and cattle which render by human being for an economic service and produce freely under their care.

#### **Animal Husbandry**

Animal husbandry is the branch of agriculture concerned with animals that are raised for meat, fiber, milk, eggs, or other products. It includes day-to-day care, selective breeding and the raising of livestock.

#### **Dairy Farm**

Dairy farm is a technique to nurse the cattle under a well-planned house to increase the production of milk and meat.

#### **Milk**

Normal mammary secretion of milking animals obtained from one or more milking without either addition to it or extraction from it, intended for consumption as liquid milk or for further processing.

#### **Milking Cow/Milch Cow**

A cow which gives milk is known as milch cow.

#### **Cow**

A female or heifer after first calving is known as cow.

#### **Calf**

Young one of cow by birth to 6 Months of age is known as calf.

#### **Heifer**

Female calf from the age of puberty to calving is known as heifer.

#### **Bull**

A male calf from the age of puberty to castration is known as bull.

#### **Production**

It refers to the yearly number of livestock that are reproduced, purchased, obtained from donation etc.in a family excluding the number of loss and death.



**Yield**

The amount of product obtained from a fixed quantity of input material. Specific to pricing formulas used in the dairy industry, yield refers to how much butter, powder or cheese can be obtained from 100 pounds/kilograms of milk.

**Grazing land**

Grazing land refers to the pasture land where livestock graze and eat growing grass. The grazing land may be fallow lands, bank of rivers, canals and road sides

**Cattle herd**

A group of cattle or other large herbivorous mammals of a single kind kept together for a specific purpose.

**Small Dairy Farm**

Dairy farm defines based on rearing the number of milking cows; small dairy farm size contains one to three number of milking cows.

**Medium Dairy Farm**

Dairy farm defines based on rearing the number of milking cows; medium dairy farm size contains three to below five number of milking cows.

**Semi-large Dairy Farm**

Dairy farm defines based on rearing the number of milking cows, semi-large dairy farm size contains above five number of milking cows.

**Smallholder Dairy Farmer**

The smallholder is a small farm operating under a small-scale agriculture model. Dairy farming maintained by smallholder crop- livestock farmers where most of the rural household keeps less than five cows in order to cultivate and also to produce milk for family consumption.

## CHAPTER 2

### REVIEW OF LITERATURE

In this chapter, reviews of the related literature to the study are presented. A good number of studies have been carried out in the livestock sector but only a few studies were conducted in Bangladesh, which were concerned with the topic of this research. The studies, which are relevant to the present study in terms of topic and methodology. That have been conducted in four section as follows:

Section I: Milk production of smallholder dairy farmer

Section II: Determinants of milk production in dairy farming

Section III: Research gap of the study

Section IV: Conceptual framework of the study

#### **2.1 Milk Production by the Smallholder Dairy Farmers**

To exploit these opportunities, small-scale dairy farmers need to be more competitive by reducing the costs of milk production and thus increasing the profitability (Ndambi et al. 2009).

Rahman and Rahman (1991) studied the potential of and constraints to dairy development in some selected areas of Bangladesh. It revealed that small farmers were being generally the owners of the cow and buffaloes in all the study areas. The findings showed that farmers in Bhabokhali, Mymensingh town and Birampur, gained substantially by keeping milch animal. Net returns which were calculated by deducting full costs from gross returns were positive and higher for the high yielding buffaloes and cows. The study identified some crucial problems such as high feed cost, low yield for indigenous breeds, lack of livestock credit and insurance for dairy development in the study areas.

Islam and Oliuzzaman (1992) conducted a study in different unions of Trishal, Gouripur, and Mymensingh Sadar Upazila. They found that the respective average numbers of cattle were 3.03, 3.49 and 3.1 per family and the average number of animals per family was 3.1. The number of milking cows in Trishal, Gouripur and Mymensingh Sadar Upazila were 0.59, 0.82 and 0.73 per family, respectively.

Talukder and Tujuddin (2000) conducted a study on economics of milk production in Bangladesh. They observed that on average milk production per cattle per year was about 620 and 1580 liters in local and cross-bred farms where the estimated value was at Tk 37266.40

and 71815.85, respectively in Manikganj district. The corresponding figures in Sirajganj district were Tk 30936.00 and 96052.00, respectively. The study also showed that net returns per farm were Tk 16489.00 and 32533.00 annually for local and cross-bred dairy farms, respectively in Manikganj district. The corresponding figures in Sirajganj district were Tk 10905.00 and 39293.00, respectively.

Alok-Roy (2000) conducted a study on the promotional activities of the main milk producers' cooperative societies in Bangladesh are examined. The functional aspects of the societies are investigated focusing on milk production, procurement and marketing. Constraints facing the societies are identified.

Omoro et al. (2003) conducted a study on the employment in rural development, small-scale dairy marketing and processing enterprises, employment opportunities and policy measures to enhance rural employment in milk production. Case studies from Kenya, Bangladesh and Ghana are presented, which demonstrate how small-scale dairy marketing and processing can generate jobs and contribute significantly to rural and urban employment, most of which occurs in the informal sector.

Hemme et al. (2004) conducted a study on the household and farm economics of small-scale dairy farmers in Bangladesh and obtains estimates of their milk production costs to gauge their vulnerability to international competition. It consists of an overview of milk production in Bangladesh and an analysis of the dairy sector in one of its districts. It is concluded that, the tow-cow small farms can produce milk at a cost almost as low as the larger farms in the study, thus small farms are competitive at the national level in Bangladesh. But in the international level, these small Bangladeshi farms are not competitive because their milk production cost is 50 percent higher than larger farms in India, Pakistan and Oceania.

Akhter (2000) conducted a study entitled "A Livestock (dairy) Credit Program of Two NGOs in Sadar Upazila of Dhaka District". He showed that the average annual costs per cow of PROSHIKA and ASA were estimated at Tk 8422 and Tk 8286 respectively. So, the average annual cost per cow of PROSHIKA was little higher than that of ASA. The study also indicated that the highest net returns of Tk 3675 and Tk 3311 were earned in small farms of PROSHIKA and ASA respectively followed by Tk 2897 and Tk 2785 by medium farms and the lowest net return of Tk 2011 and Tk 2064 were obtained by large farmers during the period of study. It was evident from the results that the profitability of small farm was always

higher than that of medium and large farms indicating higher management capability of small farmers.

## **2.2 Determinants of Milk Production in Dairy Farming**

Atasever (2015) observed in his study that relatively young farmers achieved more raw milk from their cows. Actually, younger farm owners able to manage in husbandries goals because of developed communication devices, internet using, interests or their higher energetic structures.

Better genotype and sound management are the major determinants of profitability of dairying at either farm or individual level (Djemali and Freeman, 1987; Rahman et al., 1987).

Some diseases also have influence on the milk production where mastitis is one of the most devastating and farmers in Bangladesh are not well aware of the best practices to control (Rehman et al., 1997).

Samad (2005) conducted a study in Rangpur district and it appeared from the study that the average family size in the study area was 6.17 members and overall literacy of the family members was found to be 81 percent. The average annual income per family found in the study area was Tk. 64,214.00 and 1, 02,269.00 for local breed and cross breed cows respectively. The per day total costs of raising per local and cross bred dairy cows were estimated at Tk. 37.41 and 70.52 respectively. Feed cost constituted about 61 percent of the total cost for local breed and 72 percent for cross breed dairy cows. The average milk yield per day was 2.95 and 7.74 liters for local and cross breed dairy cow respectively while the total returns per day were estimated at Tk. 68.97 and 149.61 for the same. The value of milk production represented 77 and 87 percent of total returns for local and cross breed cows respectively. The study revealed that paddy straw, green grass, labor and capital were positively related with milk yield with minor exceptions.

Jabbar and Raha (1984) conducted a study entitled “Consumption Pattern of Milk and Milk Products in Bangladesh”. The study showed that production and rural consumption of milk and milk products have decreased while import and urban consumption have increased in recent years. The study also revealed that aggregate urban consumption pattern of milk is influenced by in addition to income, religion, age, consumption of family members and ability to produce milk at home.

Kuddus (2006) performed a study to know the profitability of dairy farming, milk consumption pattern and marketing system of dairy owners. It was found from this study that net return of dairy milk in commercial region was significantly higher than that of other regions due to rearing of cross breed cows and feeding them high quality feed. Net return from dairy enterprise was 69 percent of the gross cost and this figure was the highest in the semi-urban regions (75%). The positive values of marginal value product indicate that addition of dry fodder, capital investment and labor would add positive returns through milk production. Average per capita daily milk consumption by the dairy owners of different income classes and different regions were significantly different.

