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Impact of 'One House One Farm Project' on Dairy and Poultry Production in Rajshahi District, Bangladesh

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IMPACT OF 'ONE HOUSE ONE FARM PROJECT' ON DAIRY AND POULTRY PRODUCTION IN RAJSHAHI DISTRICT, BANGLADESH

THESIS SUBMITTED FOR THE DEGREE

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DECEMBER, 2015

INSTITUTE OF BIOLOGICAL SCIENCES
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Dedicated

To

My Beloved

Late Parents

DECLARATION

I hereby declare that the thesis entitled **"IMPACT OF 'ONE HOUSE ONE FARM PROJECT' ON DAIRY AND POULTRY PRODUCTION IN RAJSHAHI DISTRICT, BANGLADESH"** is the results of my own and original investigation to the **Institute of Biological Sciences, University of Rajshahi, Bangladesh** under the supervision of **Professor Dr. Md. Jalal Uddin Sarder**, Department of Animal Husbandry and Veterinary Science, Faculty of Agriculture, University of Rajshahi, Bangladesh in fulfillment of the requirement for the degree of **Doctor of Philosophy (PhD).**

I further declare that this research work has not been submitted in part or in full previously for any academic degree in this University or any other University of home or abroad.

December 2015, Rajshahi.

Md. Zahedul Islam
PhD Fellow

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This is to certify that the thesis "**IMPACT OF 'ONE HOUSE ONE FARM PROJECT' ON DAIRY AND POULTRY PRODUCTION IN RAJSHAHI DISTRICT, BANGLADESH"** submitted by **Md. Zahedul Islam** for the degree of Doctor of Philosophy (PhD) to the **Institute of Biological Sciences, University of Rajshahi, Bangladesh** is based on the results of his own work carried out under my direct supervisi on. The thesis or part has not been previously presented for any other academic degree or in previously published or written by any other person except due reference where ever needed.

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Md. Zahedul Islam
The Author

ABSTRACT

Islam MZ 2015. Impact of 'One House One Farm Project' on Dairy and Poultry Production in Rajshahi District, Bangladesh. PhD thesis. Institute of Biological Sciences, University of Rajshahi, Bangladesh. Pp:1-315.

The aim of the present research was to evaluate the 'One House One Farm Project' on dairy and poultry production at 9 Upazilas of Rajshahi district from July 2012 to June 2015. The whole study have been done into 5 separate experiments (5 Study) to get the expected goals.

Study-I: Present scenario of 'One House One Farm Project' of Rajshahi district

The 1st study was conducted to evaluate the effectiveness of 'One House One Farm Project' (OHOFP) involving the farmers and money in 6 agricultural trades such as Fisheries, Poultry, Livestock (Dairy), Nursery, Vegetables and Others using secondary data obtained from 9 Upazila administrative offices of Rajshahi district from January to April 2015. The aim of this study was to find out the contribution of different agricultural trades involving farmers (members) and mobilization of fund (money) of OHOFP. This study investigated that agricultural trade wise involvement of the farmers in 9 Upazilas were significantly different ($P \leq 0.05$). A total 35288 farmers were involved under agricultural trades and most of them worked in Livestock (22103). Among 9 Upazilas the highest and lowest involvement (6974) and (2876) of farmers were recorded for Bagmara and Paba, respectively. On the other hand, only 799 farmers took Nursery trade while the highest loan recovery (76.76%) came from this trade. Total amount of loan Tk. 3867.05 lac was disbursed among the members of OHOFP where the highest disbursement Tk. 2474.71 lac (63.99%) was in Livestock (Dairy) whereas the loan recovery was near to lowest (33.98%) from this trade. The Bagha Upazila showed the best skill to recover loan and Bagmara showed the poorest performance in recovering 48.25% and 23.60% loan, respectively. It was concluded that a lot of farmers have got an opportunity to receive loan for the operating the agricultural trades to meet the food security against 16 crores peoples of Bangladesh as well as increased income generation under OHOFP of Rajshahi district in Bangladesh.

STUDY-II: Factors influencing the productive and reproductive parameters of dairy cows under OHOFP at Rajshahi district

The aim of the study-II was to find out factors influencing the productive and reproductive parameters of dairy cows in project areas of Rajshahi district during July 2013 to June 2015. A total of 219 dairy cows of five breeds (Local, Local × Friesian, Local × Sahiwal, Local x Jersey and Local × Sindhi) were considered for this research. In all dairy cows average mean values (mean ± S.E) of age of puberty 25.6±0.3 month (m), age of first calving 36.9±0.3 m, post-partum heat period (PPHP) 92.4±2.3 day (d), services per conception (S/C) 1.3±0.0, gestation length 280.8±0.2 d, calving interval 13.6±0.2 m, birth weight of calf 21.7±0.3 kg, milk yield per day per cow 3.7±0.2 liter, lactation length 191.0±4.8 d, total lactation yield 708.3±42.2 liter and total milk selling 31.7±2.0 thousand taka/cow were observed. There were significant ($P<0.001$) effects of breed (genotype), age, parity, body weight and body condition on the productive and reproductive performances (PRP) of dairy cows. There were also significant ($P<0.05$) effects of overall housing system, feeding practices, feed quality, veterinary caring, breeding method and socio-economic status of farmers. Considering, age of puberty, age of 1st calving, birth weight of calf, daily milk yield per cow, total lactation yield and total milk selling were significantly ($P<0.001$) highly influenced by the breeds (genotypes) specially Local × Friesian. The Local × Friesian breed showed the highest PRP and Local breeds showed the lowest PRP. The cows of >5 to <7 years age group, 3rd Parity (3rd calving stage), >200 kg body weight and good body condition were showed the best PRP. In considering management factors, the concrete housing pattern group, concrete-concrete floor type, good condition of overall housing system, proper ventilation system, stall feeding practices, good quality concentrate feed, treated by veterinarian group and artificial insemination group of breeding method showed the best PRP. In case of socio-economic status of dairy farmers, the marginal and >10000 taka monthly income group of farmers showed better PRP of dairy cows.

STUDY-III: Productive performances (PP) of broiler farms in OHPFP areas of Rajshahi district

The objective of this study was to assess the PP of broiler farms in project areas of Rajshahi district during July 2013 to June 2015. A total of 60 broiler farms (n=30250 birds) of three strains (Cob 500, n=24600, Hubbard Classic, n=2750 and Ross 308, n=2900) were considered for this study. In all broiler farms average mean values (mean ± S.E) of feed intake per broiler up to marketing age (28-32 d) 3.01±0.02 kg, body weight gain per broiler 1.73±0.02 kg, FCR 1.75±0.02, production cost per broiler 192.79±1.23 taka, total production cost 97.61±6.09 thousand taka/batch (b), selling price per broiler 216.85±2.31 taka, total selling price 109.00±6.64 thousands taka/b, profit per broiler 25.12±2.10 taka and net profit 12.21±1.14 thousands taka/b were observed. There were significant ($P<0.001$) effects of breeds, chick quality and farm size of broiler farms on PP of broilers. In managemental factors, there were also significant ($P<0.05$) effects of housing pattern, overall housing system, overall ventilation system and feed quality of broilers. In case of socio-economic status of farmers, there were slightly significant ($P<0.05$) effects of social status, economic

status, education, land owning and sex of farmers. Considering body weight gain per broiler, FCR, selling price per broiler and profit per broiler were significantly (P<0.001) influenced by the broiler strains. Semi-paca house, overall good housing system, overall excellent ventilation system, excellent quality feed of broilers, ultra-poor, <10000 taka income per month group of farmers, none education group of farmers and the female farmers showed the best broiler performances. It was suggested that Cob 500 broiler strain showed the best PP in all parameters.

STUDY-IV: Productive performances (PP) of layer farms in OHPFP areas of Rajshahi district

A total of 22 layer farms (n=17050 chickens) of six breeds (Hyline Brown, n=4250; Hisex Brown, n=5300; Hyline White, n=3000; Bovans White, n=2400; Navogen Brown, n=2000 and Deshi or Local, n=100) were considered for this study. The aim of this study was to evaluate the PP of layer farms under project areas in 6 Upazilas of Rajshahi district during July 2013 to June 2015. In all farms average mean values (mean ± S.E) of feed intake per layer per m 3.30±0.14 kg, egg mass per layer per m 1.60±0.06 kg, FCR 2.05±0.05, egg productivity percent 87.00±2.91, production cost per layer per m 133.89±5.97 taka, total production cost 108.55±12.20 thousand taka/batch (b), selling price of eggs per layer per m 177.65±6.61 taka, total selling price 140.54±14.98 thousand taka/b, profit per layer per m 43.75±3.64 taka and net profit 31.99±3.81 thousand taka/b were observed. There were significant (P<0.001) effects of breeds, chick quality, farm size and age of layer farms on PP. In managemental factors, there were also significant (P<0.001) effects of housing pattern, floor type of laying house, overall housing system, overall ventilation system and feed quality of layers. In case of socio-economic status of farmers, there were again significant (P<0.001) effects of social status, economic status (income per m), land owning and sex of layer farmers. Considering the PP, feed intake per layer per m, egg mass per layer per m, egg productivity %, production cost per layer per m, total production cost/b, selling price of eggs per layer per month and profit per layer per m were significantly (P<0.001) influenced by the breeds of layers. Hyline Brown, Hisex Brown, Hyline White and Bovans White showed better PP and Deshi or Local showed the worst PP. It was observed excellent quality chick, farm size of > 500 to < 1000 layers and >6 to 12 month age of layers showed best PP. In managemental factors, semi-paca house, bambo or iron made case, overall good housing system, overall excellent ventilation system and excellent quality feed of layers showed the best PP. In considering socio-economic status of farmers, marginal and >10000 taka income per m group of farmers showed best layer PP. It is also observed that >33 decimal land owners and the male farmers showed better PP. It was suggested that Navogen Brown layer breed showed the best PP in all parameters.

Study-V: Assessment the quality of dairy, broiler and layer feed used under OHOFP of Rajshahi district by Proximate Analysis

The aim of the study-V was to assess the quality of dairy, broilers and layer feed used by the farmers within OHOFP areas at Rajshahi district. In this study, eight types of concentrate feeds such as wheat bran, rice polish, oil cake (Mohsina), broken rice, lentil bran, pea bran, maize crust and anchor bran along with two types of roughage feeds like straw and durba grass were analyzed for 7 nutrient ingredients viz. moisture, Dry Matter (DM), Crude Protein (CP), Total Ash (TA), Acid Insoluble Ash (AIA), Crude Fiber (CF) and Ether Extract (EE) by Department of Livestock Services (DLS) laboratory, Dhaka within January to June 2015. Concentrates and roughages feed ingredients of cows feeds, feed ingredients of broiler grower and Layer-1 feeds were differed significantly (P<0.05). Among the feeds, oil cake (Mohsina) carried maximum CP (31.44%) an important factor for proper growth of dairy cows. The ingredient of three types of broiler feeds i.e. broiler grower (Nourish), broiler grower (Quality) and broiler grower (Aftab) were analyzed where the feed broiler grower (Nourish) showed the highest values of moisture (15.97%), CP (23.94%), TA (6.80%), CF (2.81%), and EE (5.07%). The value of DM was highest (89.01%) in Broiler Grower (Aftab) and all the feeds showed same value (0.43%) of AIA. In case of layer feeds, Layer-1 (Nourish) feed was the best for Layer-1 due to highest value of CP (21.01%) than other feeds like Layer-1 (Quality) and Layer-1 (Aftab). It was suggested that farmers could use oil cake (Mohsina), broiler grower (Nourish) and Layer-1 (Nourish) feed for dairy, broiler and layer farms respectively due to their highest CP values.

Finally, it was recommended that OHOFP is an effective program for income generation of agricultural farmers especially dairy, broiler and layers enterprises to increase more production and also Local x Friesian cross bred cows are huge producing profitable breed, Cob 500 broiler strain & Navogen Brown layer breed are suitable for poultry farming, oil cake (Mohsina), broiler grower (Nourish) and Layer-1 (Nourish) feed are very effective feed for dairy, broiler and layers production performances for the food security and food safety of Bangladesh.

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LIST OF ABBREVIATIONS

AC	= Assistant Commissioner
AI	= Artificial Insemination/Avian Influenza
AIA	= Acid Insoluble Ash
ANOVA	= Analysis of Variance
AOAC	= Association of Official Analytical Chemists
ASA	= Association for Social Advancement
BARD	= Bangladesh Academy for Rural Development
BAU	= Bangladesh Agricultural University
BBS	= Bangladesh Bureau of Statistics
BDT	= Bangladeshi Taka
BRAC	= Bangladesh Rural Advancement Committee
BRDB	= Bangladesh Rural Development Board
CF	= Crude Fiber
CP	= Crude Protein
d	= Day/Days
DAE	= Directorate of Agricultural Extension
DARSA	= Department of Agriculture Republic of South Africa
DC	= Deputy Commissioner/District of Columbia
DCS	= Directorate of Cooperative Services
df/ DF	= Degree of Freedom/Directorate of Fisheries
DLS	= Department of Livestock Services
DM	= Dry Mater
DMRT	= Duncan Multiple Range Test
DOC	= Day Old Chick/ Chicks
DPP	= Development Project Proposal
EE	= Ether Extract (Crude Fat)
et al.	= Et alia/Associates
F	= Factorial value
FAO	= Food and Agricultural Organization
GDP	= Gross Domestic Product
GLM	= General Linear Model
gm	= gram
GnRH	= Gonadotropin Releasing Hormone
GO	= Government Organization
GOB	= Government of Bangladesh
GT	= Grand Total
i.e.	= Latin-id est/that is
IAEA	= International Atomic Energy Agency
IBM	= International Business Machines Corporation
IGA	= Income Generating Activities
kg	= Kilogram
l	= Liter
LGRD	= Local Government and Rural Development
LH	= Luteinizing Hormone
m/M	= Month/Months/Million
MDG	= Millennium Development Goal
mL	= milliliter
MMT	= Million Metric Ton

MoFL	= Ministry of Fisheries and Livestock
MT	= Metric Ton
N/No/n	= Number
NBDs	= Nation Building Departments
NGO	= Non-Government Organization
NS	= Non Significant /Natural Service
OHOFP	= One House One Farm Project
P	= Probability
PDBF	= Palli Daridra Bimochan Foundation
PLDP	= Participatory Livestock Development Project
PPHP	= Post-Partum Heat Period
PRP	= Productive and Reproductive Parameters
PSB	= Palli Sanchay Bank
RDA	= Rural Development Academy
RDPP	= Revised Development Project Proposal
S.E	= Standard Error Mean
S/C	= Service per Conception
SFDF	= Small Farmers Development Foundation
SPSS	= Statistical Package for the Social Sciences
TA	=Total Ash
Th.Tk/th.tk	= thousand taka
TK/Tk/tk	= Taka/taka
UAO	= Upazila Agriculture Officer
UCO	= Upazila Cooperative Officer
UFO	= Upazila Fisheries Officer
ULO	= Upazila Livestock Officer
UNO	= Upazila Nirbahi Officer
URDO	= Upazila Rural Development Officer
USD	= United States Dollar
UYDO	= UpazilaYouth Development Officer
UZ	= Upazila
viz.	= Latin-videlicet/namely
yr	= year
%	= Percentage/percent
$<$	= Less than
$>$	= Greater than
±	= Plus minus
×	= Cross
χ^2	= Chi-square
^0C	= Degree Celsius

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CHAPTER 2

REVIEW OF LITERATURES

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The purpose of the section is to provide a selective review of recent and past research works are related to this study. Many research works have been done in different countries of the world on factors affecting productive and reproductive performance of dairy cows as well as broiler, layer and also feed composition for livestock. Some of the related findings of research carried out in this country or elsewhere are reviewed in this section. To make it easy and clear the review is divided into 4 sections.

2.1 Factors affecting the productive and reproductive performances of dairy cows

One is different factors like breed (genotype), age, parity, body weight, body condition, management and socio-economic condition of farmers etc. on the productive and reproductive parameters like age of puberty, age of first calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf, milk yield per day, lactation length, total milk yield per lactation, total milk selling etc. Productive and reproductive parameters of dairy cows are influenced by several factors which are mentioned bellow:

2.1.1 Breeds (genotype) of cows

Auldist *et al.* (2007) studied on the reproductive performance of Jersey × Holstein cows in predominantly Holstein herds in a pasture based dairying system of Australia. The author compared Holstein cows with J×H cows which had higher first conception rates (52 vs 42%).

Miazi, *et al.* (2007) revealed that the crossbred cows had significantly ($P<0.01$) lower pubertal age than local. The postpartum heat period and service per conception of different crossbred and local cows did not differ significantly ($P>0.05$).

Sarder *et al.* (2007) reported the genotypes of dams of cows like LF and L×SL showed a better performance under field condition at greater Rajshahi district and poor performance were recorded in L and L×S×SL of dam genotype. The experiment reflects that the L×F and L×SL genotypes of dam showed the better productive and reproductive performances of dairy cows under rural condition in Bangladesh.

Sarder (2001) observed the reproductive and productive performance of indigenous cows on 64 indigenous cows was selected from dairy and cattle improvement farm.

Rajabarihat, Rajshahi from January 1999 to December 2000. The average length of age at first calving was 39.7±7.0 months.

Bhuiyan *et al*. (2000) observed on 119 cows of two genetic groups (Friesian and Friesian × Local cross breed) to evaluate the reproductive and productive performances of both types of breed. They found phenotypic performance of Friesian cows were: birth weight 27.5 ± 0. kg; age at first fertile service 809.2 ± 9.77 days; number of services per conception 1.96±0.07; lactation length 343.36±6.16 days; lactation yield 3399.28±70.75 kg; 305 day milk yield 3046.60±26.15 kg and inter-calving interval 452.34±9.54 days. Corresponding values in Friesian x Local cross-bred cattle were 23.05±0.32 kg, 945.98±16.96 days; 1.56±0.06; 306.28±7.54 days; 1398.42±42.26 kg; 1361.22±27.74 kg and 475.49±9.16 days.

Shamsuddin *et al.* (2001) reported a shorter calving to conception interval in crossbred Sahiwal cows than that in crossbred Friesian and local cows. Sarder *et al.* (1997) found Holstein-Friesian crossbred cows requiring the longest time (149 days) to onset of post-partum oestrus compared with the local ones (119 days); consequently, the Holstein-Friesian crossbred cows remained open for the longest period (158 days).

Syed *et al.* (1998) studied on 342 lactation of Sahiwal cows and graded Sahiwals (25-87.5% Holstein) maintained at the Livestock Research and Development Farm, Surezai, Peshawar from 1980 to 1992 were analyzed. Breed type and year of calving had a significant effect on lactation yield.

Japri *et al.* (1997) found the calving recorded from crossbred dairy cattle at the Institute Haiwan, Malaysia to effect of breed of sire, percentage of Bos taurus inheritance and season of birth on calving performance of crossbred dairy cattle. The sires were Friesian, Gir, Sahiwal, Australian Friesian × Sahiwal, Brahman × Holstein or Sahiwal × Friesian crossed with Bos indicus dams. Breed of sire effect was significant on age at first service ($P<0.05$), age at first calving ($P<0.01$) and post-partum interval to first service ($P<0.05$) but not on calving interval.

Kumar *et al.* (1997) reported to comparative performance of crossbred cows at different levels of exotic inheritance from 4093 lactation of 986 crossbred cows at the Indian Veterinary Research Institute, Izatnaga. The cattle were 2 and 3 breed crosses and 3 breed inter crosses of Hariana, Holstein, Jersey and Swiss Brown. Two-breed crosses had the best performance for these traits and 3-breed inter crosses had the worst ($P<0.01$) apart from lactation yield, which was higher for 3 breed inter crosses and 2 breed crosses than for 3 breed crosses ($P<0.01$). The overall age at first calving, service period and calving interval averaged 1037.9 ±5.95, 143.0 ± 3.41 and 423.8 ± 3.44 days, respectively, and were lowest in 3 breed inter crosses ($P<0.01$).

Sarder *et al.* (1997) observed on 284 cows and 29 heifers from 53 mini-dairy farms at Natore district of Rajshahi to find the fertility and productivity in mini-dairy farm. They observed that the overall fertility was better in local nondescript cows than in Holstein-Friesian cross-bred animals (116 ± 41 vs 158 ± 82 days post-partum interval to conception and 1.4 ± 0.7 vs 1.8 ± 1.6 service per conception).

Bhuiyan (1995) demonstrated that on the cross-bred animals of six genetic groups maintained at the Sylhet Government Farm to evaluate the milk product at first and second lactation period. Analysis of data indicated that genetic group contributed significant ($P<0.05$) variation in the average daily milk yield of cows in first and second lactation. First lactation average daily milk yield was highest in (L×F) × S cows (5.6 ks) while for second lactation highest yield was found in L×F cows (5.15 kg).

Majid *et al.* (1995) studied on 547 cows of 12 genetic groups maintained at Savar Dairy Farm from 1976 to 1990 to evaluate the reproductive performances such as age at first calving, gestation length, calving interval, postpartum service period and number of services per conception. They found that performance of Friesian breed and its crosses with local cows were better among all genetic groups. Performance of Sahiwal and its cross-bred were observed to be poor.

Rahman *et al.* (1995) investigated on 265 heifers and 900 cows of 25 to 90 months old owned by different societies of Milk vita at Tangail to evaluated the reproductive status of local zebu heifers and cows of Tangail Milk Shed area. They found that the age at puberty, age at first calving, post-partum first service interval and calving to conception interval were 47.31±0.56, 56.28±0.54, 12.12±0.45 and 12.57±0.44 months, respectively.

Khan *et al.* (1991) investigated that to evaluated productive and reproductive performance of cows belonging to 4 genetic groups over 10 years at Bangladesh Agricultural

University Dairy Farm. Milk yield per day in Pabna, Jersey cross, Sahiwal cross and Sindhi cross were 2.9, 1.8, 1.5 and 1.6 kg, respectively. The corresponding lactation period, gestation length and age at first calving were 200, 400, 251, and 282 and 280.1, 278.1, 279 and 286 and 1868.3, 2411.4, 2433.6 and 2070.2 days, respectively.

Shamsuddin *et al.* (1988) reported that in general, the incidence of individual reproductive disorders in the dairy cows of Rajshahi is lower than that of big Government Farm. The reproductive performance of the cross-bred cows differs from their local types due to indifferent geographical areas (Alam and Ghosh, 1994). Ahmed and Islam (1987) have been intensive analyzed on the different breeds of cattle at Central Cattle Breeding Station (CCBS), Savar, Dhaka to evaluated performances of different breeds. The phenotypic performance of Friesian cross local were: body weight at birth 23 kg; age of puberty 18-24 months; age at first calving 45 months; average milk production per day 6.64 kg; average lactation length 341 days, calving interval period 425 days. Corresponding value in Sahiwal /Sahiwal crossbred cattle were 20kg, 18-22 months, 51 months, 3.5 kg, 312 days and 493 days.

2.1.2 Age of cow

Sarder *et al.* (1997) found the mean body weight was lowest (165 kg) in animals of >2 to 3 years group and highest (279 kg) in > 7 to 12 years age group. The cows of > 7 to 12 years old yield the largest amount of milk in average (7.7 kg). The milk production in other age groups varied from 6.0 to 6.4 kg/day. The age of the animals did not influence any of the fertility parameters significantly.

Hunter (1982) noted that extensive program of artificial insemination in dairy cows indicates fertility increasing slightly up to 3-4 years of age largely due to culling of heifers with anatomical or endocrine abnormalities and then gradually decline in cow of 6-7 years or older. In beef cattle, by contrast, fertility may not decline until 9-10 years.

Tong *et al.* (1979) studied on 1382 Holstein-Friesian cows in 36 herds. All cows were mated exclusively by AI. Reproductive efficiency was lower in 2-years-old and mature cows than in cows of intermediate stage.

De Kruif (1978) found that many factors may influence the fertility of cattle population. In female animals, over seven years of age, pregnancy rate following the first insemination was lower. He monitored calving rate of two years, four years, nine years and greater than thirteen years were 55.9, 60.0, 5306 and 42.08, respectively.

2.1.3 Parity

Zafar *et al.* (2008) showed that the lactation number (parity) had significant effect on all traits except lactation length, which showed non-significant variation among parities.

Sarder *et al.* (2003) showed that parities of progeny 1st parity, 2nd parity, 3rd parity, 4th parity, 5th parity and 6th and above parity had significant ($P<0.05$) effect on all the productive and productive performances except wastage days, birth weight of progeny's calf, lactation length and dry period. The milk yield per day and lactation yield gradually increased with increasing their parities upto 3rd parity and the best reproductive and productive performance was found in progeny of 3rd parity.

Sarder *et al.* (1997) reported the cows with more parities produced more milk than their less parity counterparts (6.0 vs 7.0 to 7.5 kg for 1st vs 4 to 5th parity).

Alam and Ghosh (1988) noted that the parity is observed to exert an effect on the onset of post-partum ovarian cyclicity in dairy cattle. First parity cows had longer intervals from calving to first post-partum ovulation and calving to first oestrus than cows of >3rd parity. The cows of 2nd and 3rd parity showed the best performance (McDougall *et al.*, 1995). The interval from calving to onset of ovarian activity became progressively longer as the number of parties increased (Darwash *et al.*, 1996). Cows in their 2nd and 3rd lactation had best performance with regard to onset of ovarian cyclicity (McDougall *et al.*, 1995; Pereira *et al.*, 1995). The cows of >4 parities had longer anoestrus periods after calving (Alam and Ghosh, 1993; Darwash *et al.*, 1996). Than *et al.* (2001) reported an increased conception rate with advancing parity from parity 2 upto 6, and then declined at parities conception rate. The calving interval is longer between first and second parity and at older ages and is shorter in intermediate age (Singh *et al.*, 1999). Post-partum first ovulation was earlier in cows that had >2 calving or of over 5 years old than in those of 3-5 years old cows (Eduvie, 1985).

2.1.4 Body weight of cow

Raheed (2002) found the Mean±SD values for the gross body weight in kg of different dairy cattle and those were to be 175.13±26.81, 237.95±30.93, 297.41±73.63, 267.82±85.11, 317.18±57.37 and 402.033±76.39 in the L×L, L×SL, L×F, L×JR, L×SL×F, L×F×F breeds, respectively.

Sarder *et al.* (1997) observed that the cross-bred animals weighted more (264 to 271 kg) than the local nondescript cows (178kg); the difference between breeds was not significant. Holstein-Friesian (HF) cross-bred cows yielded 2.5 kg more milk daily than that of local cows (7.2 vs 4.7 kg).

Saacke *et al.* (1991) reported the heavier cows produced more milk than their lighter counterparts. The mean difference in dairy milk yield was 3.2 kg between the body weight groups 130 to 150 kg and 301 to 401 kg (4.8 vs 8.0).

2.1.5 Body condition of cow

Brosaster and Broaster (1998) studied condition score at calving is dependent upon pre and post calving feeding programme and early lactation performances of the cows. Cows with a body condition score of 3.5 have the shortest interval between calving and onset of post-partum oestrus (Ribeiro *et al.*, 1997). The effect of level of feeding on the duration of anoestrus period after calving and feeding after calving influence the duration of length of post-partum anoestrus period (Wright *et al.*, 1992). Cows with poor body condition had lower LH pulse frequencies than did cows in good condition (Wright *et al.*, 1992). Shamsuddin *et al.* (2001) suggested that cows with body condition score 3.5 or more at AI used only for dairy and suckled twice or less had shorter interval between calving and conception compared with cows having ≤2.5 body condition score, used for dairy + draught and suckled continuously.

Shamsuddin *et al.* (1998) body condition score (BCS) is the useful indicator of nutritional status of the cow. The BCS at calving and initiation of luteal activity negatively influenced the interval to the onset of ovarian function Cows calving at good BCS were capable to resume ovarian cyclicity within 60 days post-partum regardless pre and post calving change in body weight (Randel, 1990).

Sarder *et al.* (1997) recorded that the fat animals (condition score = 3) were the heaviest ones (276 kg) and produced the highest amount of milk (7.8 kg). The medium cows (condition score = 2) required the shortest interval to initiate post-partum cyclicity and consequently had shortest calving to conception interval (124 and 127 days, respectively. None the less, the effects of body condition on body weight, milk production and fertility parameters were not significant. They also found that the interval from calving to first service (121 days) than did the first (147 days) and fifth parity ones (149 days). Similarly, the calving to conception interval was shortest in fourth parity cows (132 days) and longest in first parity ones (159 days). The fifth parity cows required fewest services (1.3) for conception, and highest number of services (2.1) were required in fourth parity cows.

2.1.6 Age of puberty

Sarder (2006) found that the mean age at puberty was significant lowest (25.3±8.1 m) in Friesian sire of cows and highest (32.0±5.3 m) in cow with S × SL sire. Hoque *et al.* (1999) noted that the age at puberty of SL × Pabna (35.10 m), F × Pabna (25.53 m) and Pabna × Pabna (39.23 m) did differed significantly.

Khan and Khatun (1998) reported no significant difference (P<0.05) among the SL × Pabna (37.29 m), F × Pabna (33.57 m) and Pabna × Pabna (38.8 m). Islam and Bhuiyan (1997) also found the significant (P<0.05) effect on $\frac{1}{2}$ SL × $\frac{1}{2}$ Pabna (38.53 m) and $\frac{3}{4}$ SL × $\frac{1}{4}$ th Pabna (31.12 m).

Majid *et al.* (1995) observed the age at puberty of SL×F cattle ranging from 606.4 days (20.2 m) to 770.31days (25.68 month). In the present study, progeny of Friesian bull reached sexual maturity much earlier than those of other six (6) genetic groups of sire. Dam's milk, milk get from dam, concentrate feed, green grass and health condition whose were getting available those progenies age at puberty earlier than those other management. Environmental condition, nutrition, care and management may also affect this trait. Finally, genetic makeup is the main factor, which influences this trait remarkable.

2.1.7 Age of first calving

Sarder (2006) studied that the age at first calving was significantly affected by genotype of sire. Raheed (2002) analyzed the age at first calving of different genotypes of dairy breeds. The results indicate that L×L showed the highest (42.35±6.42) age at first calving and L×F×F had the lowest (29.80±2.89) followed by L×F (33.42±7.73), L×JR (33.48±5.28), L×SL×F (35.96±5.22) and L×SL (39.85±7.67) breeds. Analysis of variance for the trait showed significant variation between the breeds (P<0.01; LSD = 3.84 at 1% level of significance).

Sarder (2001) observed that the average age at first calving of indigenous cows was 39.7±7.0 months. Majid *et al.* (1995) obtained age at first calving in 42.3 months. Nagare and Patel (1997) collected data to investigate the age at first calving in Maharastra, India from 1972 to 1992. The cattle were various cross-bred of Gir with Brown Swiss, Holstein and/or Jersey. The overall least squares means for age at the first calving was 852.72 days. F_1 Jersey × Gir were youngest at the first calving (801.54 days, P<0.05).

Roy and Tripathi (1992) analyzed the collected data of 3421 cross bred heifers over a 34 years period. They classified the heifers into 6 breed types with Friesian inheritance of ≤ 25 to 75%. They observed that age at first calving was lowest for cross-bred with 37.5-50% Friesian inheritance (1007±8.2 days) and highest for those with 25.37.5% Friesian inheritance (1065±7.9 days). There was no constant trend in age at first calving with level of Friesian inheritance.

2.1.8 Post-partum heat period

Hossain *et al.* (2005) observed that the average calving to first service for crossbred and indigenous were 116 and 137 days, respectively, which were significantly different (P<0.01).Raheed (2002) studied the postpartum heating period in days higher in the L×L (172.52±97.38) and lower in the L×JR (103.60±61.02). The corresponding values of L×SL, L×F, L×SL×F and L×F×F were 143.30±100.03, 109.69±55.17, 127.41±77.56 and 149.50±87.13, respectively. Rahman *et al.* (1995) pointed interval of calving to first service of about 12.1±0.4 months in cows.

Sarder and Islam (2001) observed that the parturition to first estrus is important economic reproductive parameters of dairy cows in mini-dairy farms. Increased period of parturition to first estrus interval is uneconomic for dairy herd. They found the lowest number of parturition to first estrus was found in L×S (104.21±12.49 days) cows followed by L×SL (160.00±7.13 days) cows. The values were not significantly different among genetic groups. Magana and Segura (1997) collecting data of the calves of 13 Holstein cows which were allowed to suck residual (SR) milk twice a day for 30 min. during a 180 days period and found that in the SR group, took longer calving to first service period than of bucket feeding groups of cows.

2.1.9 Service per conception (S/C)

Sarder (2006) found that the S×SL cross-bred cows required fewer services per conception (1.44) compared with the L×F×F (1.78±0.82). The difference between breeds of sire was not significant.

Hossain *et al.* (2005) observed that the average services per conception of crossbred and indigenous cows were 3.10 and 1.95, respectively, which were significantly different (P<0.01). Raheed (2002) found the average services per conception of different dairy breeds. The lowest services per conception observed in the L×L (1.33±0.47) and highest observed in the L×F×F (2.00±1.05) followed by L×F (1.73±0.67), L×SL×F (1.56±0.75), L×JR (1.48±0.59) and L×SL (1.37±0.49) breeds, respectively

Hoque *et al.* (1999) have demonstrated that the service per conception in the SL×Pabna, F×Pabna and Pabna cows though AI programme were 1.59±0.31, 1.35±0.26, 1.32±0.22, respectively. They have also shown that the birth weight of calves of SL×Pabna, F×Pabna and Pabna cows were 21.26±2.89, 22.50±4.88 and 17.92±3.47 kg, respectively.

Ali (1998) noted that the service per conception of crossbred and indigenous cows were 3.33 and 1.98, respectively in Gaibandha district and this difference was statistically significant (P<0.01).

Agarwal *et al.* (1997) observed the data on the conception results in cattle obtained in 1990-92 by 35 A.I. centers in Himachal Pradesh and analyzed. They found that the average service per conception was 2.5.

Sardar *et al.* (1997) reported on 284 cows and 29 heifers from 53 mini-dairy farm in Natore district of Bangladesh from December 1993 to November 1994. They found that the fertility was better in Local nondescript cows than in Holstein-Friesian crossbred animals. They also found that the service per conception of nondescript cows was 1.4±0.7 and Holstein-Friesian was 1.8±0.6, respectively.

Sultana (1995) observed data on service per conception of 540 animals of various genetic groups and overall service per conception of Local (L), Sahiwal (SL), Sahiwal × Friesian (F_1), Jersey (J), Local × Jersey (F_1) and local × Friesian (F_1) were 1.78±0.22, 1.12±0.70, 2.05±0.02, 2.01±0.34, 1.96±0.021 and 1.68±0.15, respectively. She found no significant difference in service per conception among various genetic groups. Bhuiyan and Sultana (1994) found the number of service per conception on 540 cows of different exotic breeds and their crosses at Central Cattle Breeding Station Savar, Dhaka in Bangladesh and found the highest value in $\frac{1}{2}$ Friesian, $\frac{1}{2}$ Shahiwal (2.05) and lowest in Shahiwal (1.12). Service per conception was genetic and non-genetic factors.

Halim (1992) studied that the average conception rate of local and cross bred cows were 77.65 and 74.47 percent, respectively and service per conception were 1.31 and 1.39, respectively.

Saacke *et al.* (1991) the local cows showed better S/C, because, in the mini-dairy farm, the local cows were selected for more milk production and consequently received equal attention as did the cross-bred ones. Shamsuddin *et al.* (1988) analyzed with a total of 626 pregnancies among 660 cows and 137 pregnancies among 142 heifers reported services per conception 1.69 for cows and 1.86 for heifers.

2.1.10 Gestation length

Sarder (2006) observed that the mean gestation length was lowest (277±4.5 days) in sire of L×F×F cross-bred and highest (280.0±5.1 days) in these of (SL×F). The genotypes sire had significant influence on the gestation length.

Mondol *et al.* (2005) studied that the average lactation length of different types of dairy cows of Bangladesh Agricultural University Dairy Farm. It was found that average gestation length for Jersey cross was 275±4.11days, for Sahiwal cross was 76±4.26 days, for Sindhi cross was 275±4.41 days, for Holstein cross was 275±3.95 days and for Red-Chittagong was 277±3.31days. Slightly higher and lower values were for Red-Chittagong and Sindhi cross cows, respectively. It was also evident that there was no significant difference within the gestation length of different dairy cows.

Raheed (2002) found that the average gestation period in days of L×L, L×SL, L×F, L×JR, L×SL×F did not differ significantly (F_5, 215 = 1.001) and they were 278.56±5.36, 279.78±5.13, 281.04±7.21, 280.32±8.21, 280.11±13.51 and 282.50±3.75days, respectively.

Khan and Khatun (1998) reported the gestation length of the two genetic groups (282.75 vs 286.20 days). The differences of gestation length in different parities of indigenous cows could be due to genetics and breed variation and as well as seasonal influence of calving.

Majid *et al.* (1995) studied gestation length in different genetics groups of cattle maintained at the Savar Dairy and Cattle Improvement Farm, Dhaka, Bangladesh and found a range value from 270 to 284 days. The longest gestation period was found in $\frac{1}{2}$ Local × $\frac{1}{2}$ Friesian × $\frac{1}{2}$ Sahiwal and shortest was in Friesian cows. The values were not significantly different among the genetics groups. Sultana (1995) a observed gestation period on 515 cows of Local, exotic and their crossbred in Savar Dairy and Cattle Improvement Farm, Dhaka and the observed mean was 275.41±1.36 days. Both genetic and non-genetic factors had no significant effect on gestation period.

2.1.11 Calving interval

Sarder (2006) observed that the difference in calving interval among the genetic groups of sire at 5% level of significant. Calving interval for L×F, L×SL×F, L×SL, L×S×SL and L×F×S×SL was 434±51, 437±48, 443±28, 454±64 and 447±39 days, respectively.

Hossain *et al.* (2005) reported that the average length of calving interval of crossbred and indigenous cows were 419 and 428 days, respectively. Statistically non-significant (P>0.05) variations existed between the lengths of calving interval in crossbred and indigenous cows. Raheed (2002) found the calving interval of different breeds of dairy cattle. The average calving interval of different breeds of dairy cattle were 458.06±100.02, 431.22±97.61, 408.81±60.85, 394.48±60.96, 419.59±77.47 and 454.00±96.64 days in the L×L, L×SL, L×F, L×JR, L×SL×F and L×F×F breeds, respectively.

Sarder (2001) found that the overall calving interval (474.5±46.0 days) of different parities of indigenous cows. Rasali *et al.* (1998) observed performance recording of lactating local and crossbred cows and buffaloes of various breed blood levels under farmer's management in the western hills and found an average calving interval of 492, 354, 489, 324, 350 and 285 days for Nepalese Hill (NH) cows and in Jersey × NH crossbred with <50, 50>, 50 to <75 and >75% Jersey inheritance.

Japri *et al.* (1997) studied data on calving interval of crossbred dairy cattle at the institute, Malaysia, from 1974-91. The sires were Friesian, Gir, Shahiwal, Australian Friesian×Shahiwal, Brahman×Holstein or Shahiwal×Friesian crossed with Bos Indians dams. They noted that the crossbred sired cows had slightly longer calving interval (20 days longer).

Alam *et al.* (1994) observed the collected data on 1990-91 from 6400 farm that used AI and hence had crossbred cattle and 340 farms that had not adopted AI. They noted that the calving interval crossbred cows shorted than the local cows.

Kumar *et al.* (19r97) analyzed the collected 986 crossbred cows at the Indian Veterinary Research Institute, Izathnagar to investigate the calving interval. They pointed out that the overall was (in average) 423.78±3.44 days and was the lowest in 3 crosses (P<0.01). Rahman *et al.* (1993) studied the reproductive patterns of 1202 cows of different breeds and found an average calving interval of 19±5.7, 14±1.7, 14±1.8, 16±2.5, 20±1.5, 19±2.9, 20±3.1, 18±2.5, 14±1.0, 14±1.6 and 15±1.9 months for local non-descript, Local improved, Friesian, Sahiwal, Sindhi, Local×Sindhi, Local×Sahiwal, Local×Jersey, Local×Friesian, Sindhi×Sahiwal and Friesian×Sindhi, respectively.

Halim (1992) studied on local and crossbred dairy cows and reported that Jersey×Hariana, 20 Brown Swiss × Hariana and showed that mean calving interval was 416.06, 393.12 and 370.70 days, respectively. Wahab *et al.* (1990) observed reproductive performance of 762 crossbred dairy cows in small holder and institutional herds and observed that the average calving was 536±88.6 and 447.3±103.6 days, respectively. They also showed that the long calving interval in small holders were due to inactive ovaries.

