SONALI CHICKEN FARMING IN SOME SELECTED AREAS OF JOYPURHAT DISTRICT IN BANGLADESH: A FINANCIAL ANALYSIS

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CERTIFICATE

This is to certify that thesis entitled, "***SONALI* CHICKEN FARMING IN SOME SELECTED AREAS OF JOYPURHAT DISTRICT IN BANGLADESH: A FINANCIAL ANALYSIS** " 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 AGRICULTURAL ECONOMICS ,** embodies the result of a piece of bona fide research work carried out by **ARIFA AKTAR**, Registration No.**12-04945** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

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DEDICATED
TO
ALMIGHTY ALLAH
MOHAMMAD (SM)
&
MY BELOVED PARENTS

SONALI CHICKEN FARMING IN SOME SELECTED AREAS OF JOYPURHAT DISTRICT IN BANGLADESH: A FINANCIAL ANALYSIS

ABSTRACT

This study was carried out for the purpose of determining the socio-demographic profile of *Sonali* chicken farmers, financial viability, technical efficiency and problems of *Sonali* chicken production. For achieving these objectives, 60 *Sonali* chicken farms were selected randomly from Panchbibi upazila of Joypurhat District in the month of June 2019. Both tabular and statistical analyses were applied in this study. The study has shown that the total fixed investment was Tk. 15696 per 100 *Sonali* chicken. The total variable cost was Tk. 13866 per 100 *Sonali* chicken per year. The total cost of meat production per 100 *Sonali* chicken was Tk. 14953. The net returns over variable costs were Tk. 4834 per 100 *Sonali* chicken per year. The study also found that in producing *Sonali* chicken Benefit Cost Ratio (BCR), Net Present Value (NPV) and Internal Rate of Return (IRR) were 1.12, Tk. 16912.24 and 23.38 percent, respectively. The value of NPV was positive, BCR was greater than one and IRR was more than the prevailing rate of interest. This showed that investment in *Sonali* chicken farming was profitable in the study area. Sensitivity analysis suggested that the investment in *Sonali* chicken production is profitable even for returns decreased by 5 percent, costs increased by 5 percent and if both of those happen simultaneously.

The Cobb-Douglas stochastic frontier production function was used for this study to measure technical efficiency of *Sonali* chicken producing farmers. The coefficients of parameters like total labor, day old chicks were significant and indicated negative & positive effect on *Sonali* chicken production respectively. In the technical inefficiency effect model, experience had negative & significant coefficient indicating that this helps in reducing technical inefficiency of *Sonali* chicken farmers. The analysis revealed that the mean technical efficiency of *Sonali* chicken farmers was 88 % ranging from 81 % to 99 %. On an average, 12 % technical inefficiency appears which implies that the output per farm can be increased on an average by 12 % through *Sonali* chicken production using the prevailing technology and without incurring any additional production cost. This study also identified some of the problems associated with *Sonali* chicken production. Finally on the basis of findings of the study, some recommendations were suggested for the development of *Sonali* chicken production in Bangladesh.

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ABBREVIATIONS AND ACRONYMS

ABFL	Aftab Bhumukhi Farm Limited
ASA	Association of Social Advancement
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistic
BCR	Benefit Cost Ratio
BER	Bangladesh Economic Review
BRAC	Bangladesh Rural Advancement Committee
CHS	Closed House System
DLS	Department of Livestock Services
DOC	Day-Old-Chick
et al.	and others (at elli)
Etc.	Etcetera
FAO	Food and Agriculture Organization
FY	Fiscal Year
GDP	Gross Domestic Product
H.S.C	Higher School Certificate
i.e	(L. idest), that is
IOC	Interest on Operating Capital
i.i.d.	independently and identically distributed
IR	Interest Rate
IRR	Internal Rate of Return
J.S.C	Junior School Certificate
Kg.	Kilo Gram
ln	Natural log
Ltd.	Limited Company
MLE	Maximum Likelihood Estimation
M.S.	Master of Science
NGOs	Non-Government Organizations
No.	Number

NPV	Net Present Value
NPW	Net Present Worth
NRtc	Net return over total cost
NRvc	Net returns over variable cost
OC	Operating Capital
PBP	Pay Back Period
PLDP	Participatory Livestock Development Project
PROSHIKA	Proshikkon Shikka and Unnoyan Karma Suchi
P.S.C	Primary School Certificate
%	Percentage
(R:)	Rahmatullah Alaih [May Allah's mercy/blessing be upon him]
RIR	Rhode Island Red
SLDP	Smallholder Livestock Development Project
sq. km	Square Kilometer
S.S.C	Secondary School Certificate
TC	Total Cost
TFC	Total Fixed Cost
Tk.	Taka
TOC	Total Operating Cost
TVC	Total Fixed Cost
ULO	Upazila Livestock Officers
USA	United States of America
UAE	United Arab Emirates
V-AID	Village Aid Programe

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Bangladesh is the most densely populated country in the world with a population of 162.7 million (BER, 2018, p. xxxi). About seventy-five percent of the population lives in rural areas (BBS, 2018a). Bangladesh is an agro based country. Majority of the inhabitants are directly or indirectly involved in agricultural activities for their livelihood. There is a paramount importance of agriculture sector and rural area in Bangladesh to meet its diverse development challenges. There is a direct link between the agriculture sector and rural area. Agriculture sector is very important because most of the people of the country are living in the rural areas and have a direct link between the rural development and the development of our national economy.

Agriculture is of the production sector of the economy which comprises around 14.23% of GDP as a whole in the FY 2017-18 (BER, 2018, p.21) and 40.6% labor force are involved in agricultural sector (BER, 2018, p. xxxi). The agriculture sector is the major contributor to sustain food, nutrition and livelihood security of the large population of Bangladesh to achieve self-sufficiency in food production, reduce rural poverty and foster sustainable economic development. Agriculture occupies a key position in the overall economic sphere of the country in terms of its contribution to Gross Domestic Product (GDP). Figure 1.1 represents the sectoral share of Gross Domestic Product at constant prices (Base Year: 2005-06). The broad agricultural sector (crops, animal farming, forests and fishing) contributes 14.23 percent to GDP, provides employment about 40.62 percent of the labour force according to Quarterly Labour Force Survey 2016-17 (BER, 2018, p.20).

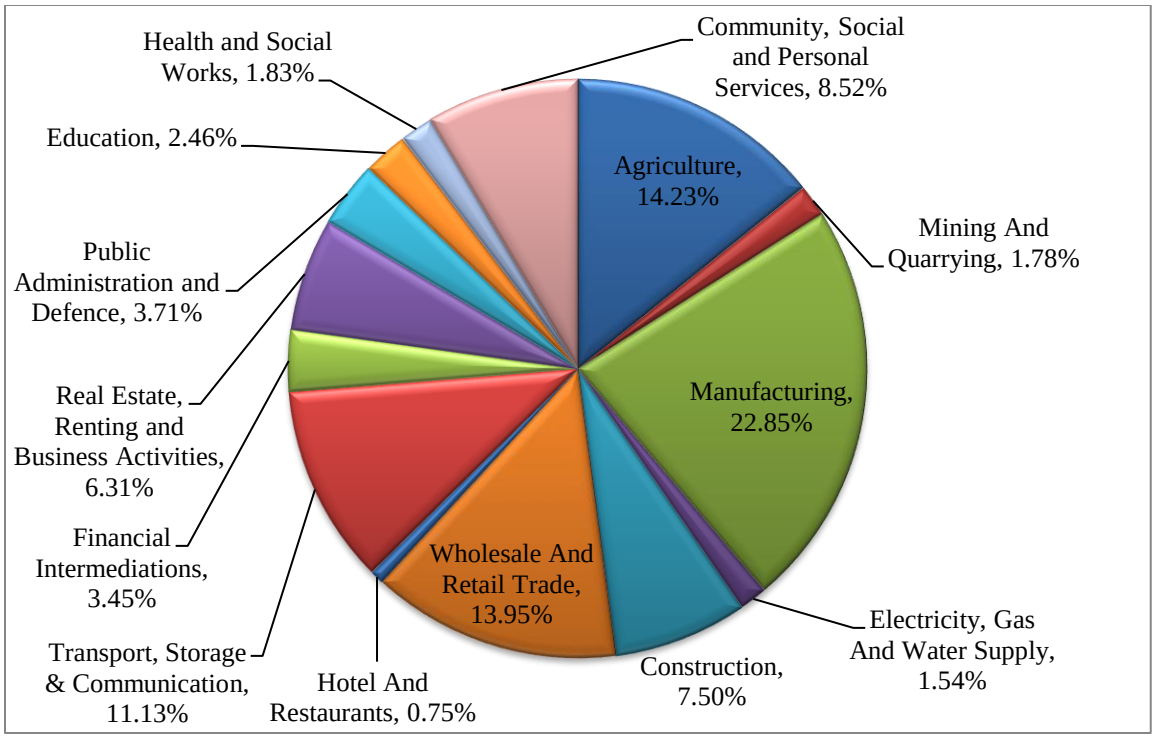

Figure 1.1: Sectoral Share of GDP at Constant Prices.

Source: BER, 2018, p.20.

An impact of climate change on agriculture has been keeping continuous pressure on food grain production. The high population growth with low growth in agricultural productivity and natural hazards adversely affect the living standards of the people in the country. Moreover, agriculture is the source of wide range of agricultural commodity markets, especially in rural areas.

An agro-based country like Bangladesh, poultry is one of the most important and promising sub-sectors having vital contribution towards her economic development. The contribution of animal farmings sub-sector in Gross Domestic Product was 1.60 percent in FY 2016 -17 and 1.53 percent in FY 2017-18 (BER, 2018, p.20). In 2017-18, animal farmings sub-sector contributed about 10.82 percent to the broad agricultural sector Gross Domestic Product (BER, 2018, p.20) (Figure 1.2). This sector plays a significant role in meeting the protein demand, earning foreign exchange and socio-economic development of the rural poor by reducing poverty through employment generation.

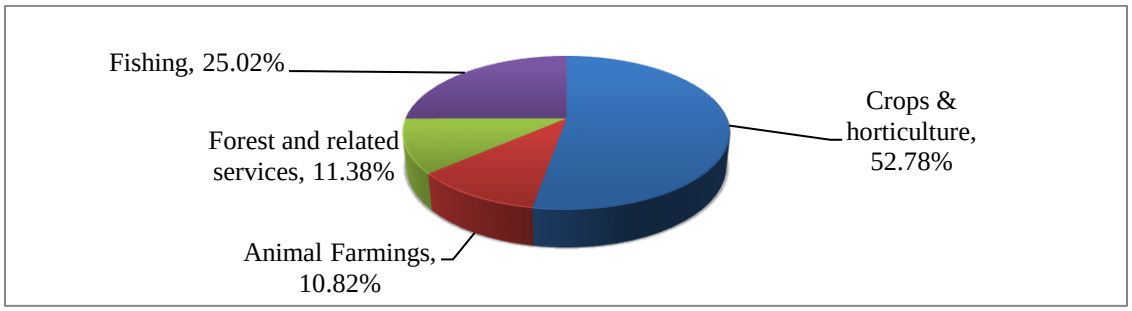

Figure 1.2: Sub-Sectoral Share to Broader Agricultural GDP in 2017-18.

Source: BER, 2018, p.20.

The rural people have been keeping indigenous chicken for centuries under semi-natural conditions mainly for their domestic consumption with very little commercial motives. At present, a large number of poultry farms have been established on commercial basis in and around the cities and towns and are operating under intensive management. Poultry meat can efficiently and rapidly fill in the shortage of body requirement. Contribution of Livestock sector was in Gross Domestic Product (GDP) 1.47 percent in (2018-19). Share of Livestock in Agricultural GDP was 13.46 % (DLS 2018-19). Table 1.1 shows Contribution of Livestock and Poultry in the National Economy of Bangladesh (2018-19).

Table 1.1: Contribution of Livestock and Poultry in the National Economy of Bangladesh (2018-19) p.

Contribution of Livestock in Gross Domestic Product (GDP) (Constant Prices)	**1.47%**
GDP growth rate of Livestock (Constant Prices)	**3.47%**
GDP volume (Current prices) (Crore Taka)	**43212**
Share of Livestock in Agricultural GDP (Current prices)	**13.46%**
Employment (Directly)	**20 %**
Employment (Partly)	**50 %**

*GDP calculated at constant price (Source: BBS); *p denotes Provisional; Prepared by Dr. Hossan Md. Salim, LE Section, DLS.

Source: DLS (2018-19)

The poultry industry in Bangladesh has emerged as the most dynamic and rapidly expanding segment of livestock economy as evident from the production level. Table 1.2 shows the increasing number of livestock and poultry population in Bangladesh.

Table 1.2 : Poultry Population of Bangladesh (in Lakh Number) from 2008-09 to 2018-19 p.

Year	Poultry Population in Lakh Number		
	Chicken	Duck	Total Poultry
2008-09	2213.94	412.34	2626.28
2009-10	2280.35	426.77	2707.12
2010-11	2346.86	441.20	2788.06
2011-12	2428.66	457.00	2885.66
2012-13	2490.11	472.54	2962.64
2013-14	2553.11	488.61	3041.72
2014-15	2617.70	505.22	3122.93
2015-16	2683.93	522.40	3206.33
2016-17	2751.83	540.16	3292.00
2017-18	2821.45	558.53	3379.98
2018-19	2892.83	577.52	3470.35

*p denotes Provisional

Source: DLS (2018-19)

Poultry sector is also most vital due to its contributions to national economy in the spheres of generation of local income, employment creation and improving the nutrition level.Poultry rearing is no more considered as low prestigious occupation fit for only weaker sections of the society. It has now become a full time job for many people and it is an attractive economic activity as well, especially to women and poor population. In addition, it can be adopted under diversified agro climatic conditions. *Sonali* chicken meat farming is more attractive to the farmers because it gives quick return to them.

1.2 History of Poultry Industry in Bangladesh

Poultry farming in Bangladesh was largely a backward venture in the past. People became interested in raising the chicken for their owen consumption. Commercial poultry rearing in Bangladesh is a relatively recent practice. In 1935 improved variety birds (White Leaghorn) were first imported in India from foreign countries. In Bangladesh raising of improved types of birds was first started in government poultry farms. In 1947, six poultry farms were first established in different places in Bangladesh for supplying eggs and chicks to the villagers. Since then, several small poultry farms had been established under Village Aid Programe (V-AID) for rural poultry development. In 1962-63, the Directorate of Livestock Services (DLS) also started about 91 small poultry units in 91 thanas with the objectives of supplying improved birds to the villagers. In 1964 a commercial poultry farm named Eggs and Hens Ltd. Was established at Gazipur near Dhaka city by Ekramul Hossain, which is regarded as a mother of commercial poultry farm in the private poultry sector. During 1968-69, the Department of Poultry Science of former East Pakistan Agricultural University, Mymensingh (Now Bangladesh Agricultural University, Mymensingh) brought day-old-chicks from Pakistan International Airlines & started poultry farming experimentally in the University. After the liberation of Bangladesh, BIMAN started a commercial poultry farm in the name of Biman Poultry Complex Ltd. At Savar, close to Dhaka city, to meet the flight catering needs of Biman, but it also fulfilled the demand for eggs of five-star hotels & also supplied day-old-chicks to private poultry farms to some extent. It reared ‘starbo’ parent stock of Savar Poultry Breeding Company of Canada. It is still in poultry business. During late 1980, the DLS took programme of distributing day-old-chicks to the villagers and farm owners through its various regional & central poultry farms. Science then, poultry production started taking shape of an industry with the establishment of a large number of small & large broiler and layer hatcheries.

1.3 The *Sonali* Breed

Between 1992 and 2001, several donors funded projects in Bangladesh, including the Smallholder Livestock Development Project (SLDP-1 and SLDP-2) and the Participatory Livestock Development Project (PLDP-1 and SLDP-2) (Dolberg *et al*.,2002), which involved nearly 1 million women ben eficiaries. These projects emphasized the rearing of cross-bred *Sonali* birds and encouraged other small-scale farmers in rural areas to become involved in the poultry sector.

The *Sonali* is a cross-breed of Rhode Island Red (RIR) cocks and Fayoumi hens and has a similar phenotypic appearance to that of local chickens; it was introduced in 1996–2000 in northern parts of Bangladesh, through these projects.

Sonali birds are well adapted to the country's environmental conditions so require less care and attention than other breeds, making them easier for women and children to rear (Saleque and Saha, 2013). Traders can sell *Sonali* at higher prices than local chickens. The *Sonali* population has been increasing and in 2010 about 150.9 million *Sonali* DOCs were produced, representing about 35 percent of the country's total commercial broiler and layer production (Huque, 2011).

Small and marginal farmers started to rear Sonali birds commercially in response to the market demand for coloured birds. Government farms were not able to supply sufficient *Sonali* DOCs to satisfy the increasing demand, which ultimately led to the establishment of private-sector hatcheries. Currently, more than 60 hatcheries of different sizes are supplying *Sonali* DOCs to small and marginal farmers in rural areas (Huque, 2011).

1.4 Importance of *Sonali* Chicken

In our daily life we need to take meat for getting animal protein. So, the poultry producers produce a big quantity of eggs and meat which play a great role to the national economy. Government declared poultry as a thrust sector & classified as agro based industry. Both eggs and chicken meat have huge domestic demand. And poultry is the sector for obvious profit. It contributes- poverty reduction, new employment generation, and nutritional status. Poultry is used as a tool of poverty reduction.

1.4.1 Socio-Economic Importance

Malnutrition and hunger are serious problems in Bangladesh. 32.6 & 36 percent of the children are underweight & stunted respectively during 2014 in Bangladesh. 14 & 22.6 percent are wasting & of the new born are low birth weight respectively (BER, 2018 pp-202). Egg, meat and milk, the three important protein foods originate from the poultry and livestock sector. On an average every person should consume at least 100 eggs, 43.5 kg. of meat and 90 liter of milk per annum to prevent malnutrition. Therefore, it is essentially needed to increase the production of eggs, meat and milk and there are good prospects to increase the production of poultry and livestock products.

The poverty rate of Bangladesh is 21.8 % (Estimated) (BBS, 2018b). The financial benefits obtained from *Sonali* chicken farming suggests that the enterprise is helpful in poverty alleviation which are now the major concern of the planning process of the country.

About 2.7 million (2016-17) people are unemployed in Bangladesh (BBS, 2018c). Specially developed varieties of chicken (*Sonali*) are now available with the traits of similar phenotypic appearance to that of local chickens & high feed conversion efficiency. Depending on the farm size, *Sonali* chicken farming can be a main source of family income or can provide subsidiary income and gainful employment to farmers throughout the year. This sector can create huge job opportunity. It offers full or part time employment of large number of peoples particularly women, children or elderly person on the farm operations. This clearly indicates that there is scope for expansion of this industry.

Bangladesh is now producing much amount of meat & egg than the requirement. Table 1.3 shows demand, production, availability and deficiency of meat and eggs during 2018-19. Livestock sector has been earning foreign currency by exporting meat and livestock products to USA, UAE, China, Kuwait, Canada, Japan and Maldives. The poultry sector is gearing up to export eggs and poultry meat by 2024, especially to the Middle East, a big market for halal meat (Ahmad, 2019).

