**CHAPTER-I**

**1. INTRDUCTION**

Bangladesh is a densely populated developing country lies in the Northeastern part of South Asia where most of the rural people are dependant for their livelihood mainly on cropping and non-cropping agricultural sector like livestock. Livestock sub-sector plays a crucial role in the traditional farming and contribute in national economy. According to Bangladesh Economic Review (2006), the per annum growth rate of 7.23% in GDP (Gross Domestic product) in 2004-2005 for livestock was the highest in all sub-sectors (Uddin, 2010). The supply of the domestically produced livestock products (Meat, Milk, Eggs) are increased by amount 1.2% annually (DLS, 2000). The livestock sub-sector is contributed 13% of total foreign exchange earnings and generated 20% of full time employment in Bangladesh (BBS, 2004).

Bangladesh has 24 million cattle, out of which 6 million are dairy cattle of local and crossbreds (DLS 2008). The country has one of the highest cattle densities of 145 large ruminants/square Kilo meter (Sq.km) compared with 90 for India, 30 for Ethiopia and 20 for Brazil (Karim, 1997). Among these population 6 million are dairy cattle (DLS, 2008) of which 92% are indigenous and 8% are crossbred cows (BBS, 2006). The estimated numbers of dairy farm in Bangladesh is 1.4 million with an average herd size of 1.3 cows (Hemme, 2008). The county has cattle population about 1.79% of the world and 5.47% of Asia (FAO, 2004) and dairy cattle ranks 12th in the world and 3rd in Asian countries (Alam et al., 1994).

Dairying is also considered a strong tool to develop a village micro economy of Bangladesh (Shamsuddin et al 2007) in order to improve rural livelihoods and to alleviate rural poverty. More regular cash income can be generated through market-oriented dairies and more employment per value added unit has been observed in dairying than in crops (Asaduzzaman 2000; Omore et al 2002). There are three major dairy production systems in the country based on input and outputs: extensive, intensive and traditional (Uddin et al 2009a).Most of the cattle in Bangladesh are non-descriptive and low yielding and few crossbred with Shahiwal, Red Chittagong and pabna cattle. High yielding crossbred like Jersey and Holstein-Friesian are found in commercial level. The local cattle yields 300 to 400 Litres of milk per lactation period of 180 to 240 days and the crossbred yields 600 to 800 Litres of milk per lactation of period of 210 to 240 days (Islam, 1992). About 64% milk in Bangladesh comes from cattle (FAO, 2004). But it can fulfill only 13.6% of the total requirement in Bangladesh (BLRI, 2001). The consumption rate also increase 4% per year (Hemme, 2008). The average annual growth rate of cow and buffalo over the period is only 0.31% but the growth rate of human population is 1.8% which is much higher. To fulfill the extra demand, the Bangladesh imports the dairy milk powder from abroad.

But milk production growth has increased from 4.1% to 7.4% per annum in 2000-2005 and 2005-2008, respectively (Hemme 2008). Even with this faster growth the per capita milk availability in 2008 was only 19 kg (Hussain et al 2008), which was far below the requirements (92 kg/person/year) as indicated by the World Health Organization (WHO). This means that in future the dairy industry of Bangladesh will be ‘demand-’ or ‘market-driven’ which corresponds to the doubling of demand for milk and milk products in 2020 in all developing countries including Bangladesh (Delgado et al 1999, Ndambi et al 2007). The key drivers for this increased market demand for dairy products are the rapid urbanization, increased population growth, and rise in absolute income (Delgado et al 1999). According to Bangladesh Economic Review (2006), the per annum growth rate of 7.23% in GDP in 2004-05 for livestock was the highest of all sub-sectors. This increase in demand has created an enormous market opportunity that can be exploited by the smallholder livestock owners who represent 70-80% of the total milk produced in the country (Jabbar et al 2005). In order to take advantage of emerging market demands for reducing their poverty, smallholders have to face challenges to improve production costs and productivity (Uddin et al 2009b). The recent historical rise in world food prices has further aggravated the situation of dairy input prices (e.g. higher price for feed, artificial insemination, veterinary services and medicine) which has also increased farm costs and ultimately affects farm profitability. This increasing input price coupling with recent historic fall of milk price push the dairy farmers in more difficult situation. The institutional arrangement in the study areas does not favour dairy farmers. The economic situation of the dairy farmers is aggravated by lack of basic infrastructure, poor access to artificial insemination and veterinary services, disorganised market structure and lack of access to technological facilities. This also limits dairy farmers’ access to inputs and support services.