Ashrafuzzamen (1993) conducted a study to determine the socio-economic characteristics of dairy cow owners in Bangladesh. He determined to analyze the relative profitability of different types of dairy cow. The study showed that per day per cattle total cost of raising indigenous and cross bred dairy cows were 33.56 and 35.05, respectively. Cost constituted about 71 and 73 percent of the total cost of indigenous cross-bred dairy cows, respectively. The corresponding net returns were Tk 15.65 and 45.83 for indigenous and cross-bred dairy cows whose net returns excluding labor cost per day were Tk 22.03 and 51.31 for indigenous and cross-bred cows, respectively.

### **2.3 Research Gap of the Study**

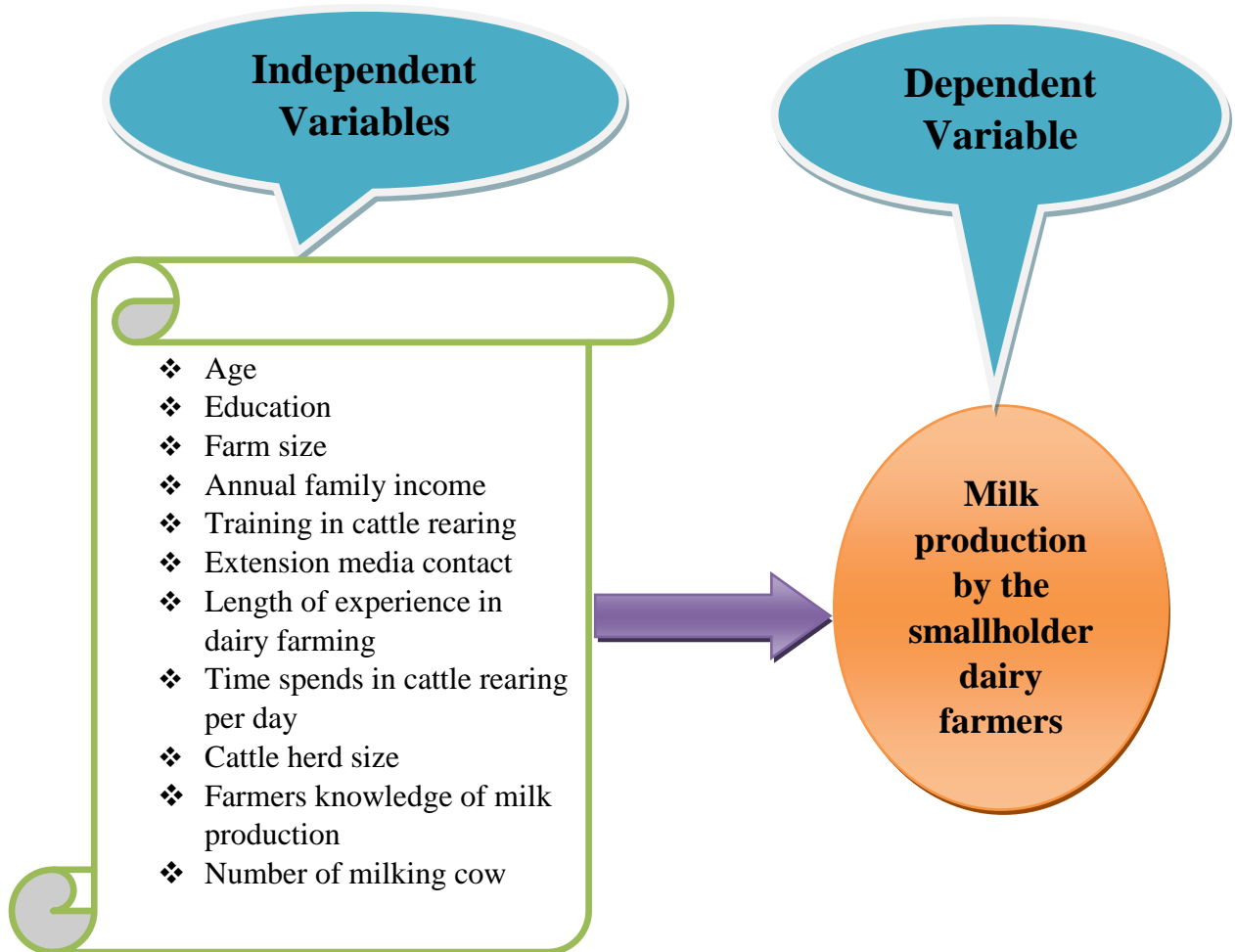
There are lots of researches on milk production in northern region of Bangladesh. Very few researches conducted on cattle milk production in southern region. Mainly conducted on buffalo milk production, but cattle milk production performance should be conducted. Smallholder dairy farmers make a huge contribution to our country's milk production, but they are often overlooked. On these considerations, the present researcher felt necessity to conduct the present research to find out the determinants that affecting on milk production in smallholder dairy farming.

### **2.4 The Conceptual Framework of the Study**

This study is concerned with milk production in smallholder dairy farming. Thus, the milk production was the main focus of the study and 11 selected characteristics were considered as those might have contribution with the determinants of average milk production of cattle. Milk production may be affected through interacting forces of many independent factors. It is not possible to deal with all the factors in a single study. Therefore, it was necessary to limit the independent variables, which included age, education, farm size, annual family income,

training in cattle rearing, extension media contact, length of experience in dairy farming, time spend in cattle rearing per day, cattle herd size, farmers knowledge of milk production and number of milking cow. The conceptual framework of the study has been presented in Figure.

2.1



**Figure. 2.1 The conceptual framework of the study**

## **CHAPTER 3**

### **METHODOLOGY**

This chapter presents a details description of the methods used in different stages of the study. A farm business study usually involves collection of data from individual farmers. The present study aimed at estimating the collection of primary data. The type of primary data collection depends upon the nature of the study and its objectives. The researcher has great responsibility to clearly describe as to what sorts of research design, methods and procedures he would follow in collecting valid and reliable data and to analyze and interpret those to arrive at correct conclusions. The chapter includes the operational format and comparative reflection of some variables used in the study. Also, statistical methods and their use have been mentioned in the later section of this Chapter.

#### **3.1 Local of the Study**

The study was conducted in Bhandaria Upazila under Pirojpur District. Bhandaria Upazila area 163.56 sq. km, located in between 22°22' and 23°33' north latitudes and in between 89°54' and 90°08' east longitudes. It is bounded by Rajapur and Kawkhali Upazilas on the north, Mathbaria Upazila on the south, Kathalia and Rajapur Upazilas on the east, Pirojpur Sadar Upazila on the west. There are seven unions under Bhandaria Upazila. Two unions were randomly selected for the study purpose. Maps of Pirojpur district and Bhandaria Upazila showing the study areas are presented in figures 3.1 and 3.2, respectively.

