

**TECHNICAL EFFICIENCY OF DUCK FARMS IN SOME SELECTED AREAS  
OF NETROKONA DISTRICT IN BANGLADESH**

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OF NETROKONA DISTRICT IN BANGLADESH**

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## **CERTIFICATE**

This is to certify that the thesis entitled ‘**TECHNICAL EFFICIENCY OF DUCK FARMS IN SOME SELECTED AREAS OF NETROKONA DISTRICT IN BANGLADESH**’ submitted to the Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agribusiness And Marketing**, embodies the result of a piece of bona fide research work carried out by **AKHI ISLAM**, Registration Number: 19-10090 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 duly been acknowledged.

**Dated:**  
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**To My Beloved and Respectable Parents  
- For their immense support and affection**

## **ABBREVIATIONS**

% = Percent

DAE = Department Of Agriculture Extension

FAO = Food and Agriculture Organization

MS = Master of Science

NGO = Non-Government Organization

No. = Number

SAU = Sher-e-Bangla Agricultural University

UAO = Upazila Agricultural Office

EE = Economic Efficiency

MLE = Maximum Likelihood Estimation

SFA = Stochastic Frontier Approach

TE = Technical Efficiency

WHO = World Health Organization

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**The Author**

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# **TECHNICAL EFFICIENCY OF DUCK FARMERS IN SOME SELECTED AREAS OF NETROKONA DISTRICT IN BANGLADESH**

## **ABSTRACT**

In Bangladesh, duck rearing has been identified as one of the ventures that can help smallholder farmers to enhance their agricultural revenue. The concentration on boosting the farmers' efficiency needed to be enhance for the purpose of maximize profits becoming more popularity with the growing adoption of duck farming. As a result, the research looked at duck production's technical efficiency (TE) and the elements that impacted on it. The study employed a random sample of 80 duck farmers from two upazilas in the Netrokona district. The parametric stochastic frontier technique was applied to evaluate Technical Efficiency, on the other hand, the Logistic regression model was applied to evaluate the sources that impact technical efficiency. The key productivity drivers were found to be the number of ducklings ( $p < 0.01$ ) and feed cost ( $p < 0.1$ ). Most of the farmers were functioning at a high degree of technical efficiency, with the average being 94%. This study also found various socioeconomic factors, such as farmer's age, education, sex, marital status, religion, farming status, main purpose of farming, years of farming, land ownership pattern & cooperative participation that affect the Technical Efficiency. The research suggests ensuring adequate and quality inputs for farmers in the haor area, providing them with financial assistance through low interest loans, providing them with appropriate training and government grants, and helping them to increase productivity through proper pricing of their produce.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

A zone of lying low terrain which is inundated at different periods throughout the year is called 'Haor'; it is a Bangla word; in Bangladesh, haor indicates a geographical site with unique characteristics (Sarif *et al.*, 2016). Animal protein is important for everyone for their mental and physical development which helps to improve human productivity, reduce high infant mortality, child malnutrition and other diseases (Alam *et al.*, 2016). Bangladesh is an agricultural country (Islam *et al.*, 2016). In Bangladesh, available animal albuminoidal sources are cows, buffalo, fish, ram, goat, and chicken, where duck contributes as a major source of protein and considers as a crucial farming component for the rural economy (Alam *et al.*, 2016). Considering total production (270.71 million), duck contributes about 16% (42.68 million) of production, taking place just after poultry chicken of population chart in the country (Ike, 2011). Poultry is a crucial component of the country's husbandry and it contributes overall GDP at 1.6%; in comparison to chicken, duck comes second in terms of egg and meat production; in most low income countries, it aids savings-less poor owner of families in escaping poverty (MoF, 2021). In haor areas, ultra-poor rural women are involve in duck rearing whatever is regarded as their significant resources and their revenue sources (Khanum and Mahadi, 2016). Duck required less care and low inputs for their management and they required marshy plains, haors, stream, pools, and cannel are all inborn aqua frame that can be used; Bangladesh having about highly worthy one-ninth of base ground as for duck cherishing (Islam *et al.*, 2016). In Netrokona, duck rearing has great prospect because it has massive ground of aqua bodies therein water taken place around several of the month in the year; these water bodies contain important feeds for ducks such as snails, worms, fishes, weeds, and abject crop plants, which remains great potentiality in duck production through better feeding and management (Zannat *et al.*, 2018).

The number of ducks in Bangladesh has been estimated to be 45.12 million, with the majority of them being home-bred; besides chicken, duck farming has become an obligatory segment of Bangladesh's economic landscape (Islam *et al.*, 2016). It has some

important focal points such as: duck management is simple and beneficial, they are little perilous breed as spare counteraction boundary of disease, they have longer economic egg-production life and eggs are heavier and show signs of improvement value, they require less care and inputs, taking meal of pests and snails, the general public prefers duck meat because it is very tasty; as indicated by a report of FAO, in terms of meat and egg preparation, Bangladesh's duck plays a significant role among the Asian nations (Islam *et al.*, 2016).

Bangladesh faces some major problems that of lower productivity of duck and inefficiently allocation of the resources (Onyenweaku and Effiong, 2006). Large costs of produces, lower benefits, and exalted feed costs are also indicators. Rather than maximum produces that intensifying of resources, Bangladesh's livestock breeding enhanced due to mean prolongation, that implying insufficiency of the current production and stocks flows, hence this need to provide duck farmers a current inclined and obligatory fact as support a sustainable duck enterprise in Bangladesh (Ismat *et al.*, 2009). The resources use efficiency concept is allied to the correlative representation of the procedures to changing conferred inputs into yields; the government has backed Bangladesh's attempts to attain food and income safety by embodying the Agricultural Development Strategy and Investment Plan (DSIP) and maximizing subsistence living with duck rearing (Hassan, 2018).

Efficiency is a concept that quantitatively measureable by the ratio of useful output to total input; technical, allocative, and economic efficiency are the three basic categories of efficiency (Parikh and Shah, 1995). “Technical efficiency refers to the ability of firms to employ the best practice in the production process so that not more than the necessary amount of a given set of inputs is used in producing the best level of output” (Parikh and Shah, 1995). “Allocative efficiency refers to the choice of optimum combination of inputs consistent with the relative factor prices” (Ojo, 1993). On the contrary, “Economic efficiency is the ability of a farm to maximize profit” (Onyenweaku *et al.*, 2006).

## **1.2 Research Question**

The specific research questions of this study are:

- What is the socio-economic status of duck farmers in study areas?
- Are the duck farmers efficient in duck farming?

- Which factors affect the efficiency of duck farms in the study areas?

### **1.3 Research Objective**

This study's particular objectives are as follows:

- To determine the socio economic status of duck farmers in study areas;
- To analyze the technical efficiency of duck farms in study areas;
- To examine the sources that affect technical efficiency among duck farms in study areas.

### **1.4 Justification of the study**

Kendua and Modon, two upazilas of Netrokona district, are more likely to benefit from duck rearing as haor areas are base for domestic duck rearing and where most of the haor area of riverine Bangladesh is in Netrokona. This research seeks to study the existing status of duck farm system and technical skills of farmers in some areas of Haor basin in Netrokona. The haor area is somewhat neglected and the traditional agricultural livelihood of the people of this area is very low. They cannot meet their daily needs properly for their low-income and larger families. In rural life men engage in crop weaving on the other hand women and children have consecutively been active in rustic duck rearing as the greatest acceptable source of income for impoverished and miserable women and kids. Starting a farm with a small number of ducks may reduce the production per bird, but it will play a significant role in improving their quality of life when the distribution of benefits is more even and it will have a huge impact on human development in the country as a whole. Duck farming can be used extensively to alleviate poverty by raising it because the cost of raising duck is relatively low, even less skilled people can do it, as well as its productivity is high and it may be integrated into home chores as well.