Therefore, there is a growing need for information about detail economic production parameters to enhance competitiveness of both the factor market and product market, locally and internationally. While farmers need to know more about the economic indicators such as cost and profitability, research on this aspect is very limited and controversial (Saadullah 2001; Alam 1994; Rao and Odermatt 2006; Khan 2007). This creates the necessity of conducting research on detailed economic indicators considering not only profitability but also input prices, factor market, product market as well as productivity.  Moreover, there is a lack of knowledge on detailed economic parameters of milk production systems especially at farm level (Ndambi et al 2008) which is also true in the case of Bangladesh dairying. Studies show that management strategies that ensure low cost milk production and favour local competitiveness compared to foreign production as well as high returns from dairying are the key incentives for farmers to continue their business (Ndambi and Hemme 2009).

In Bangladesh, the government, cooperatives, the private sectors and a few non-governmental organizations (NGOs) provide veterinary services and artificial insemination facilities to the dairy farmers. However it is well known that the quality of the veterinary services provided by public sector institution is poor and those institutions providing these services are highly insufficient. Therefore, there is a need to restructure and reorient the livestock health and breeding services and extension services providing institutions.

The increase in demand for dairy products will put increasing pressure on dairy production systems. Sustainable dairy farming is not possible with traditional breeds and feeding practices owing to their less productive performance. For these purpose the concept of intensive dairy farming with high yielding crossbreds, intensification of production, animal health issues and a greater reliance of feeds and concentrates are required. The dairy farming in this country is dependent on crop residues, natural resources and open grazing system as a source of feeds. However, the traditional sources of feeds and fodders to support the dairy production is unlikely as available grazing areas and other common property resources are shrinking and already degraded. Therefore if milk production is to increase, then stall feeding system have to follow. For these purpose a good number of small and medium sized dairy farms with the main objectives to produce milk have been develop mostly in urban and semi-urban milk pocket areas like Pabna, Sirajganj, Manikganj, Munshiganj, Faridpur, Madaripur, Kishorganj, Rangpur and kushtia district (Amin, 1994).

The profitability of a dairy farm depends to a greater extent on productive and reproductive performance of the animals. For this reason, this study focuses on in-depth economic analysis to compare different farming systems (backyard, Semi-commercial and commercial farming) in terms of costs, profit and productivity in Sirajganj district of Bangladesh. Also investigate the reproductive performances of cows under backyard, Semi-commercial and commercial farming in study area and recommend farmers that are suitable in existing ecological and socio-economic condition.

**OBJECTIVES**

The specific objectives of the study are as follows:

1. To estimate the production cost and return of dairy farming.
2. To estimate the profitability of dairy farmers.
3. To identify and reveal the problems of dairy farming and give recommendation of

improving dairy farming in Sirajganj district.

1. To predict the future profit of the selected farm owners with specific cost.

**CHAPTER-II**

**2. REVIEW OF LITERATURE**

Review of literature gives the guidelines from the past researchers and provides a foundation to the theoretical framework for present investigation. The review of past literature makes the investigator to get an insight into the methods and procedures to be followed. The following discussion that studies conducted so far mostly focused on cost and returns, in some areas with productivity, re-productivity and some management aspects of raising dairy cows. Commercial dairy farming is relatively not a new area in Bangladesh and researches dealing with performance of such farming are limited in number. However some of the studies, which are more relevant to the present study, are given below:

**Alam et al. (1994)** conducted a broad based socio-economic survey in Bangladesh and found that the proportion of cross breed cattle was 11.69%. The returns were higher by 91% for cross breed cows. Return over cash cost per lactation for cross breed cows were 158% higher than local ones.