Table 1.3: Demand, Production, Availability and Deficiency of Meat and Eggs (2018-19) p*

Products	Demand	Production	Availability
Meat	72.97 Lakh Metric Ton (120 gm/day/head)	75.14 Lakh Metric Ton	124.99 (gm/day/head)
Egg	1732.64 Crore number (104 numbers/year/head)	1711 Crore numbers	103.89 (numbers/year/head)
***Estimated population of the country: 16 crore 66 lakhs (30 June, 2019)**			

*p denotes Provisional

Source: DLS (2018-19)

Poultry manure is of high fertilizer value which can be used for increasing yield of all crops. Chemical fertilizer degrades the soil quality & its price is high so use of poultry litter as fertilizer will keep the environment clean as well as will improve the soil quality.

Sonali chicken farming has a great potential for providing additional income to both male and female of rural and urban areas through creation of employment opportunities. Sometimes women cannot go outside for earning. *Sonali* chicken farming can be an option for them to earn money staying at home.

Bangladesh's poultry farms are growing at a faster rate of 15% a year (Ahmad, 2019). One million entrepreneurs and eight million people, involved in Bangladesh's poultry sector, commercially produce 10.22 billion eggs and 1.46 million tons of poultry meat annually (Ahmad, 2019). Livestock contribution in GDP is rising day by day. It can be evident from Table 1.4.

Table 1.4: Livestock Contribution in GDP

Year	GDP (Base: 2005-06) *	Growth Rate of GDP
2009-10	2.06	2.51
2010-11	1.98	2.59
2011-12	1.90	2.68
2012-13	1.84	2.74
2013-14	1.78	2.83
2014-15	1.73	3.10
2015-16	1.66	3.21
2016-17	1.60	3.32
2017-18	1.54	3.40
2018-19p	1.47	3.47

*GDP calculated at constant price; *p denotes Provisional; Prepared by Dr. Hossan Md. Salim, LE Section, DLS.

Source: DLS (2018-19)

There is a demand of hygienically slaughter meat in the rural areas in Bangladesh. Therefore, the demand of processed poultry meat is increasing day by day and it has opportunities to set up more processing plant.

The production of maize is increasing and it is not grown only in North Bangle but also in other part of the country and dependency on import is decreasing. Feed industry also developing in Bangaladesh.

1.5 Justification of the Study

The present business environment is very dynamic and requires making rational investment decisions. It is important to note that every investor has the opportunity or option but not the obligation to invest in a particular project of a particular industry at a given time for a particular period of time. Because of the limited reversibility of investment projects, it is important to consider many business opportunities and all

associated risks before making a final investment decision. The investment appraisal is the starting point in determining the worthiness of a prospective project. The profitability of any kind of investment in any industry is the return earned on the investment. The economic profitability of each enterprise is used to determine the attractiveness of the enterprises. The more economically profitable a project is, the more attractive it is for investment and vice versa. This research will help the poultry farmers whether they should invest in this business or not.

Poultry production is commonly practiced on most farms but the profitability of such venture is questionable. This study is out to investigate the cost and returns to poultry production to enable farmer to see the advantages of that poultry offers as a means of making money.

The financial feasibility analysis of *Sonali* chicken farms serve as guide to the financial institutions for deciding scale of finance to *Sonali* chicken enterprise.

This research also aims to encourage anyone who is interested in poultry production. Its result will not only show the lines likely to be most profitable, it will also point out those branches of the business not likely to be remunerative, except under special conditions.

The technical efficiency study will play a significant role in providing useful information regarding economic inefficiencies in production and helps to identify those factors, which are associated with inefficiencies that may exist. Therefore, it is expected from this study to generate adequate understanding of the issues that might lead towards taking appropriate actions for improvement of efficiencies and the identification of the extent of inefficiencies as well as the factors associated with them.

Poverty reduction is one of the Bangladesh's policy challenges inhibiting the overall development of the country's economy. Intensification of poultry production which has been recognized as one of the quickest ways for a rapid generation of income will go a long way to solve the problem.

This study was expected to add some valuable information to the existing body of knowledge regarding *Sonali* chicken farming particularly with respect to the area under

study. The study might provide valuable information for the policy makers of Government and Non-Government Organizations to formulate policy in order to increase production and improvement of socio-economic status of the *Sonali* chicken producers.

1.6 Objectives of the Study

The specific objectives of the study are as follows-

1. To investigate the socio-demographic profile of *Sonali* chicken farmers;
2. To determine the financial viability of *Sonali* chicken farming;
3. To examine technical efficiency of *Sonali* chicken producers;
4. To identify the problems of *Sonali* chicken farming;

1.7 Organization of the Thesis

The study consists of 9 chapters. Chapter 1 explained introduction of the study. Relevant review of literature is briefly described in chapter 2. Methodology of the study is presented in chapter 3. A brief description of the study area is presented in chapter 4. Chapter 5 deals with the socio-demographic profile of the participant farmers. Financial viability of *Sonali* chikcen production is presented in chapter 6. Chapter 7 evaluated technical efficiency of *Sonali* chicken producers. Chapter 8 is designed to identify different types of problems faced by the *Sonali* chikcen farmers. Finally, Chapter 9 deals with summary, conclusion and some recommendations.

CHAPTER 2

REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

Review of literature in any research is essential because it provides a scope for reviewing the stock of knowledge and information relevant to the proposed research. The present study was based on *Sonali* chicken produced for meat purpose. But there is little information regarding knowledge and information relevant to the present research. Maximum literature reviewed here on broiler chicken because it also reared for meat production. Literature and research of the major past works in connection with the present study were searched because this knowledge and information provide guideline in designing the future research problem and validation of the new findings. Some studies relating to poultry along with *Sonali* chicken are reviewed here.

2.2 Studies Conducted in Bangladesh

Bhuiyan (2003) conducted a study on comparative economic analysis of poultry production under supervision of ABFL and farmer own management in some selected areas of Kishorcganj district. The study revealed that in ease of broiler farm total cost per year was Tk. 833860 and Tk. 653952 under ABFL supervision and farmers own management. Respectively the figures for layer farm per 18 months were Tk. 3281098 and Tk. 709712, respectively the cash expenses of broiler farm per year were Tk. 77.413 and Tk. 607177 for ABFL supervised farm and fanners own management farm, respectively, which accounted for 92.51 and 92.84 percent of their total costs. The cash expenses of layer farm per 18 months were estimated at Tk. 2937367 and Tk. 6380011. The gross returns of broiler farm per year were Tk. 1101786 and 884482 under ABFL supervision and farmers own management, respectively. The average gross returns at layer farm per 18 months stood at Tk. 6266456 and Tk. 1008381. The net returns over full cost of broiler farm per year were Tk. 267926 and Tk. 230530 under ABFL supervision and farmers own management, respectively.

Alam (2004) conducted a study on backward and forward linkages of poultry farming in some selected areas of Savar upazila under Dhaka district. This study was conducted mainly to understand the dynamics of poultry farm and to determine the cost and returns of poultry farming and explore the backward and forward linkages of the study. Backward and forward linkage effects created great potentials of capital investment by private entrepreneurs.

Bairagi (2004) examined an economic study of contract broiler farming under Aftab Bahumukhi Farm Limited. Aftab Bhumukhi Farm Limited (ABFL) is one of the commercial integrated farms that introduced contract growing of broiler and layer in 1994 and integrated it with a supply chain to survey the urban consumer. The study analyzed the economics of broiler farming with special reference to an understanding of the supply chain management. It suggested that ABFL should gain experiences and bring about efficiency at the contract growers level.

Hayder (2005) conducted a comparative profitability & technical efficiency of contract & non-contract broiler farming in Gazipur district of Bangladesh. The study revealed that the BCR of contract & non-contract broiler farms on variable cost basis was Tk. 1.53 & Tk. 1.49 & on total cost basis it was Tk. 1.34 respectively. The study also showed that the mean technical efficiency of the broiler farms was 72.83% and it was higher for contract broiler farms (77.0%) than non-contract broiler farms (68.34%).

Rahaman (2007) conducted an economic analysis of broiler production under contract farming system in a selected area of Bangladesh. The study considered sixty farmers to show the profitability and sustainability under contract growing system in Bajitpur upazila of Kishoregonj district. The total cost of broiler per farm per batch was estimated at Tk. 2754758.16, Tk. 2090541 and Tk. 3886383.67 for small, medium and large farms, respectively. Net returns were Tk. 64554, Tk. 64804 and Tk. 200285 for small, medium and large farms, respectively. Finally, he made some recommendations for the development of broiler farm in Bangladesh.

Akhter and Rashid (2008) conducted a comparative efficiency analysis of Aftab Bahumukhi Farm Limited (ABFL) supervised broiler farms and farmers' own managed

broiler farms. Data were collected from randomly selected 90 broiler farmers of which 45 were ABFL supervised farmers and 45 were own managed farmers. Cobb-Douglas stochastic production function and cost frontier function were applied to determine the technical, allocative and economic efficiency of broiler farming. Technical and economic inefficiency effect models were also estimated. The estimated mean technical efficiency of all farms was 94.06 percent. Whereas it was 94.49 percent for ABFL supervised farmers and 93.66 percent for the own managed broiler farm owners. The estimated mean allocative efficiency was 96.76 percent for all farmers, and 96.51 for ABFL supervised farmers and 96.45 percent for own managed broiler farm owners. The mean economic efficiency was estimated at about 91.60 percent for ABFL supervised farmers, 90.34 percent for own managed farmers and 91.00 percent for all farmers. This implies that the cost of broiler production per farm can be reduced by 9 percent keeping the output constant. The findings reveal that ABFL supervised farmers and own managed farmers were not significantly different in terms of efficiency.

Akther *et al.* (2009) conducted a study to estimate the comparative profitability of Aftab Bahumukhi Farm Limited (ABFL) supervised broiler farms and farmers' own managed broiler farms. The study revealed that on an average, total cost of raising broiler per batch per 1000 birds was estimated at Tk. 99,429.00 and Tk. 1,06,330 .00 for ABFL supervised farms and farmers own managed farms respectively. The respective average variable costs and fixed costs per batch per 1000 birds were calculated at Tk. 96,218.00 and Tk. 1,02,926 .00 respectively. These accounted for 96.77 percent and 96.80 percent of total costs respectably for ABFL supervised farms and independently managed farms. The estimated average gross return was Tk. 1,03,334 .00 for ABFL supervised farms and Tk. 1,09,961.00 for independent farms respectively. The average gross margins per batch per farm for 1000 birds were at Tk. 7,470.00 and Tk. 7,035.00 for the ABFL supervised farms and for farmers own managed farms respectively and average net returns were estimated at Tk. 4,259.00 for ABFL supervised farms and Tk. 3,631.00 for farmers own managed farms respectively. From the statistical evidence it was found that profit earned by ABFL supervised broiler farms and own managed broiler farms were not significantly different.

Hossain *et al*. (2010) in their study entitled "Economic Analysis of Broiler Production in a Selected Upazila of Mymensingh District", analyzed the cost, return and profitability of broiler production in a selected area of Mymensingh district. It was mainly based on primary data of 60 samples, selected purposively from nine villages under Trishal Upazila. This study revealed that the average raising cost of broiler per farm per year was estimated at Tk. 4,64,991. It was found that the variable cost per farm per year stood at Tk. 4,22,545 which accounted for 90.87 percent of total cost. The total fixed cost per farm per year accounted to Tk. 42,446. It was evident from the study that the gross return per farm per year stood at Tk. 5,90,491. The net return over total cost per farm per year was calculated at Tk. 1,22,500. The findings revealed that broiler production was a profitable enterprise. From the study a positive influence of education on efficiency was found. Educated farmers were found to have positive impact on production and were technically and economically more efficient. They also gave some recommendations like education should be one of the top priorities of the government to develop the necessary human capitals for sustainable development, the government should take various training programs for the less educated farmers.

Halcyan (2011) conducted a socioeconomic study on household poultry rearing in some selected areas of Mymensingh district. In the study, researcher selected sixty household farmers in Sadar upazilla and Trishal upazila under Mymensingh district. The Cobb-Douglas production function was used in the study to examine the effects of the independent variables on gross return in broiler production. The total cost, average gross return, net return and benefit cost ratio were Tk. 9810, Tk. 11087, Tk. 1277 and 1.13 respectively. It was concluded that socioeconomic development can be achieved with the help of household poultry farming.

Akter (2013) investigated the socioeconomic characteristics of the broiler farmers, to estimate the costs, returns and profitability of broiler enterprise and to determine the contribution of the key variables to the production of broiler farms in some selected locations of Dhaka district, Bangladesh. It was mainly done on primary data which were collected through face to face interview from the respondents of broiler production. 80 broiler farm owners were selected by using simple sample randomly technique. Both

tabular and econometric techniques were used to find out the results. The results of the analysis showed that on average total cost of broilers per farm per year was Tk. 301142.103. It was found that the variable cost per farm per year stood at Tk. 238728.73 which accounted for 79.28 percent of total cost. The total fixed cost per farm per year accounted to Tk. 62413.373. The net return over total cost per farm per year was calculated at Tk. 130257.90. The benefit cost ratios of broiler farming were 1.80 on variable cost basis and 1.43 on total cost basis. The functional analysis indicated that most of the selected variables had significant impact on the production of broiler farms. This study also identified some economic, marketing, technical, social and natural problems in broiler production. Finally, on the basis of findings of this study, some recommendations were made for the development of broiler farming in Bangladesh.

Mitu (2013) conducted an economic study on *Sonali* poultry production in selected areas of Gazipur district: economic study. The Cobb-Douglas production function was used in the study to examine the effects of the independent variables on gross return in *Sonali* poultry production. The major findings of the study was that total cost for 1000 birds were estimated at Tk. 120613 per batch, respectively. Variable cost constituted the major part of the total costs. Average variable costs for 1000 birds stood at Tk.115432 where average fixed cost for 1000 birds was estimated at Tk. 5181 per batch only. Average gross margin and average net returns for 1000 birds was estimated at Tk. 57240 and Tk. 52059 per batch. An average gross return for 1000 birds was estimated at Tk. 172672 per batch. Benefit Cost Ratio was estimated 1.4 for *Sonali* poultry production.

FAO (2015) conducted a study to to assess the technical, economic and social performance of *Sonali* birds compared with the performances of commercial broiler, commercial layer and local non-descript/deshi chickens. The study was conducted in four districts of Bangladesh: Joypurhat, Mymensingh/Gazipur, Bogra and Naogaon. Primary data were collected randomly from a total of 500 respondents. The economic performances of different types of birds revealed that the net change in inventory was positive for all enterprises in the study areas. The major cost items were human labour, feed, veterinary services, electricity and transport. The estimated benefit/cost ratio (BCR) per batch and bird for all enterprises was greater than 1, indicating that these are all

profitable businesses. The local non-descript/ deshi farms were able to derive the highest BCR (1.71), followed by *Sonali* semi-scavenging (1.65), *Sonali* intensive meat producing (1.49), *Sonali* intensive egg producing (1.44), commercial broiler (1.22) and commercial layer (1.11) farms, indicating that local non-descript birds were the most profitable venture.

Hassan (**2018)** analyzed the technical efficiency of poultry broiler production in Bangladesh from a sample of 100 poultry farmers selected from Savar and Dhamrai upazilla under Dhaka district and Bajitpur and Kuliarchar upazila under Kishoreganj district. Stochastic parametric technique was used to analyze the technical efficiency of poultry farmers. Results showed that among different input factors, DOC size and feed input play crucial role in broiler output. Estimated mean technical efficiencies were 43%, 52% and 68% for small, medium and large farms respectively. The difference in the level of technical efficiency postulated the existence of further opportunities for broiler farmers to escalate their meat productivity and income through enhancements in their technical efficiency. Different observed socioeconomic variables related to farming experience, age, education, family size, training, credit, extension contact and regular medication were found to be negative and significantly related to technical inefficiency.

2.3 Studies Conducted Abroad

Singh *et al*. (2010) completed a study on ‘‘Broiler Production in Punjab — An Economic Analysis’’. They analyzed cost and return of different sizes of broiler farms in the Punjab state .They found the total fixed investments, total variable cost and total cost of meat production per bird was highest on small farms, followed by medium and large farms. The net returns per bird over the variable costs recorded highest on large farms and economies of scale prevail on these farms. The meat-feed price ratio and benefit-cost ratio were found to increase with increase in farm-size of broiler farms, which indicated better utilization of inputs on large farms. On the basis of NPV, BCR and IRR, investment in broiler farming was found profitable in all farm-sizes, it was being most profitable on large farms, followed by medium and small farms. They observed the small broiler farms were highly sensitive to increase in costs and decrease in net returns. They

concluded that broiler farming was a profitable venture and has a bright future in the Punjab agriculture for improving economic status of the farming community.

AL-Sharafat and Al-fawwaz (2013) undertook a study on comparative analysis of different broiler farm capacities in Jordan to determine the best viable capacity to be adopted. A total of 21, 72, and 7 producers were interviewed representing small, medium, and large farms respectively. The Net Present Value (NPV), the Internal Rate of Return (IRR) and the Benefits-Costs ratio (B/C) were the discounted financial indicators used to achieve the goals of the study. The results of the study revealed that all the financial indicators used were economically acceptable in the medium and large size broiler production capacities. The NPV for these two capacities was positive and acceptable. The benefits of these two capacities outweighed the actual costs that went in the project. For small farms, the NPV value was negative indicating nonviable type of business compared to the other two capacities. Each money unit invested in small farms would cause a loss of 12.8 units (IRR = - 12.8%). On the other hand, each money unit invested in medium and large farms would provide returns higher of about 22% than the costs paid (IRR = almost 22% for both). The payback for these two capacities was 1.06 times the costs meaning that for every unit of cost the project would get 1.06 units of gain. Finally, they recommended adoption of medium to large broiler farm capacities in Jordan by this study.

Balamurugan and Manoharan (2013) studied an cost and return analysis of different sizes of integrated broiler farms in Theni District of Tamil Nadu State carried out based on the primary data collected from 150 broiler farmers for the period Mar 2011 to Feb 2012. The study showed that the total fixed investment per bird was highest on small farms, followed by medium and large farms. The total cost of meat production per bird, returns per bird over the variable costs was found highest on small broiler farms, followed by medium and large farms. On the basis of NPV, and IRR, investment in broiler farming was found profitable in all farm-sizes, it was being most profitable on large farms, followed by medium and small farms. The small broiler farms observed highly sensitive to increase in costs and decrease in net returns. The study observed that broiler farming is a profitable venture and has a bright future in the Tamil Nadu agro

based industry for improving economic status of the farming community in general and in the study are in particular.

Mwansa (2013) completed a comparative investment analysis for small scale broiler and layer enterprises in Zambia. This study was carried out for the purpose of determining the economic profitability of both broiler and layer enterprises and also to evaluate their degree of attractiveness for investment. The thesis used the NPV and IRR methods to determine the economic profitability for both broiler and layer enterprises. Consistent with the decision rules of the NPV and IRR methods, both enterprises were found to be economically viable for investment. On a comparative basis though, the small scale broiler enterprise was found to be more attractive for investment than the small scale layer enterprise as indicated by the results of the NPVs and IRRs.

Adesiyan (2014) examined the technical efficiency of poultry farmers in the Afijio local government area of Oyo state using stochastic frontier production function analysis. Data were collected using a set of structured questionnaire. The study was interested in how feed, veterinary, stocking of birds, labour and drugs variables were efficiently allocated and used. The technical efficiencies of the farmers varied between 0.45 and 1.00 with a mean efficiency of 0.78. The result showed that 38.75 per cent of the farmers were technically efficient. The study further revealed that veterinary cost and drugs positively affected technical efficiency, while the increase in the socioeconomic variables such as family size and years of farming led to decrease in technical efficiency.