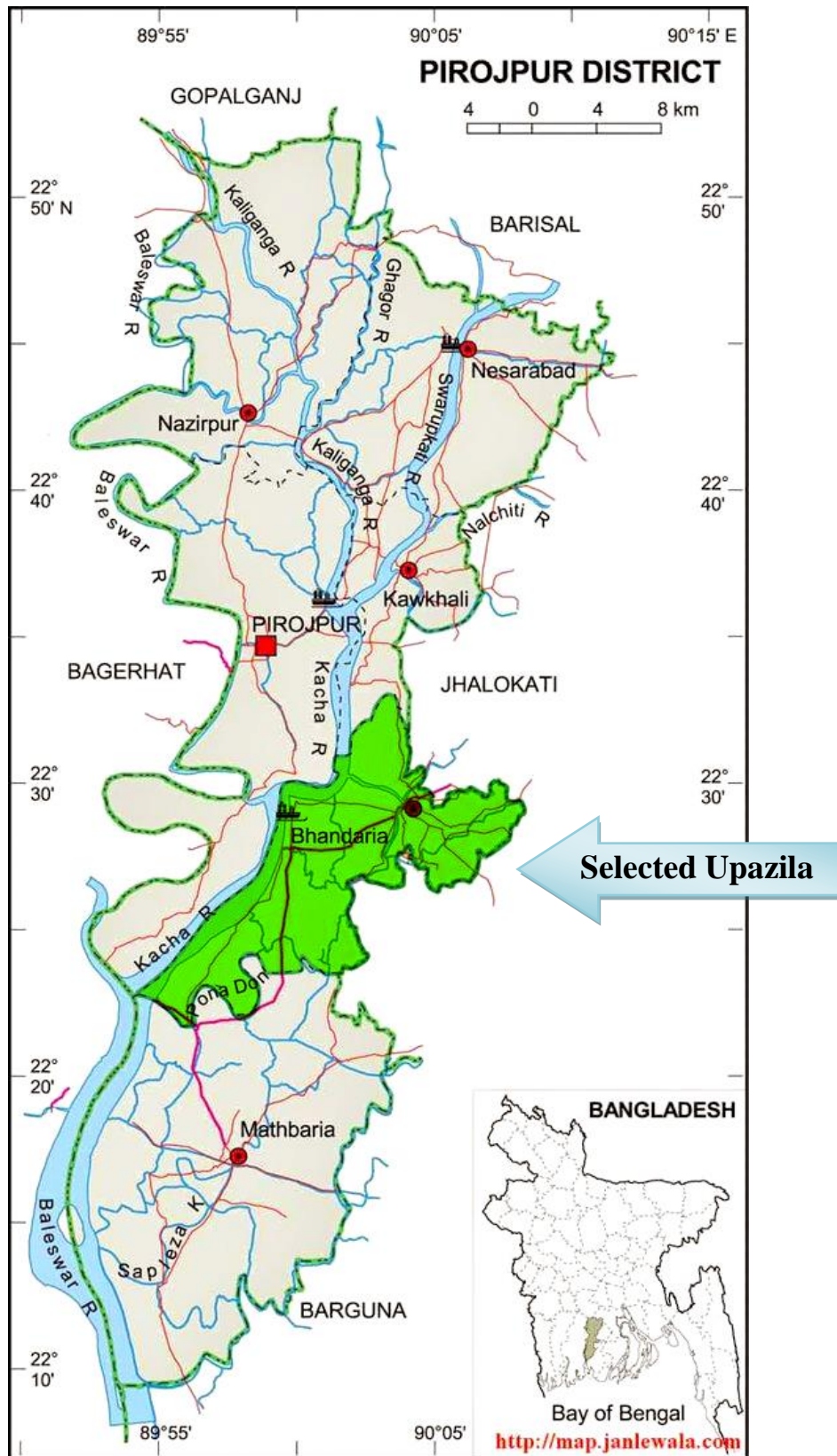


Figure 3.1: A Map of Pirojpur District Showing Selected (Bhandaria) Upazila



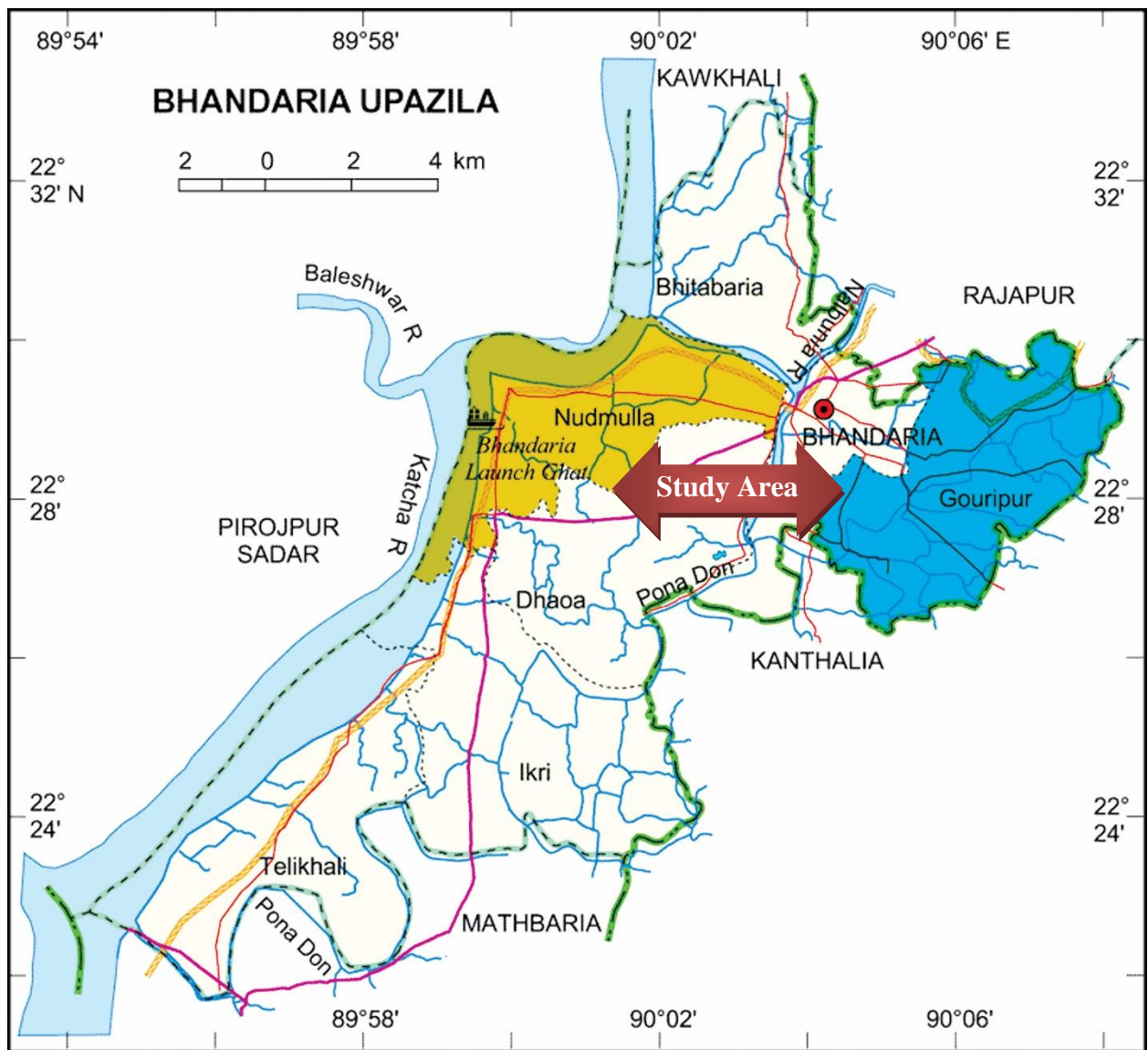


Figure 3.2: A Map of Bhandaria Upazila Showing the Study Area (Nudmulla and Gouripur Unions)

### 3.2 Population and Sample

Smallholder dairy farmers of selected four villages under Bhandaria upazilla of Pirojpur district were purposively considered as the population of the study. A list of smallholder dairy farmers who are currently rearing dairy cattle was prepared with the help of Upazila Livestock Officer, Veterinary Surgeon and their field staffs. The number of dairy farmers of the selected four villages was 229 which constituted the population of the study. The sample size was distributed proportionally from the selected villages and farmers were finally chosen for data collection following random sampling method. The sample size was calculated using the following formula, (Kabir and Rainis, 2014).

The formula,

$$n = \frac{N}{1 + Ne^2}$$

Where,

n= Sample size

N = Population size

e = Error (0.08)

Thus, the total sample size stood at around 93. The distribution of the population and sample of smallholder dairy farmers in study areas are showing below:

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

Name of Upazila	Name of Union	Name of Village	Number of Population	Number of Sample Size
Bhandaria	Nudmulla	South Shialkathi	43	18
		Nudmulla	69	28
	Gauripur	South Paikkhali	57	23
		North Paikkhali	60	24
<b>Total</b>			<b>229</b>	<b>93</b>

### 3.3 Preparation of the Research Instrument

A well-structured interview schedule was designed in accordance with the objectives of the research. Both open and closed form questions were used in the questionnaire. The questionnaire was constructed containing direct and simple question in view the dependent and independent variables. Before preparing the final schedule, a preliminary schedule was developed. The draft schedule was pretested in the study areas. The interview schedule was

then changed, modified and rearranged according to the experience gathered and in the light of the objectives of the study. A copy of the interview schedule is presented into Appendix A.

### **3.4 Period of Data Collection**

The researcher herself collected data personally through face-to-face interview from the selected respondents. To familiarize with the study area and for getting local support, the researcher took help from the local leaders and the field staffs of Upazila Livestock Office. The researcher made all possible efforts to explain the purpose of the study to the farmers. Data were collected during the period of 27<sup>th</sup> December, 2019 to 12<sup>th</sup> February, 2020.