**Ashrafuzzaman (1995)** conducted a study to investigate the socio-economic characteristics of indigenous and cross breed dairy cows owners to analyze the relative profitability. The per day total cost of raising a cross breed cow (tk. 35.05) was a little higher over an indigenous cow 6.65 litres for a cross-bred cow which was about double the average milk yield per day of 3.62 litres tk.15.64 and tk. 45.83 for indigenous and cross-bred dairy cow respectively indicating about three times higher net return from a cross bred dairy over indigenous cows.

**Kabir (1995)** conducted a study to analyze the economic performance of subsidized dairy farming in Tangail districts. The net return per farm was found Tk.14463, tk. 21773 and tk. 58173 annually for local, cross and cross-bred farm respectively. The investments per taka return were tk. 1.19, tk. 1.27 and tk. 1.37 respectively for local, and cross and cross-bred farms. Overall performance of cross bred dairy cattle was higher than local bred cows.

**Karim and Begum (1988)** conducted a study to know the prevalent situation of women’s involvement in milch cow rearing in two villages of Camilla district. They found that 42% of the total number of cattle owned by all the households was milch cow of which only 14% was of improved type. Average quantity of milk yield per milch cow was 2.77 litters. The average annual cost of feed, treatment and AI per cows Tk. 3972 of which feed cost constitutes about 98%. The annual gross return per milch cow from milk, cow dung and plough in was tk. 6674 while the net return was estimated at tk. 2763.

**Rahman (1993)** conducted a study at Kalihati and Takerhat areas under Tangail and Madaripur districts to quantify the costs and returns, to explore the interrelationship of factors affecting yield and to examine the rural employment and income generation potentials of dairy enterprise. The gross cost per cow per day was tk. 20.22 at kalihati and tk. 29.34 and 4.91 at takerhat areas.

**Rahman and Akteruzzaman (1994)** showed that the milk yield per animal per day in small, medium and large herd size were 3.87, 3.37 and 2.38 liters respectively while the cost of production per liter amounted to tk. 8.70, 9.22, and 12.33 respectively. The net returns per cow per day were tk. 8.07 and tk 4.65 respectively for small and medium herd size and the net loss estimated was tk. 3.14 in case of large herd size.

**Rahman and Raman (1991)** conducted a study on economic analysis of dairy enterprise in four selected villages of Mymensingh district in Bangladesh. The findings showed that feed cost was higher in the urban and milk pocket areas than in the rural and semi-urban areas. In Buffalo area (Ahmen Bari) feed cost is highest. The gross return per animals was positive for all types of cow. Net returns were also positive and higher for the HYV of cows and Buffaloes.

**Rajapurehit (1979)** showed that the cost of milk per liter was 0.95 rupee for crossbred cows. The total milk yield per lactation was 2077 for cross breed cows. They also observed that the net returns from crossbreed cows were higher.

A study concerned with economics of commercial dairy farming is relatively a new area in Bangladesh. Moreover to evaluate the economics of the suitable sizes of commercial dairy farming at the areas in Sirajganj district an attempt was made by the research study entitled as “Economic Analysis of Dairy Enterprises”.

**CHAPTER-III**

**3. MATERIALS AND METHODS**

**3.1 Introduction**

It is understood that methodology is the strong foundation for systematic and scientific investigation. It is important to give the details of investigation and methods adopted by the investigator in finding out the problems. This chapter outlines briefly the nature and sources of data, the tools and techniques adopted in the analysis of data to get meaningful conclusions. Here Livestock rearing usually involves collection of data from individual farmers. There are various methods of data collection for agricultural economics research. Selection of a particular method depends on many considerations. The present study was performed by the collection of data by a questionnaire, because it was considered to have some advantages over other methods. **3.2 Steps of study:**

There are several methods of data collection of which survey method is one of them. The word “survey” refers to a method of study in which an overall picture of a given universe is obtained by a systematic collection of all available data on the subject **(Efferson, 1963).** The survey method for the present study involved the following steps:

**3.2.1 Selection of a study area:**

Selection of a study area is an important step for the study to achieve the objectives .The present study was conducted in town area of Sirajganj district viz Ullapara upazilla. Under the study the following consideration taken as vital point:

a. Availability of dairy farm in that particular area due to huge amount of land and **Bathan**

b. Co-operation from the respondents so that reliable data might be obtained.