Ali *et al*. (2014) conducted a study to estimate the level of technical efficiency of open shed broiler farmers in Punjab, Pakistan. They collected data randomly from 60 broiler farmers using multistage sampling technique during January-February, 2014. Stochastic frontier Cobb-Douglas production function was used for analysis of data. Maximum likelihood estimation technique was employed for estimation. The analysis revealed that the mean technical efficiency of open shed broiler farmers was 0.880 ranging from 0.440 to 0.985. Results further showed that number of day old chicks, feed and labor positively and significantly affected broiler production while the effect of vaccination was negative and that of capacity of shed was positive but statistically insignificant. Results of

technical inefficiency effect model revealed that with the increase in age, education and membership with association, technical efficiency of broiler farmers increased.

Pakage *et al*. (2014) made an attempt to determine the input variables affecting broiler production, the level of technical efficiency achieved breeders and sources of technical inefficiency causes. This research was conducted in Malang East Java Indonesia with a sample of 55 broiler breeder with a pattern closed house system (CHS). The results showed that the variables affecting broiler production with patterns of closed house system was variable poultry (DOC), feed and medicine (drugs, vaccines and vitamins). The level of technical efficiency was achieved breeders ranged from 0.732 to 0.987 with an average of 0,929 broiler farms and businesses were located at the level of positive decreasing returns to scale. They found variables business experience, number of dependents as the root cause of inefficiency.

Borah and Halim (2017) attempted to investigate production performance, cost and return structure pertaining to broiler farming and undertake investment appraisal in terms of PBP, NPV, IRR and BCR. The cost and return analysis of different sizes of broiler farms in Sonitpur District of Assam carried out based on the primary data collected from 100 broiler farmers for the period from March 2012 to May 2012. The study revealed that average meat production per bird per cycle was 2.18 kilogram. On the basis of NPV, BCR and IRR, investment in broiler farming was found to be most profitable in large sized farms, than smaller farms, although investment was economically paying in all the farms. Sensitivity analysis revealed that small sized farms were more sensitive to increase in cost and decrease in returns.

Raut *et al. (*2017) conducted a study on financial feasibility of investment in broiler poultry units in Raigad district of Maharashtra. Per farm total cost of production was found highest on large poultry farm followed by the medium and small poultry farms. The cost of production per kg of live weight had inverse relation with the size of broiler farms. The financial feasibility analysis indicated positive NPV, BCR was greater than one and internal IRR was more than prevailing rate of interest in all size of broiler farms. This showed that the broiler poultry farming was profitable business in Raigad district.

Olorunwa (2018) studied an economic analysis of broiler production was carried out in Lagos State Ministry of Agriculture and Cooperative' Poultry Estates, Nigeria. A two stage sampling technique was employed for the selection of 100 out of 193 broiler farmers. The study deduced that broiler production was a profitable venture. It was deduced that the educational level and farming experience of the broiler farmers were the major determinants of technical efficiency. The implication of the study therefore was that the level of technical efficiency among broiler farmers in the poultry estates could be improved by 26% through better utilization of available resources. He also concluded that the major bottlenecks affecting the broiler producers in the poultry estate in order of severity were that of disease outbreak, inadequate finance and high cost of feed.

Ahiale *et al.* (2019) conducted a study to assess the technical efficiency of broiler farmers in the Mampong Municipality using cross-sectional data collected from the last production cycle 2017. By using the Cobb-Douglas type stochastic frontier model to functional form, inputs such as feed, flock size and water were all found to be statistically significant and had positive influence on technical efficiency of the sampled broiler farmers in the study area. Individual levels of technical efficiency ranged between 42% and 99% with a mean of 87%, suggesting that in the short run, the poultry farmers can still increase the efficiency of resources used at the farm level up by 13%. The determinants of technical inefficiency among the poultry farmers included age, education, farmers' experience and number of extension visits.

Ullah *et al.* (2019) conducted a study to estimate and assess technical efficiency of broiler farms in district Charsadda of Khyber Paktunkhwa province, Pakistan. They used, multistage random sampling technique to collect data from 120 broiler farms. Stochastic frontier production function of Cobb- Douglas type was utilized for the estimation. The function was estimated using Maximum Likelihood estimation technique. The results revealed that The mean technical efficiency of broiler farms was 0.85 ranging from 0.61 to 0.99, implies that farms operating at mean level of technical efficiency could produce 14% (0.99–0.85) more output for given level of inputs if they become technically more efficient. The estimated coefficient of the number of day old chicks, feed was significant. In technical inefficiency effect model, the estimated coefficients of age, experience,

credit, occupation and labor used were negative and statistically significant which implied that the technical inefficiency decreases with the increase in age and experience, credit, occupation and labor of the respondents.

2.4 Concluding Remarks

The above mentioned discussion and review in this study available from different libraries & websites. There are no studies related to financial analysis of *Sonali* chicken farming in Bangladesh but a number of studies were conducted in abroad on broiler chicken. A study on financial analysis of *Sonali* chicken farming in Bangladesh is recent in Bangladesh. Most of the studies conducted in Bangladesh dealt with production economic aspects, profitability, comparative profitability, socioeconomic characteristics of *Sonali* chicken farming. The review of literature was helpful to re-design methodological aspects with a view to overcome the limitations of previous studies. From the above studies the researcher felt the need of conducting and analyzing financial analysis of *Sonali* chicken farming in Bangladesh within the current development context, which will help the policy makers to understand the current situation of investment and take programmes to increase *Sonali* chicken production and improving the livelihood *Sonali* chicken farmers in Bangladesh. On the other hand, researcher believed that the findings of this study would provide useful updated information, which would help the policy makers and researcher for further investigations.

CHAPTER 3

METHODOLOGY

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3.1 Introduction

A sound and systematic methodology is a pre-requisite for a scientific enquiry. In fact, precision, reliability, validity and acceptability of the scientific findings/facts depend solely on the methodology adopted for investigation of a phenomenon. The selection and application of appropriate methodology bears more relevance in socio-economic studies based upon sample surveys. The selection of representative sample at the first instance and thereafter derivation of the plausible estimates invariably depends upon the methodology adopted. Therefore, this chapter has been devoted to describe the methodological aspects of the present investigation.

3.2 Selection of the Study Area

Research on farm business management involving collection of primary data requires selection of an area that would offer a scope to fulfill the objective of the study. According to Yang (1962), "the area in which a farm business survey is to be conducted relies on the particular purpose of the survey & possible co-operation from the farmers & other respondents". The present study was undertaken in Panchbibi upazila of Joypurhat district. Seven unions & one municipality of Panchbibi upazila were selected for the present study. The unions were Bagjana, Dhoronji, Balighata, Atapur, Mohammadpur, Kushumba, Ayma Rosulpur & the only municipality was Panchbibi municipality. The district is well known for the production of commercial poultry farming. Therefore, this district has been selected for the study.

The main reason behind selection of the area were as follows:

- The area had concentration of *Sonali* chicken farms.
- The area was suitable for accomplishing the objectives of the study.
- This type of study was not conducted before in this area.
- The communication to the selected area was good &
- Researcher's belief about getting well co-operation from the selected respondent.

3.3 Selection of the Samples and Sampling Technique

There were more than 2500 big, medium and small size poultry farms have been set up in the district to alleviate poverty from the region. The poultry farms are producing over 08 million hens round the year to provide meat and eggs for the consumers (The Financial Express, 2019). It is generally impossible to make a farm business survey covering all these farms & it is unwise to include too many farms in a survey. Each additional farm in the sample represents more time, more effort & larger expenditure to complete the

survey. A sample of representative farms should therefore, be chosen which could represent a reasonably true picture of the study area. Two things need to be taken into considerations in selecting samples for a study. The sample size should be large enough to allow for adequate degrees of freedom in statistical analysis & administration of field research, processing & analysis of data should be manageable with the limits imposed by physical, human & financial resources. A simple random sampling technique was followed in this study. There are 257 villages in Panchbibi Upazila of Joypurhut district. From there 27 villages will be randomly selected for the study. 60 *Sonali* chicken farms were randomly selected for the present study.

3.4 Preparation of the Survey Schedule

The data were collected by survey method with the help of specially designed schedule. The data were collected by personal interview with the selected *Sonali* chicken farm. The required information collected from *Sonali* chicken farmers was obtained in the month of June 2019. The final schedule was developed with following items of information:

- Socio-economic characteristics of *Sonali* chicken farm owners.
- Items of capital investments, costs & returns of raising *Sonali* chickens.
- Problems associated with the *Sonali* chicken farms being faced by the owners of the farms & the suggestions of the farmers.

3.5 Collection of Data

As data collection has a noteworthy impact on the quality of survey results, it is treated as a significant part of a survey. After the schedule was finalized, the selected farmers were interviewed individually with the help of a pretested interview schedule. Usually most of the respondent does not keep records of their activities. Hence it is very difficult to collect actual data and the researcher has to rely on the memory of the respondent. Before going to an actual interview, a brief introduction of the aims and objectives of the study was given to each respondent. The question was asked systematically in a very simple manner and the information was recorded on the interview schedule. When each interview was over the interview schedule was checked and verified to be sure that information to each of the items had been properly recorded. In order to minimize errors, data were collected in local units. These were subsequently converted into appropriate standard unit.

Secondary data had been collected from various research documents and papers like-

- Statistical Yearbook of Bangladesh,
- Yearbook of Agricultural Statistics
- Bangladesh Economic Reviews
- The national and international journals, articles and publications and

- Internet
- Newspapers etc.

3.6 Editing, Processing and Tabulation of Data

Data editing and coding is another vital phase of the survey, which is indispensable for data processing. It should be completed before data processing. Data editing referred to the activity of checking and cleaning data that had already been collected from the field. The collected data were checked and verified for the sake of consistency and completeness. Editing and coding were done before putting the data in computer. All the collected data were summarized and scrutinized carefully to eliminate all possible errors. Data were presented mostly in the tabular form, because it was of simple calculation, widely used and easy to understand. Besides, functional analysis was also adopted in a small scale to arrive at expected findings. Data entry and financial analysis were done in software Microsoft Excel and statistical package FRONTIER 4.1 (Coelli, 1996a) was employed for technical efficiency analysis.

3.7 Analytical Techniques

Descriptive, tabular, graphical & statistical techniques were mainly used for analysis of data in order to arrive at meaningful conclusions. The data were arranged in tabular form and were analyzed as per objectives of the study. Tabular technique was applied with the help of average and percentage to show the results in a comprehensive manner. Interpretation and discussion of the findings were presented in simple terms & finally all were arranged and compiled in the form of thesis. For this study, the following techniques will be used.

3.7.1 Measures of Financial Viability

Discounted measures will be used to measure financial viability (Gittinger, 1996). Financial viability of investment in *Sonali* chicken farming was judged with the help of following financial viability tests. The calculations were done using Microsoft Excel.

- Net present value (NPV)
- Benefit cost ratio (BCR)
- Internal rate of return (IRR)

3.7.1.1Net Present Worth (NPW) - also known as Net Present Value (NPV)

The most straight forward discounted cash flow measure of project worth is the net present worth (often abbreviated as NPW). This is simply the present worth of the incremental net benefit or incremental cash flow stream. The net present worth may also be computed by finding the difference between the present worth of the benefit stream less the present worth of the cost stream. Net present worth may be interpreted as the

present worth of the income stream generated by an investment. In financial analysis, it is the present worth of the income stream accruing to the individual or entity from whose point of view the analysis is being undertaken-say, the farm family or the processing firm. In economic analysis, it is the present worth of the incremental national income generated by the investment. Economists are somewhat inconsistent in their terminology for this measure. It is often referred to as the net present value (or NPV).

The NPW or NPV of a project is the sum total of discounted incremental net benefit (INB):

$$NPW\ or\ NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+r)^t} or = \sum_{t=0}^{n} \frac{INB_t}{(1+r)^t} or = \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

Where:

B_t = Total benefit (Tk./Year) in t^{th} year

C_t = Total cost (Tk./ Year) in t^{th} year

t = Number of year (1,2,3,……,n)

r = Interest (discount) rate.

INB = Incremental Net Benefit.

3.7.1.2 Internal Rate of Return (IRR)

Another way of using the incremental net benefit stream or incremental cash flow for measuring the worth of a project is to find the discount rate that makes the net present worth of the incremental net benefit stream or incremental cash flow equal zero. This discount rate is called the internal rate of return. It is the maximum interest that a project could pay for the resources used if the project is to recover its investment and operating costs and still break even.

The IRR is the discount rate where the net present worth of costs is equal to net present worth of benefits, i.e., the NPV equals zero. IRR is r where:

$$IRR = \sum_{t=0}^{n} \frac{INB_t}{(1+r)^t} = 0$$

In equation form, IRR is that r where:

$$\sum_{t=0}^{n} \frac{B_t}{(1+r)^t} = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

So that;

$$NPW \text{ or } NPV = \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{n} \frac{C_t}{(1+r)^t} = 0$$

The IRR is calculated iteratively, manually, or by computer.

- IRR is calculated by the interpolation method or by trial and error method. The common practice is to apply two discount rates that result in a negative and a positive NPV and hence, enclose the zero NPV.

$$\text{Financial Internal Rate of Return (IRR)} = \text{Lower discount rate} + \text{Difference between the discount} \times \left[\frac{Present\ worth\ of\ incremental\ net\ benefit\ stream\ (cashflow)at\ the\ lower\ discount\ rate}{Sum\ of\ the\ present\ worth\ of\ the\ incremental\ net\ benefit\ streams\ at\ the\ two\ discount\ rates,\ \ signs\ ignored} \right]$$

Any project or investment with an IRR greater than the opportunity cost of capital would be a profitable investment.

3.7.1.3 Benefit Cost Ratio (BCR)

A third discounted measure of project worth is the benefit-cost ratio. This is the ratio obtained when the present worth of the benefit stream is divided by the present worth of the cost stream. Note that the absolute value of the benefit-cost ratio will vary depending on the interest rate chosen. The higher the interest rate, the smaller the resultant benefit-cost ratio, and, if a high enough rate is chosen, the benefit-cost ratio will be driven down to less than 1.

The BCR is determined by dividing discounted benefits by discounted costs:

$$Benefit\ Cost\ Ratio(BCR) = \frac{\sum_{t=0}^{n} \frac{B_t}{(1+r)^t}}{\sum_{t=0}^{n} \frac{C_t}{(1+r)^t}}$$

3.7.1.4 Sensitivity Analysis

Whenever a cash-flow forecast is made, it is important to discover what else can happen besides the expected. Sensitivity analysis is critical in determining the riskiness and viability of a project. Since the cash-flow forecasts depend on production and market assumptions, it leaves room for uncertainty. It is important therefore to make alternative assumptions to see how they can affect the viability of the projects under consideration. This provides a good picture of a project if expected conditions do not occur. Those conditions may be a mixture of expected and unexpected causing a project to over- or under perform. A concern for any investment is the likelihood that a given project significantly under performs as this may defeat the profitability of investment. To reduce uncertainties surrounding the project's performance, sensitivity analysis is used to assess the effects of different situations on the NPV, IRR and BCR. Three different situations considered here these were- situation I: returns decreased by 5 percent, situation II: costs increased by 5 percent & situation III: returns decreased by 5 per cent and costs increased by 5 per cent then what would be the outcome.

3.7.2 The Stochastic Frontier Production and Technical Inefficiency Model

The stochastic frontier production function was independently proposed by Aigner, *et al.* (1977) and Meeusen and van den Broeck (1977). The original specification involved a production function specified for cross-sectional data which had an error term which had two components, one to account for random effects and another to account for technical inefficiency. This model can be expressed in the following form:

$$Y_i = f(X_i;\beta)\ \exp(V_i - U_i) \ldots\ldots (1)$$

Where:

Y_i = Production of the i-th sample (i = 1, 2,.....,n)

X_i = A (1×k) vector of functions of input quantities used by i-th farm

β = A (k×1) vector parameters to be estimated

V_is = Assumed to be independently and identically distributed N(0, σv^2) random errors, independent of the U_is

U_is = Non-negative random variables, associated with technical efficiency in production, which are assumed to be independently and identically distributed and truncated (at zero) of the normal distribution with zero mean.

According to Battese and Coelli (1995a), the technical inefficiency effects, U_i in Eq. 1 could be expressed as:

$$U_i = Z_i\delta + W_i \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, W_is are random variables, defined by the truncation of the normal distribution with zero mean and variance, $\sigma^2{}_u$, such that point of truncation by $-Z_i\delta$, i.e., $W_i \geq Z_i\delta$.

Besides the farm-specific variables, the Z-variable in Eq. 2 may also include input variables in the stochastic production frontier (1), provided that the inefficiency effects are stochastic. If Z-variables also include interactions between farm-specific and input variables, then the Huang and Liu (1994) non-neutral stochastic frontier is obtained.

The technical efficiency of the i^{th} sample firm, denoted by TE_i, is given as:

$$TE_i = \exp(-U_i) = Y_i / \{f(X_i;\beta) \exp(V_i)\} \ldots\ldots\ldots\ldots\ldots (3)$$

Where, $f(X_i;\beta) \exp(V_i)$ is the stochastic frontier production. The prediction of the technical efficiencies is based on conditional expectation of expression in Eq. 3, given model assumptions.

Parameter V_i represents the symmetric error term form and U_i represents the one-sided error component. In the stochastic production function $f(X_i) \exp(V_i)$, V_i has a symmetric distribution to capture the random effects of measurement error and exogenous shocks, which cause the placement of the deterministic kernel $f(X_i)$ to vary across firms. Technical inefficiency relative to the stochastic production frontier is then captured by the one-sided error component $\exp(-U_i)$, $U_i \geq 0$. The condition $U_i \geq 0$ ensures that all observations lie below the stochastic production frontier. Unfortunately, there is no way of determining whether the observed performance of a particular observation compared with the deterministic kernel of the frontier is due to inefficiency or to random variation in the frontier. This constitutes the main weakness of the stochastic frontier model. It is not possible to decompose individual residuals into their two components and so it is not possible to estimate technical inefficiency by observation. The best that one can do is to obtain an estimate of mean efficiency over the sample.

The β and δ coefficients are unknown parameters to be estimated together with the variance parameters which are expressed in terms of

$\sigma^2 = \sigma_u^2 + \sigma_v^2$ …….(4) and

$\gamma = \sigma_u^2/\sigma^2$……...(5)

Where, γ parameter has value between zero and one.

3.7.2.1 Empirical Model of Stochastic Frontier

In order to estimate the level of technical efficiency in a manner consistent with the theory of production function, Cobb-Douglas type stochastic frontier production function will be used in the present study.

The Cobb-Douglas form of production function has some well-known properties that justify its wide application in economic literature (Henderson and Quandt, 1971). It is a homogeneous function that provides a scale factor enabling one to measure the return to scale and to interpret the elasticity coefficients with relative ease. It is also easy to estimate and mathematically manipulate. At the same time, the Cobb-Douglas production function makes several restrictive assumptions. It is assumed that the elasticity coefficients are constant, implying constant share for the inputs. The elasticity of substitution among factors is unity in the Cobb-Douglas form. Moreover, this being linear in logarithm, output is zero if any of the inputs is zero, and output expansion path is assumed to pass through the origin. However, it is also argued that if interest rests on efficiency measurements and not on an analysis of the general structure of the underlying production technology, the Cobb-Douglas specification provides an adequate representation of the production technology. In addition, its simplicity and widespread use in agricultural economics outweigh its drawbacks. Translog stochastic production function will also be used to estimate the significant relation of different variables which in turn affects the level of efficiency. Translog function is a flexible functional form. But it is more difficult to mathematically manipulate and can suffer from degree of freedom and multicollinearity problems (Rahman, 2002 pp.32-33 & 85). However, large sample size is needed for Translog functional form. Total sample size of the present study was 60, which may be considered not large enough for Translog functional form.