### **3.5 Problem Faced During Data Collection**

During the period of data collection, the researcher had to face some problems which are stated below:

1. Most of the farmers initially hesitated to answer the questions since the researcher was unknown to them.
2. Sometimes farmers were not available at home which needed even more than one-time visits to conduct a single interview.
3. In many occasions the researcher was asked by the respondents as to what benefit they might get from the researcher. They thought that the researcher was a government officer and she might supply necessary inputs such as medicine, financial facilities etc.
4. The farmers did not keep any records of their farm i.e., production, costs, return etc. and replied questions from their memory which sometimes needed verification and additional time.

### **3.6 Measurement of Variables**

The variable is any characteristic, which can assume varying, or different values in successive individual cases (Ezekiel and Fox, 1969). A research work usually contains at least two important variables via. independent and dependent variable. An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variable (Townsend, 1953). In the scientific research, the selection and measurement of variable constitute a significant task. In this conception, the researcher reviewed literature to widen

this understanding about the natures and scopes of the variables relevant in this research. She also discussed with departmental teacher and concerned researchers of the related fields.

The various characteristics of the dairy farmers might have influence on their milk production. These characteristics were age, education, farm size, annual family income, training in cattle rearing, extension media contact, length of experience in dairy farming, time spend in cattle rearing per day, cattle herd size, farmers knowledge of milk production and number of milking cow. The milk production of smallholder dairy farmers was the main focus of the study.

### **3.6.1 Measurement of Independent Variables**

Measurement of all the determinants that affecting on milk production in smallholder dairy farmers are discussed in the following sub sections:

#### **3.6.1.1 Age**

The age of a dairy farmer was measured by counting the actual years from his/her birth to the time of interview. It was expressed in terms of complete years.

#### **3.6.1.2 Education**

Education performs an essential role in adopting improved dairy cattle management practices. Educated farmers may have more access to the relevant technical information for improvement of dairy cattle management practices and may take rational economic decisions. Education was measured in terms of grades of formal education (school/college) completed by an individual. It was expressed in terms of years of schooling. A score of one (1) was given for each year of schooling completed. If a farmer didn't know how to read and write, his education score was zero (0), while a score of 0.5 was given to a dairy farmer who could sign his name only.

#### **3.6.1.3 Farm Size**

The farm size of a dairy farmer referred to the total area of land on which his/her family carried out farming operations, the area being in terms of full benefit to his/her family. The farm size was measured in decimals for each farmer using the following formula:

$$FS = A_1 + A_2 + A_3 + A_4 + \frac{1}{2}(A_5 + A_6)$$

Where,

FS = Farm Size

A<sub>1</sub> = Homestead land including pond

A<sub>2</sub> = Own cultivating land

A<sub>3</sub> = Land taken on lease from others

A<sub>4</sub> = Land given to other on lease

A<sub>5</sub> = Land given to other on share cropping basis

A<sub>6</sub> = Land taken from other on share cropping basis

#### **3.6.1.4 Annual Family Income**

The annual family income of a respondent was measured in '000' taka on the basis of his/her total yearly earnings from agricultural and non-agricultural sources. The total yearly earning from agricultural (rice cultivation, vegetables cultivation, fish, livestock and poultry rearing, betel nut, betel leaf, fruits, spices and others) and non-agricultural sources (service, business, day labor and others) by the respondent themselves and other members of his family was determined. Thus, yearly earning from agricultural and non-agricultural sources were added together to obtain annual family income of a farmer. A score of one (1) was given for each one thousand taka.

#### **3.6.1.5 Training in Cattle Rearing**

Cattle rearing training of a dairy farmer was measured by the total number of days they participated in different livestock rearing training programmer. A score of one (1) was assigned for each day of training received.

#### **3.6.1.6 Extension Media Contact**

This variable was measured by computing an extension contact score on the basis of a respondent's extent of contact with seven selected media. Each respondent was asked to indicate the frequency of their contact with each of the selected media. Scores were assigned for a respondent's participation in extension media contact as follows:

<b>Extent of communication</b>	<b>Scores</b>
Regularly	3
Occasionally	2
Rarely	1
Not at all	0

The extension contact score of a respondent was determined by summing up their scores for contact with all the selected media. Thus, possible extension contact score could vary from zero (0) to 21, where zero indicated no extension contact and 21 indicated the highest level of extension contact.

### **3.6.1.7 Experience in Dairy Farming**

Dairy farming experience of a smallholder dairy farmer was measured by the total number of years their reared dairy cattle. A score of one (1) was assigned for each year of cultivation.

### **3.6.1.8 Time Spend in Cattle Rearing**

Farmer spend some times daily for the purpose of cattle rearing (feeding, breeding, care and management) that was measured by the number of hours. A score of one (1) was given for each hour of time spend per day.

### **3.6.1.9 Cattle Herd Size**

Smallholder dairy farmers doesn't have large herd size for their economic condition. The herd size was calculated by the total number of cattle that's included bulls, cows, heifers and also calf. A score of one (1) was given for each cattle.

### **3.6.1.10 Farmers Knowledge on Milk Production**

Farmers knowledge is one of the largest determinants that directly affecting on milk production in smallholder dairy farming. After thorough consultation with relevant experts and reviewing of related literature, 10 questions regarding cattle rearing were selected and those were asked to the respondents to determine their knowledge on dairy cattle rearing. Score was also assigned on point basis for partially correct answer. Thus, the knowledge on dairy cattle rearing score of the respondent could range from zero (0) to 20, where zero (0) indicating very poor knowledge and 20 indicate the very high knowledge on dairy cattle rearing.

### **3.6.1.11 Number of milking Cow**

Smallholder dairy farming milk production directly depend on number of milking cow. If smallholder dairy farmer can rear more than one milking cow, then their production capacity must be increased. But milking cow rearing cost is higher than other, that's why they're not interested in rearing more milking cow on their herd. So, the range of milking cow is one to three.

## **3.6.2 Measurement of Dependent Variable**

### **3.6.2.1 Average Milk Production in Small-scale Dairy Farming**

Amount of milk production in small-scale dairy farming was the dependent variable of the study. The farmers were asked about how much milk they can collect from their cow per day.

Then the average milk production was calculated by two days milk production. The score of one (1) was given for each liter of milk production.

### **3.7 Statement of Hypothesis**

According to Kerlinger (1973), a hypothesis is a conjectural statement of the relation between two or more variables. Hypothesis are always in declarative sentence form and they relate either generally of specifically variables to sentence form and they relate either generally or specifically variables to variables. Hypothesis may be broadly divided into two categories; namely, research hypothesis and null hypothesis.

#### **3.7.1 Research Hypothesis**

Research hypothesis states a possible contribution of the variables being studied or a difference between experimental treatments that the researcher expects to emerge. The following research hypothesis was put forward to know the contribution on each of the 11 selected characteristics in the smallholder dairy farming and milk production. “Each of the 11 selected characteristics in the smallholder dairy farming will have significant contribution on milk production.”

#### **3.7.2 Null Hypothesis**

A null hypothesis states that there is no contribution of the concerned variables. The following null hypothesis was undertaken for the present study “There is no contribution to the dependent variable of the selected characteristics of the smallholder dairy farmers and their milk production.” “The selected characteristics were age, education, farm size, annual family income, training in cattle rearing, extension media contact, length of experience in dairy farming, time spend in cattle rearing per day, and cattle herd size, farmer’s knowledge on milk production and number of milking cow.”

### **3.8 Data Processing**

After completion of data collection all the data of the interview schedule were compiled, tabulated and analyzed by using excel sheet according to the objective of the study. Local units were converted into standard units. All the individual responses to questions of the interview schedule were transferred in to a master sheet to facilitate tabulation, categorization and organization. Appropriate scoring technique was followed to convert the qualitative data into the quantitative data. For describing the various independent and dependent variables, the procedures have been discussed in different sub-sequent sections of next chapter.

### **3.9 Statistical Procedure**

Statistical procedure gives the result of this study. The collected data were analyzed to follow the tabular technique in accordance with the objectives of the study. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the variables. SPSS (version 25) computer program were used for analyzing the data. Multiple regression coefficients were used in order to determinants of milk production in smallholder dairy farming. It's a method of analysis of the research.