**3.2.2 Duration of study**:

The study on economic analysis of Milk production of different type of farming in different areas of Sirajganj district were conducted actually from 05 May to 04 July 2013 in the study area when stay at Ullapara Upazilla Veterinary Hospital for internship work base learning.

**3.2.3 Selection of sample and sampling procedure**:

Larger the sample size, greater is likely to be the extent of accuracy and usefulness of the results. But in reality, inclusion of all farms was not possible due to time and resource constraints. So the selection of representative sample was one of the crucial aspects for the study. Purposive sampling technique was used for selecting the sample. In total 40 farms were visited for collecting data on the basis of backyard ,semi-commercial and commercial farming .Here backyard farm, semi-commercial and commercial farm were 12, 20 and 08 respectively. The economic analysis was done on the basis of different farming conditions. The types of farming were categorized according to the following conditions:

**Backyard Farming:** This farming system is more common in rural areas where dairying is considered part of the mixed farming agricultural systems. The average herd size ranges 1 to 4. Farmers practise a cut and carry feeding system and also have access to larger public land for periodic grazing. They use scanty amount of concentrates only during the peak lactation period. Family labour is the only source for labour in dairying. The farmer does not solely depend on dairying as a significant portion of their income comes from cash crops such as rice and off-farm activities

**Semi-commercial Farming:** This farming system comprises farms with 5-15 dairy cows of which 70% are cross-bred. Farm grown crop residues (i.e. rice straw) are used for feeding. More purchased concentrates feeds are used than in the small-scale extensive system. This farming system uses the hired labour. The milk production per cow per year is higher.

**Commercial Farming:** This system uses the highest proportion of graded cows. They enjoy the benefit of a higher milk prices as they supply higher portion of milk to the city or to the cooperative. More concentrates and supplementary feeds such as vitamins, minerals and other feed additives etc are used for this reason production cost is higher. The provision of veterinary health care, artificial insemination and other support services are available at lower costs. Hired labour is used and dairy is the main source of income

**3.2.4 Preparation of questionnaire and Pre-testing**:

Before starting final data collection draft schedule were prepared keeping the objectives in mind and pre-tested to avoid post survey inconsistencies, if any. A few schedules where the pre-tested in the study area in order to ensure the appropriateness of the contents. After pre-testing, some parts of the draft schedule were improved, rearranged and modified in the light of the actual experience gained from the field and then the final schedule was developed. The questions of the study schedule included the following information:

a) General information of the dairy owner such as, family composition, literacy level, occupational status etc.

b) Information on socio-economic profiles, average milk yield per lactation, lactation period and frequency of disease incidence regarding other breeds and farming problems.

**3.2.5 Methods of data collection**:

Reliable data are directly related to the success and validity of the study. Keeping this in mind most of the data were collected by the researcher himself. To obtain the reasonable and accurate data, the researcher visited several times in the study areas. Data were collected by personal interview with the individual farm owners through farm to farm visit. During data collection the objectives of the study were clearly explained to the respondents so that they could respond freely. Question was asked systematically and explanation was given wherever necessary. Farmers usually did not keep records of their day to day transactions of farm activities. It was therefore; very difficult to collect actual data and the researcher had to rely on the memory of the farmers. To overcome this problem, of course, all possible efforts were made by the researcher himself to ensure the collection of reasonably accurate data on recall basis. Data on daily milk yield (lit), lactation length (days), lactation yield (lit), daily costs returns and faced problems of dairying were recorded.