Nahar *et al.* (1989) found calving interval of 191 and 180 crossbred progenies under farm and urban conditions. The mean calving interval of Sindhi, Sahiwal, Jersey and Holstein crossbred cows under farm conditions was 451.74, 485.84, 436.28 and 479.41 days. While under urban conditions, the same was 414.54, 128.58, 435.16 and 470.73 days, respectively. Nahar *et al.* (1992) found calving interval of 191 and 180 crossbred progenies under farm and urban conditions. The mean calving interval of Sindhi, Sahiwal, Jersey and Holstein, Friesian crossbred cows under farm conditions were 450.74, 435.83, 436.28 and 479.41days while under urban conditions were 414.54, 428.58, 435.16 and 470.73 days, respectively.

2.1.12 Birth weight of calf

Sarder (2006) found that the mean birth weight was highest in Friesian breed (20.3±2.6 kg) and lowest in S×SL cross-bred (17.5±2.4 kg). This trait was significantly affected by genetic groups of sire. Raheed (2002) found that the birth weight of the calves in kg of different dairy breeds. L×F×F produced the highest (24.00±2.57) and L×L produced the lowest (17.12±1.87) birth weight of calves. Studies by several authors such as Hussain *at al.* (1984) and Nahar (1987) have shown that the breed of the cattle affects the birth weight of the progenies.

2.1.13 Milk yield per day

Milk yield is the most important economic trait. This trait is directly related with herd profitability. Average milk production of a cow depends on her genetic makeup as well as the nutritional status and environmental interaction with genotypes.

Alam *et al.* (2008) reported that the daily milk yields of 60 indigenous (Desi), 20 Friesian × Desi and 20 Sahiwal × Desi cows were 1.7±0.6, 6.3±1.2 and 5.1±1.0 liters, respectively.

Sarder (2001) analyzed that the highest daily milk yield of indigenous cows was in fourth parity (2.5±0.7 liters) and lowest was found in first parity (1.5±0.7 liters). The daily milk yield gradually increased with the advancement of parity up to fourth. Islam (2000) stated that the milk yield is affected by age at first calving, season, lactation number, frequency of milking and body weight of the cow.

Khan and Khatun (1998) studied that daily milk yield was 8.10, 9.74 liters and 7.35 liters for SL × Pabna, F × Pabna and Pabna × Pabna genetic groups, respectively. Islam and Bhuiyan (1997) reported the corresponding milk yield for the same trait to be 8.37 liters and 7.49 liters in $\frac{1}{2}$ SL × $\frac{1}{2}$ Pabna and $\frac{3}{4}$ SL × $\frac{1}{4}$ Pabna graded cattle, respectively.

Sarder *et al.* (1997) reported that the average milk yield (liter/day) for Holstein-Friesian cross, Sahiwal cross, Sindhi cross, Jersey cross and Local cows was 7.2±2.6, 5.8±2.2, 6.4±2.76, 6.9±2.7 and 4.0±1.5 liters, respectively. They also reported more milk in cows with greater parities than those with lesser parities (6.0 vs. 7.0 kg for 1st vs. 4 to 5th parity). Sarker (1995) conducted an experiment to determine the profitability of dairy enterprise in two areas of Pabna-Sirajganj district. He showed that annual average milk production per farm and per cow were 1896.20 and 665.33 liters, respectively in Ishurdi and 5858.75 and 929.38 liters, respectively in Shahjadpur. Average milk production of local and crossbred cows were 1.63 and 6.74 liters, respectively per day, 414.02 and 1914.16 liters, respectively per lactation in Ishurdi areas. In Shahjadpurq area milk yield of local and crossbred cows were 3.54 and 8.55 liters, respectively per day and 860.22 and 2308.5 liters, respectively.

Alam *et al.* (1994) reported milk yields per day for the 1st, 2nd and 3rd lactations of 1.5, 1.5 and 1.6 liters for local cows and 2.3, 2.7 and 3.1 liters for crossbred cows, respectively; average milk production per lactation from crossbred cows was 68% higher than that of the local cows in Bangladesh. The highest amount of milk (7.7kg/d) was produced by cows at an age >84 to 144 months old (Sarder *et al.*, 1997). The milk yield of local cows was lower than that of all other genotypes at any stage of lactation (Talukder *et al.*, 2001). Sarder *et al.* (1997) found that Holstein-Friesian crossbred cows yielded 2.5 kg more milk daily than that of local cows (7.2 vs. 4.7).

Bhuiyan and Sultana (1994) found the milk yield data on 282 cows of Local, Jersey, Holstein, Sahiwal, $\frac{1}{2}$ Local×$\frac{1}{2}$ Jersey, $\frac{1}{2}$ Local×$\frac{1}{2}$ Holstein, $\frac{1}{2}$ Local×$\frac{1}{2}$ Holstein and $\frac{1}{2}$ Sahiwal×$\frac{1}{2}$ Friesian and reported an average daily milk yield of 3.00, 6.67, 10.41, 3.98, 5.56, 6.51, 6.03 and 6.64 kg, respectively in Savar Dairy Farm of Bangladesh. Genetic group, lactation number, season of calving and period of calving had significant effect on average daily milk yield. Mittal *et al.* (1989) carried out a survey on the management and performance of indigenous and European indigenous crossbred cows during 1982 to 87. They found that daily milk yield of crossbred cows in the urban areas average 9.7 to 12.1 liters per day and indigenous cows averaged 7.3 to 9.5 liters per day.

2.1.14 Lactation length

The number of days from first milking to the end of milking of a cow is called lactation length. Lactation length is the most important period for profitability of a farm; lactation period is higher then the profit must be higher.

Alam *et al.* (2008) found that the lactation length of 60 indigenous (Desi), 20 Friesian×Desi and 20 Sahiwal×Desi cows were 217.9±18.7, 253.8±21.9 and 240.8±15.7 days, respectively. The lactation length of dairy cows of Sirajgonj-Pabna region was 249 days (Shamsuddin *et al.*, 2006). The figure was 285 days for Mymensingh, 251 days for Khulna-Satkhira and 286 days for Chittagong areas. Hossain *et al.* (2005) reported that the average lactation period for crossbred and indigenous cows was 283 and 207 days, respectively, which differ significantly

(P<0.01). Karnal (2005) reported the total effects of dry period and lactation length were 28.78 and 13.68 percent, respectively, for all lactations. Both the traits contributed mainly by their direct effects.

Mondol *et al.* (2005) stated that the average lactation length of different types of dairy cows of Bangladesh Agricultural University Dairy Farm. It was found that lactation length of Jersey cross, Sahiwal cross, Sindhi cross, Holstein cross and Red-Chittagong cows 281±109; 245±106; 228±65.7; 250±38.6 and 283±58.7 days, respectively. Lowest lactation length was found in case of Sindhi cross and highest lactation length was of Red-Chittagong cow. Statistical analysis showed that there was no significance difference among the lactation length of different types of dairy cows.

Sarder (2001) observed that the total lactation length of indigenous cows in different parities was affected significantly (P<0.05) by parity of cows. Significantly (p<0.05), the highest lactation length was found in second parity (283.5±118.3 days) which did not differ from that of third, fourth and fifty parities (276.3±105.1, 261.8±100.4 and 257.9±95.8 days, respectively). Significantly (p<.05), the lowest lactation length was found in first parity (218.3±153.8 days). Hossain *et al.* (2001) conducted an economic analysis of small dairy farms (n=73) in Bajitpur, Kishoregonj, Bangladesh during January-December 2000. Farm economics was evaluated based on 411 cows and fertility was evaluated based on 202 lactating cows. The cows were mostly local Zebus and their crosses with Friesian, Shahiwal, Sindhi, Jersey and Haryana. The average lactation duration was 246.1 days in contrast to the target of 305 days.

Ali (1998) observed that the average production of milk per day from crossbred and indigenous dairy cows were 4.10 and 2.28 liters, respectively and this difference was statistically significant (p<0.001). He also found that the average length of lactation period for cross-breed and indigenous dairy cows were about 266 and 220 days, respectively and this difference was statistically significant (p<0.01).

Nagare and Patel (1997) showed data on 3235 lactation periods of crossbred cows collected in Maharashtra, India, from 1972 to 1992 to find out the lactation length. They observed that the overall least square means for lactation length was 334.68 days. They also pointed out milk yield per day was 9.61 kg. Sultana (1995) analyzed length of 321 cows using data collected from CCBS, Savar, Dhaka of various exotic breeds, local and their crosses and observed that the mean was 274.16±6.92 days. She found that the lactation length of Local (L), Sahiwal (SL), Sahiwal×Friesian, Jersey, Local×Jersey, Sindhi (S) and Local×Friesian was 241.18±10.53, 293.007±15.32, 286.69±7.949, 268.02±25.99, 266.23±10.49, 283.81±27.52 and 247.41±5.88 days, respectively. Genetic group and year of calving had significant ($P<0.001$) effect on lactation length.

Halim (1992) found that the average of lactation period for local and crossbred dairy cows were about 228 and 259 days, respectively. The variation in the length of lactation period between the local and crossbred dairy cows were significant.

Nahar *et al.* (1992) analyzed data from the village surrounding BAU a Mymensingh and analyzed the lactation length of F_1 crossbred cows of four different exotic breeds with local. The observed lactation length Sindhi×Local, Sahiwal×Local, Jersey×Local and Holstein×Local were 263.9±2.0, 296.7±2.65, 304.4±3.6 and 330.5±3.2 days, respectively. Nahar *et al.* (1989) studied the performance of 196 cows of different genotype using data maintained at BAU Dairy Farm. Mymensingh and highly significant ($P<0.01$) effect of genetic group on lactation length was observed. The reported lactation length of Local × Sindhi, Local × Sahiwal, Local × Jersey and Local×Holstein Friesian were 269.29±2.67, 295.54±3.33, 341.48±5.74 and 361.94±2.89 days, respectively. Ahmed and Islam (1987) summarized performance of different genotypes of CCBS, Savar, Dhaka and the observed lactation length of Local, Sindhi, Sahiwal, Friesian, Jersey, Friesian cross and Jersey cross were 276, 289, 312, 349, 341 and 324 days, respectively. length than the local cows.

2.1.15 Total lactation yield

Rasali *et al.* (1998) carried out performance record on lactating cow at 10 village in the high-hill, mid-hill and low-hill regions of Nepal during 1995-97 and reported standardized lactation yield in Nepalese Hill (NH) cows and in Jersey×NH crossbreds with < 50, 50, >50 to <75, 75 and >75 percent jersey inheritance as averaged 566, 925, 1188, 2518, 1601 and 1220 liters respectively with genetic group having significant ($p<0.05$) effect on this trait. Sarker (1995) found the average milk yield per lactation of local and crossbred cows were 414.02 and 1914.16 liters, respectively in Ishurdi areas of Pabna district. He also found for the some genotypes in Shahjadpur area of Sirajganj district were 860.22 and 2308.5 liters, respectively

2.1.16 Overall housing system

Hossain *et al.* (2005) found only 10 percent of the farmers provide half building and rest 90% of the farmers used Tin shed and Straw shed to use their cattle. Highest percentage of farmers (80%) provided open house, 13% provided closed and rest used Semi-closed house. On the basis of Floor type, 65% of farmhouse was found with pacca (with bricks) and the rest had unpaved floor. Hossain *et al.* (2004) studied that 63% farmers provided closed house and 63% farmers used paved floor.

2.1.17 Overall ventilation system

Keck *et al.* (2004) found that it was concluded that cows in open sheds must have access to sufficient ventilation, shade and water in summer and it is essential that they should be provided with shelter from wind and rain in winter, when extra heating may be required.

Shamsuddin *et al.* (1995) observed the effect of ventilation of the house on the condition scores, fertility and the incidence of reproductive disorders of the animals living. The duration of postpartum anoestrus, days open, wastage days and service per conception were lower in animals at the free ventilation houses than those at restricted ventilation system. Accordingly, the animals at the ventilation system had higher conception rate than those at the restricted ventilation system; however, the difference was not significant ($p = 0.12$). Of striking importance was significantly ($P<0.05$) lower incidence of reproductive disease in the animals of well-ventilated. It is likely that well ventilated houses get lighter, remain drier and cooler than the poor ventilated house. There is ample evidence that dry and cool environment favors the reproductive efficiency of the cow (Sainsbury, 1981).

2.1.18 Floor type of house

Shamsuddin *et al.* (1995) studied the body condition scores and reproductive performance of animals reared on different types of stable-floors. The nutrition condition and fertility of the animals were not affected markedly by the floor of the house. However, the incidence of reproductive diseases was lower in animals reared all the time on concrete floor (19%) than in animals on concrete floor only during night time (20%) and those always on the muddy floor (23%).

The types of stable-floors were considered as influencing factors to general health and fertility for several reasons. Firstly, in the traditional farming, the farmer prepares the muddy floor as dry as possible for the night time; during the day, the animals usually enjoy rather big area for their movement. In the mini-dairy farm the animals are usually confined in a particular area. Animals standing on muddy floor in a confined area may develop foot diseases; such animals often show poor reproductive performance. Muddy floor may reduce the fertility of the cow living on it. Secondly, animals standing always on the concrete floor may also develop foot problems leading in worst cases to lameness (Martin *et al.*, 1998). These animals are reluctant to move and thereby consume less food and receive limited exercise. He reported the animals were stall-fed; therefore, the rate of food consumption may not have been affected. Thirdly, animals living on concrete and slippery floor show less pronounced signs of behavioral oestrus resulting in poor heat detection (Martin, 1982). No matter how the floor is made of the cow in intensive management should be reared on dry and non-slippery floor to reduce the incidence of foot diseases and to maximize the change of oestrus detection.

2.1.19 Feeding practices, feeding of roughages and concentrates

Hossain *et al.* (2005) studied that the two systems of feeding, which are practiced by the dairy owners to feed their cattle. Sixty three percent farmers followed stall feeding and 37% farmers followed both stall and grazing system. The main livestock feed at the study area was rice straw. Most of the farmers (80%) used untreated straw. It was noted that 20% and 40% farmers cultivated Napier and maize, respectively and rest of the farmers did not cultivate fodder. Most important constraints regarding fodder cultivation are scarcity of land, scarcity of seed/cutting and lack of knowledge.

Sarder and Rashid (2005) found that three quality of feed (Good, Fair, Poor) had significant ($P<0.05$) effect on reproductive and productive performance of dairy cows but good quality feed had shown the excellent performances, post partum heat period, days open, wastage days, service per conception, dry period and calving interval values were increased in feed quality of fair and poor.

Alam *et al.* (2001) studied the effect of urea-molasses-mineral block (UMMB) on the ovarian cyclicity in local Zebu cattle. It was suggested that UMMB could be used as feed supplementation in Zebu heifers for enhancing earlier sexual maturity (Dziuk and Bellows, 1983). The main cause of poor reproductive performance could be due to poor health management, incorrect nutrition during and after calving. Inadequate dietary intake and decreased utilization of some nutrient may result in delayed onset of ovarian activity by preventing release of gonadotropin from the pituitary (Randel, 1990). Balanced nutrition with better management help to maintain general health condition of the cow that stimulate the endocrine system through the activation of the hypothalamo-pituitary-ovarian axis to work properly and thereby improved reproductive performance (Morrow, 1980). Feeding programs at pre and post calving period helped in initiating the earliest post-partum onset of ovarian cyclicity (Brosaster and Broaster, 1998). Accordingly the interval between calving to first post-partum service varies between the cows with interval between calving to first post-partum service varies between the cows with or without supplementation of concentrates (Shamsuddin *et al.*, 1998).

Energy restriction influences reproductive function through depression of GnRH release in hypothalamic centers in the brain (Butler and Smith, 1989). GnRH simulates release of Luteinizing hormore (LH) from the pituitary. LH stimulates ovaluation and help in the maintenance of luteal function in the ovary. The importance of nutrition and energy balance with respect to post-partum ovarian activity has been reported elsewhere (Ferguson, 1996).

Shamsuddin *et al.* (1995) observed the body weight, milk production and the fertility parameters following feeding of different grades of concentrate. Feeding grade 3 concentrate resulted in the lowest body weight. Daily average milk yield was highest in animals fed with grade 1 concentrate. The fertility parameters were best in animals fed with grade 1 concentrate and worst in Grade 3 concentrate-fed animals. However, the difference in the body weight, milk production and fertility parameters was not significant between animals fed with different grades of concentrate.

The feed supplied, in particular to the post-partum cows should be enough to maintain the cow, to support milk production, as well as to initiate the ovarian cyclicity (Butler and Smith, 1989). Tomar *et al.* (1985) stated that good nutritional status at peiparturient time reduced the length of postpartum anoestrus period and services per conception in cows.

Inadequate dietary intake and decreased utilization of some nutrient may result in delayed onset of ovarian activity by preventing of release gonadotropin from the pituitary (Osawa *et al.*, 1996). Feeding programs at pre and post calving period helped in initiating the earlier post-partum onset of ovarian cyclicity. Brosaster and Broaster

(1998) the restriction of nutrient supplementation both in pre and post-partum period causes weight loss and decreases body fat reserve a calving, delayed onset on post-partum estrus and ovulation.

2.1.20 Feed quality

The small scale farmers in the study area have limited resources available for feeding their dairy cattle. The available resources are essentially lowly digestible forages such as tropical pastures both green and mature, and agricultural by-products which are generally low in protein **(**Karume *et al.*, 2013).

Shamsuddin *et al*. (1995) studied of 284 cows and 29 heifers at Natore district of Rajshahi to evaluate the fertility, productivity and reproductive disorders of cows in the private mini-dairy farms to regard to the level of concentrate feeding. They found that the interval between calving to first postpartum oestrus, postpartum open period, days wastage and service per conception were 96-176, 101-197, 7-28 days and 1.3-2.3, respectively. After feeding three level of concentrate grade-1 (best) concentrate feed animal were heavier, yield more milk and had better fertility than those feed with grade-2 (medium) and grade-3 (poor) concentrates.

There is a strong relationship between nutrition, reproductive and productive performances in dairy cattle (Gimbi, 2006). Therefore feeding is a fundamental aspect in dairy cattle production as well as reproduction. For optimal production of milk, a dairy cow must be supplied with sufficient feeds to meet both its maintenance as well as production requirements.

Generally no concentrate is fed to the growing, working, pregnant and dry animals. Only lactating animals are given better feeding through supplementation of by-product concentrates such as, oil cakes, brans, and milled pulses, as farmers receives the immediate returns on their investment through saleable milk (Ranjhan, 1997).

A survey conducted in India (Ranjhan, 1999), showed the following ranges in percentages of feed components in rations varying according to agro-climatic region, season and stage of the production cycle: Grasses and grazing 15-30%, Crop residues 66-70%, Cultivated forages 5-8%, Concentrates 2-5%.

Dairy cows compared to other farm animals produce large amount of milk, hence require sufficient and quality feeds with all necessary nutrients, which are energy, protein, minerals and vitamins. In the monitoring study the average quantity of forages offered to the lactating animals was 40-60kg fresh weight which was slightly low compared to what they were supposed to be fed according to their body weights and amount of milk produced. In the study area mean weight of lactating cow was 420kg with an average milk yield of 8 litres supposed to be fed 11.3kg DM, 93.17 ME, 1059g CP, 37.6g Ca, and 28g P but it was offered 10.8kgDM, 87.5 ME, 78g CP, 22.9g Ca and 18.5g P per day **(**Karume *et al*., 2013).

The study shows that few respondents conserve feed to be used by their animals during the time of feed shortage in a particular dry season. Majority of the respondents did not conserve feed. Lack of feed conservation can be a major cause of reduced milk yield during dry season **(**Karume *et al*., 2013).

Concentrates or supplements are given in addition to roughage. Although more expensive than roughage, they are essential when roughage alone cannot satisfy the animal's maintenance and production requirements. Improvement in milk yield (1.5L/day) was observed when crossbred cows were supplemented with 4kg of maize bran, 2kg of cotton seed cake and 100gms of mineral powder per day in various district in Tanga region (Urassa, 1999).

In the study area majority of dairy cattle keepers supplemented their animals with concentrates and minerals. Even though majority of dairy farmers in the current study reported that they supply minerals to their lactating cows it has been observed that these minerals do not meet animal body requirements. This could probably be that the animals get inadequate amount or improper mixing ratios. Also the ingredients which have been indicated in the mineral powder manual by manufacturers might not be the actual ingredients mixed in the powder because some of manufactures are business oriented and are not faithful. In the study area the amount of mineral powder offered per cow per day was reported to be 23gms of calcium and 18gms of phosphorus, while the requirement should be 38.03grams of calcium and 28.5grams of phosphorus per cow per day **(**Karume *et al*., 2013).

2.1.21 Veterinary caring

Alam *et al.* (2010) concluded that there was good reflection of veterinary care on productive and reproductive performance of cows. The cows treated by locally trained person showed better performance than veterinarian.

2.1.22 Breeding Method

Islam *et al.* (2010) showed that the productive and reproductive parameters of dairy cows were influenced by breeding method. Considering all productive and reproductive traits, dairy cows bred by artificial insemination (AI) showed the best performance among the breeding method except lactation length and calving interval. This may be due to lack of sincereness, better management, feeding of sufficient quality feed, disease control etc. to their dairy cows.

Earlier observation recorded a better fertility in cross-bred animals reared under different management systems. The fact that, in the traditional farming, the local cows receive less attention than the cross-bred animals. But in the mini-dairy farm, the local cows were selected for more milk production and consequently received equal attention as did the cross-bred ones. The better fertility after natural service than that after artificial insemination is well established (Saacke *et al.*, 1991). Additionally, the adaptability of the local cows to the prevailing environmental conditions may also be the contributory factors for their better fertility in this study.

2.1.23 Socio-economic condition of farmers

Alam (2010) observed that there was good reflection of different economic condition of dairy farm owners on productive and reproductive performance of cows. The cows reared by the marginal farmers showed better performance. Probably marginal farmers were very conscious of cow rearing as it was their main livelihoods.

2.1.24 Socio-economic development of beneficiaries (farmers)

Monarul *et al.* (2014) reported that socio-economic development of the beneficiaries through PDBF activities were measured in eleven selected dimensions of PDBF activities in changing their socio-economic condition and increased decision making abilities.

2.1.25 Total milk selling

Monthly milk production and revenue per farm and per cow increased with the level of education of the farmer. However, LSM differences were significant only for milk production and revenue per cow, but not for monthly milk production and revenue per farm. Farmers with no education or primary school had significantly lower LSM values than those from farmers that had bachelor or higher degrees Yeamkong *et al.* (2010). Educational level of farmers may be an indicator of their ability to adopt appropriate technologies and management practices (Borisutsawat, 1996;

Kanchanasinith, 1999; Thijae, 1999; Cicek *et al*., 2007). Farmers that had a higher educational level may have had superior ability to access and understand information and technology, and may have been able to apply them more appropriately to their conditions than farmers with lower education

2.1.26 Role of nutrition and feed in dairy cows

The important role of nutrition in the success of the breeding and improvement of products, services responsible for livestock development should implement programs to support farmers in proper animal nutrition (Nishimwe *et. al.*, 2014). The productivity of indigenous cattle is low as a result of poor genetic potential, poor management practices, harsh environmental conditions, nutritional inadequacies, and diseases (Obese *et. al*., 2013). The other major obstacle to the development and intensification of animal production in developing countries is an inadequate feed supply (Westhuizen *et. al*, 2004), aggravated by the partial and imperfect knowledge of certain physiological norms of animals (Habtamu *et. al.*, 2010).

Diet is a major factor of success or failure in reproduction because it provides the cow all the energy, protein and minerals needed to meet its maintenance needs during gestation and production (Obese *et. al.*, 2013). The principal source of feeds is pasture with feed supplementation often limiting in quality and quantity (Ocen, 1999) that result into poor body condition, weight loss, low milk yield and perturbation of resumption of ovarian cycle (Damptey *et. al*., 2014).

2.2 Broiler Production System in Bangladesh

The current poultry farming is established with the domesticated fowl used for both meat and egg production. This farming also includes birds like chicken, turkey, duck, goose, ostrich, quail, pheasant, guinea fowl and peafowl. Chickens are the most popular poultry worldwide irrespective of culture and religion (Roenigk, 1999; Aho, 2001), because of high nutritive values of poultry products. Chicken meat and eggs are the major protein source for consumers in most of the countries around the world, and poultry contributes about 22 to 27 percent of the total animal protein supply in Bangladesh (Ahmed & Haque, 1990). Poultry is a promising sector for poverty reduction in Bangladesh.

In the context of Bangladesh, deshi (local) chickens are reared in the villages mainly by the women whereas the exotic chickens are used as farm animals reared both in villages and urban areas. The exotic chickens are commercially reared because they are high yielding (eggs and meat) than the indigenous breeds (Hossain, 1992).

Poultry production and poultry related industry contributes most significantly to the total livestock sector in Bangladesh. Poultry is in the top position of the livestock sector, contributing 21% of the total livestock contribution (Khan and Roy, 2003), 20% of the protein consumed originates from poultry (90% chicken followed by ducks 8% and a small number of quail, pigeons and geese) (Das *et. al.*, 2008). It is estimated that there are about 140 million chickens and 13 million ducks in the total poultry population (DLS, 2000) are scattered throughout rural areas in Bangladesh.

2.2.1 Pellet system of feeding in broilers rearing.

In our project areas pellet system of feeding is used in broilers rearing. It is really a modification of the mash system. It consists of mechanically pressing the mash into hard dry pellets or "artificial grains". Pellet is a form of complete feed that is compacted and extruded to about 1/8 inch in diameter and 1/4 inch in long (Banerjee, 1988). The greatest advantage in using pellets is that there is little waste in feeding. The disadvantage is that pellets are expensive-about 1 0 percent more expensive than that of feeds not pelleted. Asha Rajini *et al*. (1998) reported that pellets had better-feed efficiency up to six-week age of birds. On the other had Moran (1990) observed that pelleting of feed improves the body weight of poultry. Bolton and Blair (1977) reported that feed intake of broilers could be up to 10 per cent greater with crumble or pellets compared with mash.

2.3 Layer Production Performances in Bangladesh

Poultry eggs provide a valuable source of high quality proteins, minerals and vitamins required for normal growth especially for children (DARSA, 2004). Bangladesh has made considerable progress in egg production in the last three decades. High quality chicks, equipment, vaccines and medicines are available. Technically and professionally competent guidance is available to the farmers. The management practices have improved and disease and mortality incidences are much reduced. Many institutions are providing training to entrepreneurs. The per capita egg availability at present is 41 eggs; while as per BBS (Bangladesh Bureau of Statistics) (2010) information about 182 eggs per person per year are required to balance the common vegetarian diet. Layer farming i.e layers production has been given considerable importance in national policy of Bangladesh and has a good scope for further development.

Layers farming is emerging as a strong agro-based industry in Bangladesh. It is also potential source of income generation and create employment opportunities for the educated, non-educated and unemployed youths and distress women. Presently poultry meat and eggs provides the cheapest quality animal protein to the millions of people. There are around 1.5 lac small, medium and large scale poultry farms in Bangladesh and poultry population are approximately 246.

2.4 Proximate Analysis of Dairy and Poultry (Broiler and Layer) feed

The poultry farming has now turned into one of the most important division of agriculture throughout the world. It is expanding rapidly as a dynamic industry in South Asian countries like Bangladesh, India and Pakistan. The tremendous role of commercial layers and broilers is to meet the increasing demand of the population for protein by the meats and eggs. Poultry is basically a source of economical, palatable and healthy food protein (Mahesar *et al.,* 2010). In Bangladesh, poultry industry is playing a vital role in the economy of the country and providing employment for about 1.5 million people. Presently, there are more than 140 feed mills operating with the capacity of around four million tons of compound feed per annum to meets the high demand of poultry farms.

Poultry feed industry is closely connected to the primary agricultural production and forms an essential component of the food chain. Poultry feeds are known as a complete feeds, since it is prepared in such a way to contain all the vitamins, minerals, energy, protein, and other nutrients essential for proper health of the birds, egg production and growth. It is frequently recognized that feed correspond to the major expenditure of the poultry production. According to Kleyn (1992) feed costs represents 60-80% of the economic inputs in the commercial poultry industry.

Nazri (2003) reported that in poultry production the most important component is the ratio amongst the feed and egg/meat. Different feeds give different results in terms of growth and egg production. To attain the exact quantities of nutrients, it is important to balance the ratio of diets by proximate feed analysis.

CHAPTER 3

GENERAL MATERIALS AND METHODS

CHAPTER 3

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The study was conducted at 9 Upazila of Rajshahi district, Bangladesh. Major objective of the study was "to evaluate the socio-economic impacts of 'One House One Farm Project' on dairy and poultry production at 9 Upazila of Rajshahi district". The research were divided into 5 experiments (5 studies) to obtain the findings from the studies.

Study-I: Present scenario of 'One House One Farm Project' of Rajshahi district.

Study-II: Factors influencing the productive and reproductive parameters of dairy cows under OHOFP at Rajshahi district

Study-III: Productive performances of broiler farms in OHPFP areas of Rajshahi district

Study-IV: Productive performances of layer farms in OHPFP areas of Rajshahi district

Study-V: Assessment the quality of dairy, broiler and layer feed used under OHOFP of Rajshahi district by Proximate Analysis

3.1 Time schedule (January 2013 to December 2015)

The time schedule of the present studies has been designed as follows (Table-1).

Table-1: Time Schedule for the PhD research: Required 36 months (Starting from January 2013 to December 2015)

Sl. No.	Particulars	Time
1.	Review of Literatures	3 months
2.	Preparation of Draft Questionnaire	1 months
3.	Finalization of Questionnaire	1 months
4.	Selection of areas, animals and poultry farms, meetings with UNOs, ULOs & URDOs, purchase of study materials and initial field visits	2 months
5.	Collection of related books, thesis and journals	1 months
6.	Primary and Secondary data collection and follow up	18 months
7.	Feed analysis	2 months
8.	Data input into computer	2 months
9.	Analysis of data	2 months
10.	Draft Thesis Writing	2 months
11.	Final Thesis Writing	2 months
	Total time requirement	**36 months**

3.2 Study areas

The study was conducted at Rajshahi districts covering 9 Upazila. Table 2 and Fig.1 showed the study areas of the research activities.

Table 2: Total study areas 9 Upazila and 71 Unions of Rajshahi district

Serial No.	Name of Upazila	Total Unions
1	Bagha	06
2	Bagmara	16
3	Charghat	6
4	Durgapur	7
5	Godagari	9
6	Mohanpur	6
7	Paba	8
8	Puthia	6
9	Tanore	7
Total	**09**	**71**

The research areas were to be limited within all Unions (71 unions) and all Upazilas (9 Upazilas) of Rajshahi district in Bangladesh and especially in dairy and poultry production of 'One House One Farm Project'. No farmer of Pourashava or City Corporation areas was included according to the guideline of OHOF Project. Fig.1 showed the map of Rajshahi district including 9 Upazila in Bangladesh.

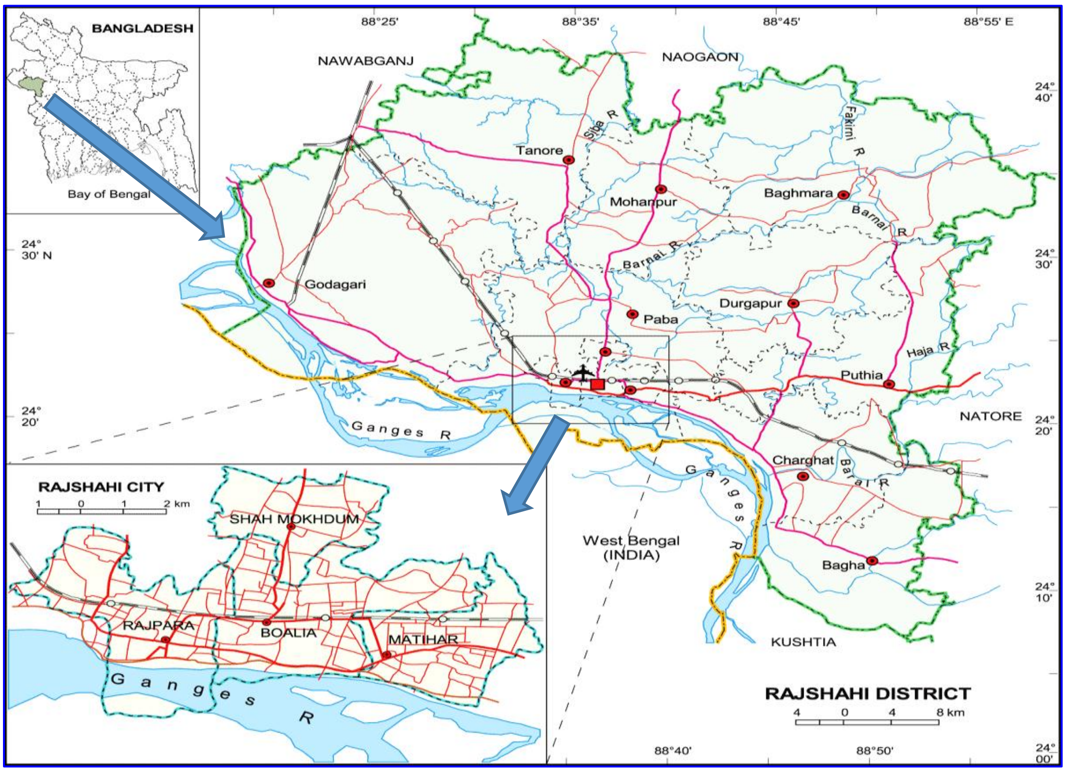

Fig. 1: Map of Rajshahi district and bullet (●) has shown the research areas

3.3 Data collection procedure

Carefully prepared questionnaire were used and designed in a simple manner to get accurate information from the dairy cows' owners and poultry (broilers and layers) farms' owners by face to face interviewing.

The primary and secondary data were used in conducting these research activities.

Sources of primary data: Carefully prepared questionnaire were used for the purpose of information collection from project areas of Rajshahi District.

Sources of secondary data: The secondary data were to be collected from project areas of Rajshahi district, Upazila UNO offices, DD (BRDB) and Upazila offices, OHOFP Coordinator's offices of 9 Upazila, completed research activities and yearly forwarding report of PD (Project Director) of OHOFP head office, Dhaka.

3.4 Population sample

The population sample of the proposed research activities were dairy cows and poultry (broilers and layers) farmers and their farms under 'One House One Farm Project' areas of Rajshahi district**.** The collected individual details data were of 301 farmers (219 dairy farmers, 60 broiler farmers and 22 layer farmers).

Table-3: Upazila wise distribution of dairy, broiler and layer farmers

S. N.	Name of Upazila	Dairy	Broiler	Layer	Total
1	**Bagha**	15	8	1	24
2	**Bagmara**	26	2	9	37
3	**Chargat**	16	10	2	28
4	**Durgapur**	24	8	1	33
5	**Godagari**	21	9	3	33
6	**Mohanpur**	25	3	1	29
7	**Paba**	48	10	3	61
8	**Puthia**	28	3	1	32
9	**Tanore**	16	7	1	24
	Total	**219**	**60**	**22**	**301**

Fig. 2: Dairy cows of OHOFP under Paba Upazila at Rajshahi district.

Fig. 3: Broiler farms of OHOFP under Tanore Upazila at Rajshahi district

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Fig. 4: Layer farms of OHOFP under Paba Upazila at Rajshahi district.

3.5 Factors considered for productive and reproductive parameters of the dairy cows

The following factors have been considered for the research.

3.5.1 Breeds

Five breeds were reared by farmers in our study areas in Rahshahi district. These were Local × Local, Local × Friesian, Local × Sahiwal, Local × Jersey, and Local × Sindhi. Dairy cows were classified as following

Group-I : Local × Local (n=103)

Group-II : Local × Friesian (n=79)

Group-III : Local × Sahiwal (n=14)

Group-IV : Local × Jersey (n=13)

Group-V : Local × Sindhi (n=10)

3.5.2 Age of cow

Ages of the cows were measured by dentition, number of horn rings and description by the farmers. Cows were divided into four groups.

Group-I : = or <3 years (n=27)

Group-II : >3 to 5 years (n=99)

Group-III : >5 to <7 years (n=54)

Group-IV : **≥7** years (n=17)

3.5.3 Parity

The cows that had one parturition were considered as Ist calving (parity-1) and so on. The cows were divided in the following groups:

Parity-1 : 1st calving (n=137)

Parity-2 : 2nd calving (n=35)

Parity-3 : 3rd calving (n=16)

Parity-4 and above: 4th and above calving (n=19)

3.5.4 Body weight

Body weight was estimated using Shaeffer's formula adopted by Mc Nitt (1983):

$$\text{Body weight} = \frac{L'' \times (G'')^2}{300 \times 2.2} \text{ kg}$$

Body weight = kg

L = Length from point of elbow to pin bone in inch

G = Length of heart girth in inch

Cows were divided into the following three groups:

Group-I : ≤ 150 kg (n=95)

Group-II : 150 to 200 kg (n=88)

Group-III: >200 kg (n=36)

Effects of body weight on reproduction and production were studied.

3.5.5 Body Condition

Healthy body condition: The gap between thighs was filled up by fat, and looked fatty and well-muscled.

Moderate body condition: Frame and covering were well balanced. The gap between thighs was filled up by fat, and looked flat not round.

According to above body condition cows were divided into two groups:

Group- I : Healthy (n=162)

Group- II: Moderate (n=57)

Effects of body condition score on production and reproduction were studied.

3.6 Productive and reproductive parameters of the dairy cows

The following parameters were used, defined by Hossain *et al.* (2001) and Ronald (1984).

Age of puberty: The age at which a heifer first shows estrus behavior. It was measured in months (m).

Age of first calving: The age when a heifer gives birth. It was also measured in months (m).

Post-partum heat period: It is considered as the interval between date of calving and the date of first heat shows. It was calculated in days.

Services per conception: The average number of services for each successful conception.

Gestation length: It was calculated as interval from conceived to parturition. The duration of gestation was expressed in term of days.

Calving interval: The number of days between two successive calving of the same cows or the period from one calving to the next is termed as calving interval. In this study calving interval was measured in days.

Birth weight of calf: The weight of calf just after parturition was recorded in kg.

Milk yield per day: It is the total milk yield in lactation divided by total number of days in that lactation and was measured in liters.

Lactation length: In this study the lactation length was measured in days. The number of days from first milking to the end of milking of cows is called lactation length.

Total lactation yield: The total quantity (liters) of milk produced throughout the lactation is considered as total lactation yield.

Total milk selling: The total milk selling from total quantity of milk in one lactation is considered as total milk selling price. It was measured in thousand taka.

3.7 Overall management

Housing system: Scientific housing system is essential for dairy cows, broilers and layers. Overall good, medium and poor housing systems were considered for each study.

Ventilation system: It is also essential for dairy cows, broilers and layers. Proper and moderate ventilation system were measured in dairy cows; excellent, medium and poor ventilation system were considered in broilers and poor, moderate & proper ventilation system were measured in layers rearing in this researches.

Feeding practice: Stall feeding, stall & tethering and stall & grazing feeding practices were considered in dairy cows rearing, but in case of broilers and layers pellet feeding was practiced from different feed company.

Vaccination: Broiler and layers birds were regular vaccinated by veterinary quack doctors or farmers themselves, but dairy cows were regular of irregular vaccinated in our research areas.

3.8 Statistical Analyses

Data collected from dairy and poultry farm owners were compiled tabulated and analyses in accordance with the objectives of the study. The raw data (extracted from questionnaire response) were decoded, entered and sorted accordingly using MS Excel. The data were transferred to analytical software IBM SPSS Statistics Version 20 for descriptive analysis. Descriptive analysis was expressed as relative frequency mean, standard error and number of observation wherever applicable. The data were sorted and cross-checked for duplication and/ or missing values. The missing values for each variable were recorded (numeric) as to be excluded in the analysis.

Factors were tested by Duncan Multiple Range Test (DMRT) to determine the effect of different factors (Steel and Torrie, 1980). Univariate Analysis of Variance was used to test significance of different factors. Some factors were also tested by Independent Samples Test (t-test).

CHAPTER 4

STUDY-I

PRESENT SCENARIO OF 'ONE HOUSE ONE FARM PROJECT' OF RAJSHAHI DISTRICT

CHAPTER 4

Study-I

Present scenario of 'One House One Farm Project' of Rajshahi district

4.1 INTRODUCTION

'One House One Farm Project' is a poverty alleviation project through family farming of the government of Bangladesh which started in 2009 under the Ministry of Local Government Rural Development and Cooperatives. The vision as well as the goal of the project is poverty alleviation and sustainable development by mobilization of fund, house hold family farming and e-financial inclusion.