## **CHAPTER 4**

### **RESULTS AND DISCUSSION**

Result and discussion chapter is a reflection of scientific research work. So, the detailed discussion of the findings and interpretation are presented in three sections in accordance with the objectives of the study. The first section deals with the selected determinants of the dairy farmers that affecting on the milk production, the second section deals with determinants of milk production performance in smallholder dairy farming and the third section deals with contribution of the selected determinants of the respondents to the milk production in smallholder dairy farming.

#### **4.1 Selected characteristics of Dairy Farmers**

In the study, there were eleven selected characteristics that affecting on the milk production of the smallholder dairy farming those are age, education, family size, farm size, annual family income, training in cattle rearing, extension media contact, length of experience in dairy farming, time spend in cattle rearing per day, cattle herd size, farmers knowledge on milk production, number of milking cow. The composite findings of the selected factors of smallholder dairy farming are presented and have been discussed in subsequent sections.

Data contained in the Table 4.1 reveal the salient features of the determinants of smallholder dairy farming in order to have an overall picture of these factors at a glance. However, separate tables are provided for individual factors, discussing and/or interpreting results concerning each of the factors in this chapter.

**Table 4.1 Salient features of the smallholder dairy farmers (n=93)**

Sl. No.	Selected Factors	Measuring Unit	Possible Range	Observe Range	Mean	Standard Deviation (SD)
01	Age	Year	Unknown	22-85	50.613	12.832
02	Education	Year of schooling	Unknown	0-17	6.452	3.852
03	Farm size	Decimal	Unknown	1.653-358.372	103.685	81.168
04	Annual family income	000" taka	Unknown	81.0-627.0	218.128	86.708
05	Training in cattle rearing	Number of days	Unknown	0-11	0.806	1.958
06	Extension media contact	Score	0-21	0-7	2.871	1.534
07	Length of experience in dairy farming	Year	Unknown	2-60	21.075	15.228
08	Time spends in cattle rearing	Hour per day	Unknown	2.5-12.0	5.161	2.034
09	Cattle herd size	Number of cattle	Unknown	1-11	3.215	1.594
10	Farmers knowledge on milk production	Score	0-20	4-17	10.140	2.998
11	Number of milking cow	Number of dairy cows	Unknown	1-3	1.194	0.449

**4.1.1 Age**

The age score of the respondent smallholder dairy farmers ranged from 22 to 85 with a mean and standard deviation of 50.613 and 12.832, respectively. Farmers were classified into three categories namely “young aged (up to 35)”, “middle aged (36-55)” and old aged (above 55). The distribution of the respondents of the study in accordance with their age categories presented in Table 4.2.

**Table 4.2 Distribution of the respondents according to their age**

Categories of the respondent	Observed range (Year)	Respondents'		Mean	Standard Deviation
		Number	Percent		
Young aged (up to 35)	22 to 85	14	15.1	50.613	12.832
Middle aged (36-55)		47	50.5		
Old aged (above 55)		32	34.4		
Total		93	100		

The table 4.2 indicate that the highest proportions (50.50 percent) of the farmers were in middle aged category compared to 34.40 percent old and 15.10 percent young aged farmers. Table 4.2 also shows that the middle and old aged respondents constitute an overwhelming majority (84.90 percent) of the respondents. The middle and old aged respondents generally tend to be involved with smallholder dairy farming than the young aged dairy farmers. In fact, the old and middle aged respondents having ability to produce huge amount of milk but it's not enough to fulfil our basic needs.

#### 4.1.2 Education

Based on their educational qualification, the respondents were classified into five categories such as 'illiterate' (0), 'can sign only' (0.5), primary (1-5), secondary (6-10), and above secondary (>10) education.

**Table 4.3 Distribution of the respondents according to their education**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Illiterate (0)	7	7.5	6.452	3.852
Can sign only (0.5)	8	8.6		
Primary education (1-5)	31	33.4		
Secondary education (6-10)	38	40.8		
Above secondary (above 10)	9	9.7		
Total	93	100		

Data shows that 40.8 percent respondents had secondary level of education than 9.7 percent of above secondary, 33.4 percent of primary, 8.6 percent of can sign only and 7.5 percent of illiterate level of education. Education plays an important role in the acceleration of agricultural development. Education helps individual to become rational, conscious and to get

useful information to solve their everyday working problem. Educated respondents may get useful information through reading leaflets, booklets, books and other printed materials. So, they get access to new techniques related to their farming activities. Education broadens the power of understanding and develops the ability of analyzing facts and situation to take accurate decision. The findings indicate that maximum dairy farmers are literate. So, they can understand the importance of milk production.

#### 4.1.3 Farm Size

Milk production also depends on farm size. If respondents have a larger farm size, he/she will be able to rear a greater number of cattle and produce more milk. Based on their farm size, the respondents were classified into three categories followed by DAE (1999) such as marginal (less than 49.42 decimal), small (>49.42 to 247.11 decimal) and medium (247.58 to 741.33 decimal).

**Table 4.4 Distribution of the farmers according to their farm size**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Marginal (less than 49.42 decimal)	27	29.0	103.685	81.168
Small (>49.42 to 247.11 decimal)	62	66.7		
Medium (249.58 to 741.33 decimal)	4	4.3		
Total	93	100		

Table 4.4 shows that the highest proportion of the respondents (66.7 percent) belonged to small farm size while 29.0 percent belonged to marginal and 4.3 percent belonged to medium for smallholder dairy farmers. Our land space and farming plots destroy day by day for this growing population in Bangladesh. Thus, most of the farmers had small farm size.

#### 4.1.4 Annual Family Income

Agriculture is the main source of family income in most of the smallholder dairy farmers. Besides agriculture, they also do other works. On the other hand, some farmers rearing cattle in small scale along with other services and business. Annual family income of the smallholder dairy farmers ranged from Taka 81 thousand to 627 thousand, the mean being 218.128 thousand and standard deviation is 86.708 thousand. On the basis of their annual family income scores, the smallholder dairy farmers were divided into three categories: "low income" (up to 150), "medium income" (151 to 250) and "high income" (above 250). The

distribution of the smallholder dairy farmers according to their annual family income is given in Table 4.5.

**Table 4.5 Distribution of dairy farmers according to their annual family income**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Low income (up to 150)	20	21.5	218.128	86.708
Medium income (151 to 250)	49	52.7		
High income (above 250)	24	25.8		
Total	93	100		

Results indicate that the respondents belonged to medium income category constituted the highest proportion (52.7 percent) followed by high income (25.8 percent) and low income (21.5 percent). The results indicate that most of the respondents belonged to medium annual income.

#### **4.1.5 Training in Cattle Rearing**

Training gives the dairy farmers' husbandry knowledge, helps cattle rearing interest and being expert to the farmers for rearing dairy cattle for more milk production. The cattle rearing training score of the farmers ranged from 0 to 11 with a mean of 0.806 and standard deviation of 1.958. Based on the training experience scores, the respondents were classified into three categories: "no training experience" (0), "low training experience" (1-3 days) and "medium training experience" (above 4 days).

**Table 4.6 Distribution of the farmers according to their training experience**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
No training experience (0)	71	76.3	0.806	1.958
Low training experience (1-3 days)	15	16.2		
Medium training experience (above 4 days)	7	7.5		
Total	93	100		

Table 4.6 shows that highest number of respondents (76.3 percent) had no any kind of training experience about cattle rearing. Nearly 16.2 percent respondents had low and 7.5 percent respondents had medium training experience about cattle rearing. So, the respondents don't know how they can improve their milk production capacity. That's why the milk production capacity is too much low in smallholder dairy farmers.

#### 4.1.6 Extension Media Contact

Extension media has vast role to develop dairy farming. The scores of the farmers regarding extension media contact ranged from 0 to 7 with a mean of 2.871 and standard deviation of 1.534. On the basis of their extension contact scores, the farmers were classified into three categories as no contact, low contact and medium contact.

**Table 4.7 Distribution of the farmers according to their media contact**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
No contact (0)	3	3.2	2.871	1.534
Low contact (1 to 3)	56	60.2		
Medium contact (above 3)	34	36.6		
Total	93	100		

A proportion of 60.2 percent of the smallholder dairy farmers had low extension media contact compared to 36.6 percent of them having medium extension media contact. There only 3.2 percent of farmers had no contact. Thus, majority of percentage of the respondents had no and low extension media contact. Extension contact is a very effective and powerful source of receiving information about new dairy farming technique and modern husbandry management. The status of no and low contacts might have significant impacts on milk production of smallholder dairy farming.