**3.2.6 Analytical technique**

In the progress of analysis of collected data various statistical tools like averages, percentages, tables, graphs and diagrams were applied in order to make the study worthy, informative and useful for the purposes. Benefit-Cost Analysis also estimated to find out the profitability of the farm owner. Data also analyzed by using simple linear Regression Model by using SPSS program. Where independent variable was monthly recurrent cost and dependent variable was monthly profit.

**CHAPTER–IV**

**4. RESULTS AND DISCUSSIONS**

**4.0 RECURRENT COST AND RETURNS OF DIFFERENT TYPES OF DAIRY FARMS**

**4.1 Monthly Recurrent Cost of Cows in Sirajganj District**

The cost and return is a very important component of dairy farming for knowing the economic status of a farm. Cost may be classified as cash cost where direct cash cost incurred are calculated from daily records and non- cash costs are family supplied input costs. Monthly recurrent cost and return were estimated from the collected data from Sirajganj district in different type of farms. The estimated monthly approximate recurrent costs of the studiedfarm households were discussed as follows:

**Table 01** shows that, monthly approximate total recurrent cost of the different type of farms. Total estimated recurrent cost of rearing cows per month in Backyard farming, Semi-commercial farming and Commercial farming were **Taka 2395.33, 5058.85 and 6293.38** respectively.

**Backyard Farm:** Out of cash cost the major portion of the feed cost 69.87%, followed by 3.73% of the veterinary cost than 1.55% of the AI cost and others are the 1.03% cost. Out of non-cash cost the major portion of feed cost was 19.50%, followed by labor cost 2.45%, depreciation on housing was 1.11% and dairy equipment cost was 0.77%.

**Semi-commercial Farm:** Out of cash cost the major portion of the feed cost 51.62%, followed by 2.88% of the veterinary cost than 1.23% of the AI cost and others are the 1.23% cost. Out of non-cash cost the major portion of feed cost was 30.47%, followed by labor cost 10.53%, depreciation on housing was 1.51% and dairy equipment cost was 0.54%.

**Commercial Farm:** Out of cash cost the major portion of the feed cost 56.43%, followed by 1.92% of the veterinary cost than 1.10% of the AI cost and others are the 1.20% cost. Out of non-cash cost the major portion of feed cost was 25.53%, followed by labor cost 11.48%, depreciation on housing was 1.51% and dairy equipment cost was 0.83%.

**Table-01: Per Month per Cow Recurrent Cost in Sirajganj District**

|  |  |
| --- | --- |
| **Particulars** | **Per Month Per Cow recurrent Cost** |
| **Backyard Farm** **n=12** | **Semi-commercial Farm****n=20** | **Commercial Farm****n= 8** | **All average (N=40)** |
| **In taka** | **%** | **In taka** | **%** | **In taka** | **%** | **In taka** | **%** |
| **Cash cost:** |  |
| **Straw** | **200.92** | **8.39** | **291.95** | **5.77** | **326.88** | **5.19** | **273.25** | **6.45** |
| **Concentrate** | **1472.67** | **61.48** | **2319.45** | **45.85** | **3225.00** | **51.24** | **2339.04** | **52.86** |
| **Vet. Care** | **89.25** | **3.73** | **145.70** | **2.88** | **120.75** | **1.92** | **118.57** | **2.84** |
| **A.I Cost** | **37.08** | **1.55** | **62.00** | **1.23** | **69.38** | **1.10** | **56.15** | **1.29** |
| **Others** | **24.58** | **1.03** | **62.20** | **1.23** | **75.25** | **1.20** | **54.01** | **1.15** |
| **Total****(cash cost)** | **1824.50** |  | **2881.30** |  | **3817.25** |  | **2841.02** |  |
| **Non-cash cost:** |  |
| **Straw** | **368.33** | **15.38** | **688.95** | **13.62** | **656.25** | **10.43** | **571.18** | **13.14** |
| **Green Grass** | **98.75** | **4.12** | **852.50** | **16.85** | **950.00** | **15.10** | **633.75** | **12.02** |
| **Labor cost** | **58.75** | **2.45** | **532.50** | **10.53** | **722.50** | **11.48** | **437.92** | **8.15** |
| **Depreciation on housing** | **26.50** | **1.11** | **76.30** | **1.51** | **95.00** | **1.51** | **65.93** | **1.37** |
| **Dairy equipment cost** | **18.50** | **0.77** | **27.30** | **0.54** | **52.38** | **0.83** | **32.73** | **0.71** |
| **Total (Non cash cost)** | **570.83** |  | **2177.55** |  | **2476.13** |  | **1741.50** |  |
| **Total recurrent cost** | **2395.33** | **100** | **5058.85** | **100** | **6293.38** | **100** | **4582.52** | **100** |