The project is run containing six missions such as, assistance for capital formation of poor farm families, sharpening their skill, allow them to sit together, taking decision independently, to develop small agricultural family farm and ensure marketing facilities for their products. Moreover, it has eleven specific objectives including formation of 81000 cooperatives involving the small and marginal farms families by 2016. Nearly 80% people of Bangladesh live in the villages, and the key elements of rural economy are the rural people and their land. The overall development of this country depends virtually on the development of its rural areas. All the elements of driving force of economy prevail in the villages. Every house in the village has unutilized land, home yard, pond/ditch, canal, etc. It also has unskilled manpower, unemployed youths and women. Alongside these resources different Nation Building Departments (NBDs) have their cadres to offer extension services to the villagers. This means that Bangladesh has all elements and resources like land, labour, capital and others in the villages. To reduce poverty and development of socio-economy through ensuring capital formation and skill development of poor villagers by livelihood activities as well as Fisheries, Livestock, Poultry, Vegetables, Nursery, Agriculture etc. are the important programs. Millions of people living in developing areas have their livelihoods from agriculture and rural development. The majority of these people suffer from malnourishment, essentially due to underproduction of agriculture, uneven distribution of land and crop production. This is an indication that increased foods production (using drought power) has a definite positive impact on the lives of both rural and urban populations in developing countries (Chawatama *et al.*, 2005).

The consumption of livestock products in developing areas is growing rapidly. In Swaziland and in South Africa, including in other developing areas of Africa, Asia and Latin America, small-scale livestock farming is parts of agricultural development (Bernet, 2000). South Asian Pro-Poor Livestock Policy Initiative (SAPPLPI)-FAO report built the evidence in South Asia, a region in which a large share of the poor are livestock dependent and the demand for animal source food is fast-growing (Ali, 2007; Otte *et al.*, 2009). The small-scale dairy farming facing a lot of problems such as scarcity of feeds and fodder, high price of concentrate and lack of technical knowledge although there were potentials particularly for the small dairy farmers (Hossain *et al.*, 2005). There is ample international evidence that small-scale agriculture has the potential to generate employment and income opportunities in developing areas (Kirsten and van Zyl, 1998). The role of livestock in both agricultural production and in improving the quality of life of small-scale farmer has always been emphasized for agricultural development (Mapiye *et al.*, 2007).

Broiler farming plays a significant role in improving the livelihood of the farmers that reflect to improve socio-economic conditions and increase women empowerment opportunity among rural people of Bangladesh (Rahman *et al.,* 2006). Due to a short life cycle, low capital investment and quick return in broiler farming may be a good source of income to rural farmers throughout the year (Bhende, 2006). Ali *et al*. (2015) revealed that the socio-economic status of the broiler farmers affect broiler production as well as profitability. However, like dairy and poultry trades the fisheries, nursery and vegetables trades might have an important role to develop socio-economic status in the developing countries and also in Bangladesh. After taking the OHOFP by the government of Bangladesh, the rural economy might have been changed where different agricultural trades contributed their specific role. Besides, contribution of different agricultural trades involving farmers and mobilization of fund of OHOFP, effectiveness of the project and the skill of Upazila administrations are needed to be found. As far as know, no enough report on this view pointed out at Rajshahi district still now. Hence this study was conducted on following objectives.

- To find out the contribution of different agricultural trades involving farmers and mobilization of fund of OHOFP at study areas.
- To observe the effectiveness of OHOFP in Rajshahi districts.
- To evaluate the skill of Upzila administrations to enhance the project.

4.2 MATERIALS AND METHODS

4.2.1 Research area and field of the Study-I

Nine Upazilas of Rajshahi District namely. Bagha, Bagmara, Charghat, Durgapur, Godagari, Mohanpur, Paba, Puthia and Tanore were considered as the area and field of OHOFP in this Study-I.

4.2.2 Farmers involvement in the Study-I

Total 35288 farmers were involved in this study Table-4 shows Upazila wise total male and female farmers (members) involvement in our study and Fig. 5 shows their involvement in percentage values.

Table-4: Upazila wise total male and female farmers involvement

Name of Upazila	Total no. of farmers	Sex of farmers	
		Male	**Female**
Bagha	4180	2508	1672
Bagmara	6974	4184	2790
Chargat	3311	1987	1324
Durgapur	3482	2089	1393
Godagari	3865	2319	1546
Mohanpur	4037	2422	1615
Paba	2876	1726	1150
Puthia	3401	2041	1360
Tanore	3162	1897	1265
Grand total	**35288**	**21173**	**14115**

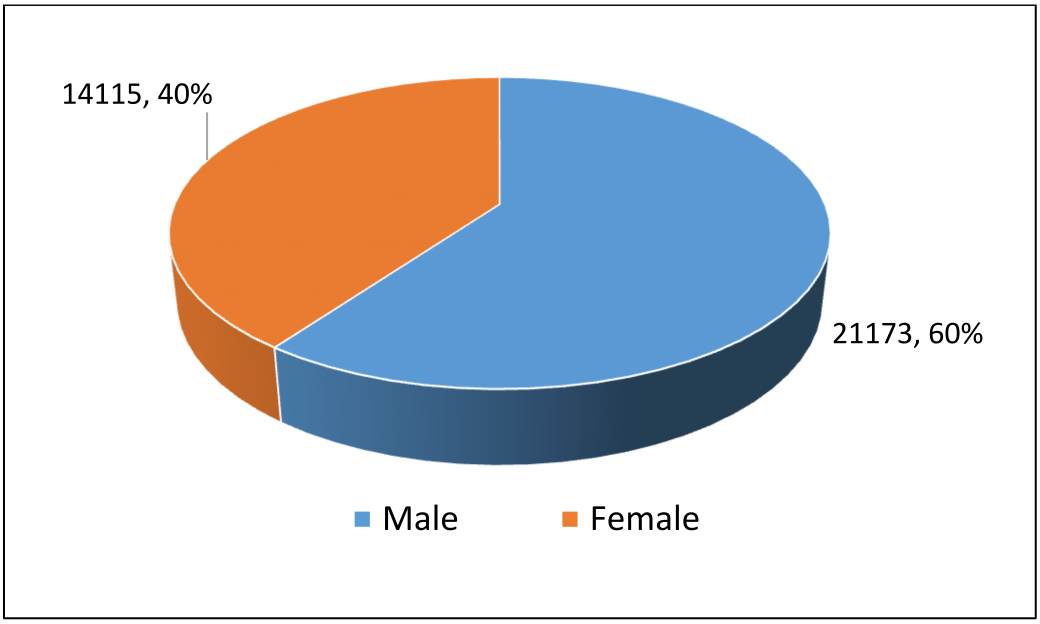

Fig. 5. Pie chart of total farmers involvement in male-female percentage values.

4.2.3 Collection of data

Secondary data from January to April 2015 were used for this study which were obtained from three sources such as:

a) Administrative offices of 9 Upazila of Rajshahi District,

b) Bangladesh Rural Development Board (BRDB), District Office of Rajshahi and

c) The project head office (PD-Project Director office), Dhaka, Bangladesh. Data were obtained as arranged tabulated sheets by direct contact with the mentioned sources and/or e-mail services.

4.2.4 Analysis of data

The data were compiled and calculated by using computer program Microsoft Office Excel 2010 for percentage and proportion. General Linear Model (GLM), Analysis of Variance (ANOVA) and Post-Hoc tests were done using IBM SPSS Statistics Version 20 software.

4.3 RESULTS

Overall results obtained from nine Upazilas of Rajshahi District viz. Bagha, Bagmara, Charghat, Durgapur, Godagari, Mohanpur, Paba, Puthia and Tanore are shown in Table 5 to 13. Table 14, 15 & 16 showed grand total of different agricultural trades viz. fisheries, poultry, livestock (dairy), nursery, vegetables and others, grand total of farmers, fund, disbursement, recovery and due of loan in lac taka. Fig 6 showed Upazila wise comparison of loan recovery and due. Table 17 was used to show ANOVA for significances test.

Table-5: At a glance of 'One House One Farm Project' in Bagha Upazila

Name of trade	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	129	3.09	13.88	2.90	13.88	100.00	0.00	0.00
Poultry	187	4.47	17.91	3.74	17.91	100.00	0.00	0.00
Livestock (Dairy)	3525	84.33	418.04	87.25	177.95	42.57	240.09	57.43
Nursery	84	2.01	8.66	1.81	8.66	100.00	0.00	0.00
Vegetables	63	1.51	5.56	1.16	5.56	100.00	0.00	0.00
Others	192	4.59	15.09	3.15	7.22	47.85	7.87	52.15
Total	**4180**	**100.00**	**479.14**	**100.00**	**231.18**	**48.25**	**247.96**	**51.75**

From Table-5 highest loan disbursement was (418.04 lac) in livestock (dairy) and lowest in vegetables (5.56 lac), but recovery rate was recorded very poor in livestock (42.57%). On the other hand, 100% loan recovery was observed in fisheries, poultry, nursery and vegetables.

More or less same results were observed in Tables 6-13 from Bagmara, Charghat, Durgapur, Godagari, Mohanpur, Paba, Puthia and Tanore Upazila.

Table-6: At a glance of 'One House One Farm Project' in Bagmara Upazila

Name of trade	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	452	6.48	48.2	7.26	13.35	27.70	34.85	72.30
Poultry	432	6.19	29.97	4.51	6.94	23.16	23.03	76.84
Livestock (Dairy)	4095	58.72	406.52	61.19	113.77	27.99	292.75	72.01
Nursery	44	0.63	3.44	0.52	2.95	85.76	0.49	14.24
Vegetables	13	0.19	0.7	0.11	0	0.00	0.70	100.00
Others	1938	27.79	175.51	26.42	19.75	11.25	155.76	88.75
Total	**6974**	**100.00**	**664.34**	**100.00**	**156.76**	**23.60**	**507.58**	**76.40**

Table-7: Present scenario of 'One House One Farm Project' in Charghat Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	297	8.97	39.33	8.15	30.53	77.63	8.80	22.37
Poultry	313	9.45	40.75	8.45	31.9	78.28	8.85	21.72
Livestock (Dairy)	1706	51.53	267.87	55.52	54.15	20.22	213.72	79.78
Nursery	218	6.58	29.4	6.09	26.75	90.99	2.65	9.01
Vegetables	31	0.94	3.21	0.67	1.59	49.53	1.62	50.47
Others	746	22.53	101.91	21.12	39.57	38.83	62.34	61.17
Total	**3311**	**100.00**	**482.47**	**100.00**	**184.49**	**38.24**	**297.98**	**61.76**

Table-8: At a glance of 'One House One Farm Project' in Durgapur Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	592	17.00	46.77	14.41	23.69	50.65	23.08	49.35
Poultry	628	18.04	33.45	10.31	19.66	58.77	13.79	41.23
Livestock (Dairy)	1034	29.70	94.06	28.98	46.77	49.72	47.29	50.28
Nursery	75	2.15	5.17	1.59	1.63	31.53	3.54	68.47
Vegetables	642	18.44	65.01	20.03	29.82	45.87	35.19	54.13
Others	511	14.68	80.1	24.68	26.11	32.60	53.99	67.40
Total	**3482**	**100.00**	**324.56**	**100.00**	**147.68**	**45.50**	**176.88**	**54.50**

Table-9: Present situation of 'One House One Farm Project' in godagari Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	19	0.49	2.5	0.70	0.82	32.80	1.68	67.20
Poultry	97	2.51	8.62	2.40	0	0.00	8.62	100.00
Livestock (Dairy)	2916	75.45	266.23	74.17	98.71	37.08	167.52	62.92
Nursery	1	0.03	0.16	0.04	0	0.00	0.16	100.00
Vegetables	568	14.70	50.31	14.02	16.85	33.49	33.46	66.51
Others	264	6.83	31.14	8.68	9.75	31.31	21.39	68.69
Total	**3865**	**100.00**	**358.96**	**100.00**	**126.13**	**35.14**	**232.83**	**64.86**

Table-10: Current position of 'One House One Farm Project' in Mohanpur Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	76	1.88	5.57	1.12	5.38	96.59	0.19	3.41
Poultry	107	2.65	6.00	1.21	5.75	95.83	0.25	4.17
Livestock (Dairy)	3272	81.05	401.74	80.87	139.93	34.83	261.81	65.17
Nursery	119	2.95	10.83	2.18	10.37	95.75	0.46	4.25
Vegetables	47	1.16	8.25	1.66	7.95	96.36	0.30	3.64
Others	416	10.30	64.41	12.96	51.95	80.66	12.46	19.34
Total	**4037**	**100.00**	**496.80**	**100.00**	**221.33**	**44.55**	**275.47**	**55.45**

Table-11: Present scenario of 'One House One Farm Project' in Paba Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	99	3.44	10.61	3.15	1.53	14.42	9.08	85.58
Poultry	122	4.24	10.58	3.15	3.24	30.62	7.34	69.38
Livestock (Dairy)	1731	60.19	207.12	61.59	74.65	36.04	132.47	63.96
Nursery	14	0.49	1.53	0.45	0.35	22.88	1.18	77.12
Vegetables	90	3.13	12.12	3.60	0.2	1.65	11.92	98.35
Others	820	28.51	94.34	28.05	37.48	39.73	56.86	60.27
Total	**2876**	**100.00**	**336.30**	**100.00**	**117.45**	**34.92**	**218.85**	**65.08**

Table-12: Present scenario of 'One House One Farm Project' in Puthia Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	165	4.85	16.42	4.03	13.98	85.14	2.44	14.86
Poultry	310	9.11	26.46	6.50	22.49	85.00	3.97	15.00
Livestock (Dairy)	2064	60.69	250.21	61.46	88.24	35.27	161.97	64.73
Nursery	179	5.26	25.45	6.25	12.58	49.43	12.87	50.57
Vegetables	137	4.03	9.77	2.40	1.6	16.38	8.17	83.62
Others	546	16.05	78.79	19.35	24.56	31.17	54.23	68.83
Total	**3401**	**100.00**	**407.10**	**100.00**	**163.45**	**40.15**	**243.65**	**59.85**

Table-13: Present scenario of 'One House One Farm Project' in Tanore Upazila

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Gross	%	Gross	%	Gross	%	Gross	%
Fisheries	139	4.40	14.82	4.67	12.21	82.39	2.61	17.61
Poultry	319	10.09	30.36	9.57	19.61	64.59	10.75	35.41
Livestock (Dairy)	1760	55.66	162.92	51.33	46.72	28.68	116.20	71.32
Nursery	65	2.06	7.22	2.27	7.22	100.00	0.00	0.00
Vegetables	114	3.61	21.15	6.66	5.81	27.47	15.34	72.53
Others	765	24.19	80.91	25.49	22.2	27.44	58.71	72.56
Total	**3162**	**100.00**	**317.38**	**100.00**	**113.77**	**35.85**	**203.61**	**64.15**

Table-14: Loan disbursement, recovery and dues of different trades (Fisheries, Poultry. Livestock-Dairy, Nursery, Vegetables & Others) in Rajshahi District. (amount in lac taka)

Name of trades	Number of farmers		Loan disbursement (lac)		Loan recovery (lac)		Loan due (lac)	
	Total	%	Total	%	Total	%	Total	%
Fisheries	1968	5.58	198.10	5.12	115.37	58.24	82.73	41.76
Poultry	2515	7.13	204.10	5.28	127.50	62.47	76.60	37.53
Livestock (Dairy)	22103	62.64	2474.71	63.99	840.89	33.98	1633.82	66.02
Nursery	799	2.26	91.86	2.38	70.51	76.76	21.35	23.24
Vegetables	1705	4.83	176.08	4.55	69.38	39.40	106.70	60.60
Others	6198	17.56	722.20	18.68	238.59	33.04	483.61	66.96
Grand total	**35288**	**100.00**	**3867.05**	**100.00**	**1462.24**	**37.81**	**2404.81**	**62.19**

Table-15: Loan disbursement, recovery and dues of different Upazilas in Rajshahi District. (amount in lac taka)

Upazila	Number of Trades		Loan Disbursement		Loan Recovery			Loan Dues		
	Total	(%)	Total	(%)	Total	UZ(%)	GT(%)	Total	UZ(%)	GT(%)
Bagha	4180	11.85	479.14	12.39	231.18	48.25	15.81	247.96	51.75	10.31
Bagmara	6974	19.76	664.34	17.18	156.76	23.60	10.72	507.58	76.40	21.11
Chargat	3311	9.38	482.47	12.48	184.49	38.24	12.62	297.98	61.76	12.39
Durgapur	3482	9.87	324.56	8.39	147.68	45.50	10.10	176.88	54.50	7.36
Godagari	3865	10.95	358.96	9.28	126.13	35.14	8.63	232.83	64.86	9.68
Mohanpur	4037	11.44	496.8	12.85	221.33	44.55	15.14	275.47	55.45	11.45
Paba	2876	8.15	336.3	8.70	117.45	34.92	8.03	218.85	65.08	9.10
Puthia	3401	9.64	407.1	10.53	163.45	40.15	11.18	243.65	59.85	10.13
Tanore	3162	8.96	317.38	8.21	113.77	35.85	7.78	203.61	64.15	8.47
Grand total	**35288**	**100**	**3867.05**	**100.00**	**1462.24**	**37.81**	**100.00**	**2404.81**	**62.19**	**100.00**

% = percentage, UZ = Upazila and GT = Grand total

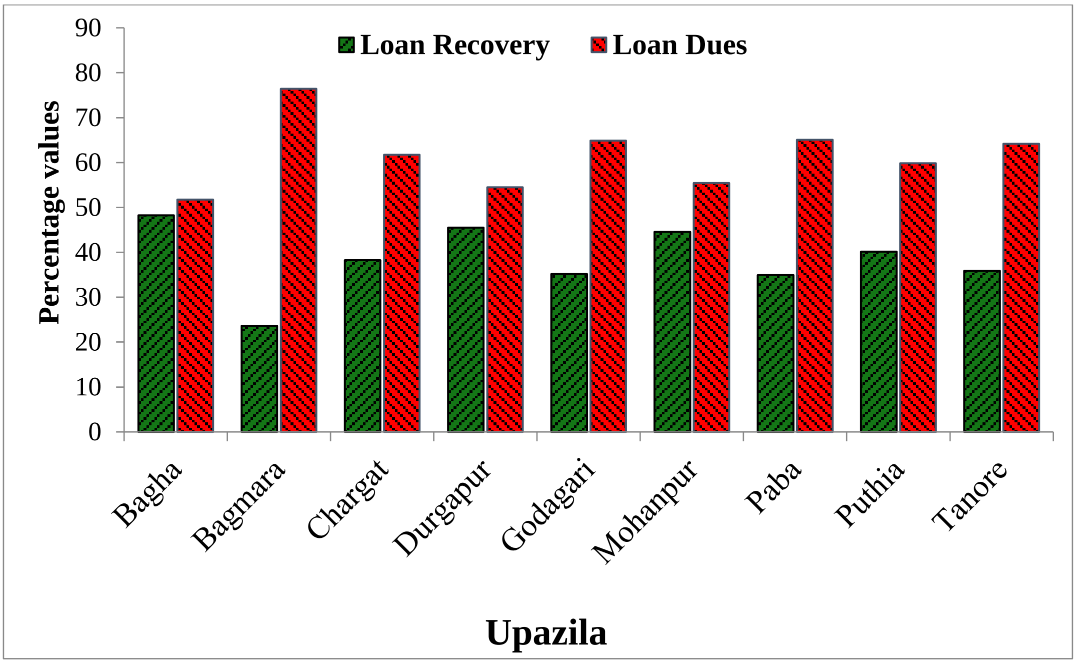

Fig. 6: Comparison of loan recovery and due on the basis of Upazila

Table-16: Deposition of savings, allotment of Welfare grant and Disbursement of Loan of OHOFP in Rajshahi district

July, 2010 (starting) to February, 2015 (Amount in lac Taka)

Name of Upazila	Deposition of savings		Allotment of welfare grant		Disbursement of revolving fund		Total fund of all societies	
	Total	%	Total	%	Total	%	Total	%
1	2	3	4	5	6	7	8=(2+4+6)	9
Bagha	142.86	11.16	99.14	10.77	132.46	10.17	374.46	10.69
Bagmara	268.44	20.97	155.3	16.88	230.07	17.66	653.81	18.66
Chargat	137.58	10.75	110.59	12.02	132.11	10.14	380.28	10.85
Durgapur	126.04	9.84	82.57	8.97	136.27	10.46	344.88	9.84
Godagari	133.65	10.44	99.94	10.86	133.04	10.21	366.63	10.46
Mohanpur	150.5	11.76	106.85	11.61	142.59	10.94	399.94	11.42
Paba	106.53	8.32	93.77	10.19	124.62	9.56	324.92	9.27
Puthia	101.78	7.95	85.42	9.28	138.27	10.61	325.47	9.29
Tanore	112.92	8.82	86.68	9.42	133.57	10.25	333.17	9.51
Total	1280.3	100	920.26	100	1303	100	3503.56	100

Table-17: Analysis of variance (ANOVA) of different parameters of nine Upazilas and six trades.

Parameters	Source of variation	df	F-value	Significance
Number of farmers	Upazilas	8	1.029	0.431
	Trades	5	30.695	0.000
Disbursement of loan	Upazilas	8	0.759	0.640
	Trades	5	33.701	0.000
Recovery of loan	Upazilas	8	0.669	0.716
	Trades	5	21.773	0.000
Loan dues	Upazilas	8	1.152	0.352
	Trades	5	31.975	0.000

df=degree of freedom

4.4 DISCUSSIONS

'One House One Farm Project' is a very good project for the Government to reduce poverty within short time in the rural level of Bangladesh. In this regard, we are discussing the present scenario of OHOFP at Rajshahi district.

4.4.1 Scenario of Agricultural trades involving the farmers

Involvement of farmers in six agricultural trades i.e. fisheries, poultry, livestock (dairy), nursery, vegetables and others in 9 Upazila of Rajshahi district were observed and the results presented as percentage values (Table 5 to 13). Among the agricultural trades maximum involvements were found in Livestock (Dairy) for all the Upazilas and the highest value was seen for 84.33% for Bagha Upazila; followed by Mohanpur (81.05%), Godagari (75.45%), Puthia (60.69%), Paba (60.19%), Bagmara (58.72%), Charghat (51.53%), Tanore (55.66%) and the lowest was for Durgapur (29.70%). On the other hand, the lowest 0.19% farmers involved in vegetables trade for Bagmara out of nine Upazilas (Table 6). On an average highest (62.64%) farmer worked in livestock trade and lowest (2.26%) was in Nursery under OHOFP in Rajshahi district (Table 14). Bernet (2000) reported that small-scale livestock farming was the parts of agricultural development in Swaziland and in South Africa, including in other developing areas of Africa, Asia and Latin America. The role of livestock in both agricultural production and in improving the quality of life of small-scale farmer has always been emphasized for agricultural development (Mapiye *et al.*, 2007). Chawatama *et al.*, (2005) stated that millions of people living in developing areas have their livelihoods from agriculture and rural development while they mentioned that the majority people suffer from malnourishment, essentially due to underproduction of agriculture, uneven distribution of land and crop production. This study investigated that agricultural trade wise involvement of the farmers in 9 Upazila (Table 17) were significantly different at $P<0.05$. However, it might be occurred due to properties of agricultural land in different Upazila of Rajshahi .

4.4.2 Constitution of fund of OHOF project

In OHOFP the fund was accumulated from two sources i.e. deposition of savings of the members of the societies and the allotment of welfare grant by the government of Bangladesh. Every society was constituted by the Upazila administration individually and the savings along with the welfare grant was the own asset of the society. Among the Upazila the biggest fund by the savings of members of the societies was found in Bagmara Tk. 268.44 lac and the societies of Puthia constituted the minimum fund of Tk. 101.78 lac. On the basis of total savings of members the highest contribution was 20.97% for Bagmara and lowest was 7.95% for Puthia to constitute the fund of OHOFP of Rajshahi district (Table 16). The total deposition of OHOFP of Rajshahi district was Tk 3503.56 lac which was constituted in addition of total welfare grant of Tk. 920.26 lac with the member's savings of Tk 1280.30 lac including revolving fund of Tk. 1303.00 lac. In this fund contribution, Bagmara Upazila was contributed the highest amount Tk. 653.81 lac and rationally it was 18.66% of the total fund of Tk 3503.56 lac.

4.4.3 Disbursement of Upazila wise loan to the different Agricultural trades

The members of OHOFP could be able to take loan against specific Agricultural trades under some terms and conditions of the government. The highest amount of loan Tk. 2474.71 lac (63.99%) was disbursed on Livestock (dairy) trade; followed by Others (18.68%), Poultry (5.28%), Fisheries (5.12%), Vegetables (4.55%) and the lowest (2.38%) was in Nursery (Table 10). On the other hand, out of nine Upazilas the maximum loan disbursement was recorded for Bagmara Upazila (17.18%) and around 12% loan was disbursed for each Upazilas of Bagha, Charghat and Mohanpur. The Upazila of Tanore distributed the lowest amount of loan (8.21%) to the members (Table 11). Hossain *et al.* (2005) has been suggested that short term institutional loan or credit should be given and to be checked regularly; and short training programme on different management should be arranged for the actual farm owners. Our study found that all the Upazilas disbursed the loan on different trades and maximum farmers had taken loan for Livestock (dairy) production. The largest amount of farmers 22103 (62.64%) involving in Livestock (dairy) production and so that maximum loan was disbursed on this trade for dairy production as well as milk and meat production.

4.4.4 Agricultural trades and Upazila wise recovery of loan and loan due

Out of six Agricultural trades the members of Nursery trade could recover their loan with the highest amount (76.76%) and the second highest was Poultry (62.47%) while the lowest (33.04%) was for Others within combined trades (Table 14). Among the Upazilas, the highest amount of loan recovery 48.25% was recorded from Bagha Upazila; followed by Durgapur (45.50%), Mohonpur (44.55%) and Puthia (40.15%); and the lowest recovery (23.60%) was found for Bagmara Upazila (Fig. 6). Julca (2000) stated that milk production in dairy trade was an important income source for small scale farmers with limited options for other activities. There is ample international evidence that small-scale agriculture has the potential to generate employment and income opportunities in developing areas (Kirsten and van Zyl, 1998). In this investigation, we found the maximum loan recovery from Nursery trade and suggested that Nursery could be considered as an important small-scale agricultural area for improving the economy of the farmers involved in OHOFP. However, the Upazila administration of Bagha has performed the best to skill the members of societies for agricultural production and therefore the farmers were been able to recover their loan.

The scenario of loan dues was observed in OHOFP and the results showed that near to highest loan dues 66.02% was recorded from Livestock (dairy) while it was lesser than the trade of Others (66.96%). On the contrary the lowest loan dues (23.24%) recorded from the trade of Nursery (Table 14). Among the nine Upazilas, the highest amount of loan dues was found for Bagmara Upazila (76.40%); followed by Paba (65.08%), Godagari (64.86%), Tanore (64.15%) and 61.76% for Charghat Upazila (Fig. 6). The lowest loan dues were recorded from the Upazila of Bagha (51.75%). Previously it was reported, the role of livestock in both agricultural production and in improving the quality of life of small-scale farmer has always been emphasized for agricultural development (Mapiye *et al.*, 2007). Our findings argued with the report and claimed that Nursery might be the most beneficial among the six trades.

CHAPTER 5

STUDY-II

FACTORS INFLUENCING THE PRODUCTIVE AND REPRODUCTIVE PARAMETERS OF DAIRY COWS UNDER OHOFP AT RAJSHAHI DISTRICT

CHAPTER 5

Study-II

Factors influencing the productive and reproductive parameters of dairy cows under OHOFP at Rajshahi district

5.1 INTRODUCTION

The members of OHOFP could be able to take loan against specific Agricultural trades under some terms and conditions of the government of Bangladesh. In OHOFP total 35288 farmers were involved and most of them involved in Livestock (Dairy) trade (22103). The highest amount of loan Tk. 2474.71 lac (63.99%) was disbursed on Livestock (dairy cows) trade. In this ground we undertook this Study-II to evaluate the productive and reproductive performances of dairy cows under 'One House One Farm Project' in Rajshahi District, Bangladesh.

Dairy cows convert large quantities of roughages into milk, the most nutritious food for human consumption. This makes efficient use of feed resources and provides a regular source of income to farmers. It is labour intensive and supports substantial employment in production, processing and marketing. Dairy farming is both a business and way of life. Agro-climatic condition of Bangladesh is favourable for dairy farming and can be effective tool for income and employment generation in rural areas.

According to Matin (1993) a small proportion of exotic pure and crossbred are seen in Bangladesh, but their exact number is not known. Dairy cows have been developed through crossbreeding using Artificial Insemination (AI) since 1950 (Ahmed and Islam, 1987). The number of cross-bred cattle is increasing with the demand of dairy cattle farmers.

The production of meat, milk and eggs meet only 17.0%, 13.6% and 16.4%, respectively, of the demand in Bangladesh (Alam, 1991). Chowdhury *et al.* (1993) reported that the people of Bangladesh get less than one fifth of the recommended level of animal protein.

In order to formulate a sound cattle-breeding programme detailed information about reproductive performance of crossbred and indigenous cattle are essential. Reproductive performance of crossbred cattle has been reported by many workers (Alam and Ghosh, 1988; Nahar *et al.*, 1989; Shamsuddin *et al.*, 1988; Khan *et al.*, 1999; Rashid *et al.*, 2007).

The main aim in breeding dairy cows is to improve production of milk. Reproductive efficiency is one of the major factors that helps in enhancing the profitability of a dairy farms. It affects the annual milk yield of the herd and the cost of herd depreciation. Management system is dependent on birth weight of calf, feeding of roughages and concentrates, body condition, age of puberty and heat detection. Insemination at right time, pregnancy management, easy parturition, nursing the calves, balanced feeding, appropriate feeding system and planned breeding need to be improved to attain the desired goal. Age of puberty, age of first calving, services per conception and reproductive disorders are economically important parameters in dairy cattle and are integral to profitability.

Rabbani *et al*. (2004) reported that dairy enterprises provide income and employment to the members of the family throughout the year and are practised by many rural youth. In Rajshahi district, small-scale dairy farms have been developed, especially by low income people. In order to develop future a plan for dairying, it is essential to know in detail the effect of management practices on production performance of various dairy breeds.

The primary objective of livestock policy is to produce animal protein and to strengthen economic development. To achieve this goal, the key factors are the improvement of nutrition, breeding, health and management. The present study was undertaken to find out the effect of breed (genotype), age of cow, parity, body condition, body weight and management on the productive and reproductive performance of dairy cows in OHOFP areas of Rajshahi district, Bangladesh.

So far as we know, no study has been under taken about factors influencing productive and reproductive parameters of dairy cows under OHOFP areas at Rajshahi district. After considering above all things the present study had been undertaken the following objectives:

Objectives

- To study the influence of breeds, parity, age, body weight and body condition of cows on productive and reproductive parameters under project areas
- To observe the effects of overall housing and ventilation system, feeding practices, roughages and concentrates feeding, veterinary caring and breeding methods on productive and reproductive parameters of dairy cows in Project areas.
- To know the influence of education, occupation, social status, economic (income) status and sex of farmers on productive and reproductive performances of dairy cows in project areas of Rajshahi district.

5.2 MAERIALS AND METHODS

Data were collected from the farmers (members) of 9 Upazila of Rajshahi district, Bangladesh during July 2013 to June 2015.

5.2.1 Data collection

Carefully prepared questionnaire were used for the purpose of information collection (Appendix-1) and also for getting general (socio-economic) information of farmers, management, productive and reproductive parameters of dairy cows from project areas 9 Upazila of Rajshahi district, Bangladesh.

5.2.2 Population study

219 dairy farmers from 9 Upazilas in Rajshahi district were interviewed with carefully prepared questionnaire. Table-18 showed Upazila wise distribution of breeds (genotypes) and number of dairy farmers in Rajshahi district.

Table-18: Upazila wise distribution of breeds (genotypes) and number of dairy farmers in Rajshahi distric

Sl. No.	Name of Upazila	Breeds (genotypes)					No. of farmers
		Local	Local × Friesian	Local × Sahiwal	Local × Jersey	Local × Sindhi	
1	**Bagha**	0	9	5	1	0	15
2	**Bagmara**	18	7	0	0	1	26
3	**Charghat**	7	4	1	1	3	16
4	**Durgapur**	13	5	4	2	0	24
5	**Godagari**	14	7	0	0	0	21
6	**Mohanpur**	11	4	0	8	2	25
7	**Paba**	18	27	1	0	2	48
8	**Puthia**	10	12	3	1	2	28
9	**Tanore**	12	4	0	0	0	16
	Total	**103**	**79**	**14**	**13**	**10**	**219**

5.2.3 General information of dairy cows and farmers under OHOFP

Some general and management information regarding in dairy cows rearing were collected through questionnaire are shown in Table-19

Table-19: General and management information regarding dairy cows rearing

Sl. No	Items	Groups/Class	No. of farmers	Percentage (%)
1	**Occupation of farmers**	Agriculture	148	67.6
		Business	38	17.4
		Service	13	5.9
		Others	20	9.1
2	**Education of farmers**	None	46	21.0
		Primary	99	45.2
		Secondary	39	17.8
		Above	35	16.0
3	**Monthly income of farmers**	= or < 5000 taka	46	21.0
		> 5000 to 10000 taka	120	54.8
		>10000 taka	53	24.2
4	**Land owned by farmers**	< 5 decimals	28	12.8
		5 - 33 decimals	64	29.2
		> 33 decimals	127	58.0
5	**Age of farmers**	<25 years	5	2.3
		25 to 40 years	129	58.9
		> 40 years	85	38.8
6	**Social status of farmers**	Ultra poor	53	24.2
		Marginal	166	75.8
7	**Family members of farmers**	= or <3 family members	41	18.7
		4 to 5 family members	118	53.9
		= or > 6 family members	60	27.4
8	**Service provided by**	ULO	21	9.6
		One house one farm project	186	84.9
		NGO	12	5.5
9	**Getting loan by farmers**	< 10000 taka.	6	2.7
		10000 to 20000 taka	202	92.2
		> 20,000 taka	11	5.0
10	**Vaccination**	Regular	156	71.2
		Irregular	63	28.8
11	**Deworming**	Regular	162	74.0
		Irregular	57	26.0
12	**Veterinary caring**	Veterinarian	115	52.5
		Quack doctor	104	47.5
13	**No. of milking per day**	Once	112	51.1
		Twice	82	37.4
		Thrice	10	4.6
14	**Housing pattern**	Concrete	17	7.8
		Semi concrete	158	72.1
		Straw made	44	20.1
15	**Feeding practices of cows**	Stall feeding	114	52.1
		Stall and tethering	26	11.9
		Stall and grazing	79	36.1
16	**Concentrate feed supply per day**	One time per day	19	8.7
		Two times per day	185	84.5
		Three times per day	15	6.8
17	**Breeding methods**	Artificial Insemination	129	58.9
		Natural	90	41.1
18	**No. of milking per day**	Once	112	51.1
		Twice	82	37.4
		Thrice	10	4.6
19	**Sex of farmers**	Male	156	71.2
		Female	63	28.8

5.2.4 Factors considered for productive and reproductive performances

Breed (genotype), age, parity, body weight, body condition of cows were considered as factors, and were classified into 2 to 5 groups as discussed in General Materials and Methods Chapter 3.

Housing pattern, floor type of house, overall housing system, overall ventilation system, feeding practices, roughages and concentrates feeding, veterinary caring, breeding method followed in cow rearing, socio-economic condition, education, occupation, land owning and sex of farmers were considered as factors, and classified as below.

5.2.4.1 Housing pattern

The dairy cows were divided into the following groups:

Group-I (Concrete) : Dairy cows house built of brick (n=17)

Group-II (Semi concrete): Dairy cows house built of brick and tin (n=158)

Group-III (Straw made) : Dairy cows house were built of straw and bamboo (n=44)

5.2.4.2 Floor type of house

The dairy cows were divided into the following groups:

Group-I (Concrete-concrete): Dairy cows house floor built of cement (n=82)

Group-II (Muddy-concrete): Dairy cows house built of cement and mud (n=87)

Group-III (Muddy-muddy): Dairy cows house were built of mud (n=50)

5.2.4.3 Overall housing system

The dairy cows were divided into the following groups:

Group-I (Good): Dairy cows were housed in overall good housing system(n=83)

Group-II (Medium): Dairy cows were housed in overall medium housing system (n=88)

Group-III (Poor): Dairy cows were housed in overall poor housing system (n=48)

5.2.4.4 Overall ventilation system

The dairy cows were divided into two groups:

Group-I (Proper): Dairy cows were housed in overall proper (good) ventilation system. There was sufficient air flow (n=198)

Group-II (Moderate): Dairy cows were housed in overall moderate (medium) ventilation system. There was moderate air flow (n=21)

5.2.4.5 Feeding practices

The dairy cows were divided into the following groups:

Group-I (Stall feeding) : Dairy cows were fed only within house (n=114)

Group-II (Stall and tethering): Dairy cows were fed within house and limited field by tethering (n=26)

Fig.7: Researcher was observing stall feeding of Local × Friesian cow at Paba Upazila

Group-III (Stall and grazing): Dairy cows were fed within house and open field through grazing (n=79)

5.2.4.6 Roughages feeding

The dairy cows were divided into two groups:

Group-I (Straw and green grass): Dairy cows were fed straw and green grasses (n=211)

Group-II (Straw, green grass and others): Dairy cows were fed straw. green grasses and others (n=8)

5.2.4.7 Concentrate feed quality

The dairy cows were divided into the following groups:

Group-I (Poor quality feed): Dairy cows were fed only rice polish and rice gruel (n=67)

Group-II (Medium quality feed): Dairy cows were fed oil cake, anchor bran, rice police, broken rice etc. (n=117)

Group-III (Good quality feed) : Dairy cows were fed oil cake, rice polish, wheat bran, broken rice, muskily, lentil bran, maize crust, salt, vitamin, minerals etc. (n=35)

5.2.4.8 Veterinary caring

The dairy cows were divided into two groups:

Group-I (Veterinarian): Dairy cows were treated by registered veterinary surgeons (n=115)

Group-II (Quack doctor): Dairy cows were treated by unqualified people (veterinary quack doctors) (n=104)

5.2.4.9 Breeding methods

Dairy farmers used different breeding method for successful conception in their cows. According to breeding method cows were divided into two groups:

Group I {Artificial Insemination (AI)}: Heated cows were bred by artificial insemination (n=129)

Group II (Natural): Heated cows were bred by naturally (n=90)

5.2.4.10 Social status of farmers

The dairy farmers were categorised into two groups like ultra poor and marginal according to social status of farmers. In this regard dairy cows were divided into two groups:

Group-I (Ultra poor): Dairy cows were reared by ultra poor persons. They could not meet basic needs. They were in limited income (<5000 tk.per month), land (< 5 decimals), and social status (n=53)

Group-II (Marginal): Dairy cows were reared by marginal categories' persons. They could meet basic needs. They were not in limited income (<5000 tk. per month), land (< 5 decimals), and social status (n=166).

5.2.4.11 Economic status (income per month) of farmers

The dairy cows were divided into the three groups under **economic status** (income per month) **of farmers**:

Group-I (= or < 5000 tk.): Dairy cows were reared by the farmers whose income per month was equal to or less than 5000 taka (n=46)

Group-II (>5000 to 10000 tk.): Dairy cows were reared by the farmers whose income per month was greater than 5000 to 10000 taka (n=120)

Group-III (>10000 tk.): Dairy cows were reared by the farmers whose income per month was greater than 10000 taka (n=53)

5.2.4.12 Educational status of farmers

The dairy cows were divided into the four groups under educational status of farmers.

Group-I (None): Dairy cows were reared by the farmers whose education was none or only could sign (n=46)

Group-II (Primary): Dairy cows were reared by the farmers whose education was primary level (n=99)

Group-III (Secondary): Dairy cows were reared by the farmers whose education was secondary level (n=39)

Group-IV (HSC & above): Dairy cows were reared by the farmers whose education was HSC and above (n=35)

5.2.4.13 Occupational status of farmers

The dairy cows were divided into the four groups under occupational status of farmers.