In consideration of the above fact, Cobb-Douglas type functional form will be tried in this study.

The Cobb-Douglas stochastic production frontier model can be specified as:

$\ln Y_i = \ln\beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \varepsilon_i$.....(6)

The subscripts i refers to the i^{th} observation.

Where, i = 1,2,3, ...60 (farms).

Y_i: Production of *Sonali* chicken for the i^{th} farm (Kg/100bird/cycle);

X_{1i}: Quantity of feeds and feed supplements for the i^{th} farm (Kg/100bird/cycle)

X_{2i}: Expenses on medicines/vaccines for the i^{th} farm (Tk./100bird/cycle)

X_{3i}: Total labor for the i^{th} farm (man-days/100bird/cycle)

X_{4i}: Day old chicks for the i^{th} farm (no//100bird/cycle)

X_{5i}: Litter sack for the i^{th} farm (sack/100bird/cycle)

$\varepsilon_i = (v_i - u_i)$ is a composite error, where $v_i \sim$ i.i.d. (independently and identically distributed) N $(0,\sigma^2)$ and $/u_i/ \sim$ i.i.d. N (μ,σ^2).

The technical efficiency $TE_i = (u_i)$ of the i^{th} firm is a non-negative random variable and follows a normal distribution truncated at zero. The mean technical efficiency input is output variable and Xs are input related variables, and the technical inefficiency effects, μ_i is given by the efficiency model in equation (2).

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 \text{.....(7)}$$

Where,

The efficiency-effects are proxies by Zs, which are farm specific variables and δ_0 δ_1, δ_2, δ_3 and δ_4 are unknown parameters to be estimated.

μ_i = Technical inefficiency effects of the i-th farmer ;

Z_1= Family, size (number)

Z_2= Level of education (years)

Z_3=Years of experience (years)

The parameters for the stochastic production frontier model and those for the technical inefficiency model will be estimated simultaneously using the maximum likelihood estimation (MLE) method by Frontier 4.1 program developed by Coelli (1996a), which estimates the variance parameters of the likelihood function.

3.8 Procedure for Evaluation of Costs

Financial analysis was followed for this study. For this reason, all costs and benefits were determined in local currency (Taka). The financial analysis from *Sonali* chicken farm owner's point of view was performed considering both cash cost and cost of family supplied inputs assuming that all inputs were purchased. In this study fixed capital investment cost; total variable cost; total fixed cost and total cost had been described. Fixed capital investment cost included investments on housings & investments on equipment. Total variable cost (TVC) included day old chicks, feed, hired labour, veterinary service and medicine/vaccines, electricity, litter, miscellaneous items & interest on operating capital cost. Total fixed cost (TFC) included depreciation on housings, depreciation on equipment's & family labour cost. Total cost (TC) included total variable cost and fixed cost.

3.8.1 Investments on Housings Cost

Cost effectiveness, durability & and safety are the factors considered by the *Sonali* chicken farmers in selecting the housing type. Initial cost of erecting the houses was seen to be quite high. Investments on housing cost include chicken shed and feed store cost in the study area. Construction cost of these houses calculated here. Simple averages were used to calculate each type of housing per 100 birds.

3.8.2 Investments on Equipment Cost

Equipment's are necessary for *Sonali* chicken production process. Farm owners generally used feeders, waterers, brooder, sprayer visquine/ chat/ bosta/ polythene, light, buckets and others equipment's. Simple averages were used to calculate per 100 birds equipment cost. Then for reducing complexity in calculation feeders & waterers, brooder & sprayer costs were added & under miscellaneous cost visquine/ chat/ bosta/ polythene, light, buckets etc. costs calculated.

3.8.3 Day-Old-Chicks Cost

A day old chick sent immediately for rearing just in a day after hatching. DOC cost was one of the important costs for *Sonali* chicken production. Cost was calculated on the basis of actual price paid by the farmers. The total quantity of DOC per 100 birds per year was multiplied by the average price of DOC paid by per bird to calculate the cost of DOC for the study areas.

3.8.4 Feed Cost

Feed cost was the largest cost item & most important input of *Sonali* chicken farm. In the study area feed cost was calculated on the basis of actual price paid by the farmers. The total quantity of feed per 100 birds per year was multiplied by the average price of feed

paid by per unit to calculate the cost of feed for the study area. All the sample farmers of the study area used ready-made mixed feed which were produced by different companies. Mixed feed contained fish meal, bone meal, rice bran, wheat bran, oil cake, minerals, salt etc.

3.8.5 Hired Labour Cost

The labour engaged for conducting different operations in poultry farms likes transportation of feeds, after care of *Sonali* chicken birds, cleaning, watering and miscellaneous works were considered. Labour cost was imputed by considering actual wages paid to them. The farmers normally engage permanent farm labour on the basis of monthly wages and casual labour on daily wages basis, for performing farm operations. The casual labour was evaluated on the basis of actual wages that prevailed in the locality.

3.8.6 Veterinary Service and Medicine/Vaccines Cost

The actual average veterinary cost of medicines and veterinary aids paid on flocks of *Sonali* chicken in completing per 100 bird per year was considered. Veterinary service and medicine/vaccines cost included cost of vaccine, cost of medicine, doctor fees etc. As chicks were costly, the farmers were very careful about the possibility of their diseases. The farmers made a good contact with the Thana Livestock Officer, private veterinary doctors & medicine shops.

3.8.7 Electricity Cost

Electricity is very important for *Sonali* chicken production. Electricity was used for producing heat & maintaining temperature inside the *Sonali* chicken shade. Electricity also used for lighting inside & outside of the shade. The actual money incurred per 100 bird per year was taken as the electricity cost.

3.8.8 Litter Cost

Poultry litter is used in confinement buildings used for raising *Sonali* chicken, broilers, turkeys and other birds. Common bedding materials include wood shavings, sawdust, peanut hulls, shredded sugar cane, straw, and other dry, absorbent, low-cost organic materials. Sand is also occasionally used as bedding. The bedding materials help absorb moisture, limiting the production of ammonia and harmful pathogens. The materials used for bedding can also have a significant impact on carcass bird performance. Therefore, litter is very necessary for *Sonali* chicken production. In the study area, most of the farms used rice husk as litter. The actual average cost incurred per 100 bird per year was calculated for this study.

3.8.9 Miscellaneous Items Cost

Miscellaneous items cost included the transportation, shed & other repairing and other costs. Actual average cost incurred per 100 bird per year added for miscellaneous items cost.

3.8.10 Interest on Operating Capital

Interest on operating capital was computed by taking into consideration all cash expenses incurred for various operations in *Sonali* chicken farming such as day-old-chicks, feed, hired labour, veterinary expenses, electricity, transportation, litter cost etc. Interest rate was charged 9 percent per annum. Time considered here 1 year. Interest on operating capital (IOC) was computed by following formula.

$$IOC = \frac{OC}{2} \times IR \times Time\ considered$$

OC = Operating Cost

IR = Interest Rate

3.8.11 Depreciation on Housings

This was calculated at the rate of 5 percent per annum on the total cost incurred on total cost housings for 100 birds. Total cost housings included shed facilities and feed store construction cost.

3.8.12 Depreciation on Equipment's

Total cost of equipment for 100 birds first estimated. The depreciation rates for different farm equipment's were taken on fixed rate @ 10 percent per annum.

3.8.13 Family Labour Cost

The family labour cost was evaluated at the rate of prevailing wages in the locality for casual hired labour at various stages of operations. Eight hours were equivalent to one man-days. In this way total family labour man-days were calculated to estimate the wage of family labour, the opportunity cost principle was used. In the study area, it was observed that sample farmers used family labour for feeding or rearing, watering, cleaning shades etc.

3.9 Procedure for Evaluation of Returns/ Benefit

3.9.1 Benefit or Gross Return

The value of produce is referred to as the gross return. Per 100 birds per year gross return was calculated by multiplying the total amount of product and by-product by their respective per unit prices. The return items included values of live *Sonali* chicken, used litter and excreta. The value of *Sonali* chicken was calculated on the basis of weight (kg) of live *Sonali* chicken sold per 100 birds per year, multiplied by the average prices of *Sonali* chicken.

Gross Return= Quantity of the product × Average price of the product + Value of by-product.

3.9.2 Net Returns

Net return over variable cost (NRvc) was calculated by deducting the total cost from the total return or gross return. That is,

Net returns over variable cost (NRvc) = Total return or gross return – Total variable cost

Net return over total cost (NRtc) was calculated by deducting the total cost from the total return or gross return. That is,

Net return = Total return or gross return – Total production cost.

3.10 Problem Faced in Collecting Data

During the period of data collection, the researcher faced the following problems.

- The *Sonali* chicken producer farmer did not keep records of their farming activities. Therefore, the researcher had to depend upon their memory. It was difficult to get actual information from memory.
- The respondent provides data in local units of measurement. It was converted into standard units of measurement later.
- Most of the respondent had no previous idea about such study. They were suspicious about the researcher & therefore were not cooperative initially, so it was difficult to convince them.
- Exact quantification of family labour was a difficult task. Because the producer often could not estimate properly the use of family labour for different purposes.
- Most of the sample farmers in the study area thought that the investigator was a government officer. So, they initially hesitated to answer & some time did not give actual answer of the questions relating to their income & expenditure. Because they were afraid of imposition of taxes.

- Sometimes, the farmer was not available at their home because they remained busy with their outside work. That is why sometimes more than two visits were required to get information from them.
- There was limitation of time. For this study, data & other necessary information had to be collected within shortest possible time.
- Necessary data were collected from a limited area covering a small number of samples. So, results obtained from this study may be inadequate to represent the actual situation of the study area.

CHAPTER 4

DESCRIPTION OF THE STUDY AREA

CHAPTER 4

DESCRIPTION OF THE STUDY AREA

4.1 Introduction

The knowledge of the study area is essential for understanding the important features of the area. The various factors like topography, location, climate, rainfall, soil, irrigation, marketing, and communication facilities decide the stability of particular enterprise in the area. This will facilitate the discussion with respect to similarities and variation of various components and that will helpful in providing the background of the region and importance of the study. The details on the above aspects have been presented in this chapter.

4.2. Location

Joypurhat District (Rajshahi Division) area 965.44 sq. km, located in between 24°51' and 25°17' north latitudes and in between 88°17' and 88°55' east longitudes. It is bounded by Dinajpur district on the north, Naogaon and Bogra districts on the South, Bogra and Gaibandha districts on the East, Naogaon district and West Bengal state of India on the West (Banglapedia, 2019a).

The study area covers Panchbibi upazila of Joypurhat District. Panchbibi Upazila (Joypurhat district) area 278.53 sq. km, located in between 25°08' and 25°17' North latitudes and in between 88°56' and 89°13' East longitudes. It is bounded by Hakimpur and Ghoraghat upazilas and West Bengal state of India on the North, Joypurhat Sadar upazila on the South, Gobindaganj and Kalai upazilas on the East, Joypurhat Sadar upazila and West Bengal state of India on the west. (Banglapedia, 2019b).

4.3 Physical Features & Topography

Parts of Joypurhat district lies on the Tista Meander Floodplain. This region occupies major part of the Teesta Floodplain as well as the Floodplains of the Atrai, Little Jamuna, Karatoya, Dharla and Dudkumar rivers.

Most areas have broad floodplain ridges and almost level basins. There is an overall pattern of olive brown, rapidly permeable, loamy soils on the high floodplain ridges, and grey or dark grey, slowly permeable, heavy silt loam or silty clay-loam soils on the lower land and parent materials rich in minerals. Eight general soil types occur in the region; of which, Noncalcareous Grey Floodplain and Noncalcareous Brown Floodplain soils predominate. They are moderately acidic throughout, low in organic matter content on the higher land, but moderate in the power parts. Fertility level, in general, is low to medium. Soils in general have a good moisture holding capacity (BBS, 2018d, p.10).

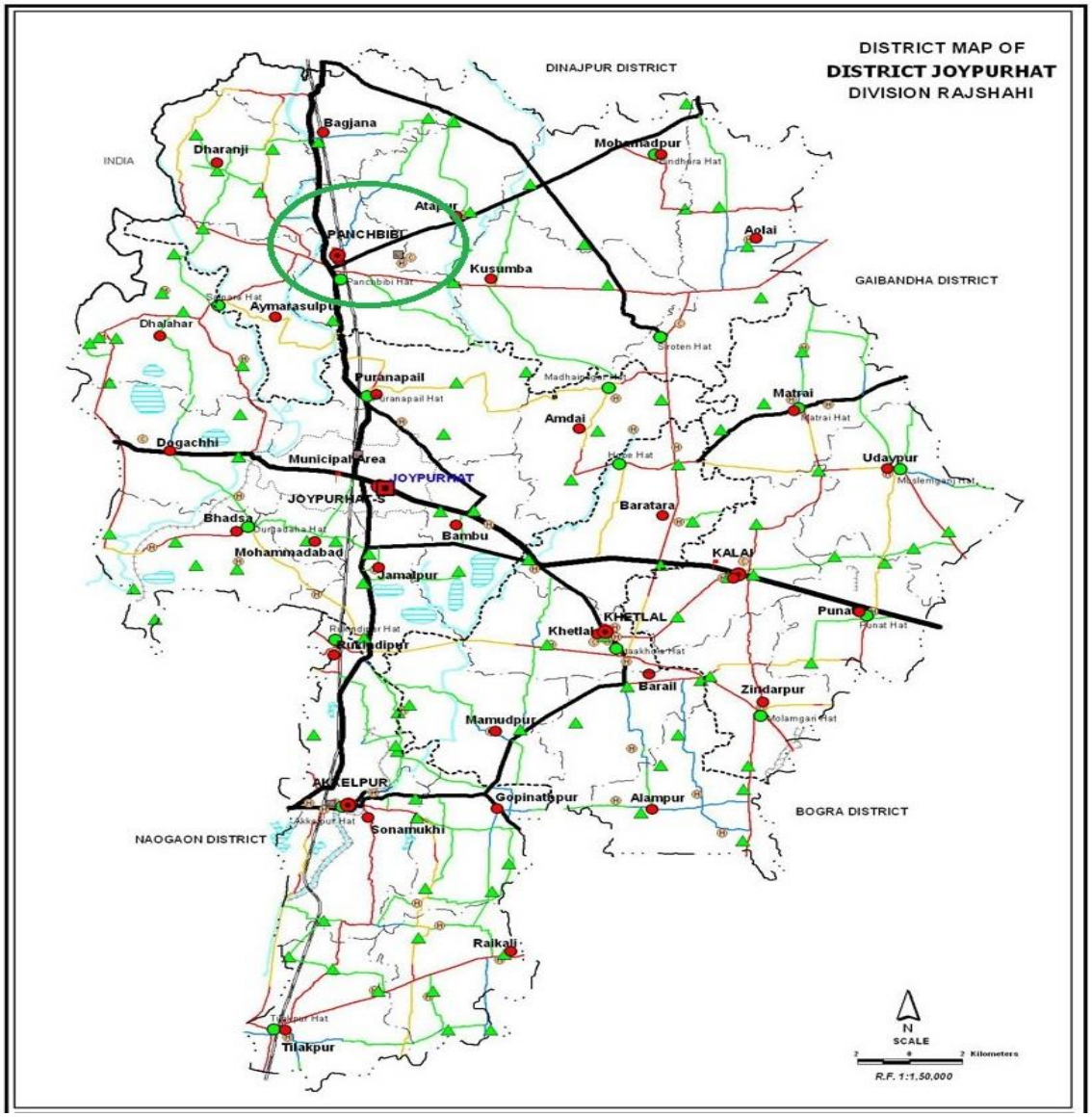

Figure 4.1: Map of Joypurhat District.

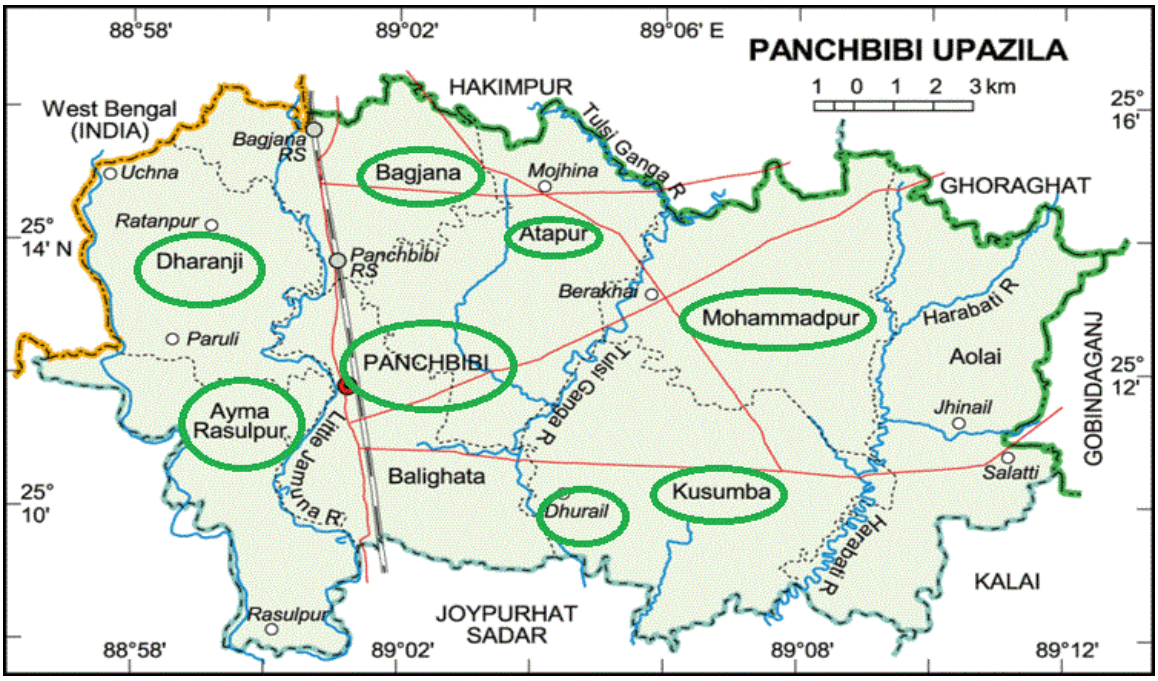

Figure 4.2: Map of Panchbibi Upazila

Table 4.1 Description of Agricultural Land (Cultivable Land) Type in 2018

(Hectare)

Name of District	High land	Medium high land	Medium low land	Low land	Very low land	Total
Joypurhat	**54141**	**31423**	**1723**	**35**	**0**	**87322**

Source: BBS, 2018e, p.9.

4.4 Climate, Temperature & Rainfall

Joypurhat is a district of Tropical climate. In winter there is much more rainfall in Joypurhat than in summer. The average annual temperature in here is 25.4 °C and the average annual rainfall is 1738 mm (Table 4.2). The driest month is December with 3 mm. Most precipitation falls in July, with an average of 364 mm. The warmest month

of the year is August with an average temperature of 28.9 °C. In January, the average temperature is 18 °C. It is the lowest average temperature of the whole year.