**Source: Field survey, 2013**

**Figure-01: Monthly recurrent cost per cow in different types of farming in Sirajganj district.**

**All (average):** Out of cash cost the major portion of the feed cost 59.31%, followed by 2.84% of the veterinary cost than 1.29% of the AI cost and others are the 1.15% cost. Out of non-cash cost the major portion of feed cost was 25.16%, followed by labor cost 8.15%, depreciation on housing was 1.37% and dairy equipment cost was 0.71%.

**4.2 Comparative Productive and Performance of Different Breeds of Cows**

The productive and reproductive performances of dairy cows are highly depended on management and farming systems. Better management increases the productive and reproductive performances. The production systems found variable during field investigation based on farming system like backyard farming, semi-commercial farming and commercial farming. Commercial farming was organized then other and production of dairy was also higher then back yard and semi-commercial system.

**Table 02. Productive and reproductive performance of crossbreds and indigenous dairy cows.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameters**  | **HF cross** | **Shahiwal cross** | **Shindhi cross** | **Indigenous** |
| **Milk production /d/cow**  | **8.36 ±2.01**  | **4.53 ±0.96**  | **4.29 ±1.12**  | **2.23 ±0.73**  |
| **Lactation period (day)**  | **262.0 ±24.15**  | **250.4 ±28.06**  | **258.8 ±34.03** | **227.8±32.50**  |
| **Age at first calving (month)**  | **34.12 ±3.78**  | **35.48 ±3.64**  | **36.12 ±4.35**  | **40.48 ±4.54**  |
| **Service per conception**  | **1.84±0.80**  | **1.32±0.48**  | **1.48 ±0.58**  | **1.92±0.91**  |
| **Gestation Length (day)**  | **275 ±3.95**  | **276±4.26**  | **275±4.41**  | **277±3.31**  |
| **Dry period (day)**  | **134.8±30.02**  | **134.8 ± 27.25**  | **163.2±32.37**  | **197.4±52.28**  |
| **Birth weight of calf (kg)**  | **22.52±0.32**  | **22.19±0.35**  | **20.16±0.86**  | **17.0±0.36**  |

**4.3 Monthly Returns from farming as per cow in Sirajganj district.**

Total estimated return of rearing cows per month in backyard, semi-commercial and commercial farming and all average were **Tk.** **4321.25, Tk. 9290.25, Tk. 11387.50 and Tk. 8333.00** respectively.

**Backyard Farm:** Out of return the major portion of the income from milk was 77.81%, followed by 20.35% and 1.84% income from calf and cow dung respectively.

**Semi-commercial Farm:** Out of return the major portion of the income from milk was 86.10%, followed by 12.16% and 1.74% income from calf and cow dung respectively.

**Commercial Farm:** Out of return the major portion of the income from milk was 86.25 %, followed by 11.91% and 1.84% income from calf and cow dung respectively.

**All** (**average**): **:** Out of return the major portion of the income from milk was 83.39%, followed by 14.81% and 1.81% income from calf and cow dung respectively.