#### 4.1.7 Experience in Dairy Farming

Experience has direct impact on smallholder dairy farming and also on milk production. Though maximum smallholder dairy farmers had no any academic knowledge, but they were experienced about dairy farming. The score of experienced dairy farmers ranged from 2 to 60 with a mean of 21.075 and standard deviation of 15.228. On the basis of their experience scores, the farmers were classified into three categories such as “low experienced (up to 10 years)”, “medium experienced (11 to 20 years)” and “high experienced (above 20 years)”.

**Table 4.8 Distribution of the respondents according to their experience in dairy farming**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Low experienced (up to 10 years)	38	40.9	21.075	15.228
Medium experienced (11 to 20 years)	18	19.3		
High experienced (above 20 years)	37	39.8		
Total	93	100		

The proportion rate of low (40.9 percent) and high (39.8 percent) experienced respondents are higher than medium (19.3 percent) experienced respondents. Old aged respondents were high experienced, but media contact was low. So, their milk production was average like other categories respondents.

#### 4.1.8 Time Spend in Cattle Rearing

Mainly smallholder dairy farmers rear indigenous cattle for milk, meat and draft purpose in semi-intensive system. During day period farmers keep their cattle in grazing land. Besides other works farmers spend few times for cattle rearing management. The scores of spend time ranged 2hours and 30 minutes to around 12 hours with a mean of 5.161 and standard deviation of 2.034. On the basis of their time spend in cattle rearing scores, the respondents were classified into three categories such as “low (up to 4 hours)”, “medium (>4 to 8 hours)” and “high (above 8 hours)”.

**Table 4.9 Distribution of the respondents according to their time spend in cattle rearing**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Low (up to 4 hours)	39	41.9	5.161	2.034
Medium (>4 to 8 hours)	45	48.4		
High (above 8 hours)	9	9.7		
Total	93	100		

Data indicates that respondents spend few times for cattle rearing. It was observed that the highest portion (48.4 percent) of the respondents spend medium level of time while (41.9 percent) respondents spend low and (9.7 percent) respondents spend high level of time. That's had direct effect on cattle production performance.

#### 4.1.9 Cattle Herd Size

Smallholder dairy farmers doesn't have very large herd size. The farmer keeps his cattle in the yard of his homestead in a small herd for night shelter. Bulls, cows, heifers, calves were kept together in the herd. The scores of cattle herd size ranged 1 to 11 with a mean of 3.215 and standard deviation of 1.594. On the basis of their cattle herd size scores, the respondents were classified into three categories such as "small size (1 to 4)", "medium size (5 to 7)" and "large size (above 7)".

**Table 4.10 Distribution of the dairy farmers according to their cattle herd size**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Small size (1 to 4)	80	86.0	3.215	1.594
Medium size (5 to 7)	11	11.8		
Large size (above 7)	2	2.2		
Total	93	100		

A proportion of 86.0 percent smallholder dairy farmers had small cattle herd compared to 11.8 percent of them having medium cattle herd. Only 2.2 percent of respondents having large sized cattle herd. In the study area, majority farmers rear small sized cattle herd. So, their milk production performance was not enough for their demand and also, they didn't get enough financial support from cattle rearing.

#### 4.1.10 Farmers Knowledge on Milk Production

The knowledge of the farmers was measured by using a total of ten questions based on several common aspects of dairy farming, such as dairy breed, milking, lactation period, feeding, prevention, vaccination, breeding, housing and sanitation and also other relevant questions for getting a deeper insight into the knowledge level on different aspects the farmers. Dairy farmers' knowledge is very important for milk production. Farmers' knowledge depends on farmer's education, training, media contact, experience and also other factors. Knowledge protects farmers' annual economic loss from dairy farming. Smallholder dairy farmers' knowledge scores could theoretically range from 0 to 20. But their observed knowledge scores ranged from 4 to 17 with the mean of 10.140 and standard deviation of 2.998. Based on the theoretical scores, the respondents were classified into four categories such as "poor knowledge (up to 6)", "fair knowledge (>6 to 12)" and "excellent knowledge (above 12)".



**Table 4.11 Distribution of farmers according to their knowledge on milk production**

Categories of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
Poor knowledge(up to 6)	10	10.8	10.140	2.998
Fair knowledge(>6 to 12)	62	66.6		
Excellent knowledge (above 12)	21	22.6		
Total	93	100		

Around (66.6 percent) of respondents possessed medium knowledge, 22.6 percent of the respondents possessed high knowledge and only 10.8 percent of the respondents had poor knowledge.

#### 4.1.11 Number of milking Cow

Number of milking cows have direct effect on milk production performance of a dairy farming. Not only milk production performance but also farmers' financial performance depends on milking cows' number. If farmers can rear more milking cows, their milk production will be increased and economic also improved. But smallholder dairy farmers were not interested to rear a greater number of milking cow for different reasons. The observed milking cow's scores ranged from 1 to 3 with a mean of 1.194 and standard deviation of 0.449. On the basis of rearing milking cow, the respondents were classified into three number as "one cow owner", "two cow owner" and "three cow owner".

**Table 4.12 Distribution of smallholder dairy farmers according to rear number of milking cow**

Classifications of the respondents	Respondents'		Mean	Standard Deviation
	Number	Percent		
One cow owner	77	82.8	1.194	0.449
Two cow owner	14	15		
Three cow owner	2	2.2		
Total	93	100		

Table shows that 82.8 percent smallholder dairy farmers were rearing one milking cow for milk production and breeding. Whether, 15 percent farmers were rearing two milking cows and only 2.2 percent farmers were rearing three milking cows. It indicates that their milk production was not enough in the study areas and farmers were not interested to establish a dairy farm.

## 4.2 Milk Production of Smallholder Dairy Farmer

Determination of milk production of the respondents ranged from 1.125 liter to 10.25 liter with the mean of 2.734 and standard deviation of 1.396. On the basis of their milk production scores, the respondents were classified into three categories such as “low production (up to 2 liter)”, “medium production (>2 to 4 liter)” and “high production (above 4 liter)”.

**Table 4.13 Distribution of respondents according to determination of milk production**

Categories of the respondents (Mean $\pm$ SD)	Respondents'		Mean	Standard Deviation
	Number	Percent		
Low production (up to 2 liter)	34	36.6	2.734	1.396
Medium production (>2 to 4 liter)	45	48.3		
High production (above 4 liter)	14	15.1		
Total	93	100		

A proportion of 48.3 percent smallholder dairy farmers had medium production capacity compared to 36.6 percent of them having low production capacity and 15.1 percent of high production capacity. Data indicates that around half of the respondents had medium level of milk production capacity, but the production was not satisfactory. In the study area most of the smallholder dairy farmers rear one milking cow, their production was not sufficient as our demand. Because maximum smallholder farmers rear indigenous cattle for their excellent immune system and sustainability, but their milk production performance is poor. So, farmers can't produce huge amount of milk that's our need. At first farmers keeps milk for calf feeding and home consumption, then sells the rest of milk in local market.

## 4.3 Contribution of the Selected Factors on Milk Production in Smallholder Dairy Farming

The purpose of this section is to explore the contribution of the selected characteristics of the farmers with the amount of milk production in smallholder dairy farming. The results of the multiple regression analysis is presented in Table 4.14.

**Table 4.14 Coefficients of multiple regression analysis of selected characteristics to milk production**

Dependent Variable	Independent Variables	$\beta$	$p$	$R^2$	Adj. $R^2$	F statistic	$p$
Milk production	Age	-0.008	0.430	0.703	0.663	17.426	0.000
	Education	-0.039	0.224 <sup>NS</sup>				
	Farm size	-0.003	0.101 <sup>NS</sup>				
	Annual family income	0.002	0.074 <sup>NS</sup>				
	Training in cattle rearing	0.131	0.043*				
	Extension media contact	-0.073	0.508				
	Experience in dairy farming	0.008	0.398				
	Time spends in cattle rearing	0.131	0.335				
	Cattle herd size	-0.376	0.035*				
	Farmers' knowledge on milk production	0.203	0.000**				
	Number of milking cow	3.071	0.000**				

\*\* Significant at  $p < 0.01$  &

\* Significant at  $p < 0.05$

The multiple regression analysis was used for determining how and which determinants of the respondents affecting on milk production of smallholder dairy farming. Table-4.14 shows that training in cattle rearing and cattle herd size are important contributing factors (at 5% percent level of significant) while farmers knowledge on milk production and number of milking cow are more important contributing factors (at 1% level of significant). Seventy point three present ( $R^2 = 0.703$ ) of the variation in the respondents' milk production performance can be attributed to their age, education, farm size, annual family income, training in cattle rearing, extension media contact, experience in dairy farming, time spends

in cattle rearing, cattle herd size, farmers knowledge on milk production and number of milking cow (Table 4.14). The F value indicates that the model is significant ( $p < 0.000$ ).