Netrokona is at the leading position of agricultural production. So far there have been various studies on different agricultural products in the haor enclosed areas of the district where emphasis has been laid on other topics such as identification of technical skills. However, little research has been done on the socio-economic status of duck farmers in the region and their technical efficiency in duck rearing. Therefore, the importance of this study is to analyze the technical skills of the duck farmers in the haor field of Netrokona by identifying their perceived problems and future prospects in duck rearing. During the

monsoons, the haor area is submerged where there is ample opportunity for fishing. On the other hand, people in these flood prone areas are trapped in water when they can concentrate on raising ducks which gives them extra income where there is no need to worry about raising chickens. Small and landless farmers can use the haors for regular duck feeding at low cost during this time. As a result, if people are engaged in duck farming in a short period of time, their income will increase and their nutritional needs will be met. The bare minimum of subsistent conditions will be developed. This isolated approach will help them become self-contained and manage hazardous environment. The present socio-economic condition can also be viewed here. It will also evaluate the present socio-economic condition which affecting the duck farmers of haor areas. The outcomes of the study will be applied to raise duck industries' outputs, as well as family's nutrition and economic security, by carrying out the proper actions in the correct manner. Overall, it will add some valuable information to haor based research. The study will also help the government and various NGO organizations to take valuable policies in the marketing channel of haor areas.

### **1.5 Scope of the study**

The technical skills of the duck farmers of Netrokona have been explored for research. Significant features that affect the TE scores are accurately represented by the existing socio-economic status of the farmers and the overall condition and characteristics of the farm to achieve maximum productivity of the farmers through minimum input usage. This study is special in Netrokona district was confined to areas where farmers, with the support of various institutions and the government, engaged themselves in large-scale duck production projects. The haor areas of the Netrokona rely heavily on duck farming because it is a high-volume operation needed minimal ground, flooded terrain and a variety of low-lying regions which are swamped with aqua in various months of a year. A standardized questionnaire was exercised to interview a sample sized of 80 farmers.

### **1.6 Structure of the Thesis**

Structure of the thesis contains six basic chapters; introduction, review of literature, research methodology, socioeconomic characteristics of the samples farmers, results and discussion, summary and conclusion. The first chapter discusses about the study's background, study questions and objectives, justification for the investigation, and overall



framework. The review of literature will be submitted in the second chapter. The research methodology as well as the linked study's analytical procedures of the relevant study will be presented in the third chapter. The fourth chapter will explain socioeconomic characteristics of the samples farmers. The fifth chapter will organize by results and discussion of the study. Finally, chapter six will conclude with study summary.

### **1.7 Chapter Summary**

The backdrop of the study, research questions, aims, and organization of the entire document are described in this chapter in an attempt to provide a first glance at the work.

## **CHAPTER 2**

### **LITERATURE REVIEW**

The purpose of this section is to offer an elaborate discussion on the relevant literature related to socioeconomic status of farmers and technical efficiency. Besides this, the chapter provided a summary and research gap based on the literature.

#### **2.1 Literature reviews on socio economic status of farmers**

Features of the socioeconomic system (respondent's age, education, marital status, farm size, areas of respondent, religion and credit assess) indicates farmer status of farming activities:

##### **2.1.1 Age of the respondent**

Age was an important socio economic indicators as status in the study area of farmers. A number of studies considered age is an important factors of farm output; for example, Guancheng *et al.*, (2015) studied that aging is associated with a positive impact on agricultural output and explained that older farmers can easily cope with various adverse effects of agricultural changes that enhance output than younger one. Whereas, FAO (2014) study showed involvement of youth in agriculture could increase productivity because they are more focused and able to taking risk related to production. According to Khan *et al.*, (2010) and Hasan (2008), farmers who are juvenile are over proficient to those who are older. Sarker *et al.*, (1999) also found a similar results as the productivity of younger farmers is higher. Above literature shows that age of the respondents works as an important socio-economic characteristics.

##### **2.1.2 Education**

Farm propellers who were familiar with farm regulatory concepts were better able to make smart agricultural decisions, which allowing them to tackle economic challenges with higher revenues or lower expenditures (Johl & Kapur, 1987). Whereas promoting a successful and efficient change for small businesses group learning was more effective for the farmers (Kilpatrick, 1998). According to Abbott and Mekeham (1988), farmer with a formal education and his knowledge about production methods, transportation, packaging and handling, mode of selling and quantities aids the buyer in determining the utility of a product. Alderman and Chishti (1991) stated that there was a link discovered

between women's educational attainment and their engagement in additional domestic operations.

Women of rural areas involved themselves to poultry production. Thus educated women as a farmer are more efficient than the uneducated farmers in decision making and managing several farm activities. Zahan *et al.*, (2016) studied a sample of 120 people in Bangladesh and explained that educated farmers were more conscious about duck production and they were interested to gather knowledge on duck rearing to improve productivity. According to Rhodes (1983), a farm's profitability is a critical aspect in its success and an educated farmer could increase his output and gain profitability by proper application of his knowledge. Khan *et al.*, (2010) stated that farmers' education and experience might significantly cut inefficiencies on the farm. Mohapatra (2013) studied that a favorable and significant association existed between agricultural sagacity and school knowledge in terms of boosting technical efficiency. Education, according to Khai and Yabe (2011), is the most essential component that has a favorable influence on technological levels of farm proficiency. Agricultural policy, on the other hand, did not assist farmers in cultivating their land more effectively, then in terms of alternative technological efficiency levels, education aided the agricultural job. From the above literature we can say that education plays an important socio-economic characteristics of the respondents.

### **2.1.3 Marital status**

The amount of engagement in agricultural operations is determined by rural farmers' married positions. Rural poultry production involved entire family where the key decision makers were women who contribute to the family's financial well-being by utilizing returns accruing from poultry (Mengesha, 2013). According to Kishore and Gupta (2009), impoverished female-headed households are more economically susceptible than male-headed households due to a lack of education and work prospects. Khanum and Mahadi (2016) studied a sample of 80 women duck raiser where they concluded that women's financial empowerment in rural regions might be aided by their participation in duck breeding farms as well as in their family. According to Desina and Djato (1997) the married women's efficiency was comparable to men's that provided empirical support for efforts to eliminate bias against women farmers in rural agriculture. Above literature

shows marital status of the respondent works as an important socio-economic characteristics.

#### **2.1.4 Farm size**

Different sizes of farms was considered by different studies as an important factors of socio economic status. Ali *et al.*, (2018) stated that farm size and area were directly affect the farm productivity. Thus production of poultry in small scale is distinguished by its high expenses of transactions (Adrian and Michael, 2009). Economic growth yet stimulated by their production and in some developing countries technology growth has positively impacted on intensifying the production of poultry (FAO, 2014b). Additionally, Uddin and Dhar (2018) collected data from 120 sample and showed that the farmers who have no or less land for production were most vulnerable than the large scale farmers. An owner of large farm took various risk on started their activities, cope with price changes and several natural calamities. Parvin and Akteruzzaman (2012) estimated a result that agricultural revenue was considerably influenced by the magnitude of the farm. Furthermore, Adedeji *et al.*, (2013) discovered a strong and substantial association between farm size and technological proficiency.

According to Sarker *et al.*, (1999), farming of poultry or duck was a profitable business and compared to other farm the large farmer were the most profitable. Pasour (2001) also found a similar result that the large farms were more profitable to small farms. However, Ajibefun and Abdulkadri (1991) stated that the readily attainable resources did not always imply effectiveness, since farmers who utilized land, labor, and capital less exquisitely were more efficient in their utilization than farmers who used them more intensively. According to the research review above, the respondents' granary magnitude is a significant socioeconomic feature.