**Table-03: Monthly returns of Rearing per cow per lactation period in Sirajganj District**

|  |  |
| --- | --- |
| **Particulars****of Return** | **per cow per month Returns** |
| **Backyard Farm (n=12)** | **Semi-commercial Farm (n=20)** | **Commercial Farm (n=8)** | **All average (N =40)** |
| **In taka** | **%** | **In taka** | **%** | **In taka** | **%** | **In taka** | **%** |
| **Income from milk** | **3362.50** | **77.81** | **7998.50** | **86.10** | **9821.88** | **86.25** | **7060.96** | **83.39** |
| **Income from calf** | **879.17** | **20.35** | **1130.00** | **12.16** | **1356.25** | **11.91** | **1121.81** | **14.81** |
| **Income from cow dung.** | **79.58** | **1.84** | **161.75** | **1.74** | **209.38** | **1.84** | **150.24** | **1.81** |
| **Total return** | **4321.25** | **100** | **9290.25** | **100** | **11387.50** | **100** | **8333.00** | **100** |
| **Profit over cash cost:** | **2496.75** |  | **6408.95** |  | **7570.25** |  | **5491.98** |  |
| **Profit over total recurrent cost:** | **1925.92** |  | **4231.40** |  | **5094.13** |  | **3750.48** |  |
| **BCR(cash cost basis)** | **2.37** |  | **3.22** |  | **2.98** |  | **2.93** |  |
| **BCR(total recurrent cost basis)** | **1.80** |  | **1.84** |  | **1.81** |  | **1.82** |  |

**Source: Field survey, 2013**

 **Figure-02: Monthly Profit from farming as per cow in Sirajganj district.**

Estimated **BCR** on the basis of cash cost for backyard, semi-commercial and commercial farming and all average were **2.37, 3.22, 2.98 and 2.93** respectively. **BCR** on the basis of total recurrent cost for back yard, semi-commercial and commercial farming and all average were **1.80, 1.84, 1.81 and 1.82** respectively.

**4.4 Simple Linear Regression Model:** (Roy, M.K. Paul, J.C. 2012.)

In practice, it is not always possible to get population data. Suppose we have a sample of n pairs of observations say (x1,y1),(x2,y2),……,(xn,yn)) from a bi-variate population of interest. The sample regression equation is the best-fitted straight line of y on x is

 $\hat{y}$ =a+bx

This sample regression line can be considered as an estimate of the population regression line

 Y=α+βX

Like population regression model sample regression model can be defined as

 Ym=a+bx+e

This is the regression model of y on x.

Here ‘a’ is the intercept and b is the slope of the regression line. In regression analysis ‘b’ is called the regression coefficient of y on x; giving the change in y per unit change of x. e’s are random error or disturbance term which are normally and independently distributed with zero mean and constant variance s2.the simple regression equation is the best fitted straight line in the least –squares sense with the sample data. It is defined as

 $\hat{y}$ =a+bx

But the observation y follows the model

 y=a+bx+e

Then the error is

 e=y-$ \hat{y}$ =(y-a-bx)

Here, we are interested to get a functional relationship between monthly costs of the farms with monthly profit of the farms. That is why simple linear regression model is utilized considering monthly cost as independent variable and monthly profit as dependent variable.

We used SPSS-16 for the analysis. Here x axis represent monthly recurrent cost of the farms and Y axis represents monthly profit of the farms. The regression equation of monthly profit of the farms on monthly recurrent cost

$\hat{y}$ **=588.359+0.69x**

Here, the t value is 1.643



 **Figure-03: The scatter diagram**

The coefficient of determination R2 is signifies whether a model is good or not. We know the value closed to 1 is considered to be a good model. The value of R2 (from SPSS) is 0.89 that means 89% of the total variation can be explained by the independent variable.

 It is known that regression measures the probable movement of one variable in term of the other. We can have the vision to estimate and predict the value of the dependent variable (Profit of the farms) for some known or given value of the independent variable (recurrent cost of the farms).