Group-I (Agriculture): Dairy cows were reared by the farmers whose occupation was agriculture (n=148)

Group-II (Business): Dairy cows were reared by the farmers whose occupation was business (n=38)

Group-III (Service holder): Dairy cows were reared by the farmers whose occupation was service holder (n=13)

Group-IV (Others): Dairy cows were reared by the farmers whose occupation was others (n=20)

5.2.4.14 Land owned by farmers

The dairy cows were divided into the three groups under land owned by farmers:

Group-I (< 5 decimals): Dairy cows were reared by the farmers who were the owner of less than 5 decimals land (n=28)

Group-II (5 to 33 decimals): Dairy cows were reared by the farmers who were the owner of 5 to 33 decimals land (n=64)

Group-III (>33 decimals): Dairy cows were reared by the farmers who were the owner of greater than 33 decimals land (n=127)

5.2.4.15 Sex of farmers

The dairy farmers were categorised into two groups like male and female farmers. In this regard dairy cows were divided into two groups:

Group-I (Male): Dairy cows were reared by male farmers (n=156)

Group-II (Female): Dairy cows were reared by male farmers (n=63)

5.2.5 Statistical analyses

Data were statistically analysed to calculate the effect of breed (genotype), age, parity, body weight, body condition, housing pattern, floor type of house, overall housing system, overall ventilation system, feeding practices, roughages feeding, concentrate feed quality, veterinary caring, breeding method of dairy cows, social status of farmers, economic status of farmers, educational status of farmers, occupational status of farmers, land owned by farmers and sex of farmers. The mean and Std Error of Mean (S.E) for age of puberty, age of first calving, post-partum heat period, services per conception, gestation length, calving interval, birth weight of calf, daily milk yield, lactation length, total lactation yield and total milk selling were calculated by using IBM SPSS Statistics Version 20 program. Factors were tested by Duncan Multiple Range Test (DMRT) to determine the effect of different factors (Steel and Torrie, 1980). Univariate Analysis of Variance was used to test significance of different factors. Some factors were also tested by Independent Samples Test (t-test). The statistical model used to estimate the components of variance was as follows:

$Y_{abcdefghijklmnopqrst} = \mu + B_a + C_b + D_c + E_d + F_e + G_f + H_g + I_h + J_i + K_j + L_k + M_l + N_m + O_n + P_o$
$+ Q_p + R_q + S_r + T_s + U_t + e_{abcdefghijklmnopqrst}$

$Y_{abcdefghijklmnopqrst}$ = individual observation

μ = grand mean

B_a= effect of breeds (genotypes) (a = 1-5)

C_b = effect of age of cow (b = 1-4)

D_c = effect of parity (c = 1-4)

E_d = effect of body weight (d = 1-3)

F_e = effect of body condition (e = 1-2)

G_f = effect of housing pattern (f = 1-3)

H_g= effect of floor type of house (g = 1-3)

I_h = effect of overall housing system (h = 1-3)

J_i = effect of overall ventilation system (i = 1-2)

k_j = effect of feeding practices (j = 1-3)

L_k = effect of roughages feeding (k = 1-2)

M_l = effect of concentrate feed quality (l = 1-3)

N_m = effect of veterinary caring (m = 1-2)

O_n = effect of breeding method (n = 1-2)

P_o = effect of social status of farmers (o= 1-2)

$Q_{p\,=}$ effect of economic status of farmers (p = 1-3)

$R_{q\,=}$ effect of educational status of farmers (q= 1-4)

$S_{r\,=}$ effect of occupational status of farmers (r = 1-4)

$T_{s\,=}$ effect of land owned by farmers (s = 1-3)

$U_{t\,=}$ effect of sex of farmers (t = 1-2)

$e_{abcdefghijklmnopqrst}$ = random error associated with $Y_{abcdefghijklmnopqrst}$

Mean effects were systematically included in the model. Random effects were assumed independently and identically distributed. General Linear Model (GLM) test i.e Univariate (Post Hoc) for multiple comprises for observed mean was performed.

Fig. 8: Dairy cows of OHOFP under Godagari, Paba Upazila of Rajshahi district

Fig. 9: Activities within Bagmara Upazila on Dairy Production

5.3 RESULTS

In total of 219 cows, studied for the effect of breed (genotype), age of cow, parity, body weight, body condition of cow, feeding practices, roughages feeding, concentrate feed quality, housing pattern, overall housing system, overall ventilation system, breeding method, veterinary caring, socio-economic status, education, occupation and sex of farmers etc. on productive and reproductive performances have evaluated under OHOFP in 9 Upazila of Rajshahi district, Bangladesh. Mean tests results, t-test and one way ANOVA test are presented in Table 20-59 and Figure- 10-69.

5.3.1 Effects of breeds (genotypes)

Effects of breed (genotype) and ANOVA on productive and reproductive performances are shown in Table- 20-21 and Fig. 10-12. In Table-20 the lowest mean value of age of puberty was in Local × Friesian (23.7±0.4 month) and highest was in local and Local × Jersey (26.8±0.4 and 26.8±0.9 month). The highest value of age of 1st calving was 28.3±0.5 month in Local and the lowest was 34.9±0.5 month in Local x Friesian. Highest value of calving interval was found in Local × Sahiwal (14.7±0.6) and lowest value was in Local × Friesian (13.0±0.2). The highest value of birth weight of calf, daily milk yield per cow, total lactation yield and total milk selling was 24.3±0.5, 5.9±0.4, 1107.8±87.4 and 50.4±4.1 respectively in Local × Friesian, but the lowest values 19.5±0.3, 2.0±0.1, 385.9±22.8 and 17.1±1.1 were observed respectively in Local cows. Highest value of lactation length was found in Local × Jersey (256.4±15.9) and lowest value was in Local × Sindhi (171±31). Age of puberty, age of 1st calving, birth weight of calf, daily milk yield per cow, total lactation yield and total milk selling were significantly ($P<0.001$) influenced by the breed (genotype) whereas post-partum heat period, service per conception and gestation length were not significantly ($P>0.05$) influenced by the breed (genotype). Calving interval and lactation length were influenced by the breed significantly ($P<0.05$).

5.3.2 Effects of age of cow

Effects of age of cow and ANOVA on productive and reproductive performances are shown in Table- 22-23 and Fig. 13-15. From Table-22, the lowest mean value of post-partum heat period was in = or <3 year (76.7±4.3 days) and highest was in >5 to <7 year (96.2±5.2 day). Highest value of lactation length was found in = or >7 yr (236.3±14.7 day) and lowest value was in in = or <3 yr (124.5±9.6 day). The highest total lactation yield and total milk selling values were 895.6±113.2 and 40.9±5.4 respectively in >5 to <7 yr and the lowest values were 525.8±104.6 and 22.1±4.2 respectively in = or <3 yr lactation length of cows was significantly (P<0.001) influenced by age of cow. Post-partum heat period, total lactation yield and total milk selling were influenced by age of cow significantly (P<0.05) whereas service per conception, gestation length, calving interval, birth weight of calf and daily milk yield were not significantly (P>0.05) influenced by age of cow..

5.3.3 Effects of Parity

Effects of parity and ANOVA on productive and reproductive performances are shown in Table- 24-25 and Fig. 16-18. In Table-24 the highest value of calving interval was 14.5±0.3 month in 2nd calving and the lowest was 12.7±0.3 month in 3rd calving. The lowest mean value of daily milk yield was in 2nd calving (3.2±0.4 liters) and highest was in 3rd calving (5.6±1.3 liters). The highest value of lactation length was found in 4th and above calving (246.7±15.1 days) and lowest value was in 1st calving (175.4±5.7 days). The highest value of total lactation yield was 1245.0±292.3 in 3rd calving, and lowest values 627.4±76.5 in 2nd calving. The highest value of total milk selling was 58.1±14.4 in 3rd calving and lowest values 27.9±1.8 in 1st calving. Calving interval, lactation length, total lactation yield and total milk selling were significantly (P<0.001) influenced by the parity whereas post-partum heat period, service per conception, gestation length and birth weight of calf were not significantly (P>0.05) influenced by the parity. Daily milk yield were influenced by the parity significantly (P<0.05).

5.3.4 Effects of body weight of cow

Effects of body weight of cow and ANOVA on productive and reproductive performances are shown in Table- 26-27 and Fig. 19-21. In Table-26 the lowest mean value of age of puberty was in >200kg (24.2±0.6 months) and highest was in <150kg (26.2±0.4 months). The highest value of age of 1st calving was 38.0±0.5 month in

<150kg and the lowest was 35.2±0.7 month in >200kg. Highest value of post-partum heat period was found in <150kg (99.5±3.8 days) and lowest value was in 150-200kg (87.5±3.2 days). The highest value of calving interval was 14.0±0.2 in <150kg and lowest values 12.7±0.3 in >200kg. The highest value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 25.2±0.7, 7.0±0.7, 1379.1±161.8 and 64.3±7.5 respectively in >200kg, but the lowest values 19.4±0.3, 2.2±0.1, 438.7±33.6 and 19.1±1.5 were observed respectively in <150kg. Birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the body weight of cow whereas service per conception, gestation length and lactation length were not significantly (P>0.05) influenced by the body weight of cow. Age of 1st calving and calving interval were significantly (P<0.01) influenced by the body weight of cow. Age of puberty and post-partum heat period were influenced by the body weight of cow significantly (P<0.05).

5.3.5 Effects of body condition of cow

Effects of body condition of cow and t-test on productive and reproductive performances are summarized in Table- 28-29 and Fig. 22-24. In Table-28 the lowest mean value of Age of 1st calving was in healthy (36.5±0.4 month) and highest was in moderate (26.3±0.5 month). The highest value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 22.6±0.3, 4.1±0.2, 789.8±54.0 and 34.7±2.5 respectively in Healthy and lowest values 19.2±0.4, 2.5±0.2, 487.8±43.4 and 23.8±2.3 were observed respectively in Moderate. Birth weight of calf, milk yield/d/cow and total lactation yield were significantly (P<0.001) influenced by the body condition of cow whereas age of puberty, post-partum heat period, service per conception, gestation length, calving interval and lactation length were not significantly (P>0.05) influenced by the body condition of cow. Total milk selling were influenced by the body condition of cow significantly (P<0.01). Age of 1st calving were influenced by the body condition of cow significantly (P<0.05).

Table-20: Effect of breed (genotype) on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Breeds (genotype)						Sig. Level
	Local	Local × Friesian	Local × Sahiwal	Local × Jersey	Local × Sindhi	Total	
Age of puberty (m)	26.8±0.4^{b} n=103	23.7±0.4^{a} n=79	25.9±1.4^{ab} n=14	26.8±0.9^{b} n=13	26±1^{ab} n=10	25.6±0.3 n=219	***
Age of 1st calving (m)	38.3±0.5^{b} n=98	34.9±0.5^{a} n=75	37.1±1.5^{ab} n=14	37.3±0.8^{ab} n=12	38±1^{ab} n=7	36.9±0.3 n=206	***
Post-partum heat period (d)	99.1±3.5 n=92	88.2±3.5 n=73	80.8±8.0 n=14	87.5±5.8 n=12	80±10 n=6	92.4±2.3 n=197	NS
Service per Conception	1.3±0.0 n=103	1.3±0.1 n=79	1.4±0.1 n=14	1.2±0.1 n=13	1±0 n=10	1.3±0.0 n=219	NS
Gestation length (d)	280.5±0.3 n=98	281.0±0.4 n=75	281.1±0.8 n=14	281.3±1.1 n=12	281±1 n=7	280.8±0.2 n=206	NS
Calving interval (m)	14.0±0.3^{ab} n=51	13.0±0.2^{a} n=46	14.7±0.6^{b} n=9	13.3±0.8^{ab} n=8	13±1^{a} n=4	13.6±0.2 n=118	*
Birth weight of calf (kg)	19.5±0.3^{a} n=98	24.3±0.5^{b} n=75	21.9±1.0^{ab} n=14	22.8±1.5^{b} n=12	23±1^{b} n=7	21.7±0.3 n=206	***
Milk yield/d/cow (l)	2.0±0.1^{a} n=98	5.9±0.4^{c} n=74	3.4±0.4^{b} n=14	3.6±0.5^{b} n=11	4±0^{b} n=7	3.7±0.2 n=204	***
Lactation length (d)	186.3±7.6^{a} n=98	188.1±6.4^{a} n=74	197.1±17.1^{a} n=14	256.4±15.9^{b} n=11	171±31^{a} n=7	191.0±4.8 n=204	*
Total lactation yield (l)	385.9±22.8^{a} n=98	1107.8±87.4^{c} n=74	658.9±97.1^{ab} n=14	927.3±125.7^{bc} n=11	754±179^{b} n=7	708.3±42.2 n=204	***
Total milk selling (th.tk)	17.1±1.1^{a} n=98	50.4±4.1^{c} n=74	29.0±3.8^{ab} n=14	37.7±5.0^{bc} n=11	35±9^{bc} n=7	31.7±2.0 n=204	***

Values are mean ±S.E. ^{abc} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-21: Analysis of variance for breed (genotype) on productive and reproductive parameters in dairy cows

ANOVA for breed (genotype)					
Dependent variables	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**P-value**
Age of puberty (m)	444.461	4	111.115	7.402	.000
Age of 1st calving (m)	491.196	4	122.799	5.987	.000
Post-partum heat period (d)	8517.412	4	2129.353	2.183	.072
Service per Conception	.447	4	.112	.482	.749
Gestation length (d)	17.457	4	4.364	.423	.792
Calving interval (m)	37.016	4	9.254	3.136	.017
Birth weight of calf (kg)	1002.145	4	250.536	18.733	.000
Milk yield/d/cow (l)	629.685	4	157.421	37.334	.000
Lactation length (d)	53011.933	4	13252.983	2.936	.022
Total lactation yield (l)	22568548.311	4	5642137.078	22.013	.000
Total milk selling (th.tk)	47139.080	4	11784.770	21.147	.000

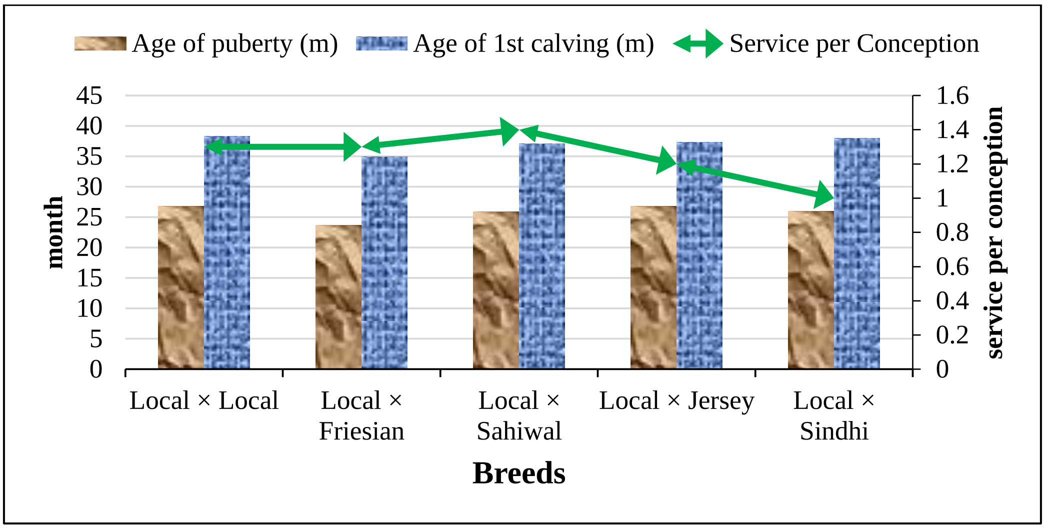

Fig. 10: Graphical representation of breed effect on age of puberty, age of 1st calving and service per conception

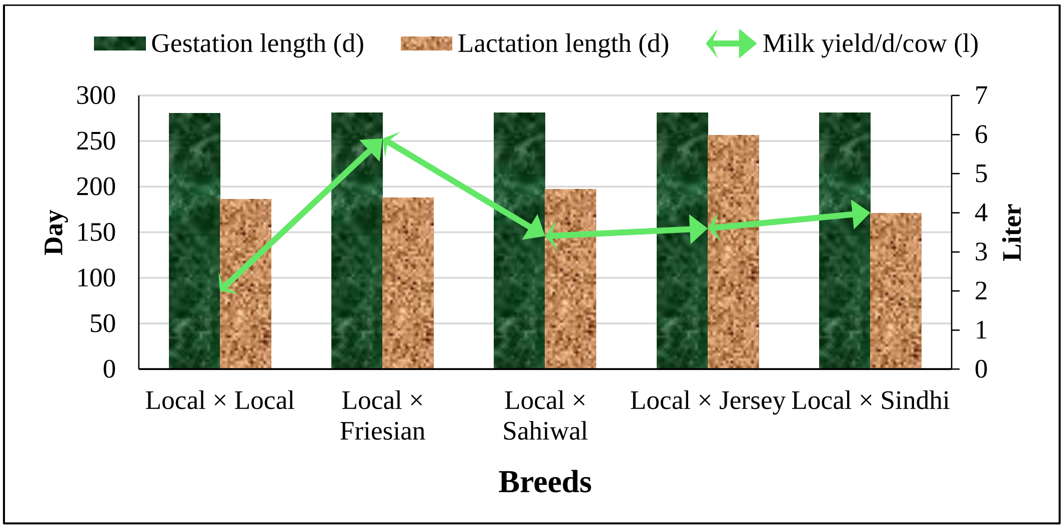

Fig. 11: Breed influences on gestation length, lactation length and milk yield per day per cow

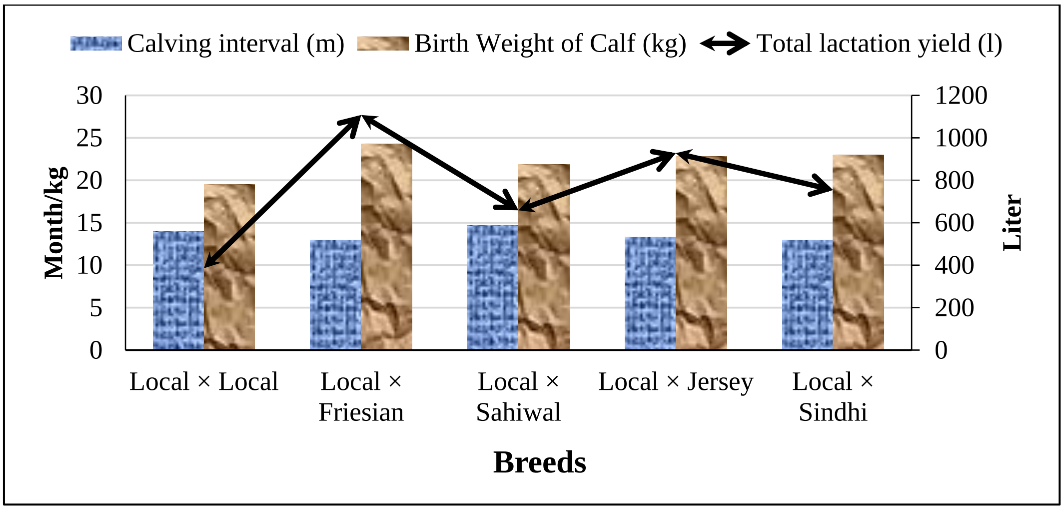

Fig 12: Effect of breed on calving interval, total milk selling and total lactation yield

Table-22: Effect of age of cow on productive and reproductive parameters s in dairy cows

Productive & reproductive parameters	Age of cow				Sig. level
	= or <3 yr	>3 to 5 yr	>5 to <7 yr	= or >7 yr	
Post-partum heat period (d)	76.7±4.3[a] n=27	95.9±3.0[b] n=99	96.2±5.2[b] n=54	85.6±5.4[ab] n=17	*
Service per Conception	1.3±0.1 n=44	1.3±0.1 n=104	1.2±0.1 n=54	1.2±0.1 n=17	NS
Gestation length (d)	280.3±0.7 n=31	281.3±0.3 n=104	280.2±0.4 n=54	280.6±0.8 n=17	NS
Calving interval (m)	13.4±0.6 n=7	13.6±0.3 n=41	13.8±0.3 n=54	12.9±0.3 n=16	NS
Birth Weight of Calf (kg)	22.0±0.8 n=31	21.5±0.4 n=104	22.6±0.6 n=54	19.6±0.9 n=17	NS
Milk yield/d/cow (l)	3.7±0.5 n=30	3.4±0.2 n=104	4.1±0.5 n=54	3.4±0.5 n=16	NS
Lactation length (d)	124.5±9.6[a] n=30	188.4±±6.3[b] n=104	219.4±8.0[c] n=54	236.3±14.7[c] n=16	***
Total lactation yield (l)	525.8±104.6[a] n=30	653.9±44.4[ab] n=104	895.6±113.2[b] n=54	772.5±111.8[ab] n=16	*
Total milk selling (th.tk)	22.1±4.2[a] n=30	29.3±2.0[ab] n=104	40.9±5.4[b] n=54	35.0±5.6[ab] n=16	*

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-23: Analysis of variance for age of cow on productive and reproductive parameters

Dependent variables	Sum of Squares	df	Mean Square	F-value	P-value.
Post-partum heat period (d)	9443.183	3	3147.728	3.260	.023
Service per Conception	0.758	3	0.253	1.104	.349
Gestation length (d)	54.040	3	18.013	1.785	.151
Calving interval (m)	11.559	3	3.853	1.224	.304
Birth Weight of Calf (kg)	123.927	3	41.309	2.340	.075
Milk yield/d/cow (l)	16.933	3	5.644	.778	.508
Lactation length (d)	209840.654	3	69946.885	18.866	.000
Total lactation yield (l)	3266466.524	3	1088822.175	3.097	.028
Total milk selling (th.tk)	8083.096	3	2694.365	3.594	.015

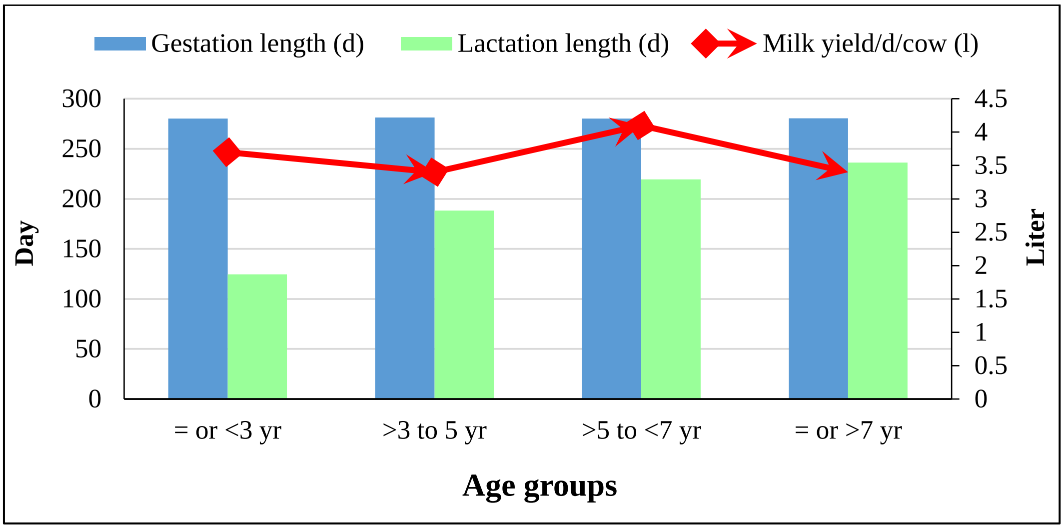

Fig. 13: Graphical representation of effect of age on gestation length, lactation length and milk yield per day per cow

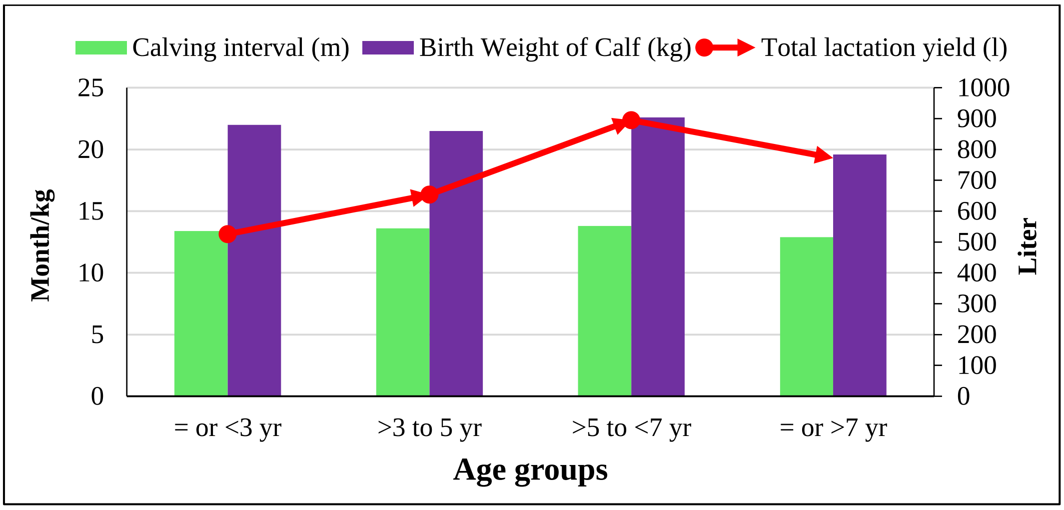

Fig. 14: Graphical representation of effect of age on calving interval, birth weight of calf and total lactation yield

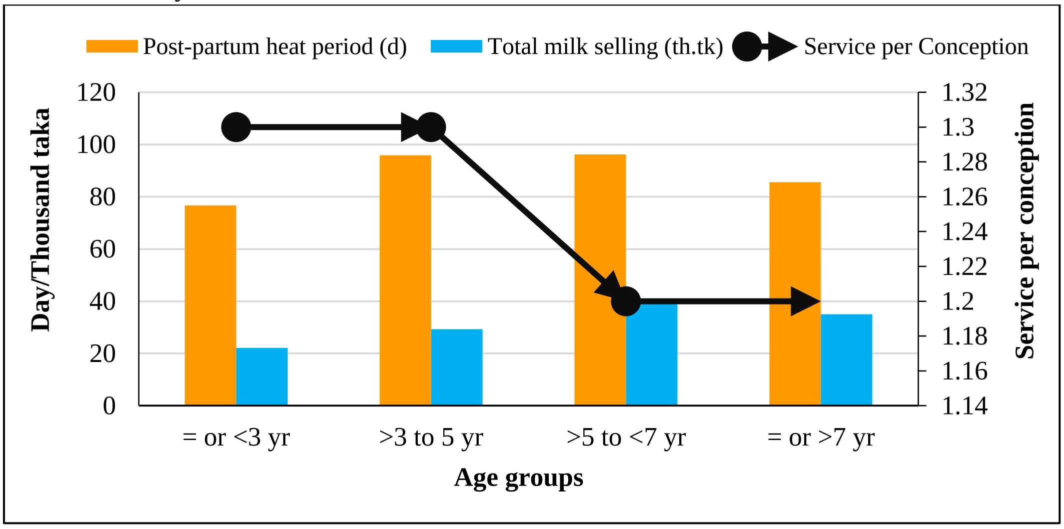

Fig. 15: Age effect on post-partum heat period, total milk selling and S/C

Table-24: Effect of parity on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Parity				Sig. level
	Ist calving	2nd calving	3rd calving	4th and above calving	
Age of puberty (m)	25.4±0.4 n=137	24.9±0.5 n=35	26.6±1.2 n=16	27.2±1.0 n=19	NS
Age of 1st calving (m)	36.6±0.4 n=136	36.7±0.8 35	38.6±1.4 n=16	38.3±0.9 n=19	NS
Post-partum heat period (d)	92.1±2.6 n=127	93.9±6.7 n=35	97.5±8.9 n=16	87.6± 6.1n=19	NS
Service per Conception	1.3±0.0 n=137	1.2±0.1 n=35	1.2±0.1 n=16	1.3±0.1 n=19	NS
Gestation length (d)	281.0±0.3 n=136	280.1±0.4 n=35	280.9±0.7 n=16	280.5±0.8 n=19	NS
Calving interval (m)	13.5±0.3[a] n=48	14.5±0.3[b] n=35	12.7±0.3[a] n=16	12.9±0.3[a] n=19	***
Birth Weight of Calf (kg)	21.6±0.4 n=136	21.9±0.7 n=35	23.4±1.4 n=16	20.6± 0.9n=19	NS
Milk yield/d/cow (l)	3.5±0.2[a] n=135	3.2±0.4[a] n=35	5.6±1.3[b] n=16	4.0±0.7[a] n=18	*
lactation length (d)	175.4±5.7[a] n=135	203.1±8.6[ab] n=35	232.5±18.1[bc] n=16	246.7±15.1[c] n=18	***
Total lactation yield (l)	631.7±41.6[a] n=135	627.4±76.5[a] n=35	1245.0±292.3[b] n=16	963.3±162.0[b] n=18	***
Total milk selling (th.tk)	27.9±1.8[a] n=135	29.0±3.9[a] n=35	58.1±14.4[b] n=16	42.2±6.9[a] n=18	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-25: Analysis of variance for parity on productive and reproductive parameters

Dependent variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	88.393	3	29.464	1.734	.161
Age of 1st calving (m)	95.085	3	31.695	1.417	.239
Post-partum heat period (d)	941.815	3	313.938	.311	.817
Service per Conception	1.055	3	.352	1.488	.219
Gestation length (d)	21.887	3	7.296	.712	.546
Calving interval (m)	50.526	3	16.842	6.001	.001
Birth Weight of Calf (kg)	72.454	3	24.151	1.348	.260
Milk yield/d/cow (l)	71.309	3	23.770	3.402	.019
Lactation length (d)	121160.984	3	40386.995	9.730	.000
Total lactation yield (l)	6800073.481	3	2266691.160	6.789	.000
Total milk selling (th.tk)	15263.949	3	5087.983	7.127	.000

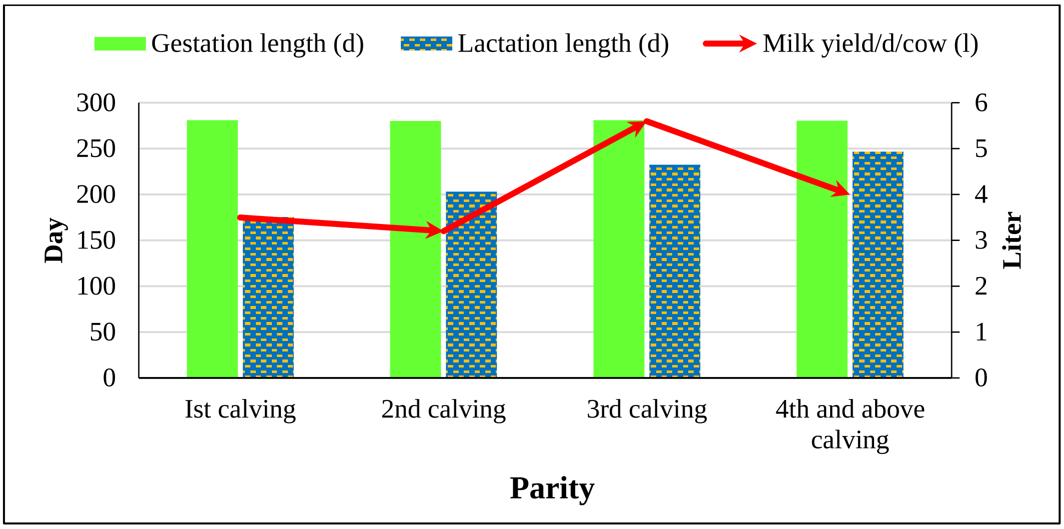

Fig. 16: Age effect on gestation length, lactation length and milk yield per day per cow

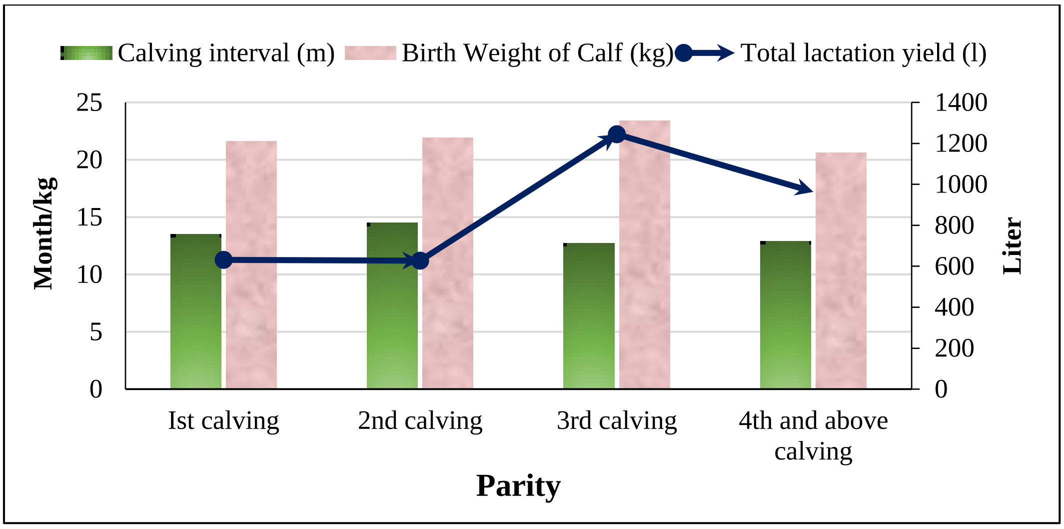

Fig. 17: Parity effect on calving interval, birth weight of calf and total lactation yield

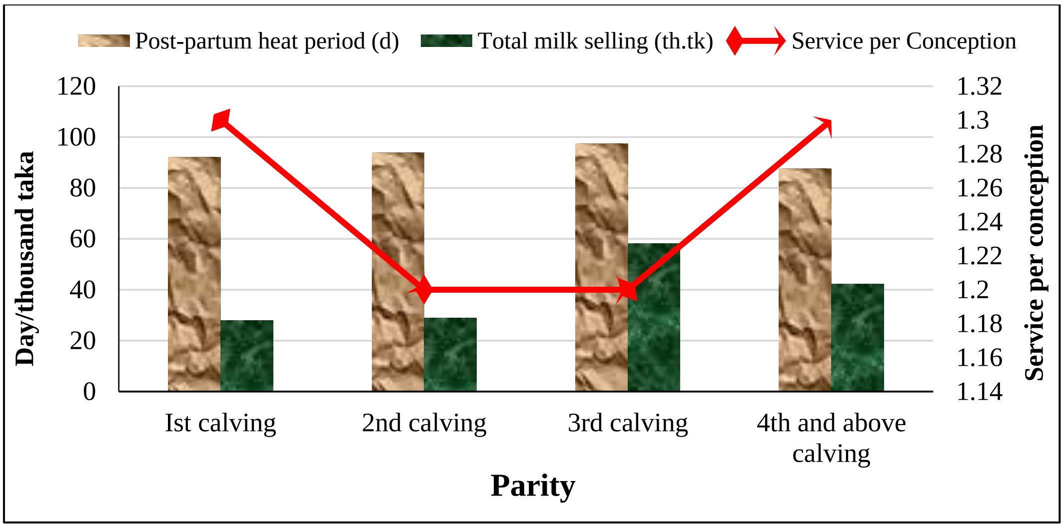

Fig. 18: Parity effect on post-partum heat period, total milk selling and S/C

Table-26: Effect of body weight of cow on productive and reproductive parameters

Productive & reproductive parameters	Body weight of cow				Sig. level
	<150kg	150-200kg	>200kg	Total	
Age of puberty (m)	26.2±0.4[c] n=95	25.5±0.5[ab] n=88	24.2±0.6[a] n=36	25.6±0.3 n=219	*
Age of 1st calving (m)	38.0±0.5[c] n=85	36.6±0.5[ab] n=85	35.2±0.7[a] n=36	36.9±0.3 n=206	**
Post-partum heat period (d)	99.5±3.8[c] n=79	87.5±3.2[a] n=84	88.2±5.1[b] n=34	92.4±2.3 n=197	*
Service per Conception	1.3±0.0 n=95	1.3±0.1 n=88	1.2±0.1 n=36	1.3±0.0 n=219	NS
Gestation length (d)	280.8±0.4 n=85	280.9±0.4 n=85	280.7±0.5 n=36	280.8±0.2 n=206	NS
Calving interval (m)	13.8±0.3[b] n=42	14.0±0.2[b] n=47	12.7±0.3[a] n=29	13.6±0.2 n=118	**
Birth Weight of Calf (kg)	19.4±0.3[a] n=85	22.6±0.4[b] n=85	25.2±0.7[c] n=36	21.7±0.3 n=206	***
Milk yield/d/cow (l)	2.2±0.1[a] n=84	3.7±0.2[b] n=85	7.0±0.7[c] n=35	3.7±0.2 n=204	***
Lactation length (d)	193.4±8.4 n=84	186.7±6.5 n=85	195.4±11.3 n=35	191.0±4.8 n=204	NS
Total lactation yield (l)	438.7±33.6[a] n=84	698.6±42.2[b] n=85	1379.1±161.8[c] n=35	708.3±42.2 n=204	***
Total milk selling (th.tk)	19.1±1.5[a] n=84	30.8±1.8[b] n=85	64.3±7.5[c] n=35	31.7±2.0 n=204	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-27: Analysis of variance body weight of cow on productive and reproductive parameters

Dependent variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	102.031	2	51.015	3.100	.047
Age of 1st calving (m)	217.227	2	108.613	5.014	.007
Post-partum heat period (d)	6643.838	2	3321.919	3.407	.035
Service per Conception	.407	2	.203	.886	.414
Gestation length (d)	1.083	2	.542	.053	.949
Calving interval (m)	29.695	2	14.848	5.010	.008
Birth Weight of Calf (kg)	988.987	2	494.494	37.160	.000
Milk yield/d/cow (l)	588.024	2	294.012	67.097	.000
Lactation length (d)	2734.349	2	1367.174	.290	.749
Total lactation yield (l)	21866223.608	2	10933111.804	42.499	.000
Total milk selling (th.tk)	50718.790	2	25359.395	47.496	.000

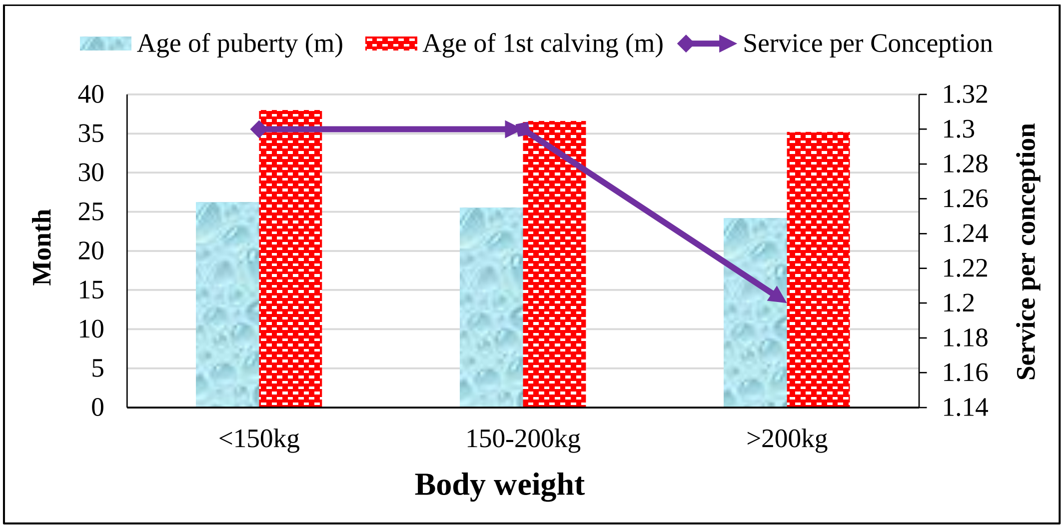

Fig. 19: Body weight effect on age of puberty, age of 1st calving and service per conception