#### **2.1.5 Areas of respondent**

Ali *et al.*, (2018) stated that farm area were directly affect the farm productivity. Gmark Consulting Ltd. (2013) conducted a research to determine the current state of duck rearing which result showed 80% of haor farmers that implying that the national supply of duck egg and meat are mostly meted from haor region. Above literature shows that areas of the respondent plays a vital role as a socio-economic characteristics.

### **2.1.6 Religion**

Religious traditions play a significant role in identifying technological effectiveness. Tanko and Ismaila (2021) stated that a strategy to agriculture technology spread that integrates culture and religion in order to increase technological efficiency. Above literature shows that religion of the respondent works as an important socio-economic characteristics.

### **2.1.7 Credit access**

Duck farming is an important source of meat for those suffering from deficiency diseases, as well as a vehicle for job creation and financial stability (Raha, 2007). According to Natukunda *et al.*, (2011), rural duck farmers had nice potentiality in development of the assembly sector by converting to a semi-intensive manufacturing system with a focus on production based on demand by sceptored them through coaching and credit interventions. Hoque and Rahman, (2004) stated that women who rearing duck could offer a similar financial gain as a day laborer.

Sarif *et al.*, (2016) investigated the socioeconomic situations of Bangladesh's vulnerable haor people wherever they declared that accessibility of low price credit may facilitate to boost the support conditions of haor individuals and additionally increase their long haul productivity on agriculture. Additionally, Jha *et al.*, (2016) explained that beside expertise and education of farmers, credit access up the living normal of individuals in haor areas through synchronizing agricultural activities.

Since less expensiveness, less skilled requirement, higher productivity its universal adoption of duck raising is a good candidate and can be included into social unit activities (Rafique and Rajib 2005). This sector had vast potentialities for the country in terms of gratifying fundamental wants, keeping the value at a minimum, ensuring animal protein as food for the individual, as well as having country's great potentiality in terms of dynamic support by lowering livestock's meat consumption, eventually, this will have a favorable influence on the country's GDP growth rate (Ahmed *et al.*, 2009). For combination data, Ele and Nkang (2014) found that mesh size, credit, motorization, and labor all were critical factors at the 5% level. Credit, on the other hand, was unimportant during the dry season, but mesh size was unimportant during the rainy season. The credit

sign coefficients did not match the expected values a priori. Credit access of the respondent works as an important socio-economic characteristics from above literature.

## **2.2. Literature reviews on Technical efficiency**

Several research were being conducted on technical efficiency of farmers and examined of various important factors that affect technical efficiency related review:

### **2.2.1 Technical efficiency**

Farmers' technical efficiency was comparing with its outputs and inputs optimal and observed values (Aigner *et al.*, 1977). Whereas observed output levels were compared to potential output and the least potential input necessary to create the same amount of output was compared to observed input levels (Kumbhakar and Lovell, 2000). To determine the duck farmers' technical and economic efficiency, the maximum likelihood estimation (MLE) approach was applied to a stochastic frontier production function. The Cob Douglas stochastic frontier model was used in various research to examine technological efficiency (Ezeh *et al.*, 2012; Ike, 2011; Mor and Sharma, 2012; Shapiro, 1977; Ma *et al.*, 2018; Hariqbaldi *et al.*, 2014; Usapfa, 2015; Hassan, 2018; Schmidt, 1974; Zellner *et al.*, 1966; Haung and Bagi, 1985; Mirakzadeh *et al.*, 2010). According to Ashagidigbi *et al.*, (2011), technical efficiency refers to how "effectively" a production unit uses resources that change throughout time to maximize profit, and is determined by the availability of the most advanced manufacturing technologies, degrees of fixed factor, product, sources, and output pricing. Economic efficiency, often known as overall efficiency, was the capacity of a farm to accomplish the right thing in the right way by combining technical and allocative efficiencies (Bogetoft, *et al.*, 2006).

Schmidt (1974) stated that the small holder agricultural farmers in were primarily impoverished, yet they are quite good at distributing their resources. Productivity improvements required new technology and inputs to update the production frontier once they were efficient. In addition, Zellner *et al.*, (1966) explained that productivity improvement was possible by greater cost-effective way of using farmers' resources using the technologies available. This findings is analogous to the findings of Haung and Bagi (1985). Farrell (1957) stated that technical efficiency will be rotten into 3 parts: scale efficiency, congestion and pure technical efficiency. If farmers cultivate their product

inefficiently using the current technology, it is more cost effective to use it than to apply new technologies (Bravo-Ureta and Pinheiro 1985).

Technical and allocative efficiency were frequently used to categorize economic efficiency. Allocative efficiency attempts to grasp a farmer's potential to optimally employ resources with varying costs, whereas technical efficiency assesses the farmers' skills to generate the highest production with accessible technology (Farrell 1957; Coelli *et al.*, 2005). According to Yusuf and Malomo (2007), the efficiency status of individual farmers was necessary to investigate for the creation of different programs aimed at improving duck as a source of income. Above literature shows the technical efficiency of the respondents.

### **2.2.2 Factors affecting technical efficiency**

Farmers efficiency were affecting by various factors, from empirical studies it could be classified as conventional and non-conventional. Loan accessibility, labor availability, extension facilities, family size, as well as dependents ratio variables were explored by Otuniya *et al.*, (2015) and Bakunmil and Yusuf (2015). Additionally Xu *et al.*, (2009) study found size of the farm, length of tenure, and distance from home are all consider as socio-economis factors in one way or another affects productivity. Frisvold and Ingram (1994) stated that agriculture had a positively significant export coefficient, according to a production function for agriculture in its entirety with calculated factors of agricultural growth. Pender *et al.*, (2004), on the other hand, look at the influence of market access on farming intensification and crop yield.

Various study considered efficiency and productivity interchangeably to the measurement of performance of farmers. Natukunda *et al.*, (2011) study found such sources as cost of feed-chicks, vaccination cost, and market distance were affecting the profitability. Information unavailability were caused the failure of new entrants to make decisions in the poultry business thus continuously falling in this trap where, despite the fact that factual data on productivity and efficiency in effective poultry layer production is available (Ashagidigbi er al, 2011). However, Cohen (1950) stated that farmer's productivity produced depend on available resources to generate particular level of output and these two phenomena are not the same. On a given production frontier, assessment of efficiency entailed comparing real output to the ideal output (Aigner *et al.*, 1977). Berger

and Humphrey (1997) found four different methods to identifying the best frontier practice which helped in estimation of relative efficiency scores. Farrell (1957) studied technical and allocative efficiency are formed productive efficiency which indicated possibility of the cost minimization in production by finding the best input combination for each given output level. In a study of variables impacting farm management performance in industrial poultry production, Mirakzadeh *et al.*, (2010) discovered that female farmers have worse farm management abilities than male farmers. As a result, female farmers should be taught how to run their farms.

According to Forsund *et al.*, (2008), the ratio of inputs and output of a production unit determined its productivity. Richmond (1974) also explained that technical efficiency is represented of the maximization of a small holder farmer's potential yield from a particular combination of inputs. Timmer and Peter (1971) investigated an efficiency's output-oriented approach through posing the issue of what amount of output can be produced without changing the quantity of input used by making better use of the existing inputs. Tadessea and Krishnamoorthy (1997) study found that a growing returns-to-scale parameter that is not equal to unity. Additionally, Ajibefun *et al.*, (2002) found farmer's inefficiency raised by farm size, experience, age, hired labor ratio to total labor as well as with increasing inefficiency, years of experience and education remain dropped. However, According to Binuomote *et al.*, (2008), it is feasible to increase production by boosting efficiency without using new technologies or strengthening the resource base. Tijani (2006) found that the revenue of off-farm and the use of traditional land preparation methods was significantly and positively correlated with technical efficiencies. Leibenstein (1975) stated that the relative significant of different factors of firm efficiency had been a spirited exchanger and it is considerable to measures efficiency from both theoretical and applied economists. The above literature illustrates the aspects that influence the respondents' technical efficiency.