Table 4.2 Climate Data for Joypurhat

Month	Average high °C	Daily mean °C	Average low °C	Average precipitation mm
Jan	24.8	18	11.2	10
Feb	27.6	20.2	12.9	15
Mar	32.5	24.9	17.3	21
Apr	35	28.4	21.9	52
May	33.6	28.7	23.8	186
Jun	32.4	28.9	25.4	330
Jul	31.7	28.9	26.1	364
Aug	31.6	28.9	26.2	321
Sep	31.7	28.6	25.6	283
Oct	31.1	27	22.9	140
Nov	28.7	22.8	17	13
Dec	25.9	19.3	12.6	3
Year	30.6	25.4	20.2	1,738

Source: Wikipedia, 2019.

The difference in precipitation between the driest month and the wettest month is 361 mm. The average temperatures vary during the year by 10.9 °C.

4.5 Area, Population and Literacy Rate

During the period from 1971 to 1984 Joypurhat was a Sub-division under Bogra district; it was turned into a district in 1984. Of the five upazilas of the district Panchbibi is the largest (278.53 sq km, it occupies 28.85% of the total area of the district) and Akkelpur is the smallest upazila (139.47 sq km) (Banglapedia, 2019a).

Panchbibi Thana, now an upazila, was formed in 1868. Panchbibi has 1 Municipality, 8 Unions, 222 Mauzas/Mahallas, and 244 villages. (Banglapedia, 2019b).

The selected unions of Panchbibi upazila are Atapur, Aymarasulpur, Kusumba, Dharanji, Bagjana, Balighata, Mohamadpur. The area, population and literacy rate are given in Table 4.3.

Table 4.3 Areas, Population and Literacy Rate of Seven Unions of Panchbibi Upazila

Name of union and GO code	Area (acre)	Population		Literacy rate (%)
		Male	Female	
Atapur 21	9433	11834	11567	49.90
Aymarasulpur 31	6670	13554	12907	55.51
Kusumba 73	11317	13514	12716	44.05
Dharanji 63	7103	13974	13140	46.84
Bagjana 42	6240	10958	10106	62.10
Balighata 52	7646	11054	10249	54.47
Mohamadpur 84	9532	11579	11340	49.30

Source: Banglapedia, 2019b.

4.6 Religion and Culture

Most of the people in Joypurhat district are Muslim but other religions people are also here. There are 758324 Muslim, 76033 Hindu, 4715 Buddhist, 183 Christian and 7441 others people lives in this district. Indigenous communities such as Santal, Munda, Oraon, Koch rajbangshi belong to this district (Banglapedia, 2019a). Joypurhat district has 2573 mosques, 186 mosque-based library, 675 trained Imam, 2200 Imam, 424

temples, 21 churches and 18 Buddhist temples. Hinda - Kasba Shahi Mosque is one such mosque in Joypurhat. Joypurhat is a district of ancient civilization and culture organizations. In the time period of old and mid era, Joypurhat contained knowledge ruled and Gauri literature. Bengali literature poet Jayadeva Goswami is the piece child of Joypurhat (Wikipedia, 2019). Folk music such as Bhawaia, Palligeeti, Marfati, Dehatottva, Jarigan, Morshia, wedding songs etc are prevalent; besides, 'Jatrapala' are also performed in the district. (Banglapedia, 2019a)

183355 Muslim, 23925 Hindu, 3451 Buddhist, 81 Christian and 4994 others lives in Panchbibi upazila. Indigenous communities such as santal, munda and oraon belong to this upazila. (Banglapedia, 2019b)

Tomb of Hazrat Abu Jafar Mohammad Nasiruddin Balkhi (R:), Remnants of the Rajbari at Atapur union are archaeological heritage and relics found in this Panchbibi upazila. There are 298 Mosque, 8 Temple, 1 Church, 3 Tomb, 1 sacred place in this upazila. Some noted religious institutions here are: Patharghata Bazar Mosque, Pakuria Mandir, Baran Mandir, Chhatinali Mandir. It has 18 library, 17 club, 1 press club, 5 cinema hall, 1 theatre stage, 1 theatre group, Bishwa Sahitya Kendra (Banglapedia, 2019b).

The people of this area are very cordial, cultured, co-operative and have national consciousness amongst themselves.

4.7 Rivers

Bangladesh is a country of many rivers. There are five rivers in Joypurhat District.these are Small Jamuna River passes through Joypurhat Sadar Upazila and Panchbibi Upazila, Tulshiganga River passes through Joypurhat Sadar Upazila, Khetlal Upazila and Akkelpur Upazila. Chiri River passes through Panchbibi Upazila, Haraboti River passes through Panchbibi Upazila & Sree River passes through Chakbarkat Joypurhat Sadar Upazila (Wikipedia, 2019).

4.8 Agriculture

The main field crops of Panchbibi Upazila of Joypurhat district are: paddy, jute, wheat, potato, sugarcane, mustard, vegetables. Extinct or nearly extinct crop is cotton. Main

fruits are mango, jackfruit, banana, blackberry, pineapple, guava, litchi. This upazila has a number of fisheries, dairies and poultries. Main exports are Jute, Leather. Ownership of agricultural land landowner 57.29%, landless 42.71%; agricultural landowner: urban 42.74% and rural 58.68% (Banglapedia, 2019b).

4.9 Occupations

Main occupations are Agriculture 69.51%, non-agricultural labourer 2.09%, industry 1.18%, commerce 11.68%, transport and communication 3.97%, service 5.14%, construction 1.15%, religious service 0.15%, rent and remittance 0.22% and others 4.91% in Joypurhat district (Banglapedia, 2019a).

Main sources of income of Panchbibi upazila are agriculture 72.34%, non-agricultural labourer 2.32%, industry 0.88%, commerce 10.64%, transport and communication 3.23%, service 3.87%, construction 1.01%, religious service 0.15%, rent and remittance 0.09% and others 5.47% (Banglapedia, 2019b).

4.10 Non- government Organizations (NGOs)

NGOs often provide essential services in the developing world that in governmental institutions would provide. As a result of ineffective legal framework or small government capacity, NGOs in Bangladesh broad role in addressing legal and political issues, such as strengthening economic and social programs. Operationally important NGOs of Panchbibi upazila are BRAC, ASA, THENGAMARA MAHILA SABUJ SANGHA, PROSHIKA, Swanirvar Bangladesh, Social Development Service (Banglapedia, 2019b).

4.11 Roads, Communication, Transport and Marketing Facilities

Transport and communication possess immense importance for the socio-economic development of the country. Transport system is the nerve of the economy which benefits development activities, new technology and ideas etc. are transmitted. In short, transport and communication system is regarded as the measuring rod of economic development. Proper implementation of development program largely depends on transport system. Road transport bears crucial importance for marketing of agricultural product. If the

producers get road transport facilities they can sell their product easily and earn profit this will provide them incentive to product more in future. Thus goes the importance of road transport in the marketing of agricultural products.

Joypurhat has 342.59 km cobbled road, 61.59 km semi-cobbled road and 1569 km raw road. Joypurhat contains eight railway stations. The total railways of Joypurhat are 38.86 km. Joypurhat Railway Station was established in 1884 in the British Raj period. It is a very important railway station in the northern part of Bangladesh. (Wikipedia,2019).

Panchbibi upazila has pucca road 94 km, semi-pucca road 35 km, mud road 269 km; railway 12 km; waterway 7 nautical miles. Extinct or nearly extinct traditional transports are palanquin, horse carriage, bullock cart. There are 21 Hats and bazars, 11 fairs, most noted of which are Panchbibi Hat, Malpara Hat, Shirtree Hat, Dharunjee Hat, Bagjana Hat, Barkandi Hat, Chhatinali Hat, Baruni Snan Mela, Panchbibi Mela, Mahipur Mela, Bagjana Mela and Mahish Mardan Mela (Banglapedia, 2019b).

4.12 Concluding Remarks

The above brief discussion gives an idea of the study area on its physical, topographical, demographic and socioeconomic situations. In recent times, poultry has become a major source of income in this area. Which plays a vital role in meeting the requirement of protein and promoting economic development of Bangladesh.

CHAPTER 5

SOCIO-DEMOGRAPHIC PROFILE OF SONALI CHICKEN FARMERS

CHAPTER 5
SOCIO-DEMOGRAPHIC PROFILE OF *SONALI* CHICKEN FARMERS

5.1 Introduction

The socio-economic features of *Sonali* chicken farmers affect the organization and management of farms as well as the investment pattern, technical efficiency, production and marketing to a large extent. Thus, it is imperative to study the existing socio-economic status of the sampled households. An attempt has been made to study the socio-demographic features of the sampled households in the study area. The socio-demographic characteristics considered in the present study were age, educational status, occupation, family size, source of family income etc.

5.2 Age Distribution of the Sample Farmers

Age is the important factor influencing enterprising attitude of farmers through various ways, ultimately affecting managerial ability, skill and judgment required in the agri-business management. In the present study, all categories of farmers of the study area were classified into different age groups as presented in Figure 5.1. It is evident from the figure that most of the farmers were middle aged in the study area. The *Sonali* chicken farmers were classified into three age groups: up to 18-32 years, 33-47 years and above 48. Out of the total sample farmers 35.00 percent belonged to the age group of 18-32 years, 46.67 percent belonged to the age group of 33-47 years and 18.33 percent fell into the age group of above 48.

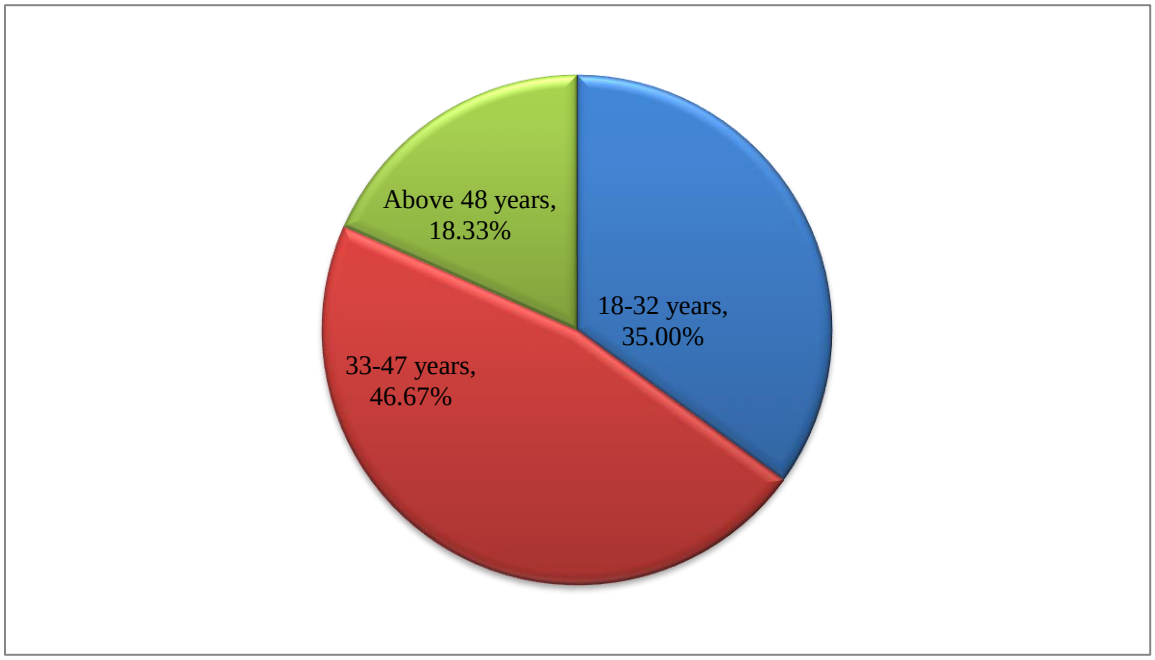

Figure 5.1: Age Distribution of Sample Farmers

Source: Field Survey, 2019.

5.3 Educational Status of the Respondents

Educational status of family members plays a catalytic role in the scientific management of farms, adoption of recommended technologies and efficient marketing of farm products. It further helps in enhancing skills and general standard of awareness in the family. Table 5.1 revealed the literacy level of respondents. It can be seen from the table that overall 10.00 percent person were found to be can sign only and 8.33, 26.67, 23.33, 16.67 and 15.00 percent were observed to be literate up to P.S.C., J.S.C., S.S.C., H.S.C. and above H.S.C. respectively. More number of respondents was educated up to J.S.C. level. Educational level describes the level of formal education attained by individual farmers.

Table 5.1: Educational Status of the Respondents

Level of education	No.	Percent (%)
Can sign only	06	10.00
P.S.C.	05	8.33
J.S.C.	16	26.67
S.S.C.	14	23.33
H.S.C.	10	16.67
Above H.S.C	09	15.00
Total	60	100.00

Source: Field Survey, 2019.

5.4 Occupational Status of the Selected *Sonali* Chicken Farmers

The main and subsidiary occupations identified of the sample *Sonali* chicken poultry owners were *Sonali* chicken farming, agriculture, business and others. It is observed from Figure 5.2 that, about 55.00 percent had *Sonali* chicken farming as main occupation.

Regarding subsidiary occupation, 46.67 percent of the poultry owners had poultry as subsidiary occupation (Figure 5.3). This indicate that majority of owners having *Sonali* chicken poultry farming as main occupation and few owners having poultry farming as subsidiary business where as remaining poultry owners were having agriculture, business and others as main or subsidiary occupation.

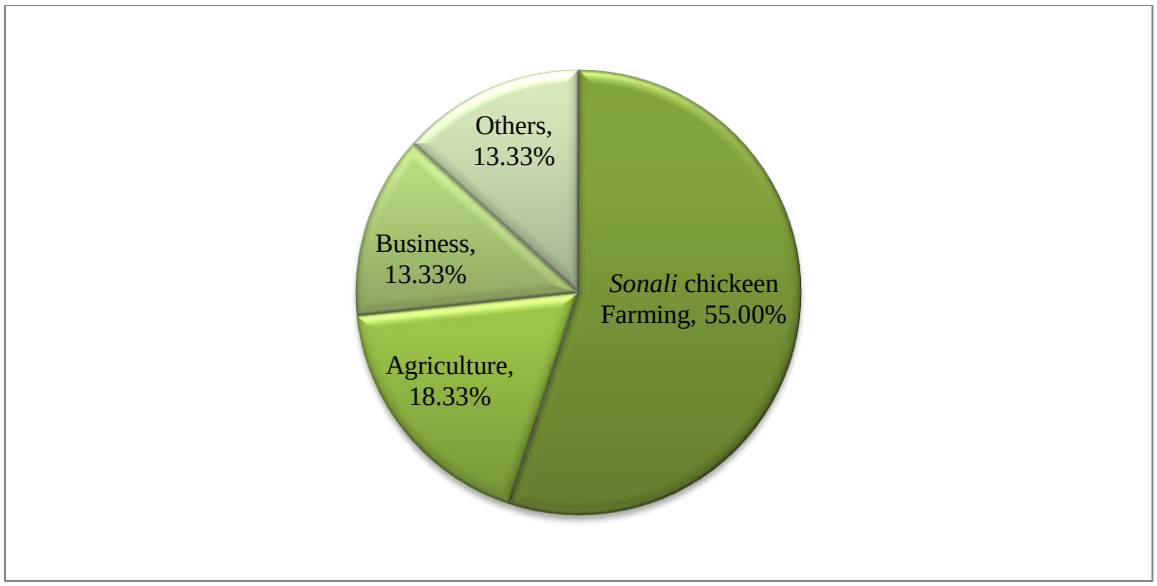

Figure 5.2: Main Occupation of the Sample *Sonali* Chicken Farmers

Source: Field Survey, 2019.

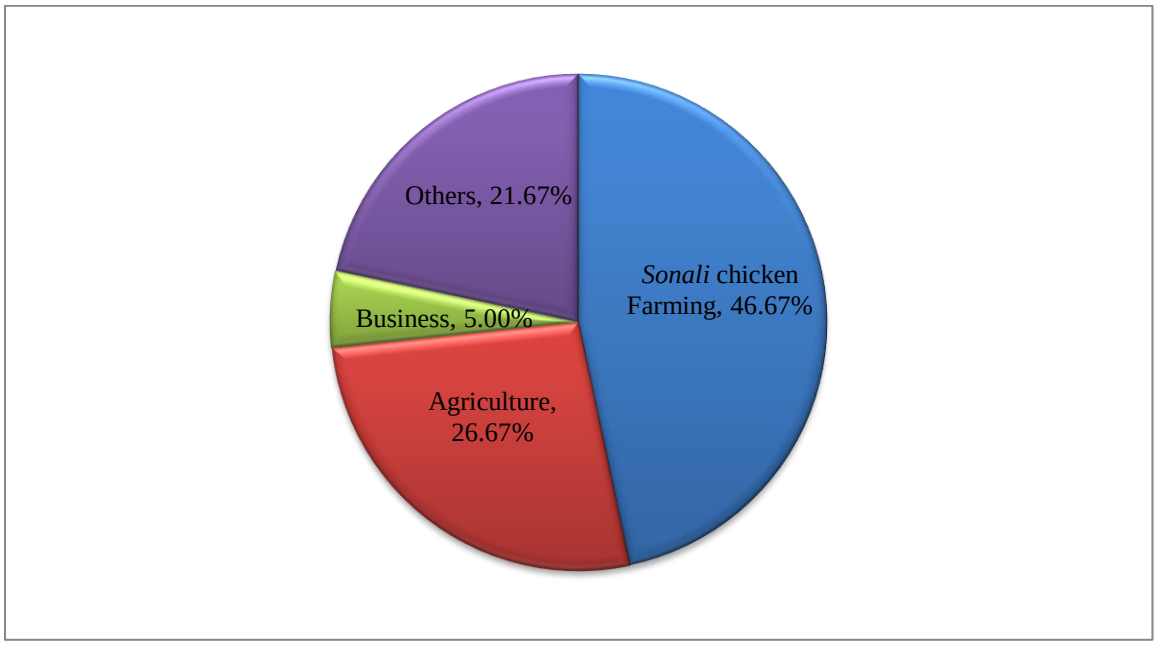

Figure 5.3: Subsidiary Occupation of the Sample *Sonali* Chicken Farmers

Source: Field Survey, 2019.

5.5 Family Size of the Selected *Sonali* Chicken Farmers

The family structure and size are important indicators determining the social and economic well-being of the families living in the area under consideration. Thus, a detailed study on family size on sample households on different categories of farms had been carried out and results were displayed in Table 5.2. The national average family size of our country was about 4.06 (BBS, 2018e, p.528). The average family sizes of the *Sonali* chicken producing farmers were found to be 4.38 which were slightly more than the average family size of the country. Most of the families around 60.00 percent in the study area consisted of 4-6 members. 31.67 percent families consisted of 1-3 members and 8.33 percent families consisted of above 7 members.

Table 5.2 Family Size of the Selected *Sonali* Chicken Farmers

No. of family members group	No. of farm family	Percent (%)	Average family size
1-3	19	31.67	4.38
4-6	36	60.00	
Above 7	5	8.33	
Total	60	100.00	

Source: Field Survey, 2019.

5.6 Experience in Poultry Rearing of the Selected *Sonali* Chicken Farmers

The experience is another important factor which denotes the how many years farmer was working in this business also given in Figure 5.4. It is seen from Figure 5.4 that, about 47,45,7 and 2 percent famers had less than 3 years, 4-6 years, 7-9 years and above 9 years of experience respectively.