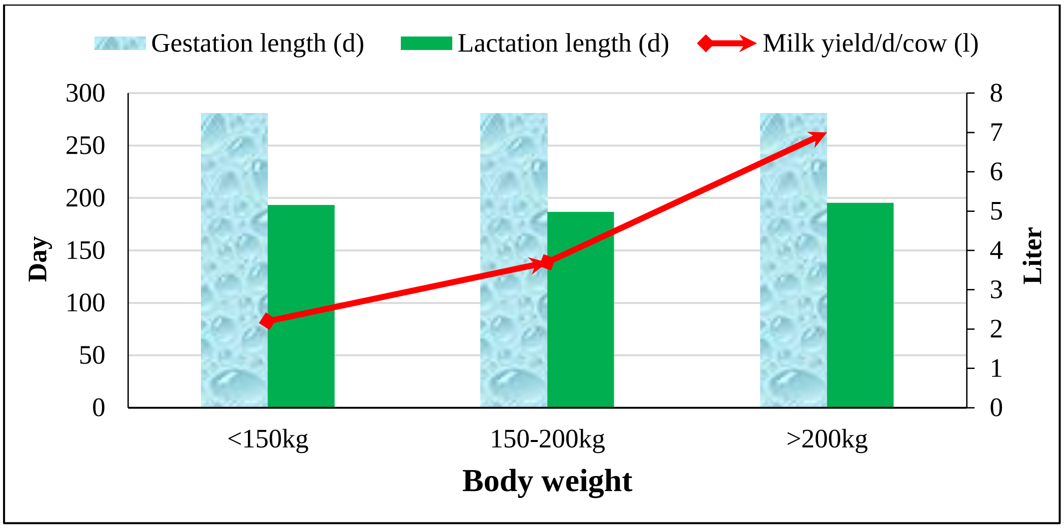

Fig. 20: Body weight effect on gestation length, lactation length and milk yield per day per cow

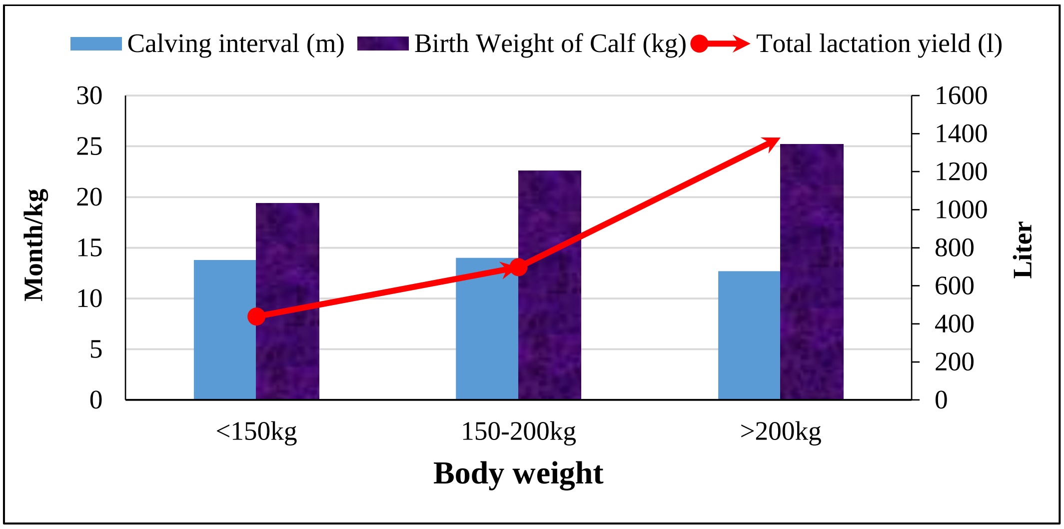

Fig. 21: Body weight effect on calving interval, total milk selling and total lactation yield

Table-28: Effect of body condition of cow on productive and reproductive parameters

Productive & reproductive parameters	Body condition of cow			Sig. level
	Healthy	Moderate	Total	
Age of puberty (m)	25.4±0.3 n=162	26.3±0.5 n=57	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.5±0.4 n=151	38.2±0.6 n=55	36.9±0.3 n=206	*
Post-partum heat period (d)	92.5±2.7 n=143	92.2±4.1 n=54	92.4±2.3 n=197	NS
Service per Conception	1.3±0.0 n=162	1.3±0.1 n=57	1.3±0.0 n=219	NS
Gestation length (d)	280.7±0.3 n=151	281.20.4 n=55	280.8±0.2 n=206	NS
Calving interval (m)	13.6±0.2 n=89	13.5±0.3 n=29	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	22.6±0.3 n=151	19.2±0.4 n=55	21.7±0.3 n=206	***
Milk yield/d/cow (l)	4.1±0.2 n=149	2.5±0.2 n=55	3.7±0.2 n=204	***
Lactation length (d)	191.3±5.8 n=149	190.1±8.2 n=55	191.0±4.8 n=204	NS
Total lactation yield (l)	789.8±54.0 n=149	487.8±43.4 n=55	708.3±42.2 n=204	***
Total milk selling (th.tk)	34.7±2.5 n=149	23.8±2.3 n=55	31.7±2.0 n=204	**

Values are mean ±S.E. S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-29: t-test for body condition of cow on productive and reproductive parameters

Dependent variables	t-value	df	P-value	Mean Difference	Std. Error Difference
Age of puberty (m)	-1.439	217	.152	-.905	.629
Age of 1st calving (m)	-2.331	204	.021	-1.723	.739
Post-partum heat period (d)	.060	195	.952	.302	5.061
Service per Conception	-.360	217	.719	-.027	.074
Gestation length (d)	-1.033	204	.303	-.520	.503
Calving interval (m)	.384	116	.702	.146	.382
Birth Weight of Calf (kg)	5.441	204	.000	3.406	.626
Milk yield/d/cow (l)	3.905	202	.000	1.60207	.41024
Lactation length (d)	.109	202	.913	1.184	10.827
Total lactation yield (l)	3.254	202	.001	301.992	92.819
Total milk selling (th.tk)	2.516	202	.013	10.9349	4.3455

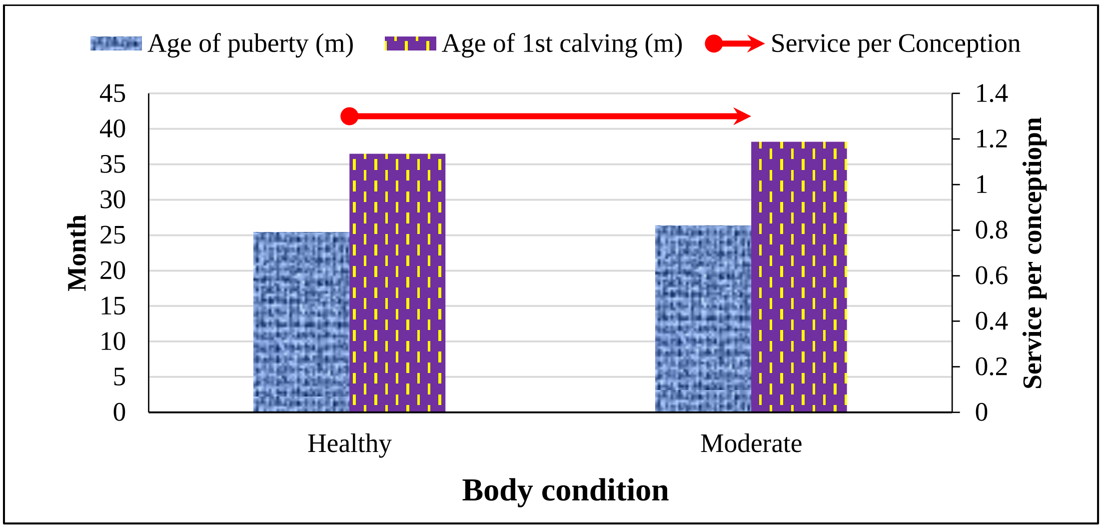

Fig. 22: Body condition effect on age of puberty, age of 1st calving and service per conception

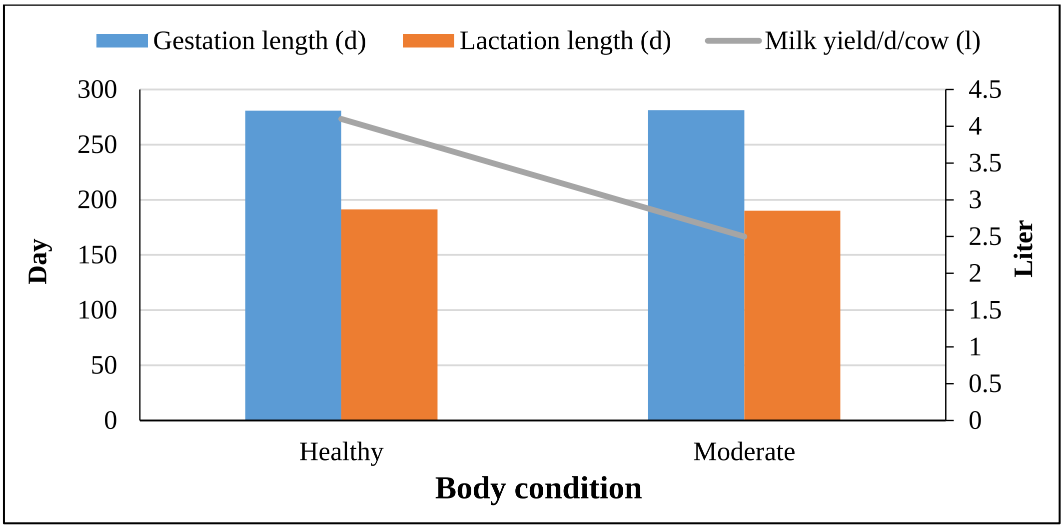

Fig. 23: Body condition effect on gestation length, lactation length and milk yield per day per cow

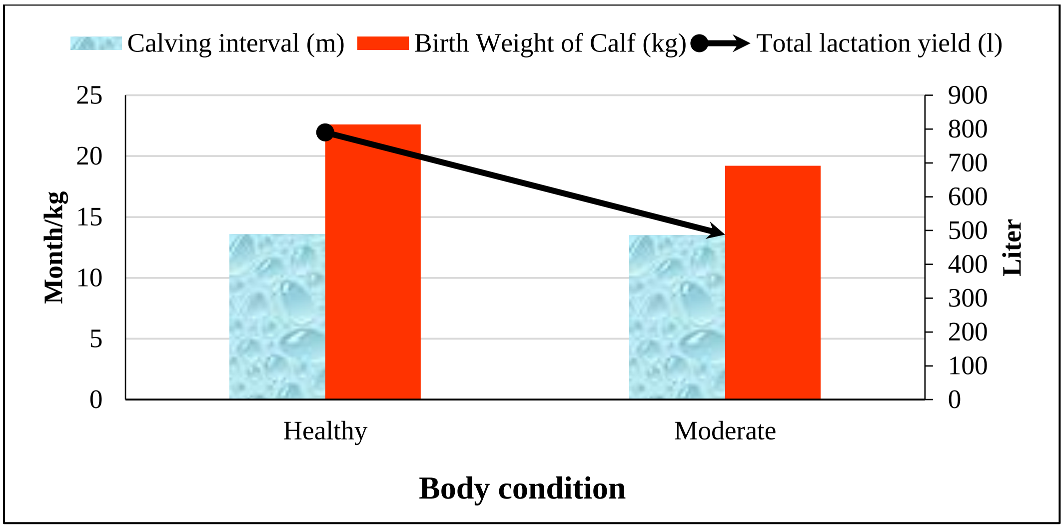

Fig. 24: Body condition effect on calving interval, total milk selling and total lactation yield

5.3.6 Effects of housing pattern

Effects of housing pattern and ANOVA on productive and reproductive performances are shown in Table- 30-31 and Fig. 25-27. In Table-30 the highest value of lactation length, total lactation yield and total milk selling was 203.6±10.5, 902.1±177.5 and 39.5±7.0 respectively in concrete and lowest values 166.4±9.2, 496.1±58.2 and 22.5±2.9 were observed respectively in straw made. lactation length, total lactation yield and total milk selling were significantly (P<0.01) influenced by the housing pattern whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf and milk yield/d/cow were not significantly (P>0.05) influenced by the housing pattern.

5.3.7 Effects of floor type of house

Effects of floor type and ANOVA on productive and reproductive performances are shown in Table- 32-33 and Fig. 28-30.

In Table-32 the highest mean value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 22.6±0.4, 4.5±0.4, 920.6±85.8 and 41.6±4.1 respectively in concrete-concrete and lowest values 20.3±0.6, 2.5±0.2, 493.4±51.9 and 21.5±2.4 were observed respectively in Muddy-muddy. Milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the floor type of house whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval and lactation length were not significantly (P>0.05) influenced by the floor type of house. Birth weight of calf was influenced by the floor type of house significantly (P<0.01).

5.3.8 Effects of overall housing system

Effects of overall housing system and ANOVA on productive and reproductive performances are presented in Table- 34-35 and Fig. 31-33. In Table-34 the lowest mean value of Calving interval was in good (13.2±0.2 month) housing system and highest was in poor (14.0±0.4 month) housing system. The highest value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 22.7±0.4, 4.6±0.4, 922.3±84.5 and 41.7±4.0 respectively in good housing system and lowest values 20.3±0.6, 2.5±0.2, 482.3±53.1 and 20.2±2.3 were observed respectively in poor housing system which were significantly (P<0.001) influenced by the overall housing system whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length and lactation length were not significantly

(P>0.05) influenced by the overall housing system. Birth weight of calf were influenced by the body condition of cow significantly (P<0.01). Calving interval were influenced by the body condition of cow significantly (P<0.05).

5.3.9 Effects of overall ventilation system

Effects of overall ventilation system and t-test on productive and reproductive performances are furnished in Table- 36-37 and Fig. 34-36.

In Table-36 the highest mean value of calving interval (14.6±0.6 month) was in moderate ventilation system and lowest was in proper (13.4±0.2 month). The highest value of birth weight of calf was (21.9±0.3) in proper ventilation system and lowest value was (19.9±0.8) in moderate ventilation system. Calving interval and birth weight of calf were significantly (P<0.05) influenced by the overall ventilation system whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, Milk yield/d/cow, lactation length, Total lactation yield and Total milk selling were not significantly (P>0.05) influenced by the overall ventilation system.

5.3.10 Effects of feeding practices

Effects of feeding practices and ANOVA on productive and reproductive performances are represented in Table- 38-39 and Fig. 37-39. In Table-38 the lowest mean value of age of puberty and age of 1st calving was 24.6±0.4 and 36.0±0.4 month respectively in Stall feeding and highest was 27.8±0.9 and 39.9±0.8 month respectively in Stall and tethering. The highest value of service per conception and gestation length was 1.9±0.1 and 283.1±0.6 respectively in stall and tethering and lowest values 1.1±0.0 and 279.6±0.4 were observed respectively in stall and grazing. The highest value of milk yield/d/cow was in Stall feeding (4.5±0.3) and lowest value was in stall and grazing (2.6±0.2). The highest value of lactation length, total lactation yield and total milk selling was 196.7±6.6, 886.5±68.3 and 40.7±3.2 respectively in stall feeding and lowest values 1.1±0.0 and 279.6±0.4 were observed respectively in stall and tethering. Age of puberty, age of 1st calving, service per conception, gestation length, milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the feeding practices whereas post-partum heat period, calving interval and birth weight of calf were not significantly (P>0.05) influenced by the feeding practices lactation length were influenced by the feeding practices significantly (P<0.01).

Table-30: Effect of housing pattern on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Housing pattern				Sig. level
	Concrete	Semi concrete	Straw made	Total	
Age of puberty (m)	24.9±1.1 n=17	25.4±0.3 n=158	26.5±0.7 n=44	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.6±1.2 n=14	36.8±0.4 n=150	37.6±0.9 n=42	36.9±0.3 n=206	NS
Post-partum heat period (d)	98.6±10.0 n=14	93.2±2.8 n=143	87.6±3.7 n=40	92.4±2.3 n=197	NS
Service per Conception	1.4±0.1 n=17	1.2±0.0 n=158	1.4±0.1 n=44	1.3±0.0 n=219	NS
Gestation length (d)	281.4±0.6 n=14	280.8±0.3 n=150	280.7±0.5 n=42	280.8±0.2 n=206	NS
Calving interval (m)	13.2±0.4 n=9	13.5±0.2 n=90	14.1±0.4 n=19	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	21.8±0.8 n=14	22.1±0.3 n=150	20.4±0.7 n=42	21.7±0.3 n=206	NS
Milk yield/d/cow (l)	4.6±0.9 n=14	3.8±0.2 n=148	2.9±0.3 n=42	3.7±0.2 n=204	NS
Lactation length (d)	203.6±10.5^{b} n=14	196.7±5.9^{ab} n=148	166.4±9.2^{a} n=42	191.0±4.8 n=204	*
Total lactation yield (l)	902.1±177.5^{b} n=14	750.3±52.2^{ab} n=148	496.1±58.2^{a} n=42	708.3±42.2 n=204	*
Total milk selling (th.tk)	39.5±7.0^{b} n=14	33.6±2.4^{ab} n=148	22.5±2.9^{a} n=42	31.7±2.0 n=204	*

Values are mean ±S.E. ^{ab} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels and NS=Non-significant.

Table-31: Analysis of variance for housing pattern on productive and reproductive parameters

Dependent Variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	49.636	2	24.818	1.486	.229
Age of 1st calving (m)	26.489	2	13.245	.586	.557
Post-partum heat period (d)	1556.256	2	778.128	.777	.461
Service per Conception	1.155	2	.577	2.553	.080
Gestation length (d)	6.006	2	3.003	.292	.747
Calving interval (m)	5.572	2	2.786	.878	.418
Birth Weight of Calf (kg)	101.242	2	50.621	2.863	.059
Milk yield/d/cow (l)	36.706	2	18.353	2.576	.079
Lactation length (d)	32417.247	2	16208.623	3.545	.031
Total lactation yield (l)	2678263.638	2	1339131.819	3.797	.024
Total milk selling (th.tk)	4920.941	2	2460.471	3.230	.042

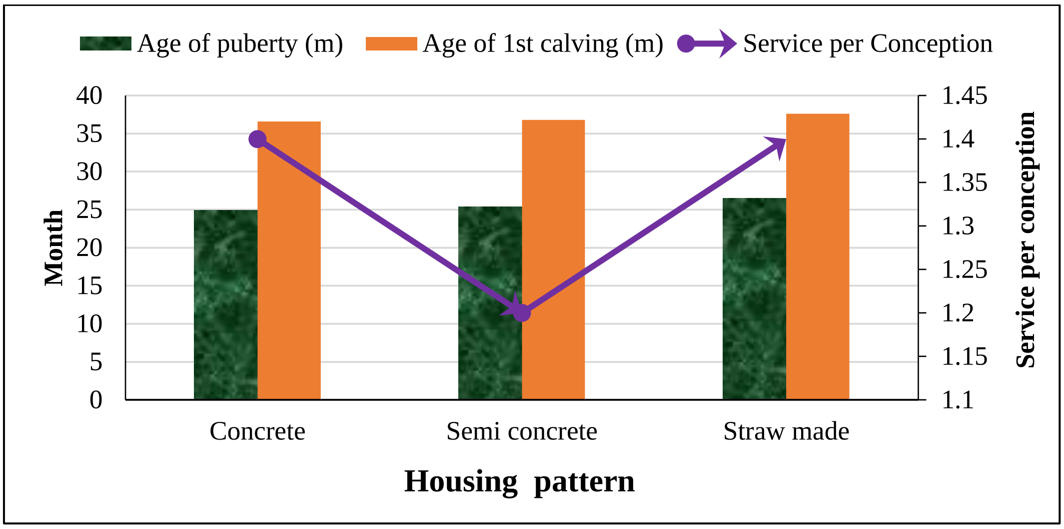

Fig. 25: Housing pattern effect on age of puberty, age of 1st calving and service per conception

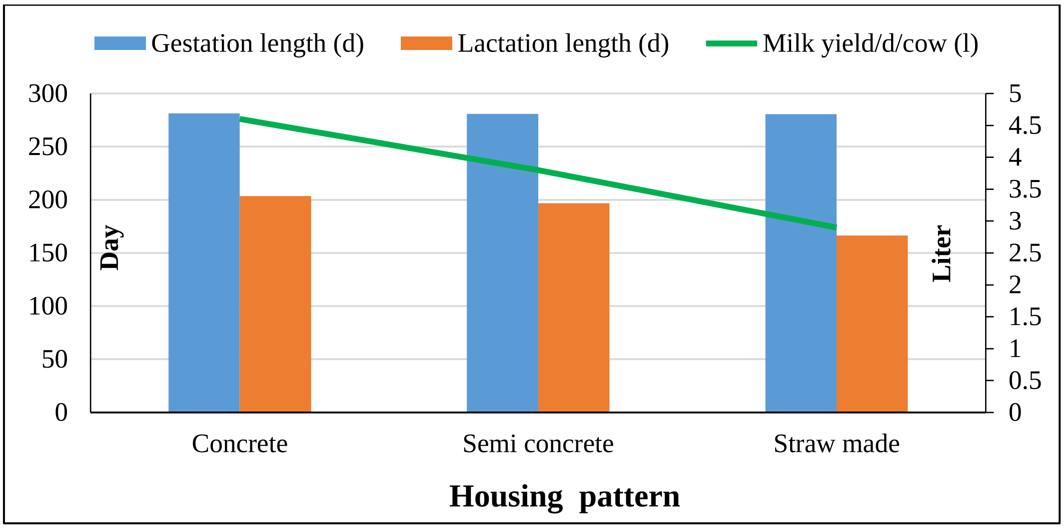

Fig. 26: Housing pattern effect on gestation length, lactation length and milk yield per day per cow

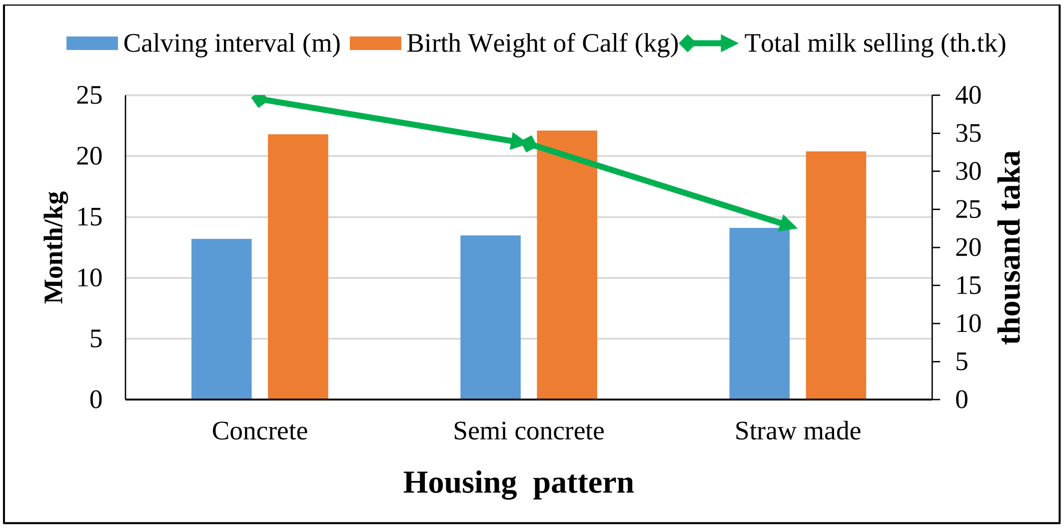

Fig. 27: Housing pattern effect on calving interval, total milk selling and total lactation yield

TABLE-32: Effect of floor type of house on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Floor type of house				Sig. level
	Concrete-concrete	Muddy-concrete	Muddy-muddy	Total	
Age of puberty (m)	25.2±0.5 n=82	25.90±.441 n=87	25.7±0.5 n=50	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.5±0.6 n=78	37.2±0.5 n=80	37.2±0.7 n=48	36.9±0.3 n=206	NS
Post-partum heat period (d)	93.9±3.5 n=76	89.1±3.8 n=77	95.8±4.5 n=44	92.4±2.3 n=197	NS
Service per Conception	1.4±0.1 n=82	1.2±0.0 n=87	1.2±0.1 n=50	1.3±0.0 n=219	NS
Gestation length (d)	280.5±0.4 n=78	281.3±0.4 n=80	280.5±0.5 n=48	280.8±0.2 n=206	NS
Calving interval (m)	13.2±0.2 n=51	13.7±0.3 n=38	14.2±0.4 n=29	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	22.6±0.4^{b} n=78	21.7±0.5^{ab} n=80	20.3±0.6^{a} n=48	21.7±0.3 n=206	**
Milk yield/d/cow (l)	4.5±0.4^{c} n=76	3.5±0.3^{b} n=80	2.5±0.2^{a} n=48	3.7±0.2 n=204	***
Lactation length (d)	204.3±7.3 n=76	179.3±7.3 n=80	189.4±11.2 n=48	191.0±4.8 n=204	NS
Total lactation yield (l)	920.6±85.8^{b} n=76	635.6±55.6^{a} n=80	493.4±51.9^{a} n=48	708.3±42.2 n=204	***
Total milk selling (th.tk)	41.6±4.1^{b} n=76	28.6±2.4^{a} n=80	21.5±2.4^{a} n=48	31.7±2.0 n=204	***

Values are mean ±S.E. ^{abc} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-33 : Analysis of variance for floor type of house on productive and reproductive parameters

Dependent Variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	19.833	2	9.917	.589	.556
Age of 1st calving (m)	20.116	2	10.058	.444	.642
Post-partum heat period (d)	1531.864	2	765.932	.765	.467
Service per Conception	0.743	2	.371	1.629	.199
Gestation length (d)	26.373	2	13.187	1.295	.276
Calving interval (m)	18.087	2	9.043	2.951	.056
Birth Weight of Calf (kg)	161.254	2	80.627	4.638	.011
Milk yield/d/cow (l)	125.468	2	62.734	9.387	.000
Lactation length (d)	24567.156	2	12283.578	2.664	.072
Total lactation yield (l)	6064719.761	2	3032359.881	9.028	.000
Total milk selling (th.tk)	13190.352	2	6595.176	9.152	.000

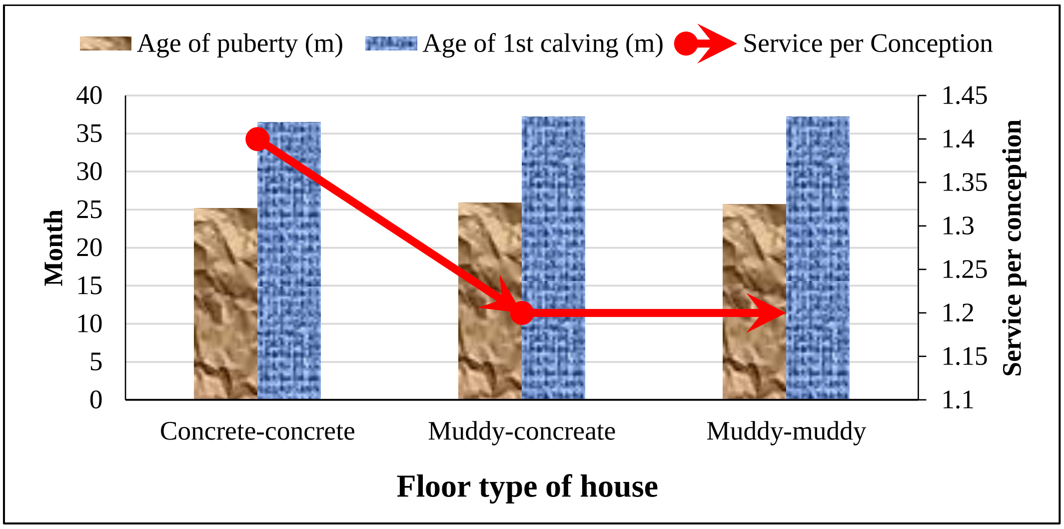

Fig. 28: Floor type effect on age of puberty, age of 1st calving and service per conception

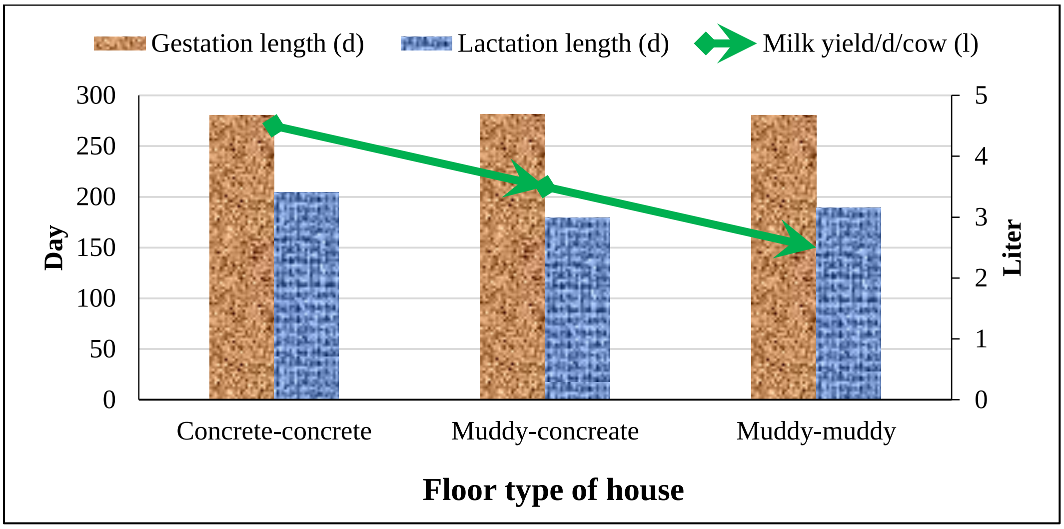

Fig. 29: Floor type effect on gestation length, lactation length and milk yield per day per cow

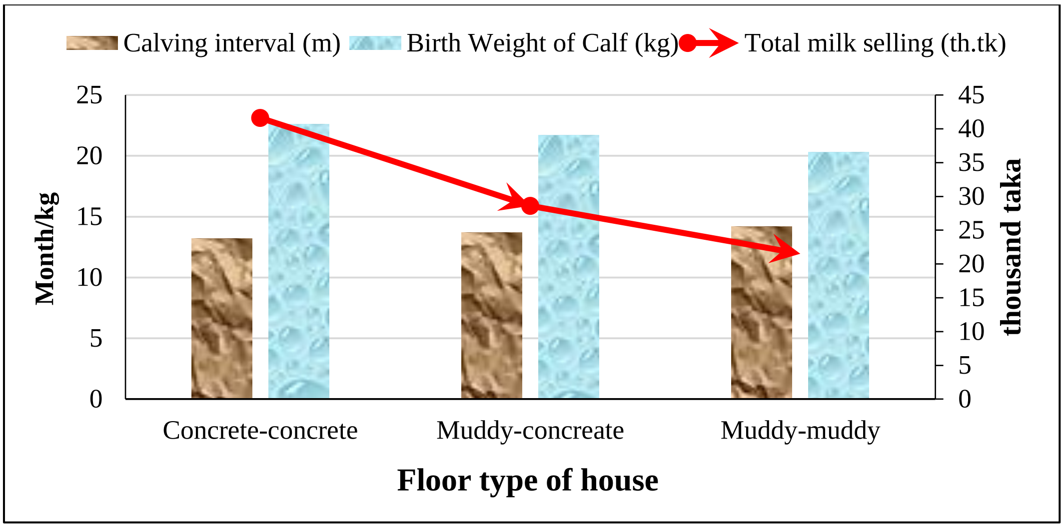

Fig. 30: Floor type effect on calving interval, total milk selling and total lactation yield

Table-34: Effect of overall housing system on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Overall housing system			Sig. level
	Good	Medium	Poor	
Age of puberty (m)	25.1±0.5 n=83	25.9±0.4 n=88	25.8±0.5 n=48	NS
Age of 1st calving (m)	36.5±0.6 n=79	37.2±0.5 n=81	37.3±0.7 n=46	NS
Post-partum heat period (d)	93.1±3.5 n=77	90.2±3.8 n=78	95.3±4.7 n=42	NS
Service per Conception	1.3±0.1 n=83	1.2±0.0 n=88	1.2±0.1 n=48	NS
Gestation length (d)	280.4±0.4 n=79	281.3±0.4 n=81	280.5±0.5 n=46	NS
Calving interval (m)	13.2 ± 0.2^{a} n=52	13.9 ± 0.3^{ab} n=39	14.0 ± 0.4^{b} n=27	*
Birth Weight of Calf (kg)	22.7 ± 0.4^{b} n=79	21.6 ± 0.5^{ab} n=81	20.3 ± 0.6^{a} n=46	**
Milk yield/d/cow (l)	4.6 ± 0.4^{b} n=77	3.4 ± 0.2^{a} n=81	2.5 ± 0.2^{a} n=46	***
Lactation length (d)	201.6±7.5 n=77	183.3±7.2 n=81	186.5±11.5 n=46	NS
Total lactation yield (l)	922.3 ± 84.5^{b} n=77	633.3 ± 55.0^{a} n=81	482.3 ± 53.1^{a} n=46	***
Total milk selling (th.tk)	41.7 ± 4.0^{b} n=77	28.8 ± 2.4^{a} n=81	20.2 ± 2.3^{a} n=46	***

Values are mean ±S.E. ^{abc} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-35 : Analysis of variance for effect of overall housing system on productive and reproductive parameters

Dependent Variables	Sum of squares	df	Mean square	F-value	P-value
Age of puberty (m)	29.573	2	14.786	.881	.416
Age of 1st calving (m)	29.826	2	14.913	.660	.518
Post-partum heat period (d)	761.808	2	380.904	.379	.685
Service per Conception	.674	2	.337	1.475	.231
Gestation length (d)	33.044	2	16.522	1.628	.199
Calving interval (m)	18.383	2	9.192	3.002	.054
Birth Weight of Calf (kg)	180.473	2	90.236	5.219	.006
Milk yield/d/cow (l)	144.227	2	72.114	10.943	.000
Lactation length (d)	14373.047	2	7186.523	1.542	.217
Total lactation yield (l)	6331540.482	2	3165770.241	9.463	.000
Total milk selling (th.tk)	14466.644	2	7233.322	10.127	.000

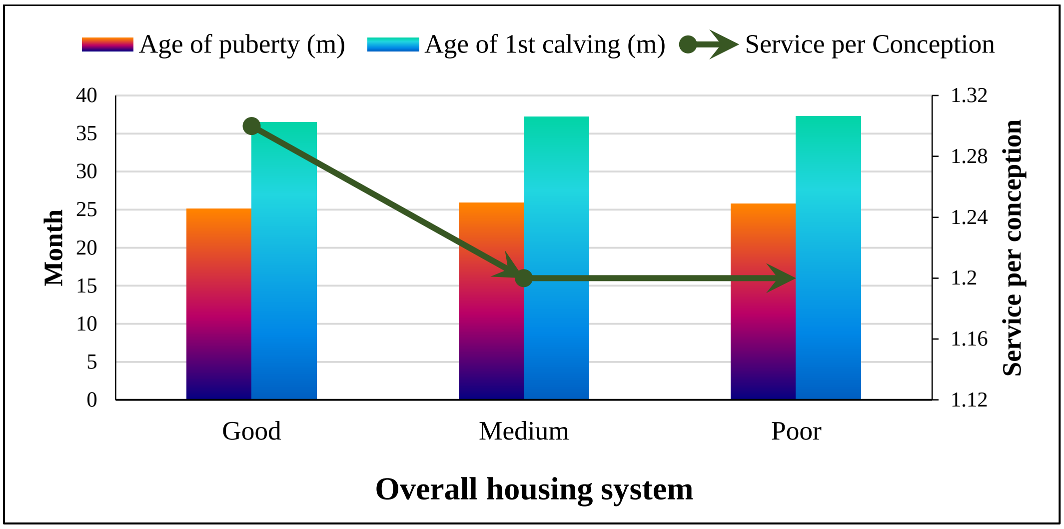

Fig. 31: Overall housing system effect on age of puberty, age of 1st calving and service per conception

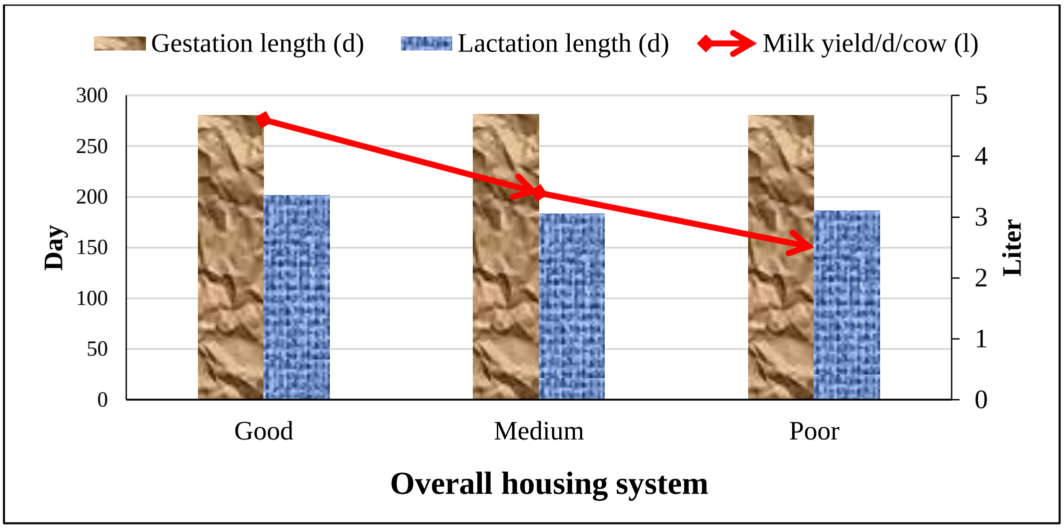

Fig. 32: Overall housing system effect on gestation length, lactation length and milk yield per day per cow

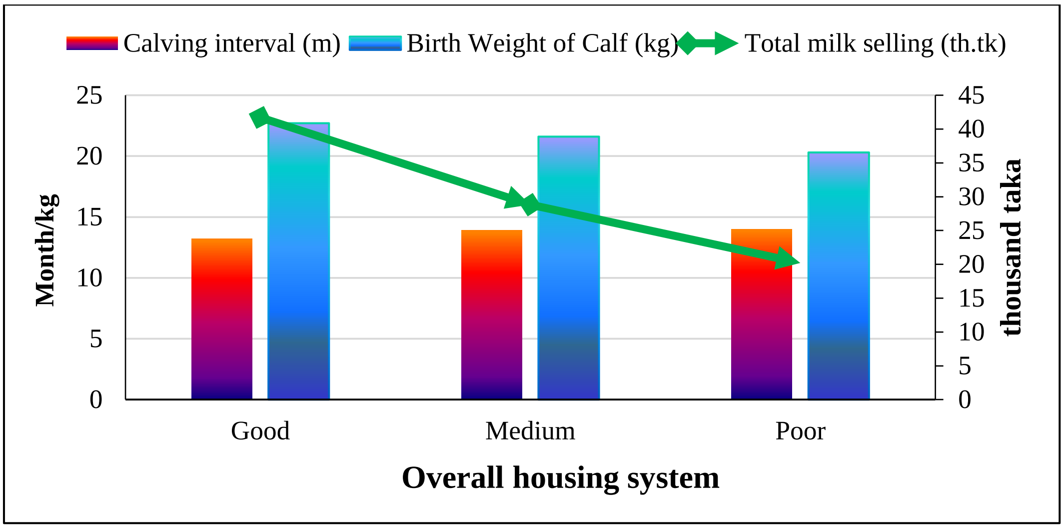

Fig. 33: Overall housing system effect on calving interval, total milk selling and total lactation yield

Table-36: Effect of overall ventilation system on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Overall ventilation system			Sig. level
	Proper	Moderate	Total	
Age of puberty (m)	25.6±0.3 n=198	25.9±0.7 n=21	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.9±0.4 n=186	37.4±0.7 n=20	36.9±0.3 n=206	NS
Post-partum heat period (d)	91.4±2.3 n=179	103.1±10.0 n=18	92.4±2.3 n=197	NS
Service per Conception	1.3±0.0 n=198	1.1±0.1 n=21	1.3±0.0 n=219	NS
Gestation length (d)	280.7±0.2 n=186	281.8±0.7 n=20	280.8±0.2 n=206	NS
Calving interval (m)	13.4±0.2[a] n=103	14.6±0.6[b] n=15	13.6±0.2 n=118	*
Birth Weight of Calf (kg)	21.9±0.3 [b] n=186	19.9±0.8 [a] n=20	21.7±0.3 n=206	*
Milk yield/d/cow (l)	3.8±0.2 n=184	2.7±0.3 n=20	3.7±0.2 n=204	NS
Lactation length (d)	191.1±4.7 n=184	189.8±22.6 n=20	191.0±4.8 n=204	NS
Total lactation yield (l)	729.7±45.7 n=184	511.9±78.8 n=20	708.3±42.2 n=204	NS
Total milk selling (th.tk)	32.5±2.1 n=184	25.0±3.8 n=20	31.7±2.0 n=204	NS

Values are mean ±S.E. [ac] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, and NS=Non-significant.