### **2.3 Summary and Research Gap**

From several literature reviews, most of the studies evaluates that the farmers are technically efficient and they use their resources efficiently as maximizing output through a given level of inputs. Different factors of TE such as age, sex, education, marital status, religion, farming status, years and farming experience



all have a significant impact on farmers' technical efficiency. Additionally, Literature explained different factors that affect farmer efficiency of production. However, most studies considered technical efficiency of different agricultural commodities such as livestock, fisheries, poultry; and very few studies considered to analyzing technical efficiency of duck on the haor areas. Moreover, researcher consider fisheries sectors on haor areas as to examine the technical efficiency in Bangladesh; whereas an important improving sector, duck production are founded less considerable in several haor based research in Bangladesh. From the above literature, it implies that this is a crucial sector which affect technical efficiency of farmers and overall economy of Bangladesh.

## **CHAPTER 3**

### **METHODOLOGY OF THIS STUDY**

#### **3.1 Chapter overview**

This section's main goal is to list all of the methodologies which is undertaken on this paper to reach the objectives of this study. A simple description of research methodology for both qualitative and quantitative research is included initially in this part. The paper's methodology is then described in depth including research design, data sources, designing of questionnaire, selection of population and sample of the study, techniques of data analysis are given gradually. Finally, in order to rationalize the different methods used in different stages of the study, a justification of study methodology is also provided.

#### **3.2 Selection of the Study Area**

In every research project, choosing the right subject area is crucial. In any research, a study area is selected where all the objectives will be fulfilled. For this study the haor areas was selected which is under two specific upazilas, namely, Kendua and Modon in Netrokona district.

The objectives of the study is fulfilled by selected this area. Specifically duck rearing at haor areas is common, however adequate study were not being conducted in this areas. Therefore haor areas of Netrokona is being selected to analysis technical efficiency of the duck farmers. Inside these two upazilas, the information was gathered from numerous communities. The people of the area have diversified earning sources. There has a haor which was the main component in the study. A large number of populations of the area depend upon rearing duck in conveniently on haor open water body. Besides they are also cultivating crops, catching fish and doing many non-farm activities. The villages are just 8-10 km away from Upazila Headquarter. Thus, the area is also convenient to collect necessary data.

#### **3.3 Selection of the Sample and Sampling Technique**

It is not possible to collect data from all the populations because of our time, budget and labor limitations. Thus, a sampling has been done to conduct the study. Purposive sampling was used to pick 80 samples because duck rearing is a key encroachment in the research region due to the high densities of population; this necessitates a multifaceted

strategy to bolstering household economic well-being. The research will add to the scant literature on duck farmer efficiency. From the study area, 58 sample respondents have been selected from Kendua upazila and 22 sample respondents have been selected from Modon upazila.

### **3.4 Preparation of the Interview Schedule**

The timeline for the interviews was meticulously planned for collect all types of data to fulfill our study objectives. A draft schedule was prepared and tested by several expert hands and farmers. Irrelevant questions were excluded and included omitted ones. Then a final questionnaire schedule was developed for the collection of data.

### **3.5 Method of Data Collection**

The researcher himself conducted whole survey. Primary data has been collected by the researcher after going to the respondent with the prepared interview schedule. Most of the farmers are illiterate and ignorant about the research system. As a result, a quick summary of the study's goals and objectives was provided. There was no recorded information with the farmers. Thus, the farmer's memories are primarily relied upon by the researcher. The data were collected at the leisure times of the farmers. After collecting all the data, a brief overlook upon the questions was given to identify any misses. If there was any missing or misunderstanding, requisitioned has been done. The local criteria were used to determine the unit. It was transformed to an international standard unit during the tabulation process. Lastly best effort was given to collect as correct information as possible. Data were collected during July to September 2020.

### **3.6 Summarization, Tabulation and Analysis of Data**

The information was thoroughly examined. All interview schedules were reviewed further to see whether there is any inconsistency or not. Irrelevant information was deleted and appropriate coding was done. Then all the information was transferred to excel master sheet.

### **3.7 Analytical Technique**

Quantitative analysis is used to analysis data which helps in assessing performance and evaluating financial instruments. It encompasses regression analysis as a main techniques of measuring data. This statistical methods as an analysis technique is a set includes linear programming and data mining are two techniques for evaluating connections

between a dependent variable and one or more independent variables. Analyses in tabular format was mostly used in the process because it is easy to use and understand. Descriptive statistics like mean, mode, variance, standard deviation has been used for analyzing socio-economic condition of duck farmers and technical efficiency will be analyzed by using Cobb-Douglas function.

### **3.7.1 Stochastic frontier production function**

Since Aigner et al., (1977) first proposed the Stochastic Frontier model; it's been around for quite some time. The model was expanded by Battese and Coelli (1995), who proposed that the technological efficiency impacts may be described as a linear function of explanatory variables indicating farm-specific features. Indicating the efficiency with which resources are used this model may depict the connection between an output and an input. The error term is also decomposed into a two-sided random error and a one-sided efficiency component in this model.

By assuming the presence of technical efficiency of production, the model may estimate individual technical efficiency of duck farmers as well as drivers of technical efficiency at the same time. TE has a range of 0 to 1. TE = 1 denotes that the farm is technically efficient since it is producing on its production frontier (Battese and Coelli, 1995). Technical efficiency is a measure of how efficiently duck farmers use their resources in this research.

In this study, technical efficiency is an estimate of resource-use efficiency by duck farmer. The stochastic production model can be written as:

$$Y = f(X_a ; \beta_i) + e^E$$

Where,

$Y$  = Quantity of duck produced (Number)

$X_a$  = A vector of explanatory variable

$\beta_i$  = Vector for unknown parameter

$e$  = error term

$E$  = stochastic disturbance term consisting two independent elements which are  $U_i$  and  $V_i$   
; Where,  $E = U_i + V_i$

$U_i$  = one sided efficiency component

$V_i$  = non-negative unobservable variable associated with the TE of duck production

The random error  $E$  represents random variation in the economic environment, measurement errors and omitted variables from the functional form. Then the frontier of the farm is-

$$Y = f(X_a ; \beta_i) + E$$

Efficiency for each farm calculated as:

$$U_i = f(Z_b ; \delta_i)$$

$Z_b$  = vector of farm specific factors

$\delta_i$  = vector of parameters

Microsoft excel software was used to log all input data before creating a data file for the program to use. STATA 16 was used to analyze the data to find out the co-efficiency.

The function can be summarized as:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \dots + \beta_n \ln X_n + E$$

$Y$  = Number of duck produced

$\beta_0$  = the coefficients of output elasticity

$X_1$  = duckling number

$X_2$  = labor cost

$X_3$  = feed cost

$X_4$  = vaccine cost

$X_5$  = housing cost

### 3.7.2 Determinants of Technical Inefficiency

It is also assumed that the efficiency effects are independently distributed and  $E$  arises by truncation at zero of the normal distribution with mean variance. Whereby:

$$U_i = \delta_0 + \delta_1 \ln Z_1 + \delta_2 \ln Z_2 + \delta_3 \ln Z_3 + \delta_4 \ln Z_4 + \delta_5 \ln Z_5$$

Where by:

$Z_1$  = farmers' age (years)

$Z_2$  = Marital status (0= unmarried, 1= married)

$Z_3$  = Educational status (1= literate, 0= illiterate)

$Z_4$  = Duck rearing experience (years)

$Z_5$  = Credit access (0= no, 1= yes)

$U_i$  = Technical efficiency

$\ln$  = Natural logarithm

The above model was developed to establish the components that contribute to the examination of technical efficiency and to evaluate the influence of socioeconomic variables on duck farmers' technical efficiencies.