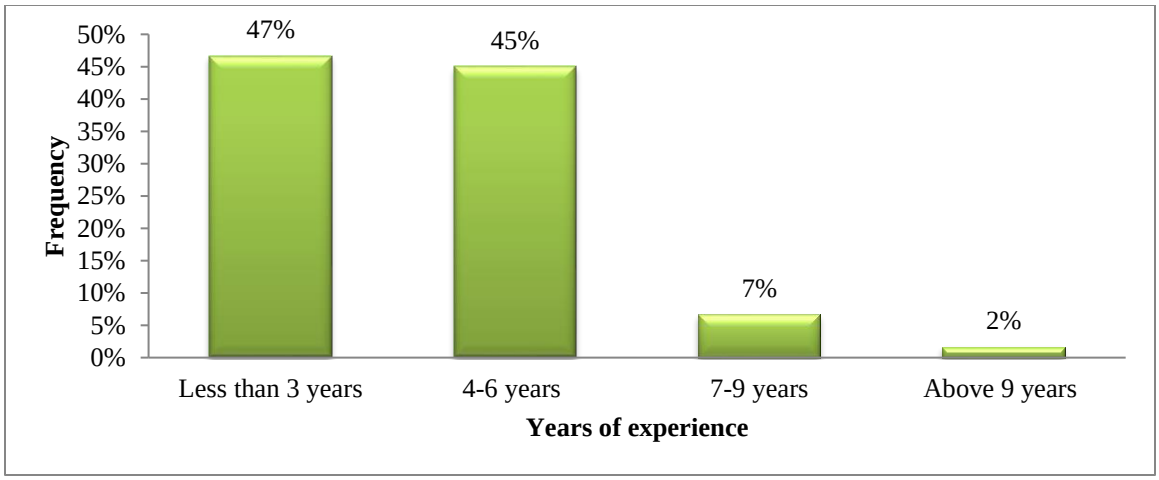

Figure 5.4: Experience in Poultry Rearing of the Selected *Sonali* Chicken Farmers

Source: Field Survey, 2019.

5.7 Sources of Credit Facilities of the Respondent

Farm credit is an important instrument, which has been used to increase agricultural productivity. The sources of credit facilities for the *Sonali* chicken farmers included Banks, NGOs, their own funding and others. In the study area different NGOs such as BRAC, BANDHAN etc. are operating their services for providing loan to the poor farmer's rate, so they can use this fund in the *Sonali* chicken farming. About 18.33 percent farmers were taken loan from Banks, 28.33 percent farmers were taken credit from NGOs and 5 percent farmers were taken loan from others as reported by the sample farmers. And 95 percent farmers were used their own funding (Table 5.2).

Table 5.2 Sources of Credit Facilities of the Sample Farmers

Items	No.	Percent (%)
Own funding	**57**	**95.00**
Banks	**11**	**18.33**
NGOs	**17**	**28.33**
Others	**3**	**5.00**

Source: Field Survey, 2019.

Note: one *Sonali* chicken farmer reported more than one source, so addition of percentage will not necessarily equal to 100.

5.8 Concluding Remarks

Socio-demographic indicators are an important ingredient to any research outcomes. How people respond to our research questions is greatly impacted by where they find themselves in a world made increasingly more complicated by social and economic disparities. Research designs that better reflect the important role of socio-demographic data will come closer to understanding how people think which will ultimately lead to more targeted, effective decision making. So, the above discussion will be more helpful to understand the *Sonali* chicken farmers' condition.

CHAPTER 6

FINANCIAL VIABILITY OF SONALI CHIKCEN PRODUCTION

CHAPTER 6
FINANCIAL VIABILITY OF *SONALI* CHIKCEN PRODUCTION

6.1 Introduction

The data collected for the present investigation were analyzed as per the methodology, keeping in view the objectives of the study. The results of the analysis are presented and discussed in this chapter.

6.2 Fixed Capital Investment Pattern on per 100 *Sonali* Chicken

The pattern of fixed capital investment for *Sonali* chicken farms has been presented in Table 6.1. Expenditures on housing and production equipment were treated as capital investment. It was revealed that total fixed investment was Tk. 15696 Table 6.1. Fixed capital investment on per 100 *Sonali* chicken included investment on buildings, equipment and other miscellaneous items. The total fixed investment is considered as initial investment of per 100 *Sonali* chicken production for financial analysis.

6.2.1 Investments on Housings

Housing cost include chicken shed and feed store cost in the study area. Three types of chicken shed were identified in the study area. These were tin shaded chicken house, half building & building. Most of the farm houses were tin shed pucca floor fenced by the iron net in the study areas. Shads are very important pre- requisite for poultry farms and this require a large amount of capital investment as birds cannot be kept without proper sheds. Poultry birds are generally very sensitive to environment and need proper protection for rearing to obtain good return from them. The investments on housings were to the tune of Tk. 13708 (87.34% of total fixed investment) and Tk. 1132 (7.21% of total fixed investment) were invested on chicken shed & feed store respectively with the sub-total Tk. 14840 (94.55 % of total fixed investment) (Table 6.1). The sheds were the main item of costs in housings.

6.2.2 Investments on Equipment

The value of equipment's like's feeders, waterers, brooder, sprayer visquine/ chat/ bosta/ polythene, light, buckets and others equipment come under investment cost. The investments on equipment were to the tune of feeders + waterers Tk. 345 (2.20 % to total fixed investment), brooder + sprayer Tk. 89 (0.57% to total fixed investment) & miscellaneous Tk. 422 (2.69 % to total fixed investment) respectively with the sub-total of Tk. 856 (5.45% to total fixed investment) (Table 6.1).

Table 6.1. Fixed Capital Investment Pattern on per 100 *Sonali* Chicken

Sl No.	Investment item	Unit	Per 100 *Sonali* chicken fixed investments	Percentages to total fixed investment
A.	**Housings**			
i	***Sonali* chicken shed**	**Tk.**	**13708**	**87.34%**
ii	**Feed store**	**Tk.**	**1132**	**7.21%**
	Sub-total (A)	**Tk.**	**14840**	**94.55%**
B.	**Equipment**			
i	**Feeders + Waterers**	**Tk.**	**345**	**2.20%**
ii	**Brooder + Sprayer**	**Tk.**	**89**	**0.57%**
iii	**Miscellaneous**	**Tk.**	**422**	**2.69%**
	Sub-total (B)	**Tk.**	**856**	**5.45%**
	Total fixed investment (A+B)	**Tk.**	**15696**	**100.00%**

Miscellaneous items include: Visquine/ chat/ bosta/ polythene, light, buckets etc.

Source: Field Survey, 2019.

6.3 Variable Costs on Per 100 *Sonali* Chicken

Variables cost included feed cost, cost of day old chicks, veterinary service and medicines/vaccines, litter cost, labour cost, interest on working capital and miscellaneous cost electricity charges incurred during the whole bird cycles per year. The various items of variable costs on per 100 *Sonali* chicken have been presented in Table 6.2. A perusal of the table brought out that the total variable cost was Tk. 13866 per 100 *Sonali* chicken per year. All the variable costs have been calculated for 4 cycles, because in the study area average number of cycles was four per year.

6.3.1 Day Old Chicks Cost

Sample farms selected for the present study were purchasing the one day old chicks from local from hatcheries or dealers. Variations in the prices of chicks were observed due to different hatcheries and location of *Sonali* chicken farm from supplying agency. The cost of DOC in the study area was found to vary over time also. While it was found be Tk. 12 in a production cycle in 2019 it went up to Tk. 44 per chick in another production cycle in the same year. The cost of chicks was recorded. The average cost of DOC was around Tk. 27. It reveals from Table 6.2 that the cost of day-old-chick was calculated at Tk. 2825 which covered 20.38 percent of the total variable cost.

6.3.2 Cost of Feeds

Feeds used by the farmers were purchased from dealers of commercial feed manufacturers like Aman, Paragon, Podma, Narish, Shorno, Kishan etc. companies. Around 23% farmer in the study used Paragon companies' feed. The feed cost per bag was found to vary during the year of study. The highest price of a 50 kg bag was Tk. 2975 & lowest price was Tk. 1650. For calculation purpose the price was converted into kg unit. On average, price of per kg. feed was Tk. 38. Table 6.2 shows that the average feed cost for per 100 *Sonali* chicken per year was Tk. 8763 covering 63.20 percent of the total variable cost. The feed cost was found to account for the highest proportion of the total variable costs incurred as input. This shows that, feed cost is the most important variable factor in *Sonali* chicken production.

6.3.3 Hired Labour Cost

Hired labour includes permanent hired labour and labour employed on daily contract basis. It is revealed from Table 6.2 that the average total hired labour cost per 100 *Sonali* chicken per year was Tk. 188 which covered 1.36 percent of the total variable cost.

6.3.4 Veterinary Service and Medicine/Vaccines Cost

Vaccination schedule was found to be followed by majority of the farmers. The common vaccinations used are Bird-flue, Typhoid, Cholera & New Castel Disease vaccine etc. in the study area. Medicines & doctors visiting costs are also included in these costs. The average cost of veterinary service and medicine/vaccines was found to be Tk. 998 for per 100 *Sonali* chicken per year which was 7.20 percent of the total variable cost (Table 6.2).

6.3.5 Electricity Cost

Electricity Cost is another important cost for *Sonali* chicken production. Electricity is important for maintaining temperature inside the shed or for protecting the birds from hot and cold climate. The average cost of electricity was found to be Tk. 127 per 100 *Sonali* chicken per year which was 0.92 percent of the total variable cost (Table 6.2).

6.3.6 Litter Cost

Rice husk is used as bedding material or litter in the study area. Per 100 *Sonali* chicken cost of litter per year were calculated at Tk. 165 which was found to be 1.19 percent of total variable cost (Table 6.2).

6.3.7 Miscellaneous Items Cost

Actual expenditure incurred towards the transportation, shed & other repairing and other cost was considered under miscellaneous cost. In the study area, per 100 *Sonali* chicken per year miscellaneous costs was found to be Tk. 202 which constituted 1.45 percent of total variable cost (Table 6.2).

6.3.8 Interest on Operating Capital

It may be noted that the interest on operating capital was calculated by taking into account all the operating costs incurred per 100 chicken per year of *Sonali* chicken farming. Interest on operating capital for *Sonali* chicken production was estimated at Tk. 597 per 100 chicken per year, which represents 4.31 percent of the total variable cost (Table 6.2).

Table 6.2: Variable Costs on per 100 *Sonali* Chicken per Year

Sl No.	Cost item	Unit	Unit Price (Tk./ Unit)	Per 100 *Sonali* Chicken per Year		Percentages to total variable cost (%)
				Quantity (Unit / 100 *Sonali* chicken)	Total Cost (Tk.)	
(i)	Day old chicks	No.	27	105	2825	20.38%
(ii)	Feed	Kg.	38	231	8763	63.20%
(iii)	Hired Labour	Tk.			188	1.36%
(iv)	Veterinary service and medicine/vaccines cost	Tk.			998	7.20%
(v)	Electricity	Tk.			127	0.92%
(vi)	Litter	Tk.			165	1.19%
(vii)	Miscellaneous items	Tk.			202	1.45%
(viii)	Total Operating Cost (TOC)	Tk.			13269	95.69%
(ix)	Interest on operating capital	Tk.			597	4.31%
	Total variable cost	**Tk.**			**13866**	**100.00%**

Miscellaneous items include transportation, shed & other repairing and other cost.

Source: Field Survey, 2019

6.4 Total Fixed Cost

Fixed costs are those which do not change in magnitude as the amount of output of the production process changes and are incurred even when production is not undertaken. Fixed cost included depreciation on housings, depreciation on equipment and family labour cost. Total fixed cost was Tk. 1087 per 100 *Sonali* chicken per year & which was 7.27% of total cost (Table 6.3).

6.4.1 Depreciation on Housings

Depreciation is the reduction in the value of equipment's or assets as time progresses. Depreciation on shed facilities and feed store as was worked out, at the rate of 5 per cent per annum to total value of housings. Even though the cost of housing may be high when taken in one unit, the depreciated value for a particular production period is usually small. This is considered as a fixed cost. The depreciation of housings per 100 *Sonali* chicken per year was Tk. 742 & which represents 4.96% of total cost (Table 6.3)

6.4.2 Depreciation on Equipment

Ordinary feeders & plastic waterers, brooder, sprayer & other equipment were used by the farmers in the study area. The number of feeder & waterers were dependent on the folk size of a farm. This was also considered as a part of fixed cost. The depreciation was charged on the value of equipment as 10 percent per annum. The depreciation cost of equipment was Tk. 86 & as a proportion of the total cost (0.57% to total cost) was negligible.

6.4.3 Family Labour Cost

Majority of the farms with some exceptions in the study area was generally utilizes family labour. Family labour cost in the study area was Tk. 260 & as a proportion of total cost it was 1.74 percent.

6.5 Total Cost of per 100 *Sonali* Chicken Production per Year

Total cost of per 100 *Sonali* chicken was Tk. 14953 per year in the study (Table 6.3). This was calculated by adding total fixed cost & total variable cost.

Table 6.3. Total Cost of per 100 *Sonali* Chicken Production per Year

Sl No.	Cost item	100 *Sonali* Chicken per year cost (Tk.)	Percentages to total cost (%)
(i)	Depreciation on Housings 5% per Annum	742	4.96%
(ii)	Depreciation on Equipment 10% per Annum	86	0.57%
(iii)	Family Labour Cost	260	1.74%
A	Total Fixed Cost	1087	7.27%
B	Variable Cost	13866	92.73%
	Total Cost (A+B)	14953	100.00%

Source: Field Survey, 2019.

6.6 Gross Return of *Sonali* Chicken Farming

The selling value of chicken and value of used litter & excreta are the two major components of gross income in poultry farm. Estimated gross return for the *Sonali* chicken farms is given in the Table 6.4. Average price of *Sonali* chicken for the study was Tk. 230. On an average, farmers produced 80 kg chicken per year from 100 chicken. The gross return from per 100 *Sonali* chicken per year was Tk. 18400 (Table 6.4). In the study area average cycle per year was 4. Therefore, gross returns were calculated for 4 cycles.

Table 6.4: Gross Return from per 100 *Sonali* Chicken per Year

Sl No.	Particulars	Unit	Unit Price	Per 100 *Sonali* Chicken per Year		Percentages to Gross returns (%)
				Quantity (Kg.)	Value(Tk.)	
1	*Sonali* Chicken	kg.	230	80	18400	98.40%
2	Used litter & excreta	Sack	60	5	300	1.60%
	Gross Return (1+2)				18700	100.00%

Source: Field Survey, 2019.

6.7 Net Returns of *Sonali* Chicken Farming

The net return is an important measure of financial success of a farm business. The overall picture of the economics of *Sonali* chicken production can be viewed on per 100 *Sonali* chicken per year from Table 6.5. The net returns over variable costs was Tk. 4834 for per 100 *Sonali* chicken per year. In the study area, *Sonali* chicken farms were generally reared on an average four cycles in a year. Therefore, net returns were calculated for 4 cycles. The net returns over total costs were Tk. 3747 for per 100 *Sonali* chicken per year. Thus, it could be concluded that *Sonali* chicken farming is a profitable venture.

Table 6.5 Net Returns from per 100 *Sonali* Chicken per Year

Sl No.	Particulars	Per 100 *Sonali* chicken per year (T.K)
i	**Gross returns**	**18700**
ii	**Fixed cost**	**1087**
iii	**Variable cost**	**13866**
iv	**Total cost**	**14953**
	Net returns over variable cost (NRvc) [i-iii]	**4834**
	Net returns over total cost (NRtc) [i-iv]	**3747**

Source: Field Survey, 2019

6.8 Financial Viability of *Sonali* Chicken Farming

Investment in *Sonali* chicken farming was evaluated as a project to study the financial viability of investments in *Sonali* chicken farming. The financial soundness, i.e. profitability of *Sonali* chicken farming as a project was examined by analyzing the cash flow during the assumed life of the investment. Net present value (NPV), benefit-cost ratio (BCR), and internal rate of return (IRR) were worked out to see the financial viability of investment in *Sonali* chicken farming.

6.8.1 Assumptions for Financial Analysis

Since it is difficult to generate cash flow for the entire life span of the project in the absence of observed temporal information on costs and benefits, the following assumptions were made for the financial analysis:

(i) Economic Life of the Project: It was assumed to be 20 years.

(ii) Construction Period: The construction of *Sonali* chicken sheds and buildings was assumed to be completed within 1st year and the arrival of first batch of day-old chicks commenced in the 2nd year.

(iii) Economic Life of Buildings and Equipment: The economic life of sheds and other buildings was assumed to be 20 years and that of equipment was assumed to be 10 years.

Accordingly, replacement of equipment has been provided for. The salvage/terminal value was assumed at 10 percent of the capital cost in respect of both the sheds and buildings and poultry equipment.

(iv) The data related to costs and returns were assumed to be uniform and constant over the project life.

(v) Discount rate: It was taken as 9 percent because the opportunity cost of capital i.e. rate at which capital was available was also 9 percent.

6.8.2 Financial Analysis of *Sonali* Chicken Farming

The calculations were done using Microsoft Excel. The data on net present value, benefit-cost ratio and internal rate of returns of investments in *Sonali* chicken farms in the study area are given in Table 6.6.

Table 6.6 Summary Result of the Financial Analysis of per 100 *Sonali* Chicken

Sl No.	Discounted measures	20 years project *Sonali* chicken
1	Benefit-cost ratio (BCR) at 9%	1.12
2	Net Present Value (NPV) at 9% (Tk.)	16912.24
3	Internal Rate of Return (%)	23.38%

Source: Field Survey, 2019.

6.8.2.1 Net Present Value (NPV)

It can be seen from Table 6.6 that NPV was positive & it was Tk. 16912.24, Therefore, investment in *Sonali* chicken farming is economically beneficial.

6.8.2.2 Benefit-Cost Ratio (BCR)

It was 1.12 for *Sonali* chicken farming, meaning that for every unit of cost the project will get 1.12 units of gain. So, the *Sonali* chicken farming was found to be profitable for farmers.

6.8.2.3 Internal Rate of Return (IRR)

The IRR for the investment is that discount rate which nullifies the present worth of cash flows and outflows. It represents the average earning power of the money used in the project over the project life. In *Sonali* chicken farming project, IRR was 23.38%. It is acceptable & means that this project is financially viable, because it is much higher than the opportunity cost of capital (Table 6.6).

6.9 Sensitivity Analysis

Reworking the analysis to see what happens under the circumstances of decreased net returns due to decrease in prices and increased gross costs, etc. is known as sensitivity analysis. To make a valid generalization it was necessary to conduct sensitivity analysis. This (Table 6.7) was reworked separately to see what happens on the profitability of *Sonali* chicken farming under varying situations. The cost of per 100 *Sonali* chicken farming was considered constant, while returns decreases at the rate of 5% or if returns of the *Sonali* chicken farming remains the same but all costs increase at the rate of 5% and if returns decreased and cost increase at the rate of 5% then what would be the outcome.

Table 6.7 Result of Sensitivity Analysis of *Sonali* Chicken Farming in the Study Areas for 100 Birds

Situation	BCR at 9%	NPW or NPV at 9% (Tk.)	IRR (%)
Present situation	**1.12**	**16912.24**	**23.38%**
Situation I	**1.06**	**9067.12**	**17.01%**
Situation II	**1.07**	**10632.72**	**18.30%**
Situation III	**1.02**	**2787.60**	**11.58%**

Source: Field Survey, 2019

NPV- Net present value, BCR- Benefit-cost ratio, IRR- Internal rate of returns.