Table-37 : t-test for overall ventilation system on productive and reproductive parameters

Dependent Variables	t-value	df	P-value	Mean difference	Std. Error difference
Age of puberty (m)	-0.309	217	0.757	-0.291	0.942
Age of 1st calving (m)	-0.409	204	0.683	-0.458	1.119
Post-partum heat period (d)	-1.499	195	0.135	-11.681	7.79
Service per Conception	1.368	217	0.173	0.15	0.11
Gestation length (d)	-1.401	204	0.163	-1.051	0.75
Calving interval (m)	-2.392	116	0.018	-1.153	0.482
Birth Weight of Calf (kg)	2.106	204	0.036	2.085	0.99
Milk yield/d/cow (l)	1.629	202	0.105	1.02772	0.63075
Lactation length (d)	0.083	202	0.934	1.337	16.158
Total lactation yield (l)	1.542	202	0.125	217.826	141.266
Total milk selling (th.tk)	1.138	202	0.257	7.4692	6.5646

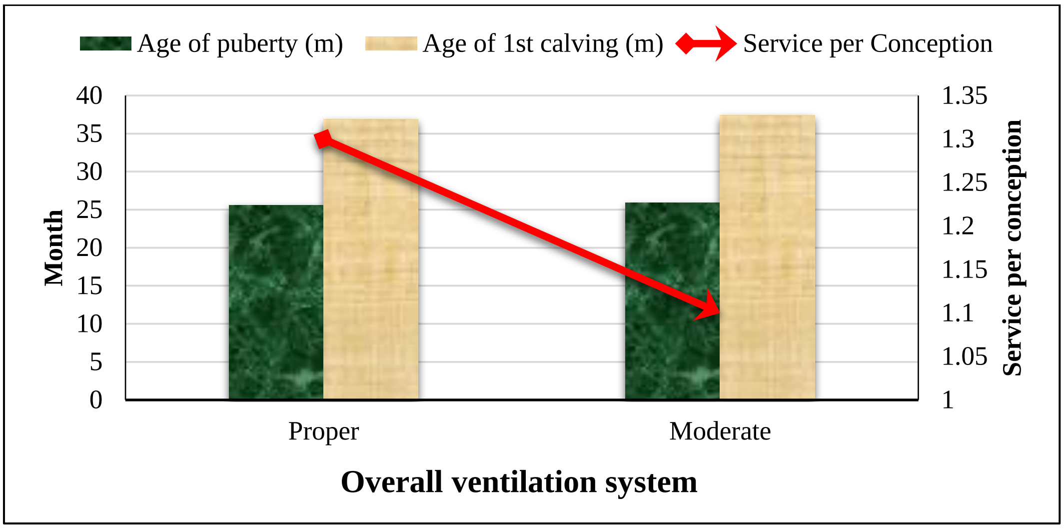

Fig. 34: Overall ventilation system effect on age of puberty, age of 1st calving and S/C

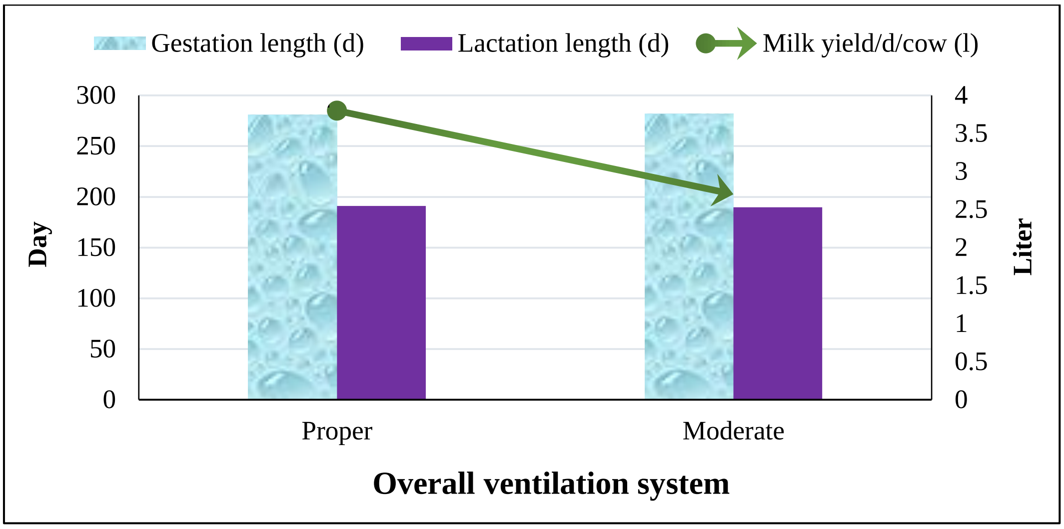

Fig. 35: Overall ventilation system effect on gestation length, lactation length and milk yield per day per cow

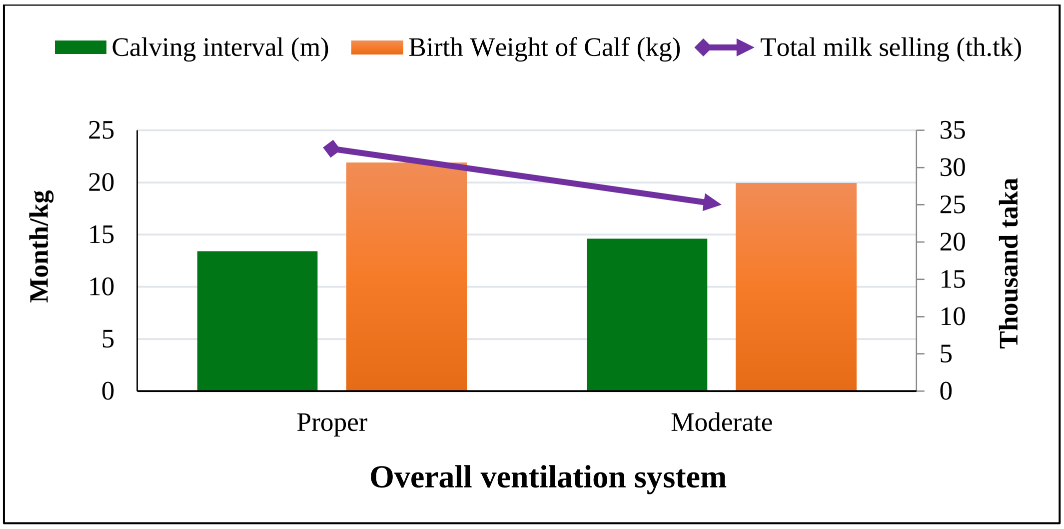

Fig. 36: Overall ventilation system effect on calving interval, total milk selling and total lactation yield

Table-38: Effect of feeding practices on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Feeding practices				Sig. level
	Stall feeding	Stall and tethering	Stall and grazing	Total	
Age of puberty (m)	24.6±0.4[a] n=114	27.8±0.9[b] n=26	26.3±0.4[b] n=79	25.6±0.3 n=219	***
Age of 1st calving (m)	36.0±0.4[a] n=107	39.9±0.8[b] n=26	37.2±0.6[a] n=73	36.9±0.3 n=206	***
Post-partum heat period (d)	93.9±3.3 n=104	83.4±5.6 n=25	93.5±3.6 n=68	92.4±2.3 n=197	NS
Service per Conception	1.3±0.0[b] n=114	1.9±0.1[c] n=26	1.1±0.0[a] n=79	1.3±0.0 n=219	***
Gestation length (d)	281.1±0.3[b] n=107	283.1±0.6[c] n=26	279.6±0.4[a] n=73	280.8±0.2 n=206	***
Calving interval (m)	13.5±0.2 n=70	13.3±0.7 n=3	13.8±0.3 n=45	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	22.3±0.4 n=107	20.4±0.5 n=26	21.3±0.5 n=73	21.7±0.3 n=206	NS
Milk yield/d/cow (l)	4.5±0.3[b] n=105	2.9±0.3[a] n=26	2.6±0.2[a] n=73	3.7±0.2 n=204	***
Lactation length (d)	196.7±6.6[b] n=105	153.5±10.8[a] n=26	196.0±8.3[b] n=73	191.0±4.8 n=204	**
Total lactation yield (l)	886.5±68.3[b] n=105	457.5±50.0[a] n=26	541.4±51.6[a] n=73	708.4±42.2 n=204	***
Total milk selling (th.tk)	40.7±3.2[b] n=105	21.8±2.4[a] n=26	22.4±2.1[a] n=73	31.7±2.0 n=204	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-39: Analysis of variance for feeding practices on productive and reproductive parameters

Dependent Variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	273.902	2	136.951	8.744	.000
Age of 1st calving (m)	322.522	2	161.261	7.628	.001
Post-partum heat period (d)	2346.599	2	1173.300	1.177	.310
Service per Conception	10.864	2	5.432	29.975	.000
Gestation length (d)	249.921	2	124.960	13.765	.000
Calving interval (m)	3.165	2	1.583	.495	.611
Birth Weight of Calf (kg)	92.335	2	46.167	2.605	.076
Milk yield/d/cow (l)	173.372	2	86.686	13.450	.000
Lactation length (d)	41910.768	2	20955.384	4.632	.011
Total lactation yield (l)	7002241.413	2	3501120.707	10.571	.000
Total milk selling (th.tk)	17375.266	2	8687.633	12.414	.000

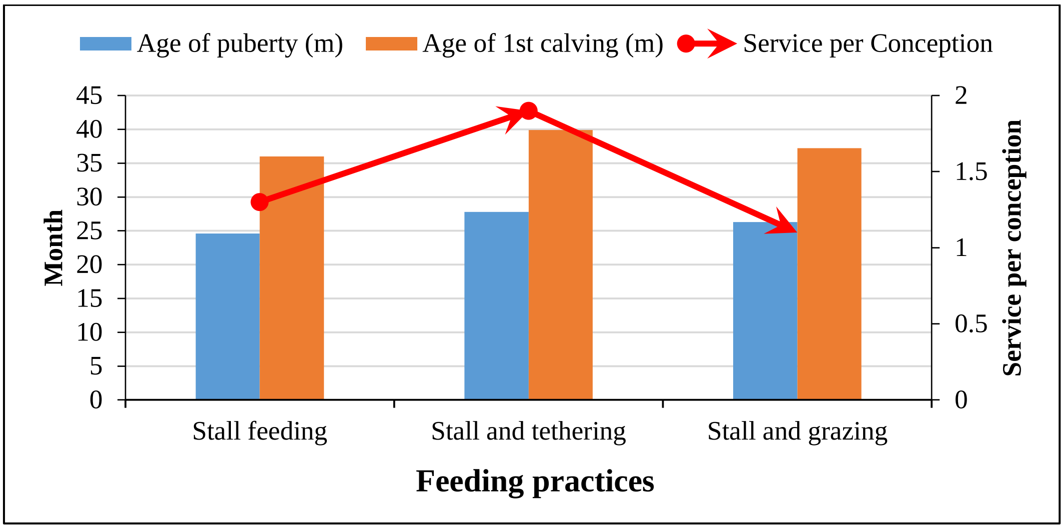

Fig. 37: Feeding practices effect on age of puberty, age of 1st calving and S/C

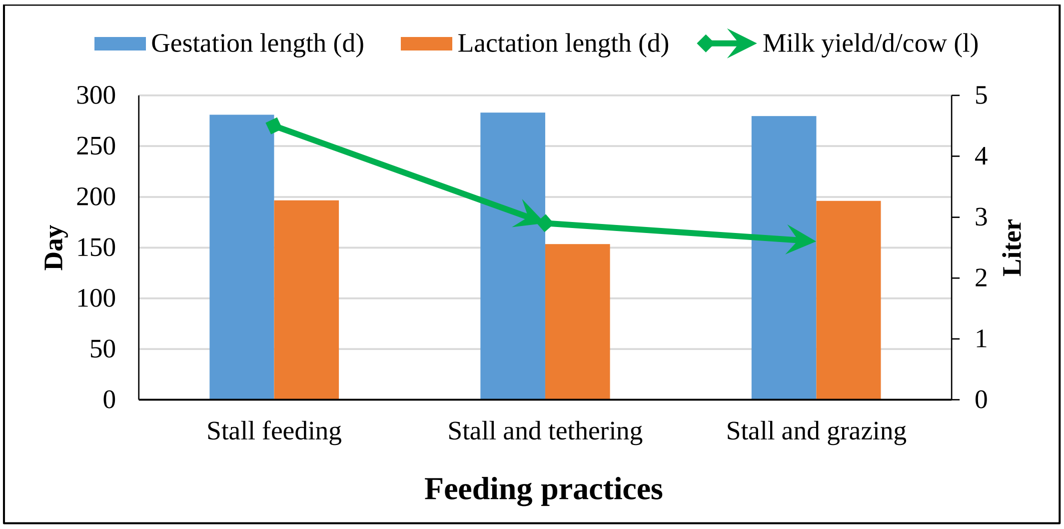

Fig. 38: Feeding practices effect on gestation length, lactation length and milk yield per day per cow

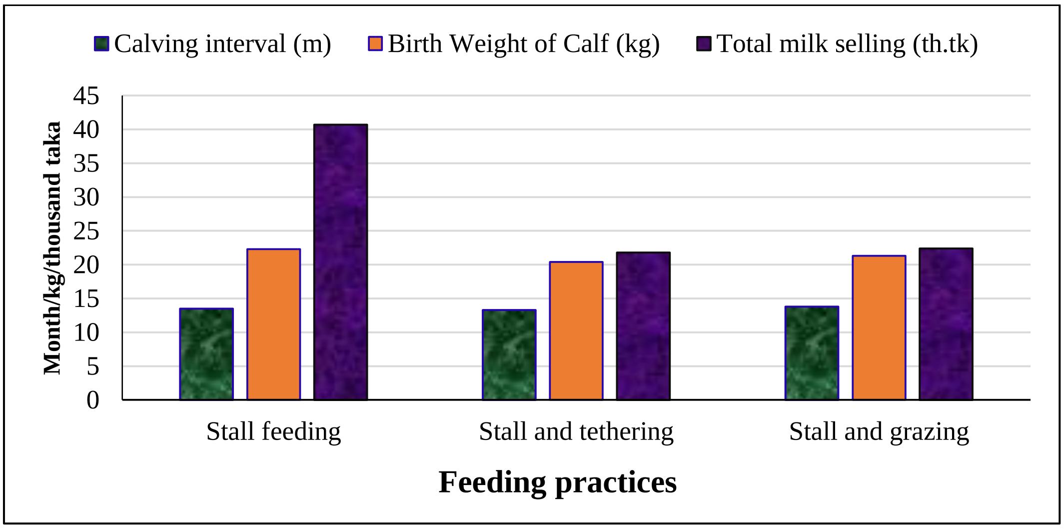

Fig. 39: Feeding practices effect on calving interval, total milk selling and total lactation yield

5.3.11 Effects of roughages feeding

Effects of roughages feeding and t-test on productive and reproductive performances are represented in Table- 40-41 and Fig. 40-42. In Table-40 the lowest mean value of age of puberty and age of 1st calving were 25.5±0.3 and 36.8±0.3 month respectively in straw and green grass feeding group and highest was 28.5±1.5 and 40.7±2.1 month respectively in straw, green grass and others feeding group. The highest value of birth weight of calf was (21.9±0.3 kg) in straw and green grass group of roughages feeding and lowest value was (17.7±1.6 kg) in straw, green grass and others group of roughages feeding. Birth weight of calf were significantly (P<0.01) influenced by the roughages feeding and age of puberty and age of 1st calving were influenced by the roughages feeding significantly (P<0.05) whereas post-partum heat period, service per conception, gestation length, calving interval, milk yield/d/cow, lactation length, total lactation yield and total milk selling were not significantly (P>0.05) influenced by the roughages feeding.

5.3.12 Effects of feed quality

Effects of feed quality and ANOVA on productive and reproductive performances are given in Table- 42-43 and Fig. 43-45. In Table-42 the lowest mean value of age of puberty, age of 1st calving and post-partum heat period was 23.3±0.6 month, 34.1±0.7 month and 87.4±4.6 day respectively in good quality feed group and highest was 26.5±0.5 month, 38.5±0.6 month and 101.7±3.8 day respectively in poor quality feed group. The highest values of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were 25.8±0.7 kg, 8.2±0.5 liter, 1644.0±137.2 liter and 72.5±6.8 thousand taka respectively in good quality feed group and lowest values 19.1±0.4 kg, 1.6±0.1 liter, 306.5±22.6 liter and 14.3±1.1 thousand taka were observed respectively in poor quality feed group. Age of puberty, age of 1st calving, birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the concentrate feed quality whereas service per conception, gestation length, calving interval and lactation length were not significantly (P>0.05) influenced by the concentrate feed quality. Post-partum heat period was influenced by the concentrate feed quality significantly (P<0.05).

5.3.13 Effects of veterinary caring

Effects of veterinary caring and t-test on productive and reproductive performances are shown in Table- 44-45 and Fig. 46-48. In Table-44 the lowest mean value of age of puberty, age of 1st calving, service per conception and calving interval were 25.0±0.4 month, 36.1±0.5 month. 1.2±0.0 and 13.2±0.2 month respectively in veterinarian group of veterinary caring and highest were 26.2±0.4 month, 37.8±0.5 month, 1.3±0.0 and 14.2±0.3 month respectively in quack doctor group of veterinary caring. The highest value of birth weight of calf , milk yield/d/cow, lactation length, total lactation yield and total milk selling were 23.0±0.5 kg, 4.6±0.3 liter, 200.7±6.1 day, 930.8±73.4 liter and 41.6±3.4 thousand taka respectively in veterinarian group of veterinary caring and lowest values 20.4±0.3 kg, 2.7±0.1 liter, 181.2±7.3 day, 485.9±27.8 liter and 21.9±1.3 thousand taka were observed respectively in quack doctor group of veterinary caring. Birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the veterinary caring whereas post-partum heat period and gestation length were not significantly (P>0.05) influenced by the veterinary caring. Age of 1st calving, calving interval and lactation length were influenced by the veterinary caring significantly (P<0.01). Age of puberty and service per conception were influenced by the veterinary caring significantly (P<0.05).

5.3.14 Effects of breeding method

Effects of breeding method and t-test on productive and reproductive performances are shown in Table- 46-47 and Fig. 49-51. In Table-46 the lowest mean value of age of puberty and age of 1st calving were 24.87±0.34 and 36.26±0.42 month respectively in artificial insemination group of breeding method and highest was 26.63±0.45 and 37.82±0.52 month respectively in natural group of breeding method. The highest value of milk yield/d/cow, lactation length, total lactation yield and total milk selling were 4.85±0.28 liter, 207.65±6.10 day, 974.61±62.45 liter and 43.93±2.92 thousand taka respectively in artificial insemination group of breeding method and lowest values 2.10±0.08 liter, 169.38±7.05 day, 364.30±21.89 liter and 15.99±0.95 thousand taka were observed respectively in natural group of breeding method. Milk yield/d/cow, lactation length, total lactation yield and total milk selling were significantly ($P<0.001$) influenced by the breeding method whereas post-partum heat period, service per conception, gestation length, calving interval and birth weight of calf were not significantly ($P>0.05$) influenced by the breeding method. Age of puberty was influenced by the breeding method significantly ($P<0.01$). Age of 1st calving was influenced by the breeding method significantly ($P<0.05$).

5.3.15 Effects of social status of farmers

Effects of social status of farmers and t-test on productive and reproductive performances are shown in Table- 48-49 and Fig. 52-54. In Table-48 the highest value of birth weight of calf, milk yield/d/cow, lactation length, total lactation yield and total milk selling was 22.22±.33 kg, 3.92±.22 liter, 200.54±5.22 day, 788.46±50.36 liter and 35.29±2.31 thousand taka respectively in marginal group of social status of farmers and lowest values 20.09±.57 kg, 2.75±.30 liter, 158.94±10.07 day, 440.74±57.19 liter and 19.86±2.86 thousand taka were observed respectively in ultra poor group of social status of farmers. lactation length, total lactation yield and total milk selling were significantly ($P<0.001$) influenced by the social status of farmers age of puberty whereas age of 1st calving, post-partum heat period, service per conception, gestation length and calving interval were not significantly ($P>0.05$) influenced by the social status of farmers. Birth weight of calf and milk yield/d/cow were influenced by the social status of farmers significantly ($P<0.01$).

Table-40: Effect of roughages feeding on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Roughages feeding			Sig. level
	Straw and green grass	Straw, Green grass and others	Total	
Age of puberty (m)	25.5±0.3[a] n=211	28.5±1.5[b] n=8	25.6±0.3 n=219	*
Age of 1st calving (m)	36.8±0.3[a] n=199	40.7±2.1[b] n=7	36.9±0.3 n=206	*
Post-partum heat period (d)	91.7±2.3 n=191	115.0±5.0 n=6	92.4±2.3 n=197	NS
Service per Conception	1.3±0.0 n=211	1.3±0.2 n=8	1.3±0.0 n=219	NS
Gestation length (d)	280.8±0.2 n=199	281.4±0.9 n=7	280.8±0.2 n=206	NS
Calving interval (m)	13.6±0.2 n=115	14.0±1.0 n=3	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	21.9±0.3[b] n=199	17.7±1.6[a] n=7	21.7±0.3 n=206	**
Milk yield/d/cow (l)	3.7±0.2 n=197	1.9±0.5 n=7	3.7±0.2 n=204	NS
Lactation length (d)	191.2±4.8 n=197	184.3±40.1 n=7	191.0±4.8 n=204	NS
Total lactation yield (l)	720.3±43.0 n=197	372.9±181.3 n=7	708.3±42.2 n=204	NS
Total milk selling (th.tk)	32.3±2.0 n=197	15.6±7.2 n=7	31.7±2.0 n=204	NS

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, and NS=Non-significant.

Table-41: t-test for roughages feeding on productive and reproductive parameters

Dependent Variables	t-value	df	P-value	Mean difference	Std. Error difference
Age of puberty (m)	-2.060	217	.041	-3.017	1.464
Age of 1st calving (m)	-2.162	204	.032	-3.910	1.808
Post-partum heat period (d)	-1.785	195	.076	-23.267	13.031
Service per Conception	.171	217	.864	.030	.173
Gestation length (d)	-.528	204	.598	-.650	1.231
Calving interval (m)	-.400	116	.690	-.417	1.044
Birth Weight of Calf (kg)	2.585	204	.010	4.160	1.609
Milk yield/d/cow (l)	1.806	202	.072	1.85859	1.02886
Lactation length (d)	.262	202	.794	6.907	26.391
Total lactation yield (l)	1.505	202	.134	347.409	230.834

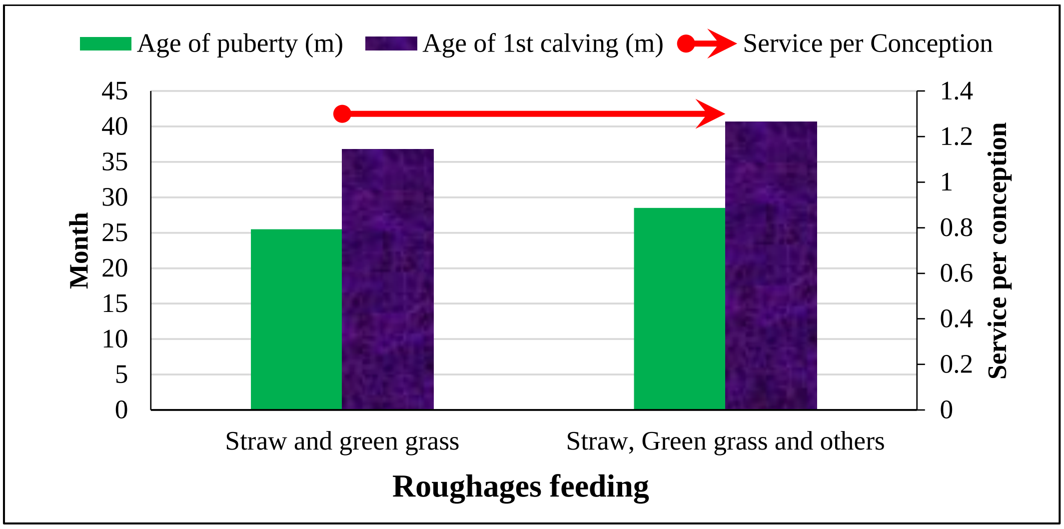

Fig. 40: Roughages feeding effect on age of puberty, age of 1st calving and service per conception

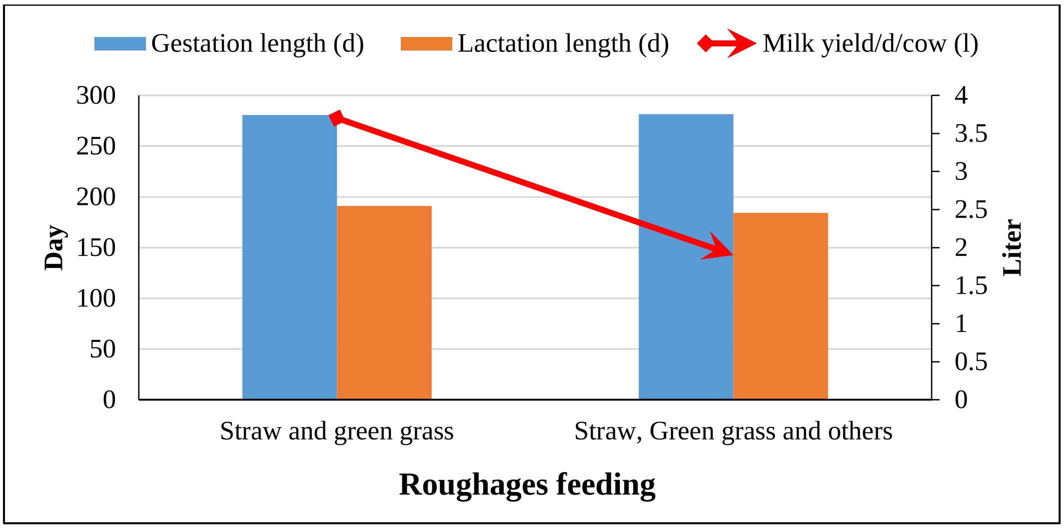

Fig. 41: Roughages feeding effect on gestation length, lactation length and milk yield per day per cow

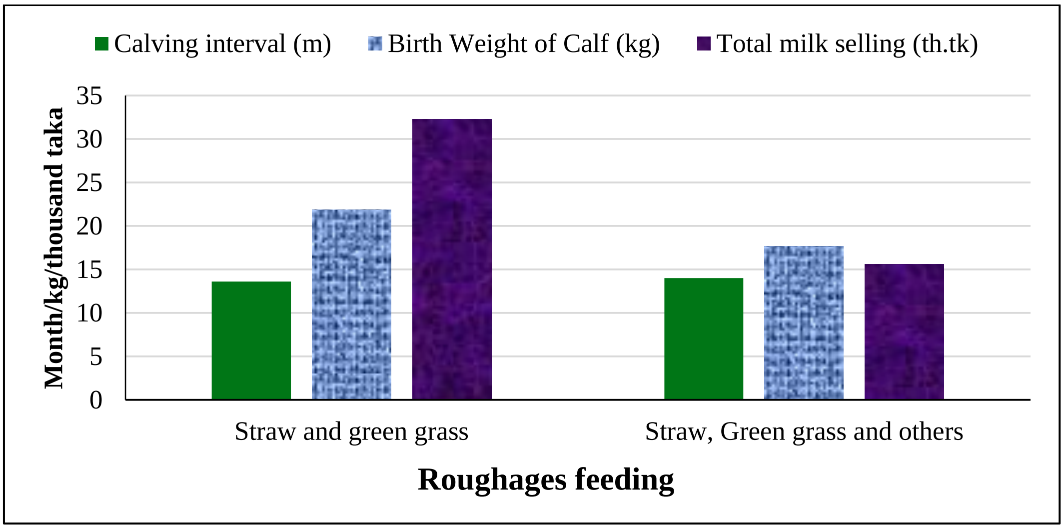

Fig. 42: Roughages feeding effect on calving interval, total milk selling and total lactation yield

Table-42: Effect of concentrate feed quality on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Concentrate feed quality				Sig. level
	Poor quality feed	Medium quality feed	Good quality feed	Total	
Age of puberty (m)	26.5±0.5[b] n=67	25.8±0.4[b] n=117	23.3±0.6[a] n=35	25.6±0.3 n=219	***
Age of 1st calving (m)	38.5±0.6[b] n=54	37.1±0.4[b] n=117	34.1±0.7[a] n=35	36.9±0.3 n=206	***
Post-partum heat period (d)	101.7±3.8[b] n=51	89.8±3.2[ab] n=111	87.4±4.6[a] n=35	92.4±2.3 n=197	*
Service per Conception	1.3±0.1 n=67	1.2±0.0 n=117	1.4±0.1 n=35	1.3±0.0 n=219	NS
Gestation length (d)	281.1±0.4 n=54	280.7±0.3 n=117	280.7±0.5 35	280.8±0.2 n=206	NS
Calving interval (m)	13.6±0.3 n=24	13.8±0.2 n=70	13.1±0.4 n=24	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	19.1±0.4[a] n=54	21.7±0.4[b] n=117	25.8±0.7[c] n=35	21.7±0.3 n=206	***
Milk yield/d/cow (l)	1.6±0.1[a] n=52	3.2±0.1[b] n=117	8.2±0.5[c] n=35	3.7±0.2 n=204	***
lactation length (d)	181.4±9.7 n=52	192.1±6.6 n=117	201.4±9.4 n=35	191.0±4.8 n=204	NS
Total lactation yield (l)	306.5±22.6[a] n=52	607.1±26.6[b] n=117	1644.0±137.2[c] n=35	708.3±42.2 n=204	***
Total milk selling (th.tk)	14.3±1.1[a] n=52	27.3±1.3[b] n=117	72.5±6.8[c] n=35	31.7±2.0 n=204	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-43: Analysis of variance for concentrate feed quality on productive and reproductive parameters

Dependent Variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	247.771	2	123.885	7.849	.001
Age of 1st calving (m)	415.648	2	207.824	10.048	.000
Post-partum heat period (d)	6003.863	2	3001.932	3.069	.049
Service per Conception	.839	2	.420	1.844	.161
Gestation length (d)	7.064	2	3.532	.344	.709
Calving interval (m)	7.145	2	3.572	1.131	.326
Birth Weight of Calf (kg)	950.134	2	475.067	35.194	.000
Milk yield/d/cow (l)	959.222	2	479.611	189.184	.000
lactation length (d)	8685.512	2	4342.756	.926	.398
Total lactation yield (l)	40238559.449	2	20119279.724	121.310	.000
Total milk selling (th.tk)	76190.109	2	38095.054	93.553	.000

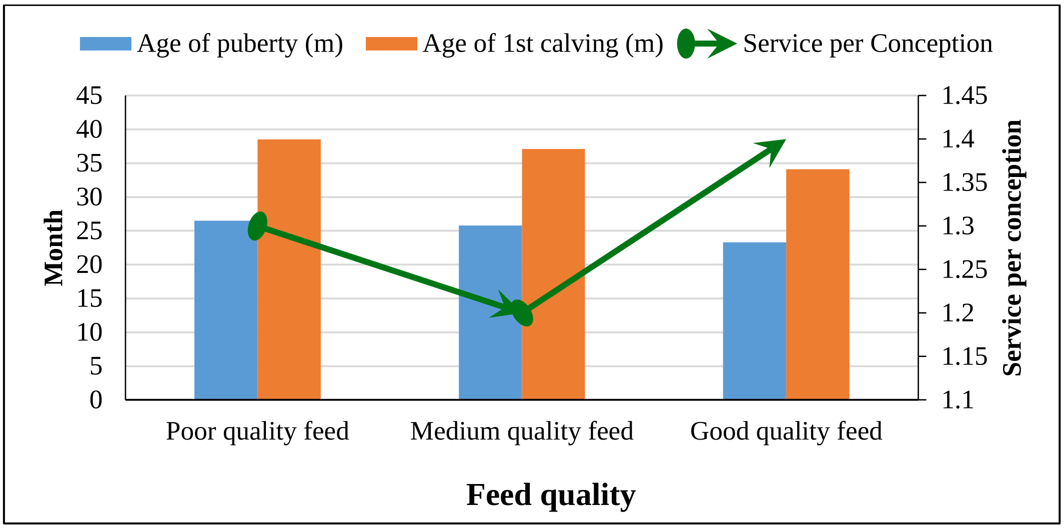

Fig. 43: Concentrate feed quality effect on age of puberty, age of 1st calving and service per conception

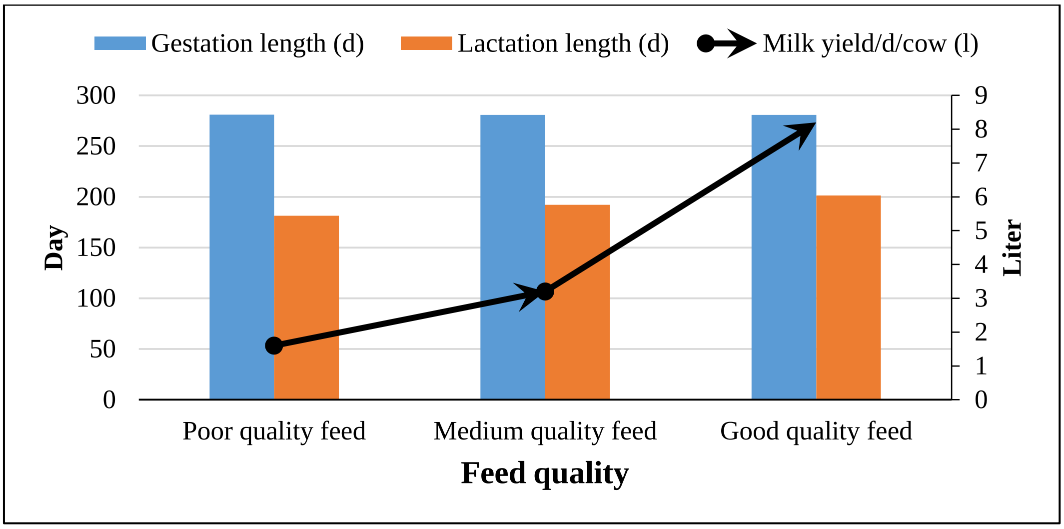

Fig.44: Concentrate feed quality effect on gestation length, lactation length and milk yield per day per cow

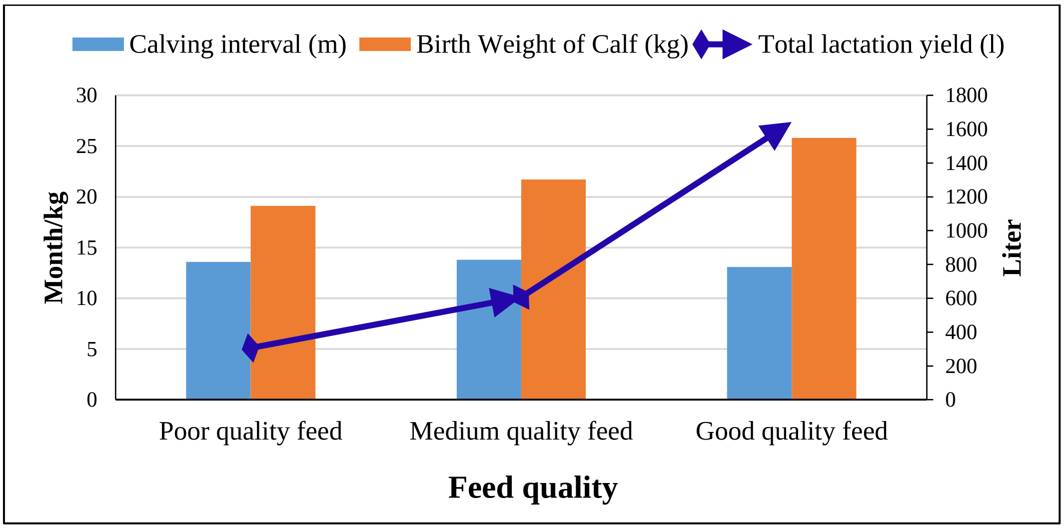

Fig. 45: Concentrate feed quality effect on calving interval, total milk selling and total lactation yield

Table-44: Effect of veterinary caring on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Veterinary caring			Sig. level
	Veterinarian	Quack doctor	Total	
Age of puberty (m)	25.0±0.4[a] n=115	26.2±0.4[b] n=104	25.6±0.3 n=219	*
Age of 1st calving (m)	36.1±0.5[a] n=104	37.8±0.5[b] n=102	36.9±0.3 n=206	**
Post-partum heat period (d)	90.9±2.8 n=100	94.0±3.6 n=97	92.4±2.3 n=197	NS
Service per Conception	1.2±0.0[a] n=115	1.3±0.0[b] n=104	1.3±0.0 n=219	*
Gestation length (d)	280.5±0.3 n=104	281.1±0.3 n=102	280.8±0.2 n=206	NS
Calving interval (m)	13.2±0.2[a] n=69	14.2±0.3[b] n=49	13.6±0.2 n=118	**
Birth Weight of Calf (kg)	23.0±0.5[b] n=104	20.4±0.3[a] n=102	21.7±0.3 n=206	***
Milk yield/d/cow (l)	4.6±0.3[b] n=102	2.7±0.1[a] n=102	3.7±0.2 n=204	***
Lactation length (d)	200.7±6.1[b] n=102	181.2±7.3[a] n=102	191.0±4.8 n=204	**
Total lactation yield (l)	930.8±73.4[b] n=102	485.9±27.8[a] n=102	708.3±42.2 n=204	***
Total milk selling (th.tk)	41.6±3.4[b] n=102	21.9±1.3[a] n=102	31.7±2.0 n=204	***

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-45: t-test for veterinary caring on productive and reproductive parameters

Dependent Variables	t-value	df	P-value	Mean Difference	Std. Error Difference
Age of puberty (m)	-2.168	216	.031	-1.196	.552
Age of 1st calving (m)	-2.481	204	.014	-1.620	.653
Post-partum heat period (d)	-.681	195	.497	-3.070	4.510
Service per Conception	-2.045	216	.042	-.132	.065
Gestation length (d)	-1.456	204	.147	-.647	.444
Calving interval (m)	-3.151	116	.002	-1.010	.320
Birth Weight of Calf (kg)	4.605	204	.000	2.598	.564
Milk yield/d/cow (l)	5.166	202	.000	1.83333	.35487
Lactation length (d)	2.057	202	.041	19.559	9.511
Total lactation yield (l)	5.668	202	.000	444.926	78.497
Total milk selling (th.tk)	5.389	202	.000	19.7358	3.6623

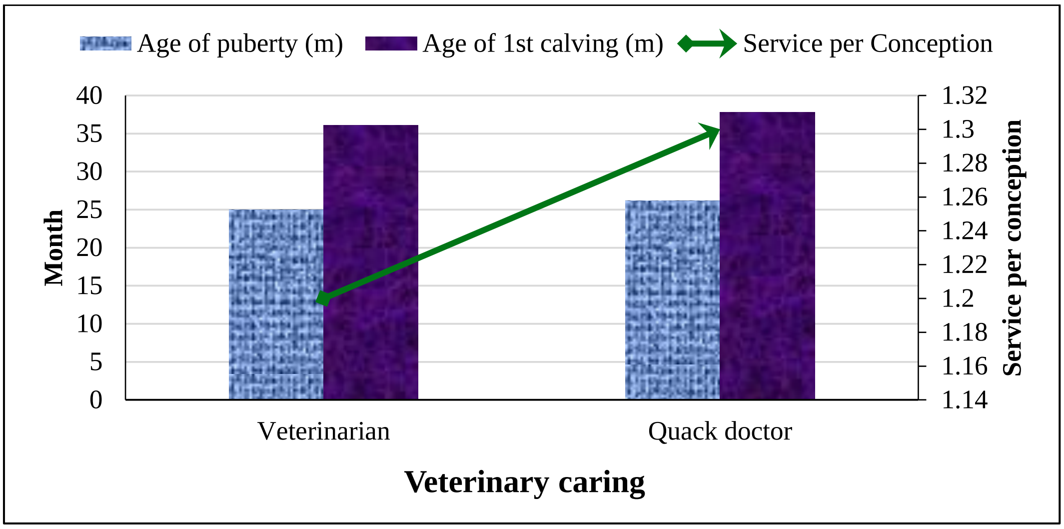

Fig. 46: Veterinary caring effect on age of puberty, age of 1st calving and service per conception