### **3.8 Ethical issue of the study**

This study maintained and followed all the ethical issues relevant of the study. Before data collection farmer's appointment were ensured. Before beginning the interviews, the farmers were informed of the study's goal. The farmer had complete discretion over whether or not to participate in the interviews and avoided misleading questions were asked which might violate the confidentiality or privacy aspects. Somewhere a little chaotic situation had to be encountered but the researcher managed it very tactfully. Additionally, all information were collected for the Master's thesis and other than the research, I haven't used it for anything else.

### **3.9 Limitations of the study**

The biggest limitation of this investigation was the covid-19 situation. Due to pandemic situations, the targeted sample size was difficult to achieve. Additionally, during face-to-face interviews, the respondent had to take extra precautions when interviewing at home or at work. While collect data from respondents it was necessary to using mask and maintaining a certain distance. In addition, it was no longer possible to wait owing to the research project's deadline.

### **3.10 Chapter summary**

A clear conception of what and why of the methodology taken for the study was provided in this chapter. More specifically, a detailed description of techniques used and why they are used in each and every step of the study is provided in this chapter.

## **CHAPTER 4**

### **RESEARCH FINDINGS**

#### **4.1 Chapter overview**

The work's research findings are presented in this section. Farmers vary with respect to different socioeconomic variables which help to know the insight profile of the farmer. The behavior aspect of an individual largely depends upon his or her socio-economic situations. It also influences the decision making capacity and to choose between the positive and the negative ones. The purpose of this chapter is to give an in-depth review of the technical efficiency results and the sources that influence duck farmers' technical efficiency in the research region.

#### **4.2 Socioeconomic Profile of the Respondents**

In this context, the socioeconomic background of the sampled farmers particularly the age of the farmers, sex, education level, marital status, and religion of farmers, farming status, main reason of duck rearing, years of farming, land ownership pattern, and cooperative membership is discussed in this chapter:

##### **4.2.1 Age of the respondents**

Respondent's age plays a vital role in duck rearing activities. Age is considered as an experience. Besides it also indicates the position of a person in a household. In this study, all the selected farmers were classified into five age groups such as: between the ages of 20 and 29, 30 and 39, 40 and 49, 50 and 59, and above 60.

According to the Table 4.1, majority are (37.50%) belonged at 20-29 age group of farmers' age. Next 26 respondents (32.50%) belonged to 30-39 age category, 17 respondents (21.25%) belonged to 40-49 age category, and only 7 respondents (8.75%) belonged to 50-59 age category while none was above 60 ages.

Table 4.1: Percentage distribution by respondent age

Age categories	No. of respondents	Percentage of respondents (%)
20-29	30	37.50
30-39	26	32.50
40-49	17	21.25
50-59	7	8.75
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.2 Sex distribution of the respondents

The respondent's sex distribution also plays a vital role in duck production activities. In our country, most of the households are male headed. But female headed households indicate the empowerment of women the decision making ability in a households.

The men led most of households, as seen in Table 4.2. Only 33 households (41.25%) were female headed while 47 households (58.75%) were male headed. That was the indication of male dominant households.

Table 4.2: Percentage distribution of respondent by sex distribution

Categories	No. of respondents	Percentage of respondent (%)
Male	47	58.75
Female	33	41.25
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.3 Level of education

One of the most crucial socioeconomic elements for farmers is their respondent's education. Farmers can make the best decisions in duck production with the aid of education and its rearing activities more efficiently. It changes the outlook of a farmer and made his or her more rationale. It also influences the farmers about the adoption of



new technology and to use the scarce resources in proper way to get maximum production and ultimately to take the risky decisions.

It appeared from the Table 4.3 that most of the respondents (68.75%) have studied up to primary level of education that means they are literate. The Table also appeared that 12 respondents (15.00%) were illiterate who only can sign their name. On the other hand, 16.25% respondents have studied up to secondary level of education and no one has graduation and post-graduation degree.

Table 4.3: Percentage distribution of the respondent by education level

Categories	No. of respondents	Percentage of respondents (%)
Illiterate	12	15.00
Primary	55	68.75
Secondary	13	16.25
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.4 Marital status of the respondents

An important socioeconomic variable was considered the respondent's marital situation. As seen on table 4.4, only 13.75% respondents were single/unmarried, 1.25% respondents were divorced, 8.75% respondents were widowed and most of the respondents (76.25%) were married.

Table 4.4: Percentage distribution by marital status

Categories	No. of respondents	Percentage of respondent (%)
Single	11	13.75
Married	61	76.25
Divorced	1	1.25
Widowed	7	8.75
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.5 Religion of the respondents

In this zone, there were no variation in the religion status. According to table 4.5, all the respondents were Muslim and there was no other religious person.

Table 4.5: Percentage distribution by religion

Categories	No. of respondents	Percentage of respondent (%)
Muslim	80.0	100.00
Hindu	-	-
Others	-	-
Total	80.0	100.0

Source: Field survey, 2020.

#### 4.2.6 Farming status of the respondent

Farmers in the haor regions is someone who uses work and care to encourage plants, land, or crops that are growing in the low lying haor basin, as well as rear animals (such as cattle, fish, poultry).

Since the land in haor areas is mostly suitable for growing different kind of crops, farmers also involve themselves to duck production as a part time or full time basis. On the basis of data collection, table 4.6 depicts that only 10.00% respondents were involved at part time farming and most of the respondents (90.00%) were full time farmers.

Table 4.6: Percentage distribution of the respondent by farming status

Categories	No. of respondents	Percentage of respondent (%)
Part time	8	10.00
Full time	72	90.00
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.7 Main reason of duck rearing

The majority of people in the study region were involved in agricultural cultivation. During rainy season, the area goes under water. Then they have only fishing opportunities. As a result, during a moment of austerity, when farmers involved themselves in duck rearing activities, they can earn extra money as a recreational activities which helps them to rise up their income level. The minimum standard of living also be improved.

Table 4.7: Percentage distribution by main reason of duck rearing

Categories	No. of respondents	Percentage of respondent (%)
Extra income	73	91.25
Recreational	7	8.75
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.8 Years of duck rearing

Years of the farming plays a vital role in agricultural production activities. It is considered as an experience.

The Table 4.8 shows that most of the farmers (80.00%) experienced about 6-10 years of duck rearing. Next 5 respondents (6.25%) belonged to 0-5 year category, 7 respondents (8.75%) belonged to 11-15 years category, and only 4 respondents (8.75%) belonged to above 15 years category.

Table 4.8: Percentage distribution by farming years

Categories	No. of respondents	Percentage of respondent (%)
0-5 years	5	6.25
6-10 years	64	80.00
11-15 years	7	8.75
>15 years	4	5.00
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.9 Land ownership of the respondents

Farmers in developing countries like Bangladesh usually cultivate the land themselves as landowners, or work as laborers on the people's land.

The Table 4.9 shows that most of the farmers (92.50%) had own their land, only 5.00% were bought and 2.50% were rent their land of farming.

Table 4.9: Percentage distribution of the respondent by land ownership

Categories	No. of respondents	Percentage of respondent (%)
Own	76	92.50
Bought	4	5.00
Rent	2	2.50
Total	80	100.00

Source: Field survey, 2020.

#### 4.2.10 Cooperative membership of the respondents

Establishment of cooperatives helps to enhance farmers' production conditions, to improve power of bargaining and to help them to get benefit from upgraded value chains. In the study area, farmers are not related themselves to cooperatives. The Table 4.10 shows that the respondents were not the member of any cooperative societies.