So, if we get the value Tk.5500 as monthly recurrent cost of the farms, we can surely get the monthly profit considering the cost and that will be Tk.4375.36

$\hat{y}$ **=580.359+0.69\*5500**

 **=4375.36**

 The monthly profit will be Tk.4720.36 if we consider monthly recurrent cost as Tk.6000.

 $\hat{y}$ **=580.359+0.69\*6000**

 **=4720.36**

The monthly profit will be Tk.5065.36 if we consider monthly recurrent cost as Tk.6500.

 $\hat{y}$ **=580.359+0.69\*6500**

 **=5065.36**

That means we are able to find out any value of the monthly profit of the selected farms for any known or given value of monthly recurrent cost.

**CHAPTER-V**

**5. PROBLEMS RELATED TO REARING DAIRY COWS**

The purposes of this section of the study is to identify the problems of raising dairy cows in the selected areas of Sirajganj district and to make suggestion with a view to solving these problems for expanding rearing of dairy cow owners as a tools of poverty alleviation under back yard, semi-commercial and commercial farming system in Bangladesh. The problems are as follows-

* **High prices of feed**: This is the most important problem of rearing dairy cows. About 100% farm owners complained about this problem.
* **Scarcity of quality feeds and fodder**: It is also an important constraint of rearing dairy cows. This problem faced about 60% of the farm owners.
* **Low prices of milk:** The prices of milk in the study areas were low. The average price of milk per liter in the study areas was estimated at taka 40-48, which was lower than the prices prevailed in many other areas of Bangladesh. The problem of low prices milk was reported by the 100% of farm owners.
* **Inadequate veterinary care and service**: It was the important problem of rising rearing dairy cows in the study area. Most of the dairy farm owners reported that the availability of the veterinary services was inadequate in the study area. About 40% of the farm owners mention this problem.
* **Distance of AI centre**: AI is one of the most important methods used for the improvement of breeds. It was found that 45% of dairy farm owners faced the problems of distance of AI centre.
* **Lack of credit**: It is one of the important constraints for improvement of dairy enterprises. About 70% farm owners could not developed their dairy farm due to the lack of credit.
* **Lack of technology**: This is also an important point for development of dairy farming. If proper technological knowledge spread among farmer the farming system will developed rapidly. About 40% farmer faced this problem.

**CHAPTER- VI**

**6. CONCLUSION AND RECOMMENDATIONS**

Dairying is an important part of the agricultural economy in Bangladesh. This chapter concludes at providing some important recommendations for future planning of the development of dairy industries. The study was conducted for comparative economic analysis of dairying under backyard, semi-commercial and commercial farming under Sirajganj district as well as regression analysis to measure the cause and effect relationship between two variables. The study revealed that **BCR** on the basis of total recurrent cost for back yard, semi-commercial, commercial farming were found in Sirajganj **1.80, 1.84, 1.81** respectively. This shows that the semi-commercial farming is more profitable than others due to less input of feed cost and extensive rearing at Bathan and also for less management cost. Cows rearing traditionally are going on as semi-commercial farming by using low cost easily available inputs of farm families. The study also compared the relative economic viability of rearing cows under different types of farming in Sirajganj district. The overall farming of dairy cows is profitable not only in Sirajganj district but can also in the whole country under the required facilities.

According to this problems found in the studied areas, the following suggestions are made to develop the farming practices of dairying and make it to sustainable for future:

* The Directorate of Livestock Services should expand their veterinary services, artificial insemination, vaccination etc. Veterinary treatment facilities should be extended up to union level and more veterinarians should be placed in every union.
* . The shortage of feeds and fodder may partially overcome by introducing high yielding variety fodder cultivation. The government and non-government organizations should play a vital role in disseminating HYV fodder cultivation.
* The price of milk should increase and legal payment system should be established by estimating milk fat percentage in the root level.
* Technology is also an important tool for the development of dairy farming. If proper technological knowledge spread among farmers the farming system will develop rapidly. Government should impose special emphasis on the dairy sector.

 **CHAPTER- VII**

**7. REFERENCES**

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