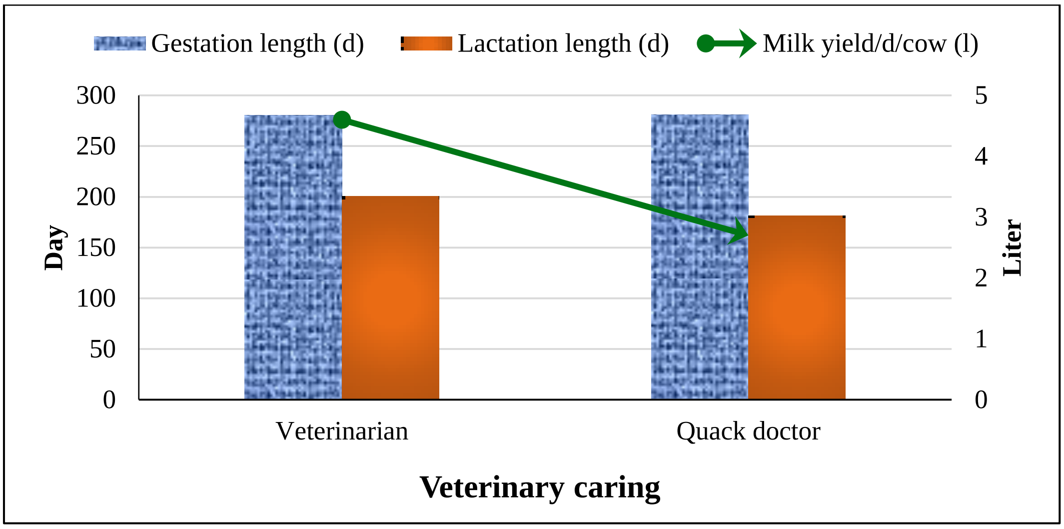

Fig. 47: Veterinary caring effect on gestation length, lactation length and milk yield per day per cow

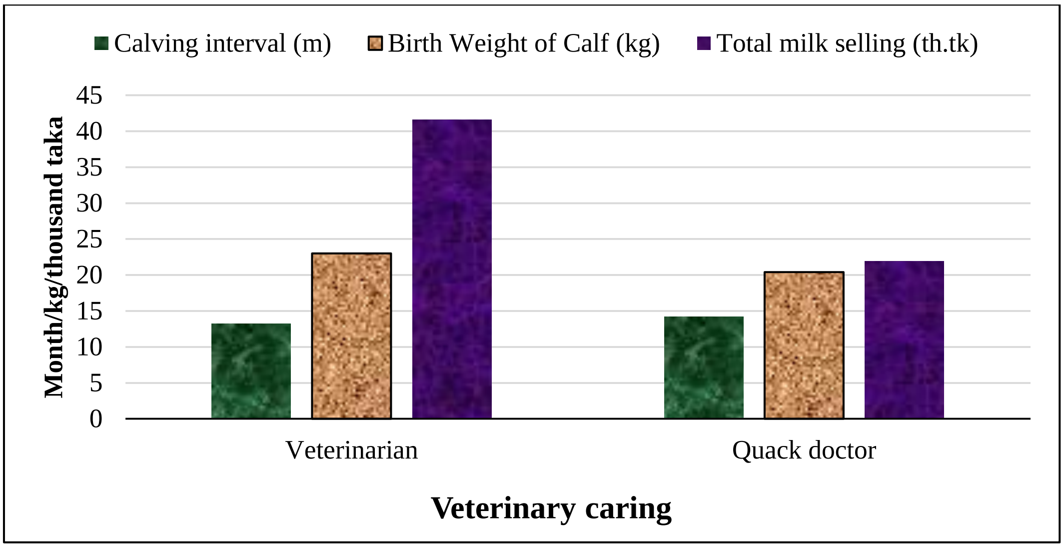

Fig. 48: Veterinary caring effect on calving interval, total milk selling and total lactation yield

Table-46: Effect of breeding method on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Breeding method			Sig. level
	Artificial Insemination	Natural	Total	
Age of puberty (m)	24.87±0.34[a] n=129	26.63±0.45[b] n=90	25.59±0.28 n=219	**
Age of 1st calving (m)	36.26±0.42[a] n=117	37.82±0.52[b] n=89	36.94±0.33 n=206	*
Post-partum heat period (d)	94.33±3.07 n=115	89.79±3.27 n=82	92.44±2.25 n=197	NS
Service per Conception	1.28±0.04 n=129	1.28±0.05 n=90	1.28±0.03 n=219	NS
Gestation length (d)	280.94±0.29 n=117	280.62±0.35 n=89	280.80±0.22 n=206	NS
Calving interval (m)	13.50±0.22 n=76	13.76±0.25 n=42	13.59±0.16 n=118	NS
Birth Weight of Calf (kg)	23.03±0.41 n=117	20.02±0.35 n=89	21.73±0.30 n=206	NS
Milk yield/d/cow (l)	4.85±0.28[b] n=115	2.10±0.08[a] n=89	3.65±0.19 n=204	***
lactation length (d)	207.65±6.10[b] n=115	169.38±7.05[a] n=89	190.96±4.79 n=204	***
Total lactation yield (l)	974.61±62.45[b] n=115	364.30±21.89[a] n=89	708.35±42.15 n=204	***
Total milk selling (th.tk)	43.93±2.92[b] n=115	15.99±0.95[a] n=89	31.74±1.95 n=204	***

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-47: t-test for breeding method on productive and reproductive parameters

Dependent Variables	t-value	df	P-value	Mean difference	Std. Error difference
Age of puberty (m)	-3.204	217	.002	-1.765	.551
Age of 1st calving (m)	-2.356	204	.019	-1.555	.660
Post-partum heat period (d)	.993	195	.322	4.538	4.568
Service per Conception	.020	217	.984	.001	.066
Gestation length (d)	.716	204	.475	.322	.450
Calving interval (m)	-.764	116	.446	-.262	.343
Birth Weight of Calf (kg)	5.380	204	.000	3.012	.560
Milk yield/d/cow (l)	8.392	202	.000	2.75105	.32781
lactation length (d)	8.218	202	.000	3.46341	.42143
Total lactation yield (l)	4.112	202	.000	38.270	9.307

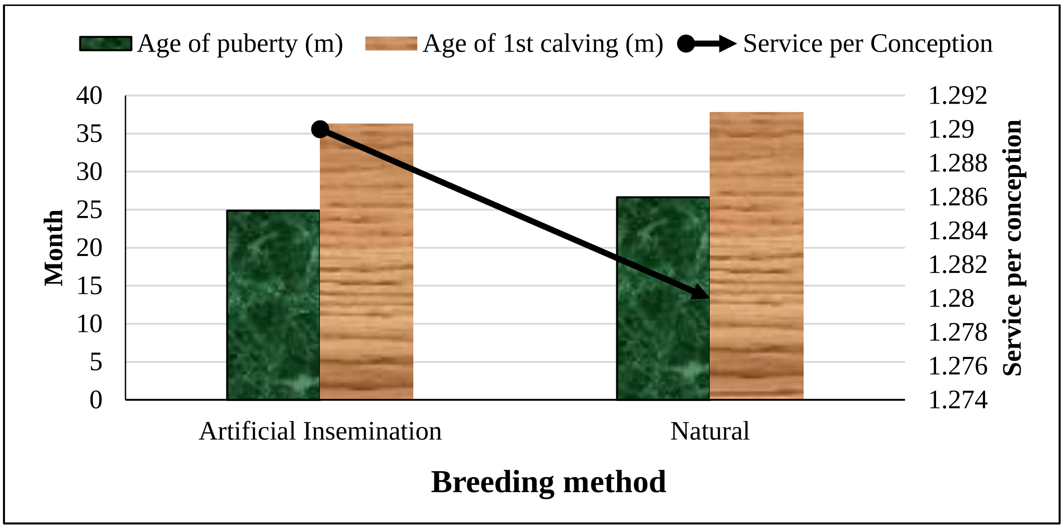

Fig. 49: Breeding method effect on age of puberty, age of 1st calving and service per conception

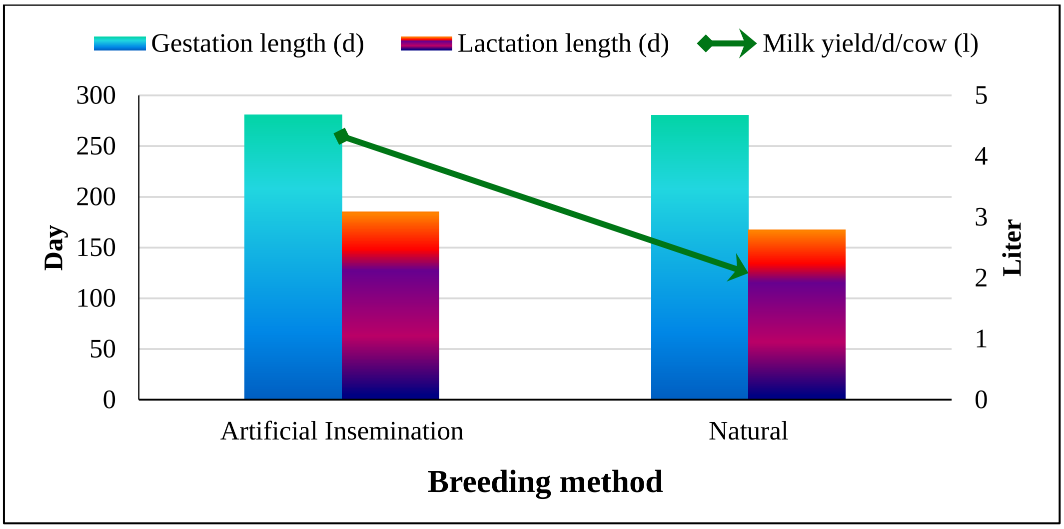

Fig. 50: Breeding method effect on gestation length, lactation length and milk yield per day per cow

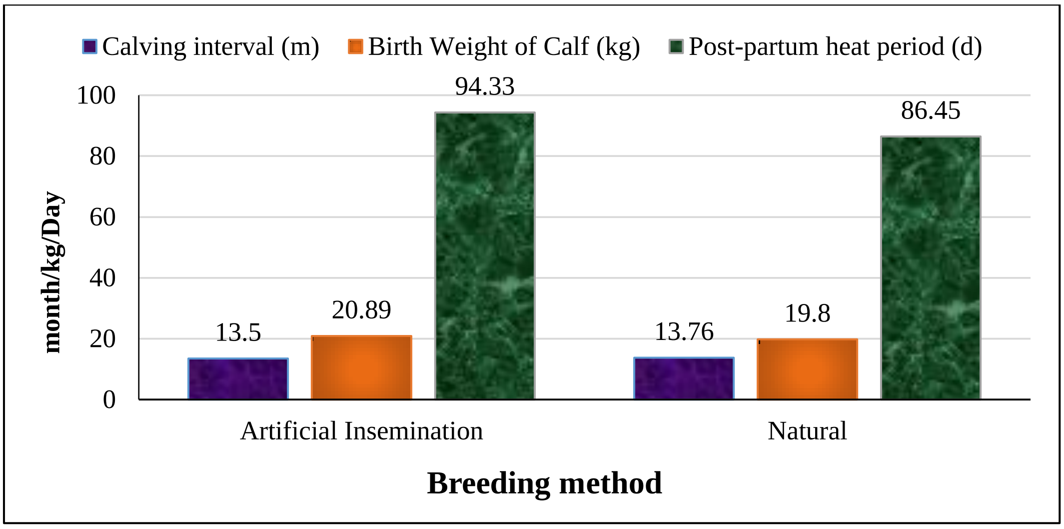

Fig. 51: Breeding method effect on calving interval, total milk selling and total lactation yield

Table-48: Effect of social status of farmers on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Social status of farmers			Sig. level
	Ultra poor	Marginal	Total	
Age of puberty (m)	25.87±.51b n=53	25.51±.32 n=166	25.59±.27 n=219	NS
Age of 1st calving (m)	37.15±.67 n=47	36.87±.37 n=159	36.94±.33 n=206	NS
Post-partum heat period (d)	91.38±4.79 n=42	92.73±2.55 n=155	92.44±2.25 n=197	NS
Service per Conception	1.34±.066 n=53	1.26±.037 n=166	1.28±.032 n=219	NS
Gestation length (d)	280.53±.48 n=47	280.88±.25 n=159	280.80±.22 n=206	NS
Calving interval (m)	14.17±.51 n=18	13.49±.168 n=100	13.59±.164 n=118	NS
Birth Weight of Calf (kg)	20.09±.57[a] n=47	22.22±.33[b] n=159	21.73±29 n=206	**
Milk yield/d/cow (l)	2.75±.30[a] n=47	3.92±.22[b] n=157	3.65±.18 n=204	**
Lactation length (d)	158.94±10.07[a] n=47	200.54±5.22[b] n=157	190.96±4.79 n=204	***
Total lactation yield (l)	440.74±57.19[a] n=47	788.46±50.36[b] n=157	708.35±42.15 n=204	***
Total milk selling (th.tk)	19.86±2.86 n=47	35.29±2.31 n=157	31.73±1.95 n=204	***

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-49: t-test for social status of farmers on productive and reproductive parameters

Dependent Variables	t-value	df	P-value	Mean difference	Std. Error difference
Age of puberty (m)	.559	217	.577	.362	.647
Age of 1st calving (m)	.348	204	.728	.275	.789
Post-partum heat period (d)	-.245	195	.807	-1.348	5.511
Service per Conception	1.067	217	.287	.081	.076
Gestation length (d)	-.656	204	.512	-.349	.531
Calving interval (m)	1.493	116	.138	.677	.453
Birth Weight of Calf (kg)	-3.094	204	.002	-2.135	.690
Milk yield/d/cow (l)	-2.643	202	.009	-1.16506	.44080
Lactation length (d)	-3.772	202	.000	-41.605	11.029
Total lactation yield (l)	-3.573	202	.000	-347.711	97.319
Total milk selling (th.tk)	-3.412	202	.001	-15.4308	4.5222

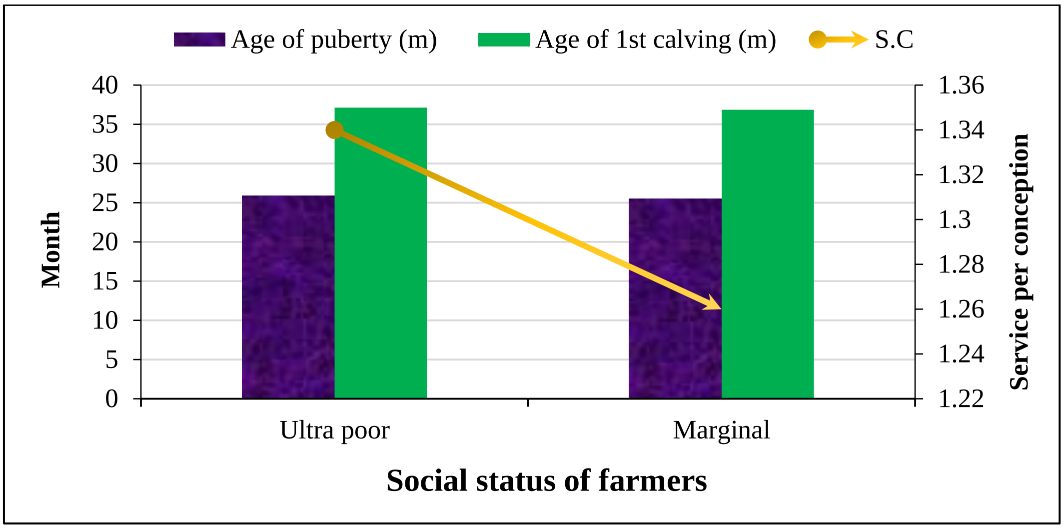

Fig. 52: Social status effect on age of puberty, age of 1st calving and service per conception

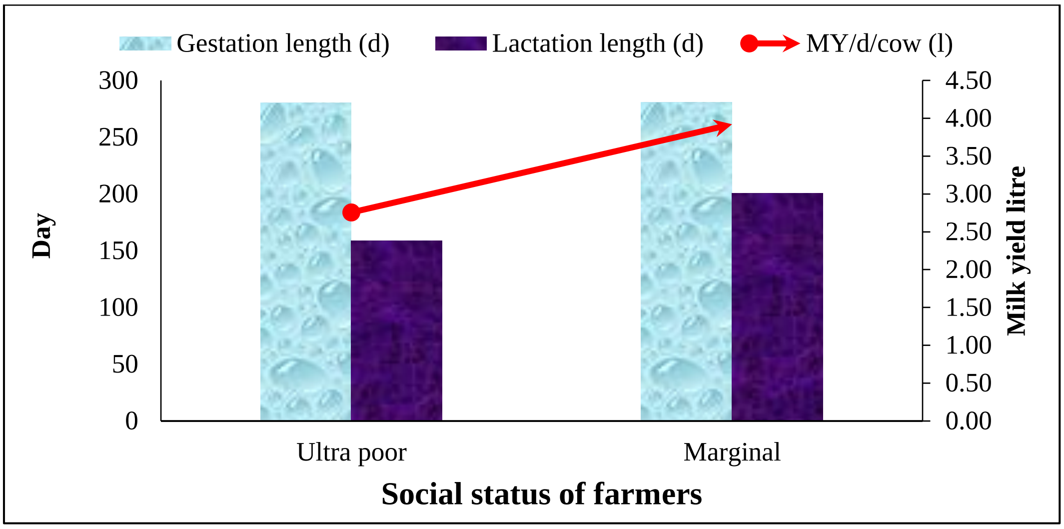

Fig. 53: Social status effect on gestation length, lactation length and milk yield per day per cow

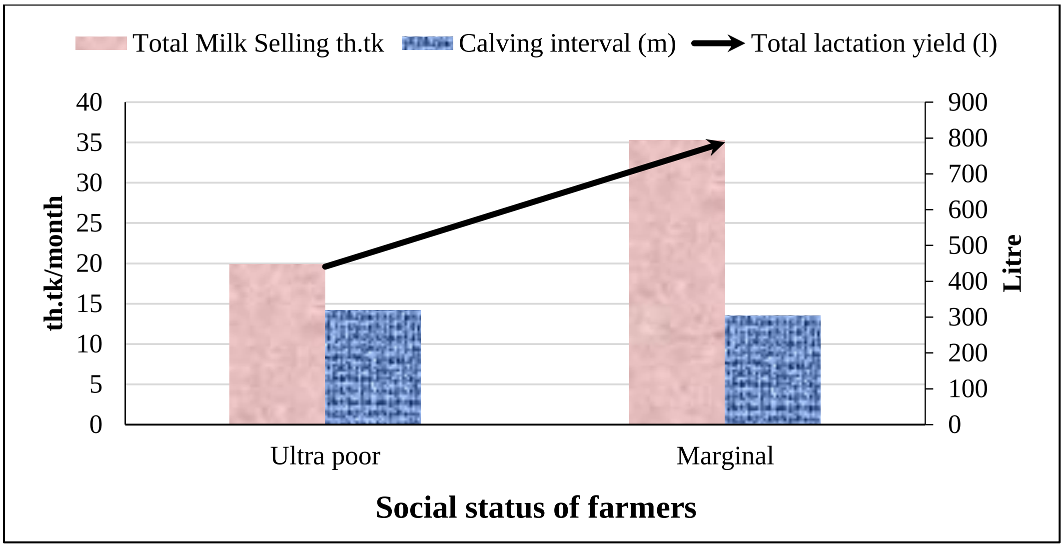

Fig. 54: Social status effect on calving interval, total milk selling and total lactation yield

5.3.16 Effects of economic status (income per month) of farmers

Effects of economic status of farmers and ANOVA on productive and reproductive performances are presented in Table- 50-51 and Fig. 55-57. In Table-50 the lowest mean value of Post-partum heat period was in >5000 to 10000 taka (85.0±3.2 month) and highest was in >10000 taka (101.9±4.3 month). The highest value of birth weight of calf was in > 5000 to 10000 taka (21.9±0.5) and lowest value was in = or < 5000 taka (16.9±1.1). The highest value of milk yield/d/cow, lactation length, total lactation yield and total milk selling was 3.8±0.5, 201.5±12.5, 805.2±87.6 and 36.63±3.81 respectively in >10000 taka and lowest values 2.1±0.2, 152.0±12.6, 355.8±38.6 and 14.97±1.62 were observed respectively in or <5000 taka. Birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the economic status (income per month) of farmers whereas age of puberty, age of 1st calving, service per conception, gestation length and calving interval were not significantly (P>0.05) influenced by the economic status (income per month) of farmers. Post-partum heat period and lactation length were influenced by the economic status (income per month) of farmers significantly (P<0.01).

5.3.17 Effects of educational status of farmers

Effects of educational status of farmers and ANOVA on productive and reproductive performances are summarized in Table- 52-53 and Fig. 58-60. In Table-52 the highest value of lactation length, total lactation yield and total milk selling was 226.9±10.9 day 978.3±118.7 liter and 41.7±4.9 thousand taka respectively in HSC & above group of educational status of farmers and lowest values 169.3±9.3 day in none, 590.5±42.5 liter and 27.0±2.0 thousand taka were observed respectively in primary group of educational status of farmers. lactation length and total lactation yield were significantly (P<0.01) influenced by the educational status of farmers whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf and milk yield/d/cow were not significantly (P>0.05) influenced by the educational status of farmers, but average mean values of others parameters of the cows were nearest to the best performances values HSC & above group of educational status of farmers . Total milk selling was influenced by the educational status of farmers significantly (P<0.05).

5.3.18 Effects of occupational of farmers

Effects of occupational of farmers and ANOVA on productive and reproductive performances are shown in Table- 54-55 and Fig. 61-63. In Table-54 the highest value of lactation length was in service holder (261.00±22.82 day) and lowest value was in others (178.33±14.841 day). lactation length were significantly (P<0.01) influenced by the occupation of farmers. Age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were not significantly (P>0.05) influenced by the occupation of farmers. Though the average mean value of daily milk yield had no significant variation, yet highest value of daily milk yield (4.28±0.86 liter) was observed in others group of occupation of farmers and lowest was (3.51±0.36 liter) in business group of occupation of farmers. Similarly average lowest mean value of age of puberty and age of 1st calving were 24.45±0.76 and 35.44±0.79 month respectively in others group of occupation of farmers and highest were 26.77±0.86 and 37.80±0.92 month respectively in service holder group of occupation of farmers.

5.3.19 Effects of land owned by farmers

Effects of land owned by farmers and ANOVA on productive and reproductive performances are shown in Table- 56-57 and Fig. 64-66. In Table-56 the lowest mean value of calving interval was (13.3±0.2 month) in >33 decimals group of land owned by farmers and highest was (15.0±0.6 month) in <5 decimals group of land owned by farmers. The highest value of total lactation yield and total milk selling were 808.5±61.1 liter and 35.8±2.8 thousand taka respectively in >33 decimals group of land owned by farmers and lowest values 465.0±61.9 liter and 22.5±3.1 thousand taka were observed respectively in <5 decimals group of land owned by farmers . Calving interval and total lactation yield were significantly (P<0.01) influenced by the land owned by farmers. Age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, birth weight of calf, milk yield/d/cow and lactation length were not significantly (P>0.05) influenced by the land owned by farmers. Though the average mean value of daily milk yield had no significant variation, yet highest value of daily milk yield (4.0±0.3 liter) was observed in in >33 decimals group of land owned by farmers and lowest was (2.8±0.3 liter) in <5 decimals group of land owned by farmers. Similarly average lowest mean value age of 1st calving and post-partum heat period were 36.8±0.5 month and 89.2±2.7 day respectively in >33 decimals group of land owned by farmers and highest were 37.2±0.6 month and 97.7±4.8 day respectively in 5-33 decimals group of land owned by farmers. Total milk selling were influenced by the land owned by farmers significantly (P<0.05).

5.3.20 Effects of sex of farmers

Effects of sex of farmers and t-test on productive and reproductive performances are shown in Table- 58-59 and Fig. 67-69. In Table-58 the lowest mean value of service per conception was (1.2.±0.0) in female and highest was (1.3±0.0) in male which was significantly (P<0.05) influenced by the sex of farmers. Whereas age of puberty, age of 1st calving, post-partum heat period, gestation length, calving interval, birth weight of calf, milk yield/d/cow, lactation length, total lactation yield and total milk selling were not significantly (P>0.05) influenced by the sex of farmers. Though the average mean value of daily milk yield had no significant variation, yet highest value of daily milk yield (3.7±0.2 liter) was observed in male farmers and lowest was (3.4±0.4 liter) in female farmers. Similarly average lowest mean value of age of puberty, age of 1st calving, post-partum heat period, gestation length and calving interval were 25.5±0.4 month, 36.7±0.6 month, 90.1±4.8 day, 280.4±0.4 day and 13.4±0.3 month respectively in female farmers and highest were 25.6±0.3 month, 37.0±0.4 month, 93.3±2.6 day, 280.9±0.3 day and 13.5±0.2 month, respectively in male farmers.

Table-50: Effect of economic status of farmers on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Economic status (income per month) of farmers				Sig. level
	= or < 5000 taka	> 5000 to 10000 taka	>10000 taka	Total	
Age of puberty (m)	25.4±0.5 n=46	25.8±0.3 n=120	25.4±0.7 n=53	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.1±0.6 n=40	37.0±0.4 n=117	37.4±0.8 n=49	36.9±0.3 n=206	NS
Post-partum heat period (d)	94.7±5.3[ab] n=38	85.0±3.2[a] n=113	101.9±4.3[b] n=49	91.0±2.4 n=200	**
Service per Conception	1.2±0.1 n=46	1.3±0.0 n=120	1.3±0.1 n=53	1.3±0.0 n=219	NS
Gestation length (d)	280.6±0.5 n=40	280.9±0.3 n=117	280.6±0.5 n=49	280.8±0.2 n=206	NS
Calving interval (m)	14.2±0.5 n=20	13.5±0.2 n=66	13.4±0.3 n=32	13.6±0.2 n=118	NS
Birth weight of calf (kg)	16.9±1.1[a] n=46	21.9±0.5[b] n=120	20.1±1.0[b] n=53	20.4±0.4 n=219	***
Milk yield/d/cow (l)	2.1±0.2[a] n=46	3.7±0.2[b] n=120	3.8±0.5[b] n=53	3.4±0.2 n=219	***
lactation length (d)	152.0±12.6[a] n=46	177.4±6.7[ab] n=120	201.5±12.5[b] n=53	177.9±5.5 n=219	**
Total lactation yield (l)	355.8±38.6[a] n=46	712.2±59.6[b] n=120	805.2±87.6[b] n=53	659.8±41.1 n=219	***
Total milk selling (th.tk)	14.97±1.62[a] n=46	32.03±2.81.2[b] n=120	36.63±3.81[b] n=53	29.56±1.89 n=219	***

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, ** = Significant at 1% levels, *** = Significant at 0.1% levels and NS=Non-significant.

Table-51: Analysis of variance for economic status of farmers on productive and reproductive parameters

Dependent Variables	Sum of squares	df	Mean Square	F-value	P-value
Age of puberty (m)	8.0	2	4.0	.236	.790
Age of 1st calving (m)	39.7	2	19.8	.880	.416
Post-partum heat period (d)	10470.9	2	5235.5	4.861	.009
Service per Conception	0.3	2	0.1	.552	.577
Gestation length (d)	5.3	2	2.6	.255	.775
Calving interval (m)	7.7	2	3.9	1.224	.298
Birth Weight of Calf (kg)	848.5	2	424.2	10.634	.000
Milk yield/d/cow (l)	100.9	2	50.4	7.009	.001
lactation length (d)	60536.4	2	30268.2	4.669	.010
Total lactation yield (l)	5701871.3	2	2850935.7	8.223	.000
Total milk selling (th.tk)	1317.187	2	6585.939	8.950	.000

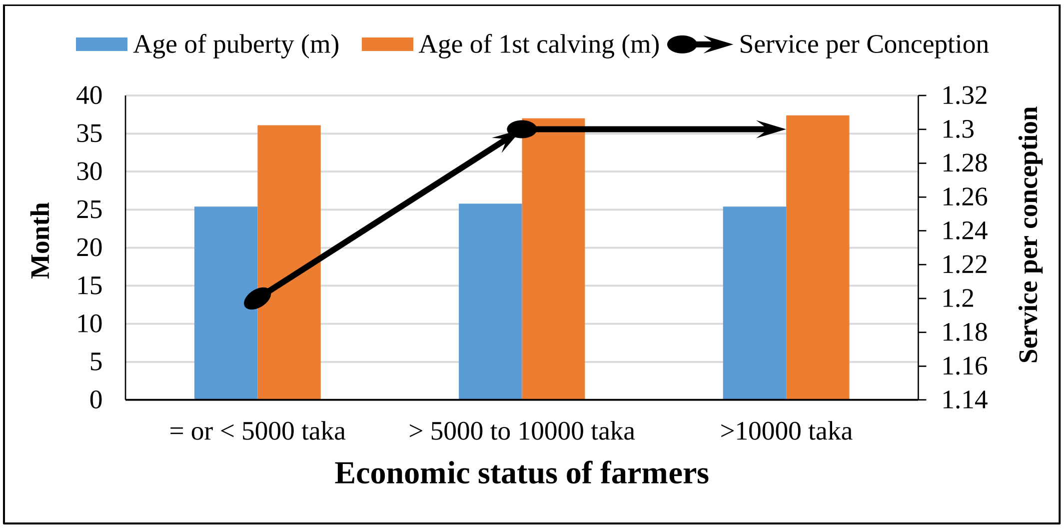

Fig. 55: Economic status effect on age of puberty, age of 1st calving and service per conception

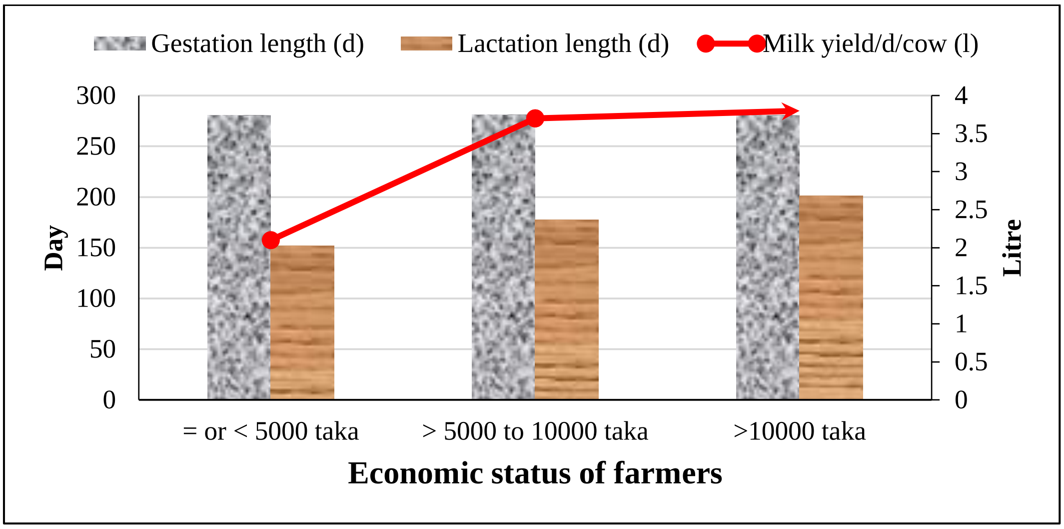

Fig. 56: Economic status effect on gestation length, lactation length and milk yield per day per cow

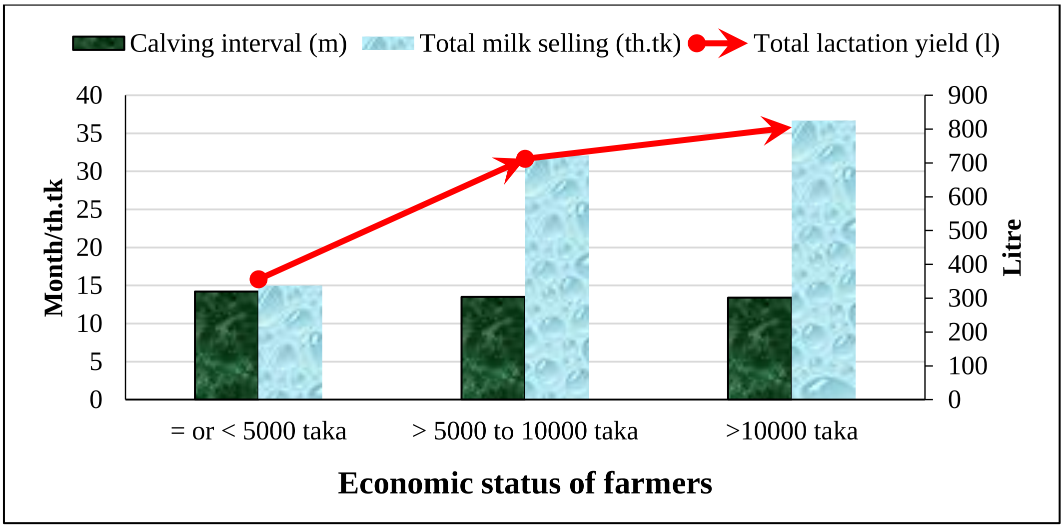

Fig. 57: Economic status effect on calving interval, total milk selling and total lactation yield

Table-52: Effect of educational status of farmers on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Educational Status of Farmers					Sig. level
	None	Primary	Secondary	HSC & above	Total	
Age of puberty (m)	25.1±0.6 n=46	25.6±0.4 n=99	26.1±0.7 n=39	25.7+0.7 n=35	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.0±0.6 n=46	37.3±0.5 n=99	37.4±0.8 n=39	36.6±0.8 n=35	36.9±0.3 n=219	NS
Post-partum heat period (d)	86.5±5.0 n=46	95.3±3.8 n=99	92.3±4.1 n=39	92.3±4.3 n=35	92.4±2.3 n=219	NS
Service per Conception	1.3±0.1 n=46	1.3±0.0 n=99	1.3±0.1 n=39	1.2±0.1 n=35	1.3±0.0 n=219	NS
Gestation length (d)	281.4±0.5 n=46	280.5±0.3 n=99	280.9±0.5 n=39	280.9±0.7 n=35	280.8±0.2 n=219	NS
Calving interval (m)	13.3±0.3 n=46	13.7±0.2 n=99	13.8±0.4 n=39	13.4±0.4 n=35	13.6±0.2 n=219	NS
Birth Weight of Calf (kg)	22.2±0.6 n=46	21.8±0.4 n=99	20.8±0.7 n=39	22.1±0.8 n=35	21.7±0.3 n=219	NS
Milk yield/d/cow (l)	4.3±0.5 n=46	3.2±0.2 n=99	3.6±0.5 n=39	4.2±0.5 n=35	3.7±0.2 n=219	NS
Lactation length (d)	$169.3±9.3^{a}$ n=46	$187.3±7.0^{a}$ n=99	$194.1±12.4^{a}$ n=39	$226.9±10.9^{b}$ n=35	191.0±4.8 n=219	**
Total lactation yield (l)	$767.1±129.3^{ab}$ n=46	$590.5±42.5^{a}$ n=99	$710.8±95.8^{a}$ n=39	$978.3±118.7^{b}$ n=35	708.3±42.2 n=219	**
Total milk selling (th.tk)	$35.6±6.4^{ab}$ n=46	$27.0±2.0^{a}$ n=99	$30.8±4.3^{ab}$ n=39	$41.7±4.9^{b}$ n=35	31.7±2.0 n=219	*

Values are mean ±S.E. ^{ab} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, and NS=Non-significant.

Table-53: Analysis of Variance for Effect of Education of Farmers on productive and reproductive parameters

Dependent variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	21.776	3	7.259	.429	.732
Age of 1st calving (m)	56.748	3	18.916	.838	.474
Post-partum heat period (d)	2330.342	3	776.781	.775	.509
Service per Conception	.441	3	.147	.637	.592
Gestation length (d)	26.494	3	8.831	.863	.461
Calving interval (m)	4.087	3	1.362	.424	.736
Birth Weight of Calf (kg)	44.607	3	14.869	.824	.482
Milk yield/d/cow (l)	43.743	3	14.581	2.046	.109
Lactation length (d)	62659.825	3	20886.608	4.701	.003
Total lactation yield (l)	3795826.947	3	1265275.649	3.627	.014
Total milk selling (th.tk)	5929.302	3	1976.434	2.599	.053

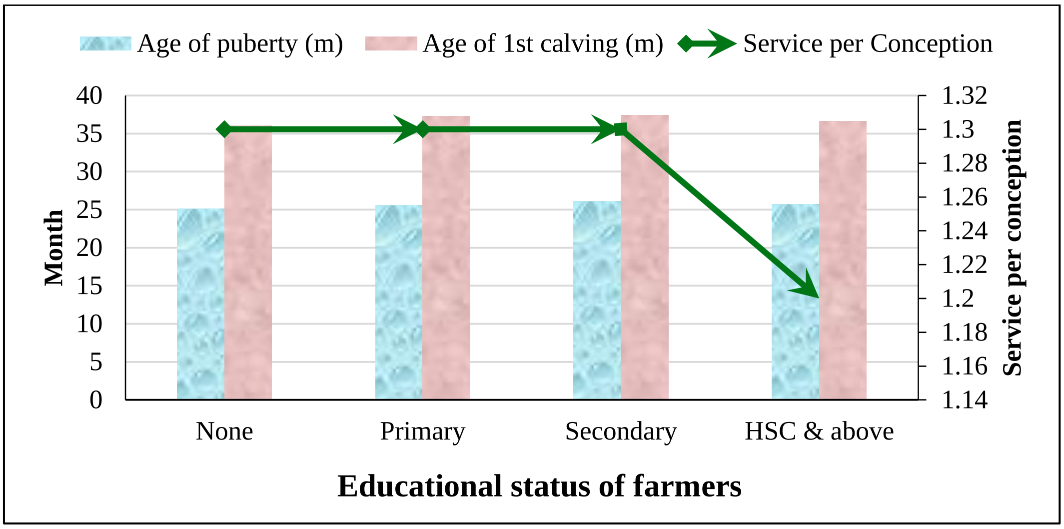

Fig. 58: Educational status effect on age of puberty, age of 1st calving and service per conception

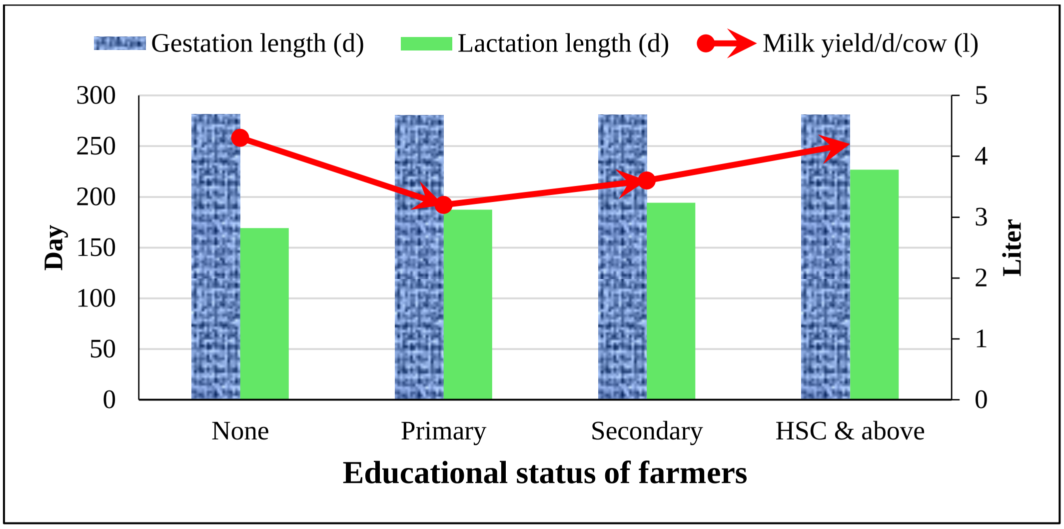

Fig. 59: Educational status effect on gestation length, lactation length and milk yield per day per cow

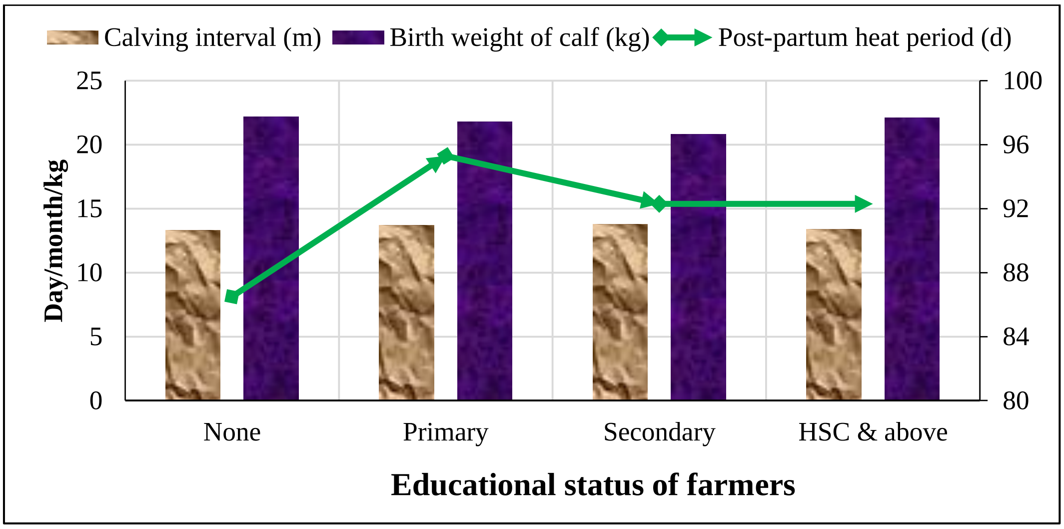

Fig. 60: Educational status effect on calving interval, birth weight of calf and post-partum heat period

Table-54: Influence of occupation of farmers on productive and reproductive parameters in dairy cow

Productive & reproductive parameters	Occupation of farmers					Sig. level
	Agriculture	Business	Service holder	Others	Total	
Age of puberty (m)	25.43±0.34 n=148	26.45±0.71 n=38	26.77±0.86 n=13	24.45±0.76 n=20	25.59±0.27 n=219	NS
Age of 1st calving (m)	36.91±0.42 n=148	37.54±0.76 n=38	37.80±0.92 n=13	35.44±0.79 n=20	36.94±0.33 n=219	NS
Post-partum heat period (d)	93.08±2.75 n=148	96.86±4.77 n=38	88.50±9.61 n=13	80.59±8.455 n=20	92.44±2.25 n=219	NS
Service per Conception	1.31±0.04 n=148	1.26±0.07 n=38	1.08±0.07 n=13	1.20±0.09 n=20	1.28±0.03 n=219	NS
Gestation length (d)	280.85±0.27 n=148	280.68±0.48 n=38	280.50±1.17 n=13	280.83±0.73 n=20	280.80±0.22 n=219	NS
Calving interval (m)	13.49±0.19 n=148	14.14±0.37 n=38	12.83±0.54 n=13	13.14±0.59 n=20	13.59±0.16 n=219	NS
Birth Weight of Calf (kg)	21.60±0.37 n=148	22.35±0.59 n=38	21.90±1.449 n=13	21.39±0.82 n=20	21.73±0.29 n=219	NS
Milk yield/d/cow (l)	3.61±0.23 n=148	3.5135±0.36 n=38	3.55±0.40 n=13	4.28±0.86 n=20	3.6520±0.18 n=219	NS
Lactation length (d)	188.42±5.66^{a} n=148	187.70±11.23^{a} n=38	261.00±22.82^{b} n=13	178.33±14.84^{a} n=20	190.96±4.79 n=219	**
Total lactation yield (l)	685.68±48.09 n=148	671.15±79.88 n=38	928.50±122.27 n=13	837.50±245.65 n=20	708.35±42.15 n=219	NS
Total milk selling (th.tk)	30.68±2.1775 n=148	30.09±3.51 n=38	37.50±4.72 n=13	40.04±12.32 n=20	31.739±1.95 n=219	NS

Values are mean ±S.E. ^{ab} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, ** = Significant at 1% levels, and NS=Non-significant.