Table 4.10: Percentage distribution of the respondent by cooperative membership

Categories	No. of respondents	Percentage of respondent (%)
Member	-	-
Non-member	80	100.00
Total	80	100.00

Source: Field survey, 2020.

#### 4.3 Stochastic frontier production function results

The stochastic frontier production parameters' MLEs (Maximum Likelihood Estimates) for duck are presented in Table 4.11. Five factors affecting the duck raising technical efficiency parameters which shows in the table were: Number of duckling, labor cost, feed cost, vaccination cost and housing cost for farmer of duck production.

Table 4.11: Estimated Stochastic Production Frontier for duck farmers in Netrokona

Variable	Co-efficient	Standard error	P value
No of duckling	0.1016***	0.0343	0.000
Labor cost	0.594*	0.0401	0.1
Feed cost	0.0268**	0.012	0.03
Vaccine cost	-0.045**	0.0207	0.02
Housing cost	-0.008*	0.033	0.1
Intercept	-0.533***	0.294	0.070
Diagnostic statistics			
Log likelihood = 174.90553;			
Number of objects = 80;			
Wald chi2(7) = 76620.81;			
Prob > chi2 = 0.0000.			

Source: Survey data (2020); “\*\*\*”, “\*\*”, “\*” indicates significant at 1%, 5% and 10%

**Number of duckling:** The result shows that the number of duckling is positively related with duck production and significant at 1%. The coefficient of number of duckling is 0.1016682 implying that a 1% increase in the number of duckling will results in a 0.1016 % increases the number of duck production when other inputs are constant.

**Labor cost:** The cost of labor is estimated of significant at 10% and positive for the production of duck. If the labor cost increases, the duck production also increases. Increasing labor cost means increasing labor work hourly and production increases when they work longer hours. The coefficient of the labor cost is 0.594961, which indicates that a 1% increase in the cost of man employed will result in a 0.59 % increase in the number of duck production given that other inputs remain constant.

**Feed cost:** The estimated coefficient of feed cost is positive and significant at 5%. The coefficient is 0.0268489 that means when given other inputs constant, a 1% increase of the cost of feed supplied to duck will result in 0.02 % rise in the quantity of duck production. Increasing feed cost means feeding the best quality food; that means increased feed cost increases production of duck.

**Vaccine cost:** The result of vaccine cost is negatively related with duck production and significant at 5%. The coefficient is -0.0456667 which means 1% increase in vaccine cost

decrease the production of duck by 0.0456 %. This is contradictory with some research. However, farmers in this study area indicated that when a duck was infected for any reason, then rest of the duck in that group also become infected as well as die, respectively. At that time, if the farmers increase vaccination cost it only increases the cost of production, in fact it does not increases the production of duck.

**Housing cost:** The coefficient of duck housing cost is negatively related to duck output and at 10%, this is considerable. The housing cost's coefficient is -0.0080485, indicating that if housing cost increases, duck production decreases. Many authors have argued against it. However, smallholder duck farmers said that increasing housing costs means increasing housing space. As space increases, production decreases, especially in winter when duck loses weight and is more likely to get the flu.

#### 4.4 Frequency distribution of technical efficiency

Duck farmers' average TE (technical efficiency) is 94%, which indicates on average 6% improvement still possible in farms production by proper utilizations of available resources in the study area. In production of duck, technical efficiency is estimated at the highest and lowest values of 99% and 56% respectively. No farm, however, was able to obtain a TE of 100% and it spread across the farms.

Table 4.12: Frequency distribution of technical efficiency level

Technical efficiency (%)	Range	Frequency (%)
0-20	0	0
21-40	0	0
41-60	2	1.56
61-80	0	0
81-100	78	98.44
Total	80	100
Highest technical efficiency 99 %		
Lowest technical efficiency 56 %		
Average technical efficiency 94 %		

Source: Computed from survey data (2021)

#### 4.5 Sources of technical efficiency in duck production

Table 4.13 shows the sources that influence technological efficiency in the duck industry. The technical efficiency sources analysis result in duck raising revealed as ages of the farmers, their marital status, duck rearing experiences, level of education, and credit access are at various degrees of risk statistically significant.

Table 4.13: Sources of duck production's technical efficiency

Variables	Coefficient	Std. error	t-ratio	P value
Age	-0.217***	0.0671	-3.24	0.002
Marital status	0.226**	0.087	2.60	0.01
Education(1=literate, 0=illiterate)	0.351**	0.173	-2.03	0.04
Experience	0.1607*	0.1049	-1.53	0.10
Credit access(0=no, 1=yes)	0.0345*	0.0887	2.51	0.10

Source: Survey data (2021)

**Age:** The coefficient of age is significant at 1% and negative. This indicates that increasing age would lead to decrease in technical efficiency in duck farming in the study area. In duck production, older farmers are more inefficient compared to the younger farmers since they are less energetic and duck production requires constant care and attention.

**Marital status:** The coefficient of marital status is positive and significant at 5%. This indicates that the married persons in the study area are more efficient than unmarried farmers. Probably it's reflecting greater availability of labor.

**Education:** The coefficient of education is positive and is significant at 5% that means the education of duck farmers is positively related to technical efficiency in the study area. In the efficiency parameters the educated farmers are likely to apply their learning more properly than the illiterate farmers. The duck production requires specific knowledge about farming and marketing of duck as well as general education.

**Experience of production:** The experience of duck production is positive and significant at 10%. In the study area, the experienced farmers more positively related to technical

efficiency than the inexperienced or less experienced one in production which affects long run farming and production of duck, reduces the cost per unit by improving resource-use efficiency.

**Access to credit:** The coefficient of credit access is positive and significant at 10%. This means that the duck farmer who has access of credit is technically more efficient than the farmers who have limited access of credit in this study area.

#### **4.6 Problems in duck rearing faced by the farmers**

In haor areas, duck rearing has become a very popular and lucrative business now. However, duck farmers has to face various problems at different times in raising duck.

The Table 4.14 shows that most of the farmers (66.25%) faced a common problem that is lack of input facilities, and rest of the duck farmers faced various problems at duck raising in the study area.

Table 4.14: Percentage distribution of duck farmers' problems

Categories	No. of respondents	Percentage of respondent (%)
Lack of input facilities	53	66.25
Lack of timely care and management	19	23.75
Lack of credit and loan facilities	5	6.25
Lack of extension and government support	2	2.50
Lack of proper pricing of output	1	1.25
Total	80	100.00

Source: Field survey, 2020.

#### **4.7 Chapter summary**

The duck farmers' socioeconomic position is depicted in this section as well as their technical efficiency and various sources which affecting TE in the study area. This study finds out five sources (age, marital status, duck rearing experience, level of education and credit access) that affects technical efficiency in haor areas of Netrokona in Bangladesh.



## **CHAPTER 5**

### **DISCUSSION**

#### **5.1 Chapter overview**

This section summarizes the research findings based on the study objectives: assessing the farmers' socioeconomic situation, evaluating duck farmers' technical efficiency, and investigating the causes that impact technical efficiency in Netrokona.

#### **5.2 Socio economic status of duck farmers**

As a method of improving lives, a considerable sum of Bangladesh's rural farmers are presently active in duck production. In Netrokona, duck rearing has great prospect because there are large low-lying areas of water bodies where water taken place around several of the month in the year, that remains nice potentiality in production of duck through higher feeding and management.