However, each predictor may explain some of the variance in respondents' milk production conditions simply by chance. The adjusted R-square value penalizes the addition of extraneous predictors in the model, but values of 0.663 still show that the variance in respondents' milk production can be attributed to the predictor variables rather than by chance, and this is the suitable models (Table 4.14). In summary, the model suggest that the respective authority should consider training in cattle rearing, cattle herd size, farmers' knowledge and number of milking cow.

#### **4.3.1 Contribution of Number of Milking Cow on Milk Production in Smallholder Dairy Farming**

For the multiple regression, it was observed that the contribution of number of milking cow on milk production in smallholder dairy farming was measured by the testing of following null hypothesis;

“There is no contribution of number of milking cow on milk production in smallholder dairy farming.”

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- a. The contribution of number of milking cow was significant 1% level (0.000).
- b. So, the null hypothesis could be rejected.
- c. The direction between number of milking cow and milk production was positive.

The  $\beta$ -value of number of milking cow was (3.071). So, it can be stated that as farmers number of milking cow increased by one unit, milk production of smallholder dairy farmers increased by 3.071 unit. Considering the effects of all other factors that affecting on milk production.

Based on the above finding, it can be said that farmers had rear more number of milking cows to increase the milk production. So, number of milking cow has high significantly contributed to the milk production.

### **4.3.2 Contribution of Farmers' Knowledge on Milk Production in Smallholder Dairy Farming**

For the multiple regression, it was concluded that the contribution of farmers' knowledge on milk production in smallholder dairy farming was measured by the testing of following null hypothesis;

“There is no contribution of farmers' knowledge on milk production in smallholder dairy farming.”

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- a. The contribution of farmers' knowledge was significant 1% level (0.000).
- b. So, the null hypothesis could be rejected.
- c. The direction between farmers' knowledge and milk production was positive.

The  $\beta$ -value of farmers' knowledge on milk production was (0.203). So, it can be stated that as farmers knowledge increased by one unit, milk production in smallholder dairy farmers increased by 0.203 unit.

Based on the above finding, it can be said that farmers had more knowledge to increase the milk production. So, farmers' knowledge has high significantly contributed to the milk production. Farmers' knowledge on milk production in small-scale dairy farming that's direct effect on more milk production.

### **4.3.3 Contribution of Training in Cattle Rearing on Milk Production in Smallholder Dairy Farming**

For the multiple regression, it was concluded that the contribution of training in cattle rearing on milk production in smallholder dairy farming was measured by the testing of following null hypothesis;

“There is no contribution of training in cattle rearing on milk production in smallholder dairy farming.”

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- a. The contribution of training in cattle rearing was significant 5% level (0.043).
- b. So, the null hypothesis could be rejected.
- c. The direction between training in cattle rearing and milk production was positive.

The  $\beta$ -value of farmers training in cattle rearing was (0.131). So, it can be stated that as farmers training in cattle rearing increased by one unit, milk production in smallholder dairy farmers increased by 0.131 unit.

Based on the above finding, it can be said that farmers had more training in cattle rearing to increase the milk production. So, cattle rearing training has high significantly contributed to the milk production. Training helps farmers to gather knowledge on small-scale dairy farming which ultimately helps more milk production.

#### **4.3.4 Contribution of Cattle Herd Size on Milk Production in Smallholder Dairy Farming**

For the multiple regression, it was concluded that the contribution of cattle herd size on milk production in smallholder dairy farming was measured by the testing of following null hypothesis;

“There is no contribution of cattle herd size on milk production in smallholder dairy farming.”

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- a. The contribution of cattle herd size was significant 5% level (0.035).
- b. So, the null hypothesis could be rejected.
- c. But the direction between cattle herd size and milk production was negative.

The  $\beta$ -value of farmers cattle herd size was (-0.376). So, it can be stated that as farmers cattle herd size increased by one unit, milk production in smallholder dairy farmers decreased by 0.376 unit. Because farmers not only kept milking cattle but also kept non-milking cattle in the same herd in smallholder dairy farm. Non-milking cattle had no direct contribution on milk production. For this cattle herd size direction was negative from milk production.

Based on the above finding, it can be said that farmers had small cattle herd size for milk production and their production was low. So, cattle herd size has high significantly contributed to the milk production.

## CHAPTER 5

### SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Dairy sector in Bangladesh plays an important role for improving human nutrition and national income. This sector provides important animal protein to our diet in the form of milk, meat, sweet, butter, ghee, butter-oil etc. Some changes have been taken place in dairy farming in Bangladesh. Gradually quite a significant number of smallholders has adopted dairy farming to their supplement family income.

The study would conduct to Nadmulla and Gouripur Union of Bhandaria Upazilla under Pirojpur district. Among the total smallholder dairy farmer's population of two unions 93 were selected as a sample size of the study from four villages. A well-constructed structured interview schedule was developed based on objectives of the study for collecting information. The researcher herself was collect data from the sample respondents through personal contact. The independent variables are age, education, farm size, annual family income, training in cattle rearing, extension media contact, experience in dairy farming, time spends in cattle rearing, cattle herd size, farmers' knowledge on milk production, milking cow. The dependent variable of the study was milk production of smallholder dairy farming. Data collected from the respondents were compiled, coded, tabulated and analyzed in accordance with the objectives of the study. In order to determine of milk production in smallholder dairy farming, multiple regression analysis was used. The major findings of the study are summarized below:

#### **5.1 Summary of Findings**

##### **5.1.1 Characteristics of the Respondents**

###### **Age**

The highest proportion (50.5 percent) of the respondents fall in the middle-aged category compared to 34.4 percent old and 15.1 percent young aged category.

###### **Education**

Major proportion (40.8 percent) of the respondents was under the category of "secondary education", 33.4 percent "primary education", and 9.7 percent "above secondary education", and 8.6 percent "can sign only". And only 7.5 percent of respondents were illiterate.

**Farm size**

The average respondents' proportion, 37.6 percent had medium and 34.4 percent had small farm while 15.1 percent had marginal farm and 12.9 percent had large farm size.

**Annual family income**

The majority of the respondents (52.7 percent) had medium income where 25.8 percent farmers had high and 21.5 percent had low family income.

**Training in cattle rearing**

A large proportion of the respondents (76.3 percent) had no training experience while the rest 16.2 percent and 7.5 percent of them had low and medium training experience.

**Extension media contact**

Majority proportion (60.2 percent) of the dairy farmers had low extension media contact compared to 36.6 percent of them had medium media contact and 3.2 percent of them had no extension media contact.

**Experience in dairy farming**

The farmers average proportion (40.9 percent) were low experienced where 39.8 percent were high and 19.3 percent were medium experienced.

**Time spends in cattle rearing**

The average time spend proportion 48.4 percent respondents spent medium compared to 41.9 percent spent low and 9.7 percent spent high rearing time.

**Cattle herd size**

The majority of smallholder dairy farmer's proportion (86.0 percent) had small herd size where 11.8 percent of them had medium and only 2.2 percent had large herd size.

**Farmers' knowledge on milk production**

About (49.5 percent) of the farmers possessed medium knowledge where 38.7 percent of the farmers possessed high and 7.5 percent and 4.3 percent of the farmers possessed poor and very high knowledge on milk production respectively.

**Number of milking cow**

The proportion of respondents (82.8 percent) had one milking cow compared to 15 percent had two and 2.2 percent had three milking cows.

**5.1.2 Average Yield of Milk Production**

The smallholder dairy farmers' milk production capacity ranged from the possible range of 1.125 to 10.25 liters with a mean and standard deviation of 2.734 and 1.696, respectively. The smallholder dairy farmer belonged to medium category constituted the highest



proportion (48.3 percent) followed by low production of 36.6 percent and high production of 15.1 percent.