Situation I: Returns decreased by 5 percent

Situation II: Costs increased by 5 percent

Situation III: Returns decreased by 5 percent and costs increased by 5 percent

The results of sensitivity analysis considering the above-mentioned situation is presented in Table 6.7. BCR of *Sonali* chicken farming was found greater than one in all situations. NPV was positive at 9% discount rate and IRR was also higher than the opportunity cost of capital. This indicates that if the return decreased by 5% while the cost of *Sonali* chicken farming remained unchanged investment in *Sonali* chicken was financially viable from the point of view of the owner. If returns of the *Sonali* chicken farming remains the same but all costs increase at the rate of 5% investment in *Sonali* chicken was also financially viable. On the other hand, if gross cost increased by 5% and returns decreased by 5% simultaneously, BCR>1, NPV was positive and IRR was higher than the opportunity cost of capital which implies that *Sonali* chicken farming was financially viable.

6.10 Concluding Remarks

While agricultural products had increased manifolds, it is showing signs of diminishing marginal return. Considering BCR, NPV and IRR, the present results revealed that investment on *Sonali* chicken project is profitable. Following sensitivity analysis, it may be concluded that investment on *Sonali* chicken farming project is financially feasible.

CHAPTER 7

TECHNICAL EFFICIENCY OF SONALI CHICKEN PRODUCERS

CHAPTER 7

TECHNICAL EFFICIENCY OF *SONALI* CHICKEN PRODUCERS

7.1 Introduction

The measurement of the efficiency of production has been an important area of research over the last two decades. For this purpose stochastic frontier production function has been used. Coelli (1996b) observed that thirty out of forty studies on application of frontier models to agriculture have used stochastic frontier production function. The advantage of using stochastic frontier models are: (1) It introduces a disturbance term representing statistical noise, measurement error and exogenous shocks beyond the control of production units which would other-wise be attributed to technical inefficiency, (2) It provides the basis for conducting statistical tests of hypothesis regarding the production structure and the degree of inefficiency.

The estimation of efficiency with the help of production function has been a popular area of applied econometrics. Technical efficiency reflects the ability of a farmer to obtain the maximum possible output from a given level of inputs and production technology. It is a relative concept, since each farmers production performance is compared to a best-practice input-output relationship or production frontier. A farmer is technically inefficient in the sense that if it fails to produce maximum output from a given level of inputs. Technical inefficiency is then measured as the deviation of a farmer from the best-practice frontier.

Stochastic frontier production function model is considered appropriate for efficiency measures when the farms are operating under different prices and factor endowments. Within a production-function context production is the process of combining and coordinating materials of factors (inputs, factor-resources on productive services), in the creation of some good on services (Output on product).

The modeling and estimation of stochastic frontier production functions, originally proposed by Aigner, Lovell and Schmidt (1977) and Meeusen and Van Den Broeck (1977), has been an important area of economic study in the last two decades. Reviews of

applications in agriculture are given by Battese and Coelli (1995b). In the latter half of the last decade, various models have been proposed for the inefficiency effects in stochastic frontier production functions. Huang and Liu (1994) specified a non-neutral stochastic frontier production function, in which the technical inefficiency effects were specified in terms of various firm-specific variables and interactions among these variables and the input variables in the frontier.

The main objective of this chapter is to estimate the technical inefficiency as well as frequency distribution of *Sonali* chicken farmers in the selected areas through technical efficiency analysis. The technical efficiency in production was estimated by using the stochastic frontier production. The maximum likelihood estimates for the parameters of the Cobb-Douglas Stochastic Frontier Production functions for the *Sonali* Chicken producer farmers of the study area are obtained using the computer software FRONTIER 4.1 (Table 7.1).

7.2 Interpretation of ML Estimates of the Stochastic Frontier Production Function

Maximum likelihood estimation begins with writing a mathematical expression known as the Likelihood Function of the sample data. The likelihood of a set of data is the probability of obtaining that particular set of data, given the chosen probability distribution model. This expression contains the unknown model parameters. The values of these parameters that maximize the sample likelihood are known as the Maximum Likelihood Estimates or MLE's. The maximum likelihood estimates for parameters of the Cobb-Douglas stochastic frontier production function and technical inefficiency effect model for *Sonali* Chicken production for all farmers are presented in Table 7.1. Asides from estimates of coefficients in the model, the output also provides other variance parameters such as sigma square (σ^2), gamma (γ) and log-likelihood function.

7.2.1 Feed (X_1)

The regression coefficient of feed (X_1) was positive and insignificant (Table 7.1).

7.2.2 Medicines /Vaccines (X_2)

In case of medicines / vaccines cost, the regression coefficient was (-0.0107) negative and insignificant (Table 7.1).

7.2.3 Total labor (X_3)

The regression co-efficient of total labor was negative (-0.0252) and significant at 1 percent level of significance. It implies that 1 percent increase in total labour use, would decrease the production of *Sonali* chicken by 0.0252 percent, other things remaining the same (Table 7.1).

7.2.4 Day old chicks (X_4)

The regression coefficient of day-old-chicks was 0.2965 which indicates that one percent increase in the number of day old chicks (DOC), on an average, would result in an increase in the production of *Sonali* chicken by 0.2965 percent in farm, keeping other factors same (Table 7.1).

7.2.5 Litter (X_5)

The regression coefficient of litter was negative (-0.0042) and insignificant (Table 7.1).

Table 7.1: Maximum-Likelihood Estimates for the Cobb-Douglas Production Function of *Sonali* Chicken Production

Variable	Parameter	Coefficient	t-ratio
Stochastic frontier			
Constant	β_0	3.0016	4.5595***
ln Feed (X_1)	β_1	0.0292	0.8018
ln Medicines/Vaccines (X_2)	β_2	-0.0107	-0.9518
ln Total labor (X_3)	β_3	-0.0252	-2.0771***
ln Day old chicks (X_4)	β_4	0.2965	2.2343***
ln Litter (X_5)	β_5	-0.0042	0.3672
Inefficiency model			
Constant	δ_0	0.1415	1.8330*
Family size (Z_1)	δ_1	-0.0003	-0.1703
Education (Z_2)	δ_2	0.0017	1.0383
Experience (Z_3)	δ_3	-0.0051	-3.0294***
Variance parameters			
Sigma-Sq.	σ^2	0.0020	6.2274***
Gamma	γ	1.0000	278.6169***
Log-likelihood function		102.39	

Note: ***, ** and * indicates significant at 1, 5 and 10 percent level respectively.

Source: Field survey, 2019.

7.3 Interpretation of Technical Inefficiency Model

Farmers' socio-economic characteristics may influence farmers' production decisions as well as the overall technical efficiency in production. This section reports on sources of inefficiency estimated in the model. A negative sign on parameter inefficiencies implies that the variable reduces technical inefficiency while a positive sign increases technical

inefficiency. As expected the results in table 7.1 shows that, Family size & experience, have a negative sign and therefore reduced technical inefficiency (or increased technical efficiency) while education have a positive sign which indicates increased inefficiency. The variable experience was statistically significant at one percent. The inefficiency model presented in Table 7.1 gave some insights on factors affecting technical efficiency.

The estimated coefficient of family size variable (Z_1) was negative and statistically insignificant.

The estimated coefficient of education variable (Z_2) was positive and insignificant. The estimated coefficient of farming experience (Z_3) was negative and statistically significant at 0.01 level, which indicates that farmers with more years of farming experience in *Sonali* chicken production were relatively more efficient. The more the farmers stay in the *Sonali* chicken farming business, the more they get acquainted with the risk elements and learn ways of mitigating possible losses.

The total variance value of sigma square (σ^2) was 0.0020 which was highly significant, indicating a good fit and the correctness of the specified distribution assumption of the composite error term. Furthermore, a high value of the natural log for the likelihood functions (102.39), which means the observed results were more likely to occur, again implying a high predictive ability of the model. The value of Gamma (γ) (1.00) measures the relationship between random variation in the production of meat and inefficiency in the use of inputs. The significant value of γ (gamma) and σ^2 indicates that there are significant technical inefficiency effects in the production of *Sonali* chicken.

7.4 Technical Efficiency and Its Distribution

Table 7.2 shows frequency distribution of farm-specific technical efficiency for *Sonali* chicken farmers. It reveals that average estimated technical efficiencies for *Sonali* chicken are 88 percent which indicate that *Sonali* chicken production could be increased by 12 percent with the same level of inputs without incurring any further cost. Increase of only managerial skills result a substantial increase of output for *Sonali* chicken.

Table 7.2: Frequency Distribution of Farm-Specific Technical Efficiency Estimates from Cobb-Douglas Stochastic Frontiers for *Sonali* Chicken

Efficiency (%)	**No. of Farms**	**Percentage of farms (%)**
0-80	0	0.00
81-85	22	36.67
86-90	29	48.33
91-95	6	10.00
96-100	3	5.00
Total number of farms	60	
Minimum	0.81	
Maximum	0.99	
Mean (μ_i)	0.88	

The minimum and maximum technical efficiencies were observed to be 81 and 99 percent respectively. It was observed that 48.33 percent of sample farmers were found to have received outputs which were ranged from 86-90 (Table 7.2).

CHAPTER 8

PROBLEMS OF SONALI CHICKEN FARMING

Chapter 8

PROBLEMS OF *SONALI* CHICKEN FARMING

8.1 Introduction

There is a great market for commercial poultry farming in Bangladesh. And it is already an established business opportunity. The economic system of Bangladesh is mostly dependent on agriculture and agricultural related production. Poultry products like meat and eggs are the main source of animal protein for Bangladeshi people. Poultry farming is a lucrative business. But there are some problems faced by the farmers. *Sonali* chicken farmers were asked to rank the problems faced by them while doing their farming. The problems were listed and the farmers were asked to rank these problems in their order of priority. The ranks were then converted into percent position. The ranks corresponding to each problem are presented in Table 8.1. The problems were broadly classified under four categories such as economic, marketing technical and social and natural problems.

8.2 Economic Problems

Higher price of DOC

High price of DOC was one of the most important problems for *Sonali* chicken farming. About 100.00 percent of farmers reported that they faced this problem (Table 8.1). In the study area average price of DOC was around Tk.27.

Higher price of feed

High price of quality feed was also one of the most important limitations of producing *Sonali* chicken in the study area. Most of the farmers were collecting feed from local dealers. Dealers sell feed at very high price. About 98.33 percent of farmers reported that higher price of feed was one of the major problems for them (Table 8.1).

Price fluctuation of *Sonali* chicken

Price fluctuation was a very severe problem for the farmers. The profit from this business is not certain. In recent years the farmers of the study area faced the problem very greatly.

Due to loss in this business some of the farmers closed their farms. About 91.67 percent of farmers reported that there was price fluctuation of *Sonali* chicken (Table 8.1).

Table 8.1 Major Problems Faced by the Sample Farmers

Problems and constraints	No. of respondent	Type of problems	Percent (%)	Rank
Higher price of DOC	60	Economic	100.00	1st
Higher price of feed	59	Economic	98.33	2nd
Price fluctuation of *Sonali* chicken	55	Economic	91.67	3rd
Lower price of *Sonali* chicken	53	Marketing	88.33	4th
Unavailability of veterinary doctor	51	Technical	85.00	5th
Lack of training facilities	49	Technical	81.67	6th
Electricity problem	46	Technical	76.67	7th
Lack of capital	44	Economic	73.33	8th
Out-break of diseases	42	Social and Natural Problem	70.00	9th
Non-availability of credit	41	Economic	68.33	10th
Late payment	35	Marketing	58.33	11th
Non-availability of day-old chicks	1	Technical	1.67	12th

Source: Field Survey, 2019

Note: one *Sonali* chicken farmer reported more than one problems, so addition of percentage will not necessarily equal to 100.

Lack of Capital

Money can be considered as oil for running any business. *Sonali* chicken farming is not the opposite. Getting timely and accurate amounts of money is very important for *Sonali* chicken farming. Getting money from banks and NGO's farmers have to go through a complicated process. Which is very complicated for a few educated and illiterate people. So, they borrow money from dealers or lenders. And for that, they have to pay higher interest. About 73.33 percent of farmers reported that lack of capital was one of the major problems for them (Table 8.1).

Non-availability of Credit

Farms have a lot of difficulty getting institutional credit. About 68.33 percent of farmers reported that lack of sufficient fund was one of the major problems for them (Table 8.1). They pointed out that when they need loan for *Sonali* chicken farming as per possible amount they did not get that help from institutional sources due to complicated bureaucratic procedures. To mitigate this problem, immediate measures should be taken to simplify the lending procedures as early as possible.

8.3 Technical Problems

Unavailability of Veterinary Doctor

The climate of Bangladesh is very favorable for spreading of any kind of poultry disease. There is no effective program to maintain disease free poultry. In the study area there is a lack of veterinary doctor. Although they can be found they took high fees for coming in shade. Sometimes they don't want to come at the farm. About 85.00 percent of *Sonali* chicken producing farmers reported this problem (Table 8.1).

Lack of Training Facilities

Scientific knowledge and skilled labor are essential for *Sonali* chicken farming. Among the respondent farmers, some farmers had basic knowledge of input use, but there were many farmers who had knowledge gap in farming of *Sonali* chicken. In the study area, about 81.67 percent of farmers claimed that they had lack of scientific knowledge and

training (Table 8.1). Most of the farmers were dependent on the local dealer for rearing *Sonali* chicken. Research organizations and NGOs can play a vital role to disseminate scientific knowledge and training.

Electricity Problem

For better production electricity is important. But in the study area load shedding is a daily occurrence. Some farmers had to use oil lamp or charge light. Some farmers in the study area uses solar electricity and generators. In the survey area, 76.67 percent of *Sonali* chicken producers claimed that they faced this problem (Table 8.1).

Non-availability of Day-Old Chicks

Another problem of *Sonali* chicken farming is late payment. About 1.67 percent of farmers reported this problem (Table 8.1).

8.4 Marketing Problems

Lower Price of *Sonali* Chicken

The most important marketing problem is lower price of *Sonali* chicken. The *Sonali* chicken farmers were not getting fair price of their product. Cost of production is sometimes higher than *Sonali* chicken price. As farmers are rural they do not get same price as the urban market price. About 88.33 percent of farmers in the study area reported this problem (Table 8.2).

Late Payment

Another problem of *Sonali* chicken farming is late payment. The farmers bought inputs from various intermediaries like dealers who did not pay all value of the product in cash. For this reason they could not start activities on time for the next batch. Table 8.1 shows that 58.33 percent farm owners faced this problem.

8.5 Social and Natural Problems

Out-break of Diseases

About 70.00 percent of *Sonali* chicken producing farmers reported that attack of *Sonali* chicken disease hampered the production of *Sonali* chicken (Table 8.1). Gumboro, Ranikhet, Fowl pox, Cholera etc. are the most common diseases. To overcome this problem, scientific use of medicine, vitamin and vaccine should be ensured. Extension workers, Upazila Livestock Officers (ULO) & DLS scientists may take initiatives to ensure scientific approach to overcome this problem.

8.6 Measures Suggested by Farm Owners

To overcome the problems of *Sonali* chicken farming & to make poultry industry more profitable in the study area, the following suggestions were given by the owner of the poultry farms:

1. Government should monitor & regulate market, monitor hatchery, set regulation, set a fair price of DOC, financial help to farmer to reduce the high price of DOC.
2. Government should give subsidy on feed, monitor & regulate feed market, improve market management, set regulation, set a fair price of feed, financial help to farmer to reduce the high price of feed. Farmers' co-operative formation is needed to give pressure in these crises.
3. Lower Price of chicken is the most important problem in the study areas farmers. Government should monitor market, financial help to farmer, compensate farmer, ensure a fair price of *Sonali* chicken which is relevant with cost of production.
4. For disease management more government & private doctors are needed in the study area. Quality vaccine at lowest cost should be ensured in the study area. Sometimes doctors denied to come at farm this should be ensured. In winter season frequent visit of doctors should be ensured by the government.
5. Electricity problem is a very acute problem in the study area. Government need to solve this problem, monitoring is needed here. Solar energy should be available at lowest price & with loan facility.

6. To remove financial problem, non- availability of credit need government & private banks & NGO's credit facility. Credit interest should be reduced for poultry loan & loan should get at right time. Difficulty in getting formal credit should be removed.
7. When farmers buy different inputs, they have to pay high interest to the dealers this problem should be resolved. Inputs should be available at time.
8. DLS should provide training to the farmers. NGO's also can take part here to give training among farmers.
9. Day-old chicks supply should be ensured at all the time at lowest price.
10. Businessmen syndicate should be controlled by government, market monitoring committee needed to remove price fluctuation of *Sonali* chicken.

8.7 Concluding Remarks

The above mentioned problems, of course, are interrelated with one another and hence, need to be removed comprehensively through an integrated program for the overall development of *Sonali* chicken farming. Problems faced by the farmers were ranked on the basis of corresponding percentages. Most of the farmers were reported that high price of DOC was the main constraint for their *Sonali* chicken production. And this problem occupies first position according to its ranking.

CHAPTER 9

SUMMARY, CONCLUSION AND RECOMMENDATIONS

CHAPTER 9

SUMMARY, CONCLUSION AND RECOMMENDATIONS

9.1 Summary

Bangladesh is known as a small, agro-based, developing country with large population. As a developing country, unemployment or underemployment and malnutrition are two major problems. The country has already been marked for her low productivity, protein deficiency, poverty and external dependency.

Sonali chicken farming has great potential for solving unemployment problem and can provide additional income to our farming community through creating self-employment opportunities. There is a bright prospect of *Sonali* chicken industries in Bangladesh, because of low capital requirement for small scale farm and ready market for *Sonali* chicken meat. Furthermore, it generates income through all the year.

Now a days, many private companies, have been involved in the poultry sub-sector as well as agro processing, agribusiness development and marketing services. In the poultry sub-sector, a large number of poultry farms have been established through private initiatives. Private poultry farms like Aftab Bahumukhi Farm, Paragon Poultry, Biman Poultry Complex, Nourish Poultry & Hatchery, Kazi farms are some of the notable ventures in the country providing huge employment and income opportunities to thousands of rural contact growers and also improving nutrition intake of the people in general.

Basic information on *Sonali* chicken industry is essential to take proper decision for the development of this industry. Bangladesh has little information and knowledge about the performance of *Sonali* chicken farming system. The present study made an attempt to collect information about socio-demographic profile, cost and rates of return from *Sonali* chicken production. The study also tried to assess the financial viability of *Sonali* chicken production and the technical efficiency of *Sonali* chicken farmers and also identify some important problems that the producers are facing.

The specific objectives of the present study were as follows:

1. To investigate the socio-demographic profile of *Sonali* chicken farmers;
2. To determine the financial viability of *Sonali* chicken farming;
3. To examine technical efficiency of *Sonali* chicken producers;
4. To identify the problems of *Sonali* chicken farming;

Keeping the objectives of the study in mind, Panchbibi upazila of Joypurhat district was selected for the study because a large number of commercial *Sonali* chicken farms have been established in this study area recently. So, *Sonali* chicken farm is available here. For the study, total 60 *Sonali* chicken farms were selected. The Microsoft Excel software was used to analyze the data and descriptive statistics like average, count, percentage etc. were used to interpret the data. Stochastic frontier production function was estimated to find out the technical efficiency of *Sonali* chicken production by using computer software FRONTIER 4.1.