The above study shows that most of the farmers were between age group 20 to 29 and no one above 60 aged. This age group is significantly impact on farming proficiency through adherent in duck rearing. This group of people are more active than the other where duck requires constant care and management. In Bangladesh, rural haor areas are generally male dominated (Rahji and Falusi, 2005). The maximum households (58.75%) were male headed and rest households (41.25%) were female headed. In the study area, male are more active and successful in agricultural sectors than female. Education seems to have a greater favorable impact, rather than old ones, on current arable surroundings (Jamison *et al.*, 2002). In the study area, maximum farmers (68.75%) were literate who studied up to primary level of education. Education helps them to understand various agricultural challenges and modernizing agriculture with gathering proper information. Membership status of the respondents shows that there were no households who had membership of any cooperative societies. However, the cooperative societies helps farmers so that they can jointly tackle the constraints limiting their full involvement in duck production. Most of the farmers (76.25%) were married. There were no other religious farmers except Muslim in this area. Most of the farmers had their own land and experience for duck rearing in the study zone. In the research region, the farmers in a large number had their own property and duck-rearing experience.

### **5.3 Technical efficiency of duck farms**

The stochastic frontier production parameters' Maximum Likelihood Estimates (MLE) are applied to investigate TE. Five factors affecting the stochastic frontier production parameters of duck production which shows in the table were: Number of duckling, labor cost, feed cost, vaccination cost and duck housing cost for farmer of duck raising.

The farmers' technical efficiency of haor zones duck rearing is influenced by a number of causes in this research. The ducklings' quantity coefficient has a beneficial impact on technical efficiency; Usapfa L. (2015) and Ng'eno at al. (2010) also show the similar result. The elasticity coefficient of the labor cost is 0.59, this means that if the cost of labor rises, duck farmers' technical efficiency rises as well; Usapfa L. (2015) and Ng'eno at al. (2010) finding also consistent with this finding. Feed cost is a positive significant factor in this study, accounting for 5% of the total. Mor and Sharma (2012), as well as Hassan (2018), came to identical conclusions. The elasticity coefficient for cost of vaccination with 5% significant level is negatively proportional to ducks quantity. Findings from the two authors Ma *et al.*, (2018) and Ng'eno at al., (2010) show the positive relationship which is contradict of this findings. From survey data estimation, the coefficient of cost of housing is negatively related with duck production. This implies as raising the duck housing cost will lower duck output. This finding similar with the Usapfa, L., (2015) but Ng'eno *et al.*, (2010) and Ukwuaba and Inoni (2012) conclusions are in conflict.

Here, average technical efficiency (TE) of duck farmers is 94%, which indicates on average 6% improvement still possible in farms production by proper utilizations of available resources in the study area. In production of duck, technical efficiency is estimated at the highest and lowest values of 99% and 56% respectively. No farm, however, was able to obtain a TE of 100% and it spread across the farms.

### **5.4 Sources that affect technical efficiency**

The technical efficiency sources analysis result in duck raising revealed as ages of the farmers, their marital status, duck rearing experiences, level of education, and credit access are at various degrees of risk statistically significant.

From above finding it is showed that, the coefficient of age is negatively related to TE whereas other sources such as the coefficient of marital status, education, experiences,

and credit access positively affect the technical efficiency. Ezeh *et al.*, (2012) finding is similar with the findings as people become older, their technical efficiency decreases in where Echebiri *et al.*, (2006) finding disagrees with this result; their findings indicated positive relation to the age with production of duck. Married person are more conscious about their family earning and consumption. This determinants also affect TE positively. This result corresponds with the findings by Usapfa L. (2015) stated a positive relationship of marital status on TE. Thus, duck production requires specific knowledge about rearing and marketing of duck rather than general education. That resulted a positive impact of education on TE. In case of adopting and utilizing new technologies, proficiency is higher for literate farmers; this conclusion is consistent with that of Ogolla and Mugabe (1996) and Ezeh *et al.*, (2012). Ugwumba and Lamidi (2011) studied that experienced farmers are more efficient in production which affects long run farming and production of duck, reduces the cost per unit by improving resource-use efficiency. The survey result also agreed with this study. Ismat *et al.*, (2009) finding also correspond with this study which revealed that farmers' liquidity can be exalted and they can afford nicer accommodation if they have access to lower-cost loans, vaccinations as well as feeds as technical inputs.

### **5.5 Chapter summary**

The discussion in the preceding chapter is according to the study's empirical findings. This findings on duck farmers' socioeconomic status and this results on technical efficiency and various sources which affecting TE in the study area is discusses in this chapter.

## CHAPTER 6

### SUMMARY, CONCLUSION AND RECOMMENDATION

#### 6.1 Chapter Overview

Based on the empirical findings after analysis of data in previous chapter, this section shows whole study summarization, study conclusion, and its recommendation.

#### 6.2 Summary

The economic condition of Bangladesh is steadily growing towards development at a low to medium motion where livelihoods centered on different haor areas; haor areas have been neglected for a long time which can be considered as a major obstacle to national development. Haor represents a large part of the infrastructural development of Bangladesh, therefore it is difficult to expect overall progress of the country without the development of these regions. On the other hand, the haor zones of Netrokona covers a huge population which demands special vision and development. Some long-term plans can be adopted in the context of development of this particular region, keeping in view the challenges of temperature change.

Different identities of socio-economic such as age, religion, sex, marital status, education, farming status, years and experiences of farming greatly effect on technical efficiency of farmers. Additionally, Literature explained different factors that affect farmer efficiency of production. However, most studies considered technical efficiency of different agricultural commodities such as livestock, fisheries, poultry; and very few studies considered to analyzing technical efficiency of duck on the haor areas. Moreover, researcher consider fisheries sectors on haor areas as to examine the technical efficiency in Bangladesh; whereas an important improving sector, duck production are founded less considerable in several haor based research in Bangladesh. From the above literature, it implies that this is a crucial sector which affect technical efficiency of farmers and overall economy of Bangladesh.

The lesson exercised on 80 selected duck farmers from two upazilas of Netrokona district. A structured questionnaires were applied to gather information. The parametric stochastic frontier approach was applied to evaluate technical efficiency, on the other hand, the Logistic regression model was applied to evaluate the sources that impact technical efficiency. Socioeconomic factors with variety have been shown to have an

impact on technological efficiency such as Farmers' age, degree of education, sex distribution, marital status, religion, farming status, major purpose for duck rearing, years of farming, land ownership pattern, and cooperative participation are all factors to consider.

The researcher aim was assessing duck farmers' technical efficiency in the Netrokona's haors zones. The first objective was identifying the duck farmer's socio-economic status in Netrokona. This work found that most of the farmers (37.50%) belonged to 20-29 age group, where 59% household were male headed. Respondents had an average primary level of education, with experienced over 5 years of duck rearing. All farmers of this area were Muslim and cultivated their own land as a full time farmers. Most of the farmers rearing duck for extra income and they were not a member of any cooperatives.

The second objective was calculating the farmers' technical efficiency of duck farming in Netrokona haor zones. The key productivity drivers were found to be the number of ducklings ( $p < 0.1$ ) and feed cost ( $p < 0.01$ ). Most of the farmers were functioning at a high degree of technical efficiency, with the average being 94 percent. Whereas, duck production was shown to be positively correlated with the number of ducklings produced, but negatively correlated with the cost of immunization and housing. The output from duck rearing was influenced by other related inputs. It was directly connected to the majority of these parameters. Duck productivity, for example, is directly related to labor and feed costs.

In Netrokona, the duck farmers' average technical efficiency was being resulted of 94%, while the lowest and highest technical efficiency was 56% and 99% respectively. Socioeconomic factors with variety have been shown to have an impact on technological efficiency such as Farmers' age, degree of education, sex distribution, marital status, religion, farming status, major purpose for duck rearing, years of farming, land ownership pattern, and cooperative participation are all factors to consider. However, TE did not dominate through residual identities at this area.