## **5.2 Conclusion**

Dairy farming in Bangladesh has been practiced for a long time at a small scale. Dairy cattle have been used here the double purpose as draught purpose and milk production. However, with the change of technology, farmers have been seen to reduce the use of cattle as draught power and increase the use of power tiller for land preparation etc. Domestic supply of milk however falls for short of our demand and for thus a huge malnutrition problem particularly among the children. On the basis of the findings of this study and their interpretation in the light of other relevant factors the following conclusions are drawn:

1. Average 84.9 percent of the smallholder dairy farmers had low to medium milk production capacity. It is therefore, concluded that the overall milk production performance was not satisfactory in the study area and need to more develop in small scale dairy farming.
2. Training in cattle rearing had significant contribution on milk production. The highest proportion of the farmers had not any cattle rearing training experience against low to medium training experience. It is concluded that farmers training experience is too low, so their milk production status also not enough.
3. Cattle herd size had significant contribution on smallholder dairy farmers' milk production. Though research structure built on smallholder dairy farming, so farmers belonged to highest proportion of small herd size. It is concluded that the farmers' cattle herd size has direct effect on milk production.
4. Knowledge had positive and significant contribution to the determination of milk production. It presents that knowledge of the stallholder dairy farmers was an important factor on milk production.
5. Milking cow had significant contribution in small scale dairy farming and also milk production. Higher the number of cows higher the milk production. Dairy farms' milk production depends on rearing the number of milking cows.

## **5.3 Recommendations**

### **5.3.1 Recommendations for policy implications**

If proper remedial measures could be taken, dairy farming could be a viable commercial enterprise which in turn would play a vital role to overcome the problems of low income,

unemployment and under nutrition of our country. Based on the findings and conclusions the recommendations of the study have been presented below:

1. Training had significant contribution with the small-scale dairy farming. So, the DLS may increase financial support for arrange more training program on milk production.
2. Cattle herd size significantly depended on milk production in smallholder dairy farming. So, the DLS and respective NGO's workers should contact more with the farmers having larger cattle herd size.
3. Knowledge on small-scale dairy farming was more important factor to determine milk production. So, the DLS should arrange more seminar and training program on dairy cattle rearing in small-scale to improve farmers' knowledge level.
4. Milking cow had most significant contribution to the milk production in smallholder dairy farmers. If maximum farmers rear more than one milking cow, then their milk production rate will be increased. Respective GO's and NGO's should encourage to rear more milking cows in smallholder dairy farmers.

### **5.3.2 Recommendations for further study**

A small and limited research work cannot provide unique and universal information related to determine of milk production in smallholder dairy farming. Further studies should be undertaken on related matters. On the basis of scope and limitations of the present study and observations made by the researcher, the following recommendations are made for further study:

1. The study was conducted in only two unions under Bhandaria upazila in Pirojpur district. Similar studies should be conducted in other upazila and district of south region in the country to get a clear picture of the south region in our country which will be helpful for stablishing effective dairy development policy formulation.
2. The study investigated the contributions of the 11 selected factors of the farmers with their milk production performance. But smallholder dairy farmers' milk production might be affected by other various personal, social, psychological, cultural and situational factors. It is, therefore, recommended that further study should be conducted involving other factors of the farmers.
3. In this study farmers' average milk production was determined by two consecutive day's production. Therefore, it may be recommended that research should be determined more than two days production data.

4. In the present study farmers' age, education, farm size, annual family income, extension media contact, experience in dairy farming, time spends in cattle rearing had no significant contribution their milk production. In this connection, further verification is much necessary.

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## APPENDIX

### APPENDIX-A

AN ENGLISH VERSION OF INTERVIEW SCHEUDLE

**Department of Agricultural Extension and Information System**

**Sher-e-Bangla Agricultural University**

**Sher-e-Bangla Nagar, Dhaka-1207**

An interview schedule for a research on study entitled

**EXPLORING THE DETERMINANTS OF MILK PRODUCTION IN**

**SMALLHOLDER DAIRY FARMING**

Serial No:.....

Name of the respondent:.....Contact No.....

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

Upazila:.....District:.....

(Please answer the following questions. Your information will be kept confidential and will be used for research purpose only.)

#### **1. Age**

What is your present age? .....years

#### **2. Education**

What is the level of your education?

1. Do not know reading & writing.....
2. Can sign only.....
3. I have passed up to class.....
4. Others (if any) .....

### 3. Farm Size

Please mention the land area according to use

Sl. No.	Use of land	Land area	
		Local unit	Decimal
1.	Homestead land including pond (A <sub>1</sub> )		
2.	Own cultivating land (A <sub>2</sub> )		
3.	Land taken on lease from others (A <sub>3</sub> )		
4.	Land given to other on lease (A <sub>4</sub> )		
5.	Land given to other on share cropping basis (A <sub>5</sub> )		
6.	Land taken from other on share cropping basis (A <sub>6</sub> )		
	Total=A <sub>1</sub> +A <sub>2</sub> +A <sub>3</sub> +A <sub>4</sub> +1/2(A <sub>5</sub> +A <sub>6</sub> )		

### 4. Annual Family Income

Please mention the amount of annual income from the following sources

Sl. No.	Sources of income	Taka
1.	Agricultural	
	a) Rice cultivation	
	b) Vegetable cultivation	
	c) Fish	
	d) Livestock and poultry rearing	
	e) Betel nut	
	f) Betel leaf	
	g) Fruits	
	h) Spices	
	i) Others	
2.	Non-agricultural	
	a) Service or other profession	
	b) Business	
	c) Day labor	
	d) Others	
Total		



## 5. Training in Cattle Rearing

Did you receive any livestock related training in the last five years?

Yes..... /No..... (If yes, please furnished following information)

SL No.	Title of the training course	Duration	Training offering organization
1.			
2.			
3.			

## 6. Extension Media Contact

Please indicate the extent of your exposure with the following media:

Sl. No.	Information sources	Extent of communication			
		Regularly (3)	Occasionally (2)	Rarely (1)	Not at all (0)
1.	Neighbor	5-6 times/ months( )	3-4 times/ months( )	1-2 times/ months( )	0 times/ months( )
2.	Model/ideal farmer	5-6 times/ months( )	3-4 times/ months( )	1-2 times/ months( )	0 times/ months( )
3.	Livestock field worker	5-6 times/ months( )	3-4 times/ months( )	1-2 times/ months( )	0 times/ months( )
4.	Veterinary Surgeon (VS)	5-6 times/ year( )	3-4 times/year( )	1-2 times/ year( )	0 times/year ( )
5.	Upazilla Livestock Officers (ULO)	5-6 times/ year( )	3-4 times/year( )	1-2 times/ year( )	0 times/year ( )
6.	Training program	5-6 times/ year( )	3-4 times/year( )	1-2 times/ year( )	0 times/year ( )
7.	Television program	5-6 times/ months( )	3-4 times/ months( )	1-2 times/ months( )	0 times/ months( )

## 7. Length of Experience in Dairy Farming

How many years have you experienced about dairy farming?

Ans: ..... Year(s)

### 8. Time Spend in Cattle Rearing Per Day

How much time do you spend each day for cattle rearing?

Ans: .....hour/Day

### 9. Cattle Herd Size

How many cattle do you have?

Ans: .....

### 10. Farmers Knowledge on Milk Production

SL. NO.	Questions	Assigned score	Obtained score
1.	Do you know the names of two crossbred dairy cattle?	2	
2.	When and how many times you get enough milk?	2	
3.	What kind of feed does your cow give during lactation period?	2	
4.	Have you any idea about processed feed? How do you expect milking cattle to be if they were given processed feed?	2	
5.	How much experience do you have about feeding anthelmintics to dairy cattle?	2	
6.	What types of vaccine do you give to the cattle?	2	
7.	Are you aware of the diseases that are mostly affected by dairy cow?	2	
8.	How do you know about AI (Artificial Insemination) technique?	2	
9.	Have you any separate housing system for your milking cow and calf? Why?	2	
10.	What kind of sanitation procedure do you take for your cattle?	2	
	Total		

### 11. Number of Milking Cow

How many of your cows gives milk?

Ans:.....

## 12. Average Per Day Milk Production

Please provide information regarding milk production on the followings:

Days	Number of dairy cows	Types of cow	Time		Day Total (L)
			Morning	Afternoon	
1		Local (L)			
		Crossbred (L)			
2		Local (L)			
		Crossbred (L)			
Average (L)					

Thank you for your kind cooperation.

Date:

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Signature of students