The socio-demographic characteristics of the sample *Sonali* chicken farms were as follows: the age of the respondents ranged from 18 years to above 48 years. About 35.00 percent respondents were in young aged (18-32 years); 46.67 percent respondents were in middle aged (33-47 years) and 18.33 percent fell into the age group of above 48 in case of *Sonali* chicken farms. In *Sonali* chicken farming system, 10.00 percent farm owners were found to be able to sign only. Amongst *Sonali* chicken farm owners, highest percentage was found to have J.S.C. level of education and percentage was 26.67. In terms of occupation, 55 percent respondents were engaged in *Sonali* chicken farming as their main occupation, while 46.67 percent respondents took it as subsidiary occupation. The average family size was 4.38 persons for *Sonali* chicken farm owners. Around 60.00 percent of the *Sonali* chicken farmer had a family size of 4-6 people. Most of the (47 percent) *Sonali* chicken farmer had less than 3 years of experience in poultry farming. About 95.00 percent farmers were used their own funding for doing business.

Housing and production equipment costs were the major fixed capital investment. The total capital investment was estimated at Tk. 15696 for per 100 *Sonali* chicken. *Sonali* chicken shed cost Tk. 13708 per 100 *Sonali* chicken was the highest cost among all total

fixed investment items and which consisted 87.34 percent of total fixed investment. For per 100 *Sonali* chicken Tk. 856 was invested on equipment which represented 5.45 percent of the total fixed investment.

The total variable cost was estimated at Tk. 13866 for per 100 *Sonali* chicken per year. Feed cost was the largest cost item among all the variable cost items for *Sonali* chicken production. Average feed costs per 100 *Sonali* chicken per year stood at Tk. 8763 for *Sonali* chicken farms; which accounted for 63.20 percent of total variable cost. Day old chick cost was the second largest cost item for *Sonali* chicken production was estimated at Tk. 2825 per 100 *Sonali* chicken per year & was 20.38 percent of total variable cost. Veterinary service and medicine/vaccines cost were estimated at Tk. 998; interest on operating capital were estimated at Tk. 597; miscellaneous items costs were estimated at Tk. 202; litter costs were estimated at Tk. 165; electricity costs were estimated at Tk. 127 and hired labour costs were estimated at Tk. 188 per 100 *Sonali* chicken per year for *Sonali* chicken production.

The depreciation was charged on the value of housings as 5 percent per annum and on equipment as 10 percent per annum. Depreciation on housings & equipment per 100 *Sonali* chicken per year were estimated at Tk. 742 and Tk. 86 respectively. Family labour cost in the study area per 100 *Sonali* chicken per year was Tk. 260.

On an average, total cost per 100 *Sonali* chicken per year were estimated at Tk. 14953 for *Sonali* chicken farms. The study reveals that the variable cost shared the major part of the total cost (92.73 percent) for farms. Variable cost per 100 *Sonali* chicken per year was estimated at Tk. 13866 for *Sonali* chicken farms. Fixed cost per 100 *Sonali* chicken per year was estimated at Tk. 1087 which accounted for 7.27 percent of the total cost.

Gross return per 100 *Sonali* chicken per year was estimated at Tk. 18700. The net returns over variable costs & net returns over total costs were estimated at Tk. 4834 & 3747 per 100 *Sonali* chicken per year respectively.

On the basis of net present value, benefit-cost ratio and internal rate of return, investment in *Sonali* chicken farming was found profitable. NPV was positive & it was Tk. 16912.24, BCR was 1.12 meaning that for every unit of cost the project will get 1.12

units of gain & IRR was 23.38% much higher than the opportunity cost of capital (9%). Therefore, investment in *Sonali* chicken farming is economically beneficial.

In the sensitivity analysis, three different situations that included situation I: returns decreased by 5 per cent, situation II: costs increased by 5 percent & situation III: returns decreased by 5 per cent and costs increased by 5 per cent. All scenarios used a constant discount rate of 9 percent. The analysis across all situations revealed that *Sonali* chicken enterprises were economically viable as it showed BCR greater than one, positive NPVs and IRRs in excess of the 9 percent opportunity cost of capital used in the analyses. The sensitivity analysis for *Sonali* chicken enterprise showed an NPV of Tk. 9067.12 for situation I, Tk. 10632.72 for situation II and Tk. 2787.60 for situation III. In addition, the IRRs for all situations were in excess of the 9 percent opportunity cost of capital used in the study. BCR of *Sonali* chicken farming was found greater than one in all situations. *Sonali* chicken enterprise was economically viable for investment.

Total labour, day old chicks included in the production frontier had a significant influence. Feed, medicines/vaccines & litter was not significant. The β -coefficient (output elasticity) was highest for day old chicks (0.2965) & coefficient of total labour was negative (-0.0252).

In the technical inefficiency effect model, experience had expected (negative) coefficients & significant at 1 % level. The negative coefficient implies that experienced farmers are technically more efficient than non-experienced farmers. The mean technical efficiencies for *Sonali* chicken are 88 percent which indicate that *Sonali* chicken production could be increased by 12 percent with the same level of inputs without incurring any further cost. Increase of only managerial skills result a substantial increase of output for *Sonali* chicken. The mean technical efficiency ranged from 81 percent to 99 percent. Maximum *Sonali* chicken farms had the range of 86 to 90 percent technical efficiency level. Highest (48.33 percent) *Sonali* chicken farms stood in this range.

The high price of day old chick, high price of' poultry feed, price fluctuation of *Sonali* chicken, lack of capital & non-availability of credit were the major economic problems of *Sonali* chicken farming. Unavailability of veterinary doctor, lack of training facilities,

electricity problem & non-availability of day-old chicks were the major technical problems of *Sonali* chicken production. Lower price of *Sonali* chicken & late payment were the major marketing problems of *Sonali* chicken production. The outbreak of diseases also created problem in *Sonali* chicken farming & which was a social and natural problem.

To overcome the aforesaid problems and in order to make the *Sonali* chicken farms profitable, the farmers gave some valuable suggestions such as: supplying poultry feed, medicine, vaccine, day old chick at lower price; ensuring reasonable *Sonali* chicken meat price; creating public awareness; improving veterinary service; ensuring training facility, institutional credit and electricity etc.

9.2 Conclusion

The benefit cost ratio, net present worth and internal rate of return indicate that rising of *Sonali* chicken is a profitable business in the study area. Sensitivity analysis also indicates that the owners of *Sonali* chicken can earn profit under changing situation. There is a wider scope for the development of *Sonali* chicken farming in this country. The findings suggest that the enterprise is helpful in employment generation and poverty alleviation which are now the major concern of the planning process of the country. Poultry is making a key contribution to the national economy through creating employment, generating local income and improving nutrition level of the low income people. Lot of problems and difficulties were found in *Sonali* chicken production in the study area. To overcome the difficulties of *Sonali* chicken raising and to make *Sonali* chicken production more profitable in the country, the following recommendations are put forward in order to improve the existing production of live *Sonali* chicken.

9.3 Recommendations

On the basis of the salient findings of the study, certain broad implications were derived for policy makers and extension personnel to design suitable development strategy for increasing *Sonali* chicken production in the study area, and were indicated here as follows.

- Necessary steps should be taken to establish, backward and forward linkage of poultry as well as *Sonali* chicken production for adequate supply of inputs at lower price and reasonable *Sonali* chicken meat price.
- Existing contract farms should be encouraged for expansions their *Sonali* chicken production.
- Educated and unemployed youth should be encouraged for *Sonali* chicken production through extension program, scientific training facility and institutional credit at easy terms and conditions.
- More veterinary care center should be established with adequate veterinary technicians, field assistants and modern logistic support.

9.3 Limitations of the Study

The present study provides some useful information for *Sonali* chicken farmers, decision makers as well as for extension workers. However, the study suffered from the following of limitations although all possible steps were taken to make it more accurate and meaningful.

- The *Sonali* chicken producer farms owner did not keep records of their farming activities. Therefore, the researcher had to depend upon their memory. It was difficult to get information from memory.
- Exact quantification of family labour was a difficult task. Because the producer often could not estimate properly the use of family labour for different purposes. In the present study the researcher had carefully asked the period of time spent by family members in different operations.
- There was limitation of time. For this study, data and other necessary information had to be collected within the shortest possible time.
- The required data were collected from a limited area in Joypurhat district covering a small number of samples. So, the result obtained from this study may be inadequate to represent the overall situation of the country.

9.4 Avenues for Further Research

The limitation of study indicated some new avenues of research which might be undertaken in the context of Bangladesh. These are discussed below.

- Similar study considering a large number of samples could be taken.
- As the present study covered only Panchbibi upazila under Joypurhat district, a similar study could be conducted covering various geographical regions of the country and made a cross country comparisons of *Sonali* chicken production.

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APPENDICES

APPENDICES

SURVEY SCHEDULE FOR SAMPLE FARMERS DEPARTMENT OF AGRICULTURAL ECONOMICS SHER-E-BANGLA AGRICULTURAL UNIVERSITY

SONALI CHICKEN FARMING IN SOME SELECTED AREAS OF JOYPURHAT DISTRICT IN BANGLADESH: A FINANCIAL ANALYSIS

Sample No: ☐

1. Farmers Details:

a	Name:	b	Fathers name:
c	Village:	d	Union:
e	Upazila:	f	District:
g	Mobile No.:	h	Marital Status:

2. Socio-economic Characteristics of Farmers

2.1 General Information

a)	Age	:			
b)	Education	:	□Can sign only -1, □P.S.C-2, □J.S.C-3, □ S.S.C-4, □H.S.C-5, □Above H.S.C -6		
c)	Main Occupation:		d)	Subsidiary Occupation:	
	*Occupation: *Sonali* Chicken Farming-1, Agriculture-2, Business-3, Service-4, Others-5				
e)	Experience in farming (years)		:		

2.2 Family Size:

a)	Number of family members		
b)	Male members in family (nos.)	c)	Female members in family (nos.)
d)	Child (nos.) (bellow12 years)	e)	Number of members related with agriculture

3. Capital Investment Related Information:

a) Land area under *Sonali* chicken farm (decimal):
b) Land area under *Sonali* chicken farm own / mortgage land:
c) Lease value / mortgage value of land area under *Sonali* chicken farm (Tk.)…….. (only for land area in 1 year)

d) Fixed Equipment / Information about *Sonali* chicken house

Items	**Number**	**Size / Volume**	**Price/ construction cost (TK)**	**Life of asset**	**Salvage value (TK)**
Tin shaded *Sonali* chicken house					
Half Building					
Building					
Water pot					
Visquine					
Heating Material					
Fan					
Light					
Feeder					
Bamboo/ steel Case					
Feed store					
Labour / Office Room					
Sprayer					
Other Equipment’s					

4. Information of *Sonali* Chicken Raised (for 1 year)

No. of batch in a year	No. of DOC	Number of died	No. of Live chicken	Production (kg)	Sold (kg)	Price (Tk.) /kg	Total value (Tk.)	Rearing duration days
1								
2								
3								
4								

5. Cost Information

I. Cost of DOC

Number of DOC	Price per DOC (Tk.)	Total value (Tk.)

II. Litter cost

Unit	Quantity	Price per unit (Tk.)	Total value (Tk.)

III. Feed Cost

Items	Unit	Quantity		Price (TK.)	Total cost (BDT)
		Home supplied	Purchased		
Grain					
Common Salt					
Oil Cake					
Bran					
Fish meal					
Bone meal					
Drinking Water					
Mixed feed (Company Name)					

IV. Human Labor Cost

Activity	Labour Man-days; (8 hours/day)			Wage rate	Monthly wage
	Family	Hired	Total		
Feeding					
Cleaning shed					
Night Guard					
Monthly employed labor					

V. Veterinary care

Activities	Quantity/Frequency	Unit Price (Tk.)	Total Cost (BDT)
Doctors visit			
Medicine			
Vitamin			
Vaccine			
Total			

VI. Utilities (per month)

Description	Unit	Amount Tk.
Power/Electricity		
Water		
Total		

VII. Other Expenses

Description	Total Amount Tk.
Transportation Expenses	
Reparing Cost of House & Others	
Miscellaneous Expenses	
Total	

6. Production

Description	Unit	Amount	Unit Price (Tk.)	Total Value (Tk.)
Sonali Chicken Production				
Litter				

7. Where do you collect information /services about the followings?

Particulars	From where	Satisfaction level	Comment if any
Veterinary care			
Medicine			
Feed			

Satisfaction level: 1= Satisfied, 2 = Dissatisfied

8 .Which Types of Remedial Action Taken ?

Diseases	Measure
Bird flue	
Typhoid	
New Castel Disease	
Cholera	
Food poisoning	
Pox	
Vermes	
Gambura	
Nasuka	
Marex	

1=Vaccine, 2= Oral medicine , 3 =Prevention, 4= Weather factor management

9. The way of cleaning litter.

a) Scientific **b) Non scientific**

10. What type of problems do you face in *Sonali* Chicken farming?

Problems	**Response (yes-1,no-2)**	**Solution**
Higher price of DOC		
Higher price of feed		
Lower Price of *Sonali* Chicken		
Out-break of diseases		
Unavailability of veterinary doctor		
Electricity problem		
Social restriction		
Political unrest		
Financial problem		
Rumor		
Non-availability of credit		
Late payment		
Lack of training facilities		
Non-availability of day-old chicks		

11. Where do you get your fund?

Sources of fund	**Amount (TK)**	**Interest (%)**	**Expanses for acquiring loan**	**Installment period**
Own source				
Bank				
NGO				
Lending from others				

12. Do you have any change in the followings with *Sonali* Chicken farming?

Description	**Before**	**After**
Income		
Food Habit		
House		
Family Planning		
Child Schooling		
Savings		
Asset		
Social status		

Scale: 1=Improved, 2=Not Improved

13. Household Income

Occupation	**Income**	**Total**
Sonali Chicken Farming		
Business		
Agriculture		
Day labor		
Service		
Others		

Signature with date

FINANCIAL ANALYSIS

Table: NPV, IRR & BCR for *Sonali* Chicken Enterprise for a Period of 20 Years in Present Situation

Year	Investment Cost (Tk) (a)	Total Cost (Tk) (b)	Gross Cost (a+b)(Tk)	Gross Returns (Tk)	Incremental Benefit (Cash Flow) (Tk)
0	15696	0	15696	0	-15696
1		14953	14953	18700	3747
2		14953	14953	18700	3747
3		14953	14953	18700	3747
4		14953	14953	18700	3747
5		14953	14953	18700	3747
6		14953	14953	18700	3747
7		14953	14953	18700	3747
8		14953	14953	18700	3747
9		15809	15809	18786	2977
10		14953	14953	18700	3747
11		14953	14953	18700	3747
12		14953	14953	18700	3747
13		14953	14953	18700	3747
14		14953	14953	18700	3747
15		14953	14953	18700	3747
16		14953	14953	18700	3747
17		14953	14953	18700	3747
18		14953	14953	18700	3747
19		14953	14953	18700	3747
20		14953	14953	20270	5317

Source: Field Survey, 2019.

Discount Rate: 9%

NPV: Tk.16912.24078

IRR: 23.38%

Present worth 9% (cost)(A): Tk.139990.087

Present worth 9% (benefit)(B): Tk. 156902.3278

Benefit cost ratio at 9% (B/A): 1.12

SENSITIVITY ANALYSIS

Situation I: Returns decreased by 5 percent

Table: NPV, IRR & BCR for *Sonali* Chicken Enterprise for a Period of 20 Years in Situation I

Year	Investment Cost (Tk) (a)	Total Cost (Tk) (b)	Gross Cost (Tk) (a+b)	Gross Returns (Tk)	Incremental Benefit (Tk) (Cash Flow)
0	15696	0	15696	0	-15696
1		14953	14953	17765	2812
2		14953	14953	17765	2812
3		14953	14953	17765	2812
4		14953	14953	17765	2812
5		14953	14953	17765	2812
6		14953	14953	17765	2812
7		14953	14953	17765	2812
8		14953	14953	17765	2812
9		15809	15809	17847	2038
10		14953	14953	17765	2812
11		14953	14953	17765	2812
12		14953	14953	17765	2812
13		14953	14953	17765	2812
14		14953	14953	17765	2812
15		14953	14953	17765	2812
16		14953	14953	17765	2812
17		14953	14953	17765	2812
18		14953	14953	17765	2812
19		14953	14953	17765	2812
20		14953	14953	19257	4303

Source: Field Survey, 2019.

Discount Rate: 9%

NPV: Tk.9,067.12

IRR: 17.01%

Present worth 9% (cost) (A): Tk.139990.087

Present worth 9% (benefit)(B): Tk.14905721.14

Benefit cost ratio at 9% (B/A): 1.06476976

Situation II: Costs increased by 5 percent

Table: NPV, IRR & BCR for *Sonali* Chicken Enterprise for a Period of 20 Years in Situation II

Year	Investment Cost (Tk.) (a)	Total Cost (Tk.) (b)	Gross Cost (Tk.) (a+ b)	Gross Returns (Tk.)	Incremental Benefit (Cash Flow) (Tk.)
0	15696	0	15696	0	-15696
1		15701	15701	18700	2999
2		15701	15701	18700	2999
3		15701	15701	18700	2999
4		15701	15701	18700	2999
5		15701	15701	18700	2999
6		15701	15701	18700	2999
7		15701	15701	18700	2999
8		15701	15701	18700	2999
9		16599	16599	18786	2187
10		15701	15701	18700	2999
11		15701	15701	18700	2999
12		15701	15701	18700	2999
13		15701	15701	18700	2999
14		15701	15701	18700	2999
15		15701	15701	18700	2999
16		15701	15701	18700	2999
17		15701	15701	18700	2999
18		15701	15701	18700	2999
19		15701	15701	18700	2999
20		15701	15701	20270	4569

Source: Field Survey, 2019.

Discount Rate : 9%

NPV: Tk.10,632.72

IRR: 18.301%

Present worth 9% (cost) (A): Tk.146,269.61

Present worth 9% (benefit) (B): Tk.156,902.33

Benefit cost ratio at 9% (B/A): 1.072692616

Situation III: Returns decreased by 5 percent and costs increased by 5 percent

Table: NPV, IRR & BCR for *Sonali* Chicken Enterprise for a Period of 20 Years in Situation III

Year	Investment Cost (Tk) (a)	Total Cost (Tk) (b)	Gross Cost (Tk) (a+b)	Gross Returns (Tk)	Incremental Benefit (Cash Flow) (Tk)
0	15696	0	15696	0	-15695.65
1		15701	15701	17765	2064.32
2		15701	15701	17765	2064.32
3		15701	15701	17765	2064.32
4		15701	15701	17765	2064.32
5		15701	15701	17765	2064.32
6		15701	15701	17765	2064.32
7		15701	15701	17765	2064.32
8		15701	15701	17765	2064.32
9		16599	16599	17847	1247.22
10		15701	15701	17765	2064.32
11		15701	15701	17765	2064.32
12		15701	15701	17765	2064.32
13		15701	15701	17765	2064.32
14		15701	15701	17765	2064.32
15		15701	15701	17765	2064.32
16		15701	15701	17765	2064.32
17		15701	15701	17765	2064.32
18		15701	15701	17765	2064.32
19		15701	15701	17765	2064.32
20		15701	15701	19257	3555.82

Source: Field Survey, 2019.

Discount Rate: 9%

NPV: Tk. 2,787.60

IRR: 11.581%

Present worth 9% (cost) (A): Tk.146,269.61

Present worth 9% (benefit) (B): Tk. 149,057.21

Benefit cost ratio at 9% (B/A) :1.019057985