The third goal of researcher was investigating the sources of duck farmers' technical efficiency in Netrokona. Respondent age, marital status, education, experience, credit access have direct impact on technical efficiency. Among this factors marital status, education, experience, credit access of the respondents significantly effect on technical

efficiency at a positive rate however increase of respondent's age cause to decrease the technical efficiency. In case of duck productivity respondent marital status, education, experience, credit access have positive significant relationship with it. These factors also have positive significant relation with farm output and farmer long term efficiency. Education, experiences, and access of low cost credit increase the possibility to cope with advantage technologies and taking risk for improve production.

Finally this study characterized the duck farmers of haor area, calculated their technical efficiency and identified decisive variables for duck rearing at haor zones of Netrokona. Future improvement is on duck production in haor area so much dependent on the opinions of rural duck farmers. Farmer's opinions on socio economic condition on haor areas can help to improve the position of farmer's livelihood. It may suggest improving the factors which directly affects the farmer socio economic status on the haor area.

### **6.3 Conclusion**

The duck production's technological efficiency in this region is pretty good, according to the Netrokona zone's results, is pretty high. The technical proficiency analysis shows that its average is 94 percent where the lowest and highest levels are between 56 percent and 99 percent respectively. It estimates that there is still a lot of room for duck farmers in the research region to enhance their productivity and revenue by up to 6% by improving the input proficiency they utilize at the scale of the farm. The research looks at the duck farmers' socio-economic position which is existing in the haor zones, as well as the amount of duck farming's favorable engagement. Finally, it can be concluded that the district's haor lands were ideal for farmers duck production. Duck raising is a challenging industry for women's empowerment in rural living, as it may both support household requirements while also providing opportunities for women to progress commercially. Due to a lack of infrastructure, poorly educated, landless impoverished farmers in the haor zone were found to be less protected in agriculture and livelihood. As a result, there is necessary being accelerate development by launching various initiatives, both governmental and private, to make the residents of Haor aware of the benefits of raising ducks. This will bring cooperative benefits to the farmers of haor zones. Increasing the participation of farmers in this system by announcing various incentive packages, limiting the price of duck inputs, identifying areas suitable for raising ducks, taking

timely measures to increase production and ensuring future prospects. In addition to benefiting from this, farmers need to be accustomed to nutritious food. Above all, the poorer, lower-class small farmers living in the haor zones of Bangladesh have great potential to improve their living standards through duck production. For this, farmers need to pay attention to all the issues that can have a positive impact on duck rearing through proper care of ducks, complete feeding, and regular vaccination. As a result, by providing quality products suitable for commercial use, the nutritional deficiencies of the entire country can be filled and exported abroad which will help in economic development and reduction of poverty of the people of the country. In conclusion, it is important to increase the skills of farmers by providing all kinds of training for raising ducks in a scientifically developed housing system and to encourage farmers to continue raising duck in the haor areas even at times when there is no water in the haor. Therefore, prominent haor area of Netrokona, farmers will improve the current position of duck farming.

#### **6.4 Recommendations**

In order to enhance duck farmers' technical efficiency against various backdrop from finding of the study, the following are recommended:

1. Supply of adequate input at low price and controlling markets as locally to secure quality inputs is important. Many duck farmers argued that they cannot get adequate input at reasonable price at reasonable time.
2. Credits and loan facilities should be made available to the farmers with lowest rate of interest to overcome different problems of inadequacy of capital. This will maximize their potential of duck rearing as well as enhance their secured nutrition contribution.
3. The farmer should be gained knowledge about proper care duck and timely management of inputs and other related services. They should be encouraged to form cooperative societies so that they can jointly tackle the constraints limiting their full involvement in duck production.
4. The extension officer at Upazila level should take some steps regarding the development of the duck farmer's farming systems through training program and implementation of different administrative and institutional projects being significant

ideas towards development of the *haor* area regarding the improve duck production with timely accessibility of credit.

5. Proper price of agricultural output produced from the *haor* farmers should be ensured. The linkage between the farm area and the market should be developed. Proper information regarding the market should be ensured.

### **6.5 Recommendations for further research**

It was to look at the duck farmer's technical efficiency and the factors that influence it were the subject to research. The aim of the study was to analyze the technical efficiency of duck production and determine socio-economic factors that contribute to technical efficiency of duck production in the Haor areas of Netrokona district. This study calculates the highest achievable production of a duck farmer based on resource costs and output prices' income. Particularly if resources are paid for by the farm while duck rearing as for business purpose and is significantly grasp for the farm to obtain maximum profits and theory shows the maximum output point at different form. The results of this study suggest that the haor area of Netrokona district is very suitable for duck rearing so there is a need for more research in this area to find out the full results of farmers & technical efficiency which the survey suggests. It is recommended that the further studies be done on the basis of different haor areas in Bangladesh. Also other studies can investigate the market condition of duck production in Haor areas and the problems of this production taking into consideration the technical issues.

### **6.6 Chapter Summary:**

The study's overall summary, its conclusion and recommendation is included on this section.



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**APPENDICES**

**TECHNICAL EFFICIENCY OF DUCK FARMERS IN SOME SELECTED  
AREAS OF NETROKONA DISTRICT, BANGLADESH**

**Questionnaire for Respondents**

Date: \_\_/\_\_/\_\_

SL No.: \_\_\_\_\_

Name of Interviewer:

Mobile No:

**FARMER'S BACKGROUND**

1. Gender : Male / female
2. Age : (years)
3. Marital status of respondent : Single / Married / Divorced / Widowed
4. Level of education : Illiterate / Primary school (1-5) / Secondary school (9-10) / above 10
5. Religion : Islam / Hindu / Buddhist / Christian
6. Are you a member of cooperative? Yes / No
7. If yes, what you benefited?.....

**A. FARMING INFORMAION**

1. Are you a part time or full time farmer? Part time / Full time
2. What was your main reason for duck farming? Extra income / Employ people / Recreational / Family consumption / Others
3. How long have you been involved in duck farming?.....years
4. Do you have land right where you practise farming? Yes/ No
5. How did you acquire the land where you farm? Bought / Traditional leader / Rent (lease) / Gift(inheritance) / other
6. If you bought or pay rent for the land, how much do/did you pay (Tk/Year)?.....

## B. ACCESS TO INPUT SUPPLY SERVICE

1. Types of inputs used to production:

Types	Amount	Unit price	Total cost	Source of input
Housing equipment				
Ducklings				
Vaccination				
Feed				
Labor				
Others				

## C. TOTAL PRODUCTION: CONSUMED AND MARKETED

1. Types of produce and marketed:

Type	Amount produced	Amount consumed	Amount marketed	Unit price	Revenue	Buyers	Market place
Duck							
Egg							
Others							

**D. ACCESS TO CREDIT**

1. Do you have access to credit for your business? Yes / No

2. If yes, please fill the table given below.

Source of credit	Amount	Purpose	Repayment (Yes/No)
Commercial Bank			
Cooperatives			
Micro finance			
Relatives/friends			
Local money lenders			
If others specify			

**E. GOVERNMENT SUPPORT**

1. Do you receive any form of government support, extension advice? Yes/ No

2. If yes, how does the extension officer help you? Inputs/ Production/ Marketing

3. State the type of assistance provided by extension officers :

.....  
.....  
.....

**F. MARKETING**

1. How many ducks do you produce per year?.....(head count)

2. Do you sell (none / some/ all) of the produced ducks?

3. Marketing costs when take product to the market:

Types	Transport cost	Sales tax	Others	Total cost
Cost estimated				

**CONCLUSION AND REMARKS**

1. Do you have any general problems with duck farming? Yes / No

2. If yes, what are these problems?

.....  
 .....  
 .....

3. Do you see any opportunity for new entrants and growth of existing duck farmers?  
 Yes/ No

4. If yes, where the opportunity and what do you need to take advantage of the  
 opportunity?

.....  
 .....

**END**