Table-55: Analysis of Variance for occupation of farmers on productive and reproductive parameters

Dependent variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	75.996	3	25.332	1.521	.210
Age of 1st calving (m)	61.145	3	20.382	.904	.440
Post-partum heat period (d)	3281.572	3	1093.857	1.097	.352
Service per Conception	.815	3	.272	1.187	.316
Gestation length (d)	1.859	3	.620	.060	.981
Calving interval (m)	14.349	3	4.783	1.531	.210
Birth Weight of Calf (kg)	18.946	3	6.315	.347	.791
Milk yield/d/cow (l)	8.052	3	2.684	.367	.777
Lactation length (d)	53217.075	3	17739.025	3.950	.009
Total lactation yield (l)	907515.382	3	302505.127	.833	.477
Total milk selling (th.tk)	1825.549	3	608.516	.779	.507

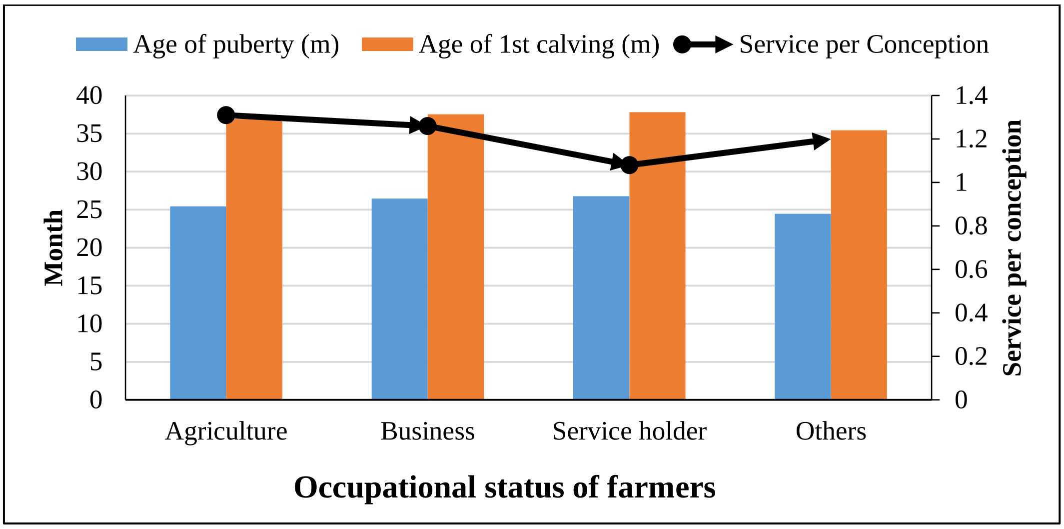

Fig. 61: Occupational status effect on age of puberty, age of 1st calving and service per conception

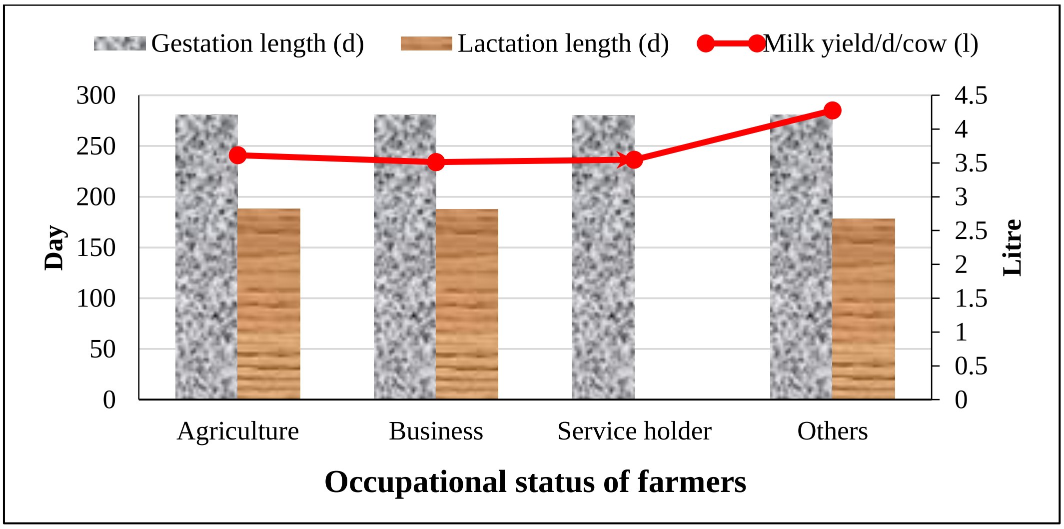

Fig. 62: Occupational status effect on gestation length, lactation length and milk yield per day per cow

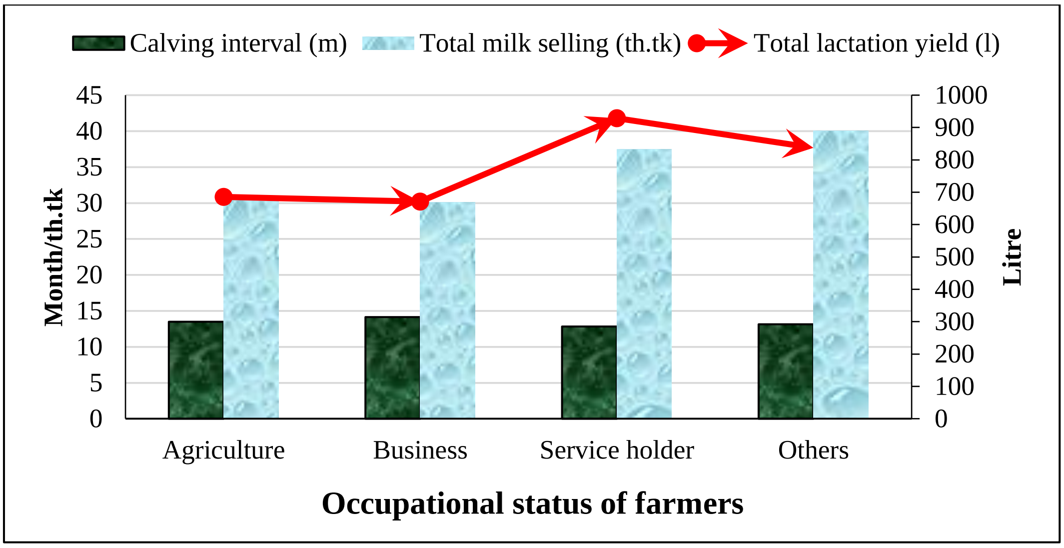

Fig. 63: Occupational status effect on calving interval, total milk selling and total lactation yield

Table-56: Effect of land owned by farmers on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Land owned by farmers				Sig. level
	< 5 decimals	5 - 33 decimals	> 33 decimals	Total	
Age of puberty (m)	24.9±0.6 n=28	26.2±0.5 n=64	25.4±0.4 n=127	25.6±0.3 n=219	NS
Age of 1st calving (m)	36.9±0.9 n=27	37.2±0.6 n=57	36.8±0.5 n=122	36.9±0.3 n=206	NS
Post-partum heat period (d)	97.6±6.9 n=25	97.5±4.8 n=51	89.2±2.7 n=121	92.4±2.3 n=197	NS
Service per Conception	1.3±0.1 n=28	1.2±0.1 n=64	1.3±0.0 n=127	1.3±0.0 n=219	NS
Gestation length (d)	280.9±0.6 n=27	280.6±0.4 n=57	280.9±0.3 n=122	280.8±0.2 n=206	NS
Calving interval (m)	15.0±0.6[b] n=12	13.7±0.3[a] n=29	13.3±0.2[a] n=77	13.6±0.2 n=118	**
Birth Weight of Calf (kg)	21.1±0.7 n=27	20.9±0.6 n=57	22.2±0.4 n=122	21.7±0.3 n=206	NS
Milk yield/d/cow (l)	2.8±0.3 n=27	3.4±0.3 n=57	4.0±0.3 n=120	3.7±0.2 n=204	NS
Lactation length (d)	167.8±15.1 n=27	183.4±10.6 n=57	199.8±5.3 n=120	191.0±4.8 n=204	NS
Total lactation yield (l)	465.0±61.9[a] n=27	612.8±66.8[ab] n=57	808.5±61.1[b] n=120	708.3±42.2 n=204	**
Total milk selling (th.tk)	22.5±3.1[a] n=27	27.5±3.2[ab] n=57	35.8±2.8[b] n=120	31.7±2.0 n=204	*

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, ** = Significant at 1% levels, and NS=Non-significant.

Table-57: Analysis of variance for land owned by farmers on productive and reproductive parameters

Dependent Variables	Sum of Squares	df	Mean Square	F-value	P-value
Age of puberty (m)	43.158	2	21.579	1.290	.277
Age of 1st calving (m)	4.486	2	2.243	.099	.906
Post-partum heat period (d)	3248.976	2	1624.488	1.637	.197
Service per Conception	.197	2	.099	.427	.653
Gestation length (d)	2.848	2	1.424	.138	.871
Calving interval (m)	29.047	2	14.523	4.892	.009
Birth Weight of Calf (kg)	78.999	2	39.499	2.220	.111
Milk yield/d/cow (l)	34.878	2	17.439	2.445	.089
Lactation length (d)	27021.54	2	13510.77	2.938	.055
Total lactation yield (l)	3323321.83	2	1661660.91	4.754	.010
Total milk selling (th.tk)	5348.027	2	2674.013	3.520	.031

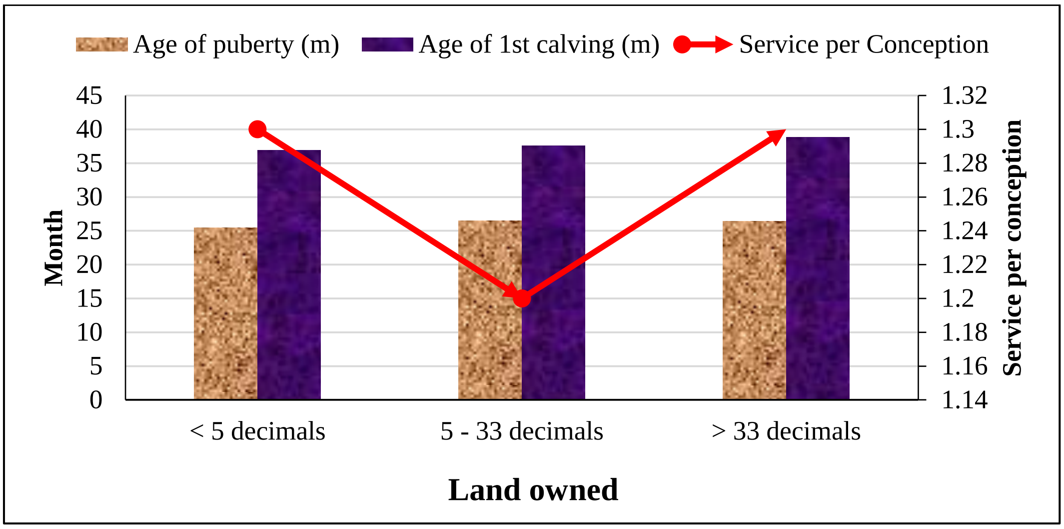

Fig. 64: Land owning effect on age of puberty, age of 1st calving and service per conception

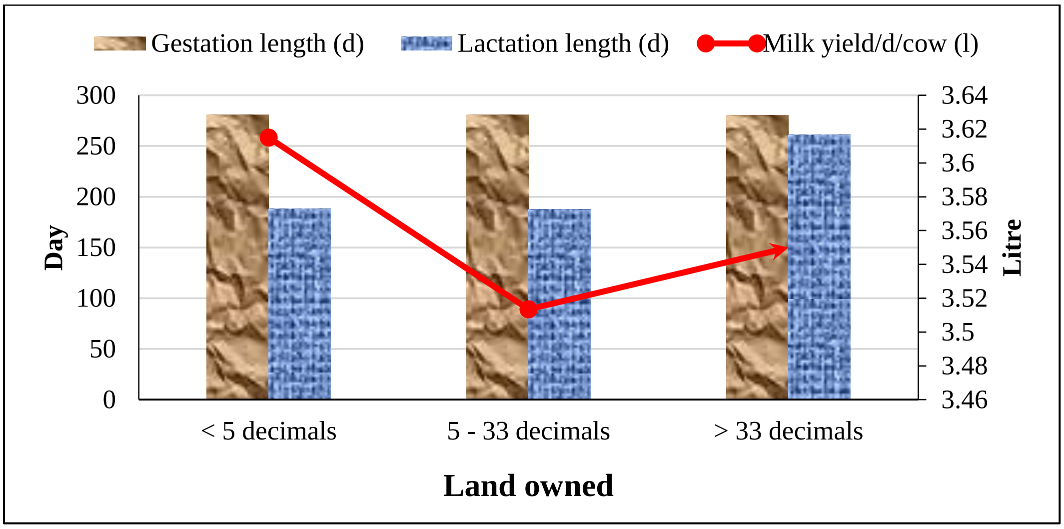

Fig. 65: Land owning effect on gestation length, lactation length and milk yield per day per cow

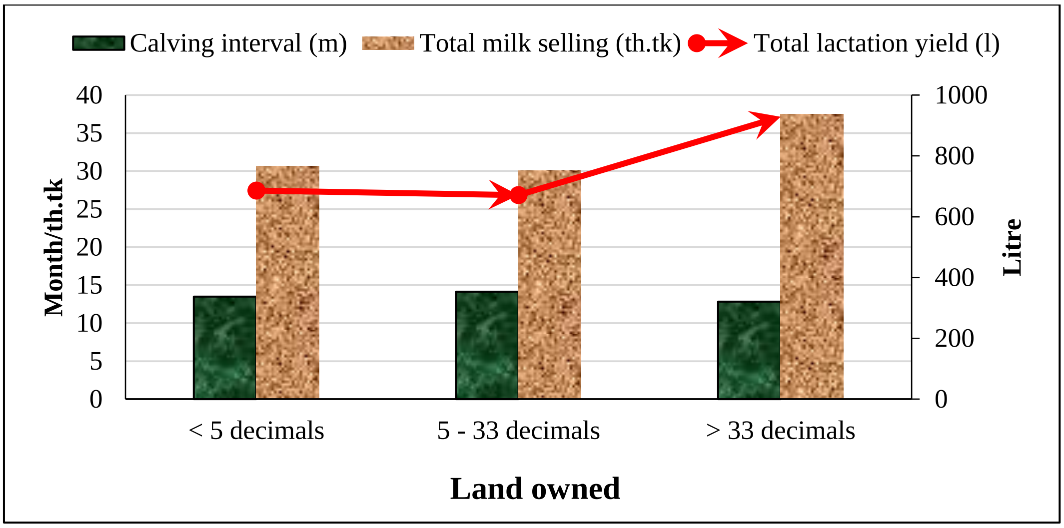

Fig. 66: Land owning effect on calving interval, total milk selling and total lactation yield

Table-58: Effect of sex of farmers on productive and reproductive parameters in dairy cows

Productive & reproductive parameters	Sex of farmers			Sig. level
	Male	Female	Total	
Age of puberty (m)	25.6±0.3 n=156	25.5±0.4 n=63	25.6±0.3 n=219	NS
Age of 1st calving (m)	37.0±0.4 n=148	36.7±0.6 n=58	36.9±0.3 n=206	NS
Post-partum heat period (d)	93.3±2.6[b] n=146	90.1±4.8[a] n=51	92.4±2.3 n=197	NS
Service per Conception	1.3±0.0 n=156	1.2±0.0 n=63	1.3±0.0 n=219	*
Gestation length (d)	280.9±0.3 n=148	280.4±0.4 n=58	280.8±0.2 n=206	NS
Calving interval (m)	13.5±0.2 n=88	13.9±0.3 n=30	13.6±0.2 n=118	NS
Birth Weight of Calf (kg)	22.0±0.3 n=148	21.0±0.6 n=58	21.7±0.3 n=206	NS
Milk yield/d/cow (l)	3.7±0.2 n=146	3.4±0.4 n=58	3.7±0.2 n=204	NS
Lactation length (d)	194.1±5.5 n=146	183.1±9.7 n=58	191.0±4.8 n=204	NS
Total lactation yield (l)	734.6±45.3 n=146	642.2±94.8 n=58	708.3±42.2 n=204	NS
Total milk selling (th.tk)	32.3±2.0 n=146	30.3±4.8 n=58	31.7±2.0 n=204	NS

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation, m= month, d=day, kg= Kilogram, l= liter, * = Significant at 5% levels, and NS=Non-significant.

Table-59: t-test for sex of farmers on productive and reproductive parameters

Dependent Variables	t-value	df	P-value	mean difference	Std. Error difference
Age of puberty (m)	.124	217	.902	.076	.613
Age of 1st calving (m)	.467	204	.641	.344	.736
Post-partum heat period (d)	.614	195	.540	3.162	5.149
Service per Conception	2.056	217	.041	.146	.071
Gestation length (d)	1.040	204	.299	.515	.495
Calving interval (m)	-1.094	116	.276	-.411	.376
Birth Weight of Calf (kg)	1.521	204	.130	.996	.655
Milk yield/d/cow (l)	.796	202	.427	.33278	.41788
Lactation length (d)	1.033	202	.303	10.972	10.624
Total lactation yield (l)	.990	202	.323	92.485	93.446
Total milk selling (th.tk)	.476	202	.635	2.0655	4.3390

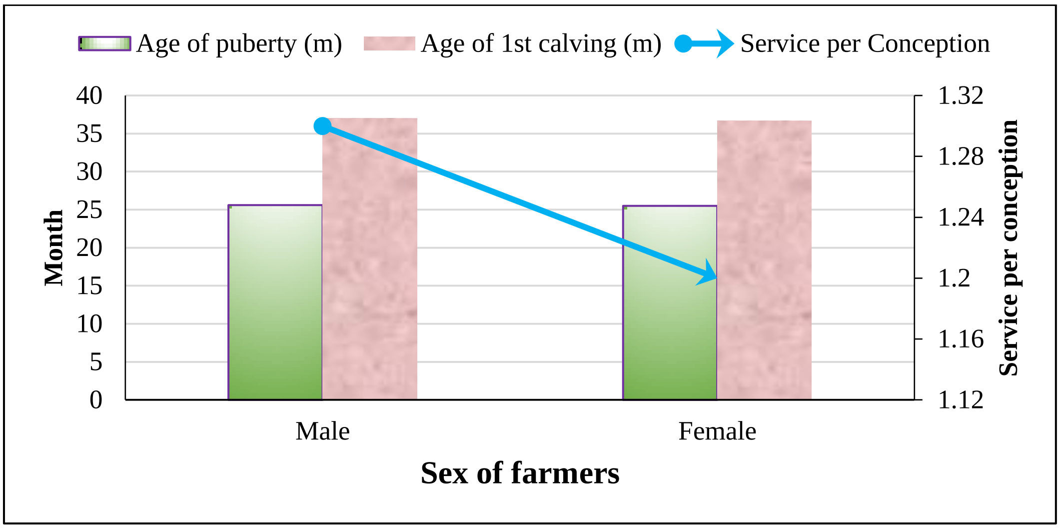

Fig. 67: Sex effect on age of puberty, age of 1st calving and service per conception

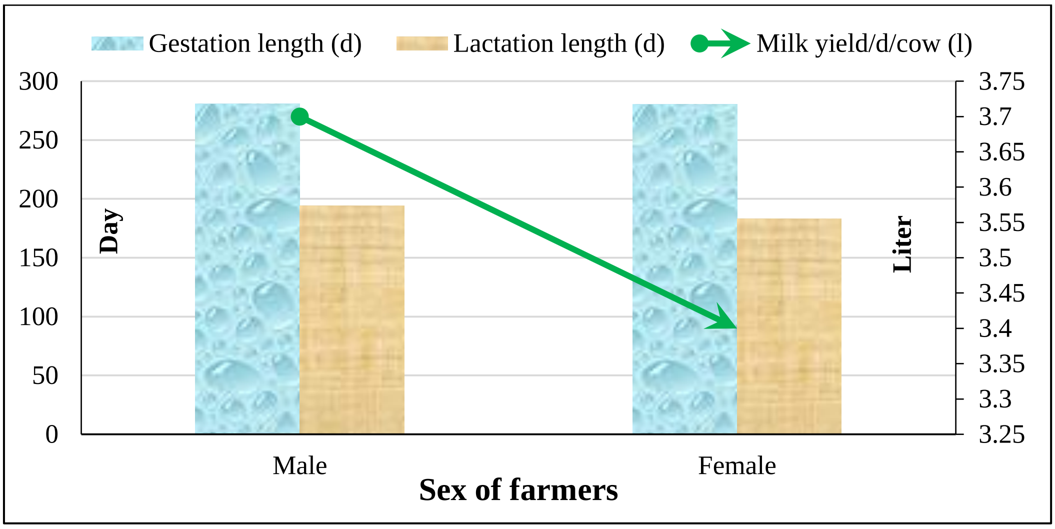

Fig. 68: Sex effect on gestation length, lactation length and milk yield per day per cow

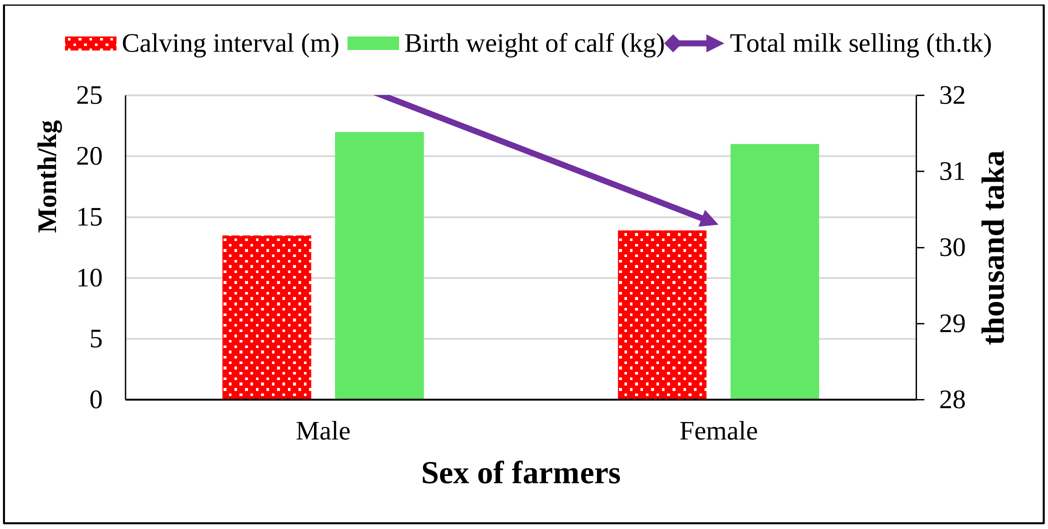

Fig. 69: Sex effect on calving interval, total milk selling and total lactation yield

5.4 DISCUSSION

Most of the influencing factors viz., breeds (genotypes), age of cow, parity, body weight, body condition of cow, feeding practices, roughages feeding, concentrate feed quality, housing pattern, overall housing system, overall ventilation system, breeding method, veterinary caring, socio-economic status, education, occupation, land owned by farmers and sex of farmers etc. were considered on productive and reproductive parameters viz., age of puberty, age of first calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf, milk yield per day, lactation length, total lactation yield and total milk selling. In total of 219 dairy cows under OHOFP in 9 Upazila of Rajshahi district were studied and followed up from July 2013 to June 2015. Our study and findings are discussed below.

5.4.1 Effects of breeds (genotypes)

Effects of breed (genotype) and ANOVA on productive and reproductive performances are presented in Table- 20-21 and Fig. 10-12.

In Table-20 age of puberty of Local × Friesian was significantly lower than that of Local, Local × Sahiwal and Local x Sindhi, while the differences between Local × Sahiwal and Local × Sindhi were not significant and same result was found within Local and Local × Jersey. Age of 1st calving was lowest (34.9±0.5 month) in Local × Friesian and highest (38.3±0.5 month) in Local, whereas that of Local × Sahiwal, Local × Jersey and Local × Sindhi showed no significant difference within the breed. Calving interval between Local and Local × Jersey showed no significant difference. It showed lowest in Local × Friesian & Local × Sindhi and highest in Local × Sahiwal but within Local × Friesian and Local × Sindhi no significance difference was found. Birth weight of calf was lowest (19.5±0.3 kg) in Local and higher in others breeds. Local × Friesian cows produced highest (5.9±0.4 liter) milk per day and Local cows produced lowest (2.0±0.1 liter) milk per day. Milk productions of other breeds (genotypes) Local × Sahiwal, Local × Jersey and Local × Sindhi were not significantly different among them because of carrying higher exotic blood. The longest lactation length (256.4±15.9 day) was in Local × Jersey and shortest in Local (186.3±7.6 day), whereas there were no significant difference among Local × Friesian, Local × Sahiwal and Local × Sindhi. It was due to that of breeds (genotypes) carrying higher exotic blood. Total lactation length and total milk selling were lowest in Local and highest in Local × Friesian whereas there were no significant difference among others breeds (genotypes). Age of puberty, age of 1st calving, birth weight of calf, daily milk yield per cow, total lactation yield and total milk selling were significantly (P<0.001) influenced strongly by the breeds (genotypes) whereas post-partum heat period, service per conception and gestation length were not significantly (P>0.05) influenced. Calving interval and lactation length were significantly (P<0.05) influenced by the breed. We observed that Local × Friesian breeds (genotypes) showed the highest performances and Local breeds showed the lowest performances. Local × Jersey, Local × Sahiwal and Local × Sindhi breeds showed the medium performances.

Islam *et al*. (2010) found that breeds (genotypes) had significant (P<0.05) effect on age at puberty, age at first service, age at first calving, service per conception, post partum heat period, wastage days, milk yield per day, milk yield per lactation, weaning period, dry period and birth weight of calf. These results were more or less similar to our study.

Many researchers studied the effect of breed on productive and reproductive performance: some results are similar to those of the present study. Rahman *et al*. (1995) found that the age at puberty, age at first calving, post-partum first service interval and calving to conception interval of local zebu cows were 47.3±0.6, 56.3±0.5, 12.1±0.5 and 12.6±0.4 months, respectively. Rokonuzzaman (2006) found the average milk yield of Holstein Friesian cross, Sahiwal cross, Sindhi cross and Indigenous dairy cows were 8.4±2.0, 4.6±1.0, 4.4±1.1 and 2.4±0.7 litres, respectively. The average ages at first calving were 34.1±3.8, 35.5±3.6 and 40.5±4.5 months, respectively. The average lactation lengths were 262±24.2, 250.4±28.1, 258.8±34.3 and 227.8±32.5 days, respectively. The average dry periods were 134.8±30.0, 134±27.3, 163±32.4 and 197.4±52.3 days, respectively. The average post-partum heat periods were 86.5±23.7, 94.0±38.1, 127.1±43.5 and 121.2±53.0 days, respectively. The average service per conception were 1.84±0.80, 1.32±0.48, 1.48±0.6 and 1.9±0.9, respectively. The average calving to first service was 98.3±26.3, 96.5±36.4, 131.2±41.1 and 124.4±55.4 days, respectively. The average calving intervals were 396±29.7, 385.2±39.7, 422.0±42.0 and 425.2±64.8 days, respectively. Bhuiyan *et al*., 2000 and Majid *et al*., 1995 found better productive and reproductive performances in Friesian crossbred cows than other breeds.

Sarder *et al*. (1997) reported that the average milk yield (litres/day) for Holstein-Friesian cross, Sahiwal cross and Local cows was 7.2±2.6, 5.8±2.2 and 4.0±1.5, respectively. Shamsuddin *et al*. (2001) found a shorter calving interval in Sahiwal crossbred cows than in crossbred Friesian and Local cows. The significant effect of genetic group on daily milk production was also found by Khan and Khatun (1998), Bhuiyan and Sultana (1994), Nahar *et al*. (1992) and Rahman *et al*. (1993). They found that performance of Friesian breed and its crosses with local cows were better than in all other genetic groups. Performance of Sahiwal and its cross-bred were observed to be poor. They showed that average age at first calving in pure-bred Friesian was lowest of 940.0±45.7 day; in SL it was the highest of 1679.0±154.3 days, whereas in local it was 1269.3±42.0 days. Ahmed and Islam (1987) found in Friesian cross local that body weight at birth was 23 kg; age of puberty 18-24 months; age at first calving 45 months; milk production per day 6.6 kg; lactation length 341 days, and calving interval 425 days. Corresponding values in Sahiwal/ Sahiwal crossbred cattle were 20kg, 18-22 months, 51 months, 3.5 kg, 312 days and 493 days. Sarder (2001) observed that the average age at first service and at first calving were 30.0±7.0 and 39.7±7.0 months, respectively. Khan *et al*. (1999) found significant (P<0.05) effects of genetic groups on lactation period, gestation length and age at first calving. Kumar *et al*. (1997) observed comparative performance of crossbred cows at different levels of exotic inheritance. Age at first calving, service period, calving interval, milk production had the best performance in two-breed crosses whereas 3-breed crosses had the worst (P<0.01). Syed *et al*. (1998) mentioned that breed type significantly affected lactation length and average daily milk yield; Sahiwal cows had the lowest (P<0.05) average daily yield (5 kg) among crossbreds, ranging from 6.4 to 7.5 kg. Dhara *et al*. (2006) observed significant (P<0.01) effects of genotype on age at calving and lactation length.

The average values of productive and reproductive parameters like gestation length, PPHP etc. considering the breeds (genotypes) of cows were similar with above authors but some parameters is excepted standard. Most of the factors are responsible for the variation of values of productive and reproductive performances of cows. The variation of results may be due to breed, sire, dam, nutrition, semen type, heat detection, disease prevalence, management and environmental factors.

5.4.2 Effects of age of cow

Effects of age of cow and ANOVA on productive and reproductive performances are shown in Table- 22-23 and Fig. 13-15.

From Table-22, post-partum heat period of cows was lowest (76.7±4.3 day) in = or <3 yr age group and highest (96.2±5.2 day) in >5 to <7 yr age group which was differed significantly (P<0.05). However, no significant difference was found among >3 to 5 yr, >5 to <7 yr and = or >7 yr age group. Service per conception, gestation length, calving interval, birth weight of calf and daily milk yield were not significantly (P>0.05) influenced by age of cow. But, average mean value of daily milk yield was highest in >5 to <7 yr age group. Highest value of lactation length was found in = or >7 yr (236.3±14.7 day) and lowest value was in in = or <3 yr (124.5±9.6 day). The highest total lactation yield and total milk selling values were 895.6±113.2 and 40.9±5.4 respectively in >5 to <7 yr age group and the lowest values were 525.8±104.6 and 22.1±4.2 respectively in = or <3 yr age group. lactation length of cows was significantly (P<0.001) influenced by age of cow. We found that the cows of >5 to <7 yr age group showed the better performances in maximum productive and reproductive parameters.

The findings were similar to the findings of Hunter (1982), who stated that in dairy cows fertility increased slightly up to 3-4 years of age largely due to culling of heifers with anatomical or endocrine abnormalities and then gradually declined in cow of 6-7 years or older. Tong *et al*. (1979) found that reproductive efficiency was lower in 2-year-old and mature cows than in cows of intermediate age. De Kruif (1978) showed that many factors may influence the fertility of cattle. In cows over seven years of age, pregnancy rate following the first insemination was lower. He reported that calving rate of cows aged two, four, nine and greater than 13 years were 55.9, 60.0, 53.1 and 42.1, respectively. Gwazdauskas *et al.* (1975) found that CR declined with age as follows: heifers 47.6, young cows 42.7 and older cows 31.9. Spalding *et al*. (1975) reported a slight increase in the fertility of cows up to 3 to 4 years of age and decline after 4 years. They found a marked decline in fertility in cows over 7 years of age.

The values of productive and reproductive parameters considering the age of cows were similar with those of the above authors but some parameters differed. The variation of the present study with others may be due to many reasons like age grouping of cows, breed, sample size, data error, management, humidity and temperature.

5.4.3 Effects of Parity

Effects of parity and ANOVA on productive and reproductive performances are shown in Table- 24-25 and Fig. 16-18

In Table-24 the highest value of calving interval was 14.5±0.3 month in 2nd calving and the lowest was 12.7±0.3 month in 3rd calving which was differed significantly

(P<0.001), but no significant different was found among first, third and fourth & above calving stage of parity. The lowest mean value of daily milk yield was in 2nd calving (3.2±0.4 liter) and highest was in 3rd calving (5.6±1.3 liter) which was differed significantly (P<0.05), but no significant different was found among first, second and fourth & above calving stage of parity. Highest value of lactation length was found in 4th and above calving (246.7±15.1 days) and lowest value was in 1st calving (175.4±5.7 days). The highest value of total lactation yield was 1245.0±292.3 in 3rd calving, and lowest values 627.4±76.5 in 2nd calving. The highest value of total milk selling was 58.1±14.4 in 3rd calving and lowest values 27.9±1.8 in 1st calving. Calving interval, lactation length, total lactation yield and total milk selling were significantly (P<0.001) influenced by the parity whereas post-partum heat period, service per conception, gestation length and birth weight of calf were not significantly (P>0.05) influenced by the parity. Daily milk yield were influenced by the parity significantly (P<0.05). We found in our study that in maximum parameters of the cows 3rd calving stage of parity was showed the best performances.

The results are similar to those of Sader and Islam (2001) who observed that parity affected all the productive and reproductive performances except birth weight of calf, lactation length and dry period. Asimwe *et al*. (2007) reported that parity significantly (P<0.01) affected calving to 1st service interval, number of services per conception and calving interval. Alam and Ghosh (1988) found influence of parity on the onset of post-partum ovarian cyclicity and calving to conception interval in dairy cattle. In the present study younger cows performed better than the older cows. Similar results were observed by Nazmul (2007). McDougall *et al*. (1995) reported that the cows of 2nd and 3rd parity shown the best performance. Darwash *et al*. (1996) found that interval from calving to onset of ovarian activity become longer as the number of parities increased. Grohn and Rajawala (2000) did not find any significant effect on parity in relation to the onset of post-partum ovarian cyclicity. Zu and Zun (1997) reported a higher first service conception rate in cows at their first 3 parities than in later parities. The relationship between parity and reproduction is somewhat controversial and appears to vary with herd. There could be numerous reasons, including competition for resources between older and younger cows, nutritional level and early post-partum care.

The values of productive and reproductive parameters considering the parity of cows were similar with above authors. The variations of the present study with others may be due to many reasons, like age grouping of cows, breed, sample size, data error, management, environmental effects etc.

5.4.4 Effects of body weight of cow

Effects of body weight of cow and ANOVA on productive and reproductive performances are represented in Table- 26-27 and Fig. 19-21.

In Table-26 the lowest mean value of age of puberty was in >200kg (24.2±0.6 month) and highest was in <150kg (26.2±0.4 month) which was differed significantly (P<0.05). The highest value of age of 1st calving was 38.0±0.5 month in <150kg and the lowest was 35.2±0.7 month in >200kg which was differed significantly (P<0.01). Highest value of post-partum heat period was found in <150kg (99.5±3.8 days) and lowest value was in 150-200kg (87.5±3.2 days) which was differed significantly (P<0.05). The highest value of calving interval was 14.0±0.2 in 150-200kg and lowest values 12.7±0.3 in >200kg which was differed significantly (P<0.01). The highest value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 25.2±0.7, 7.0±0.7, 1379.1±161.8 and 64.3±7.5 respectively in >200kg, but the lowest values 19.4±0.3, 2.2±0.1, 438.7±33.6 and 19.1±1.5 were observed respectively in <150kg which were significantly (P<0.001) influenced by the body weight of cow whereas service per conception, gestation length and lactation length were not significantly (P>0.05) influenced by the body weight of cow. Age of 1st calving and calving interval were significantly (P<0.01) influenced by the body weight of cow. Age of puberty and post-partum heat period were influenced by the body weight of cow significantly (P<0.05). We found that the cows of >200kg body weight showed the best performances in maximum productive and reproductive parameters.

The results agree with those of Sarder *et al.* (1997) who reported that body weight depends on the breed and was reflected in the reproduction. Heavier cows produce more milk. The cross-bred animals weighed more (264 to 271 kg) than the local nondescript cows (178kg); the difference between breeds was not significant. Saacke *et al*. (1991) reported that the heavier cows yielded more milk than their lighter counterparts. The mean difference in daily milk yield was 3.2 kg between the body weight groups 130 to 150 kg and 301 to 401 kg (4.8 vs 8.0).

It may be concluded that the farmers (members) of OHOFP of Rajshahi district were more cautious about maintaining good management, feeding, selection of cows etc.

5.4.5 Effects of body condition of cow

Effects of body condition of cow and t-test on productive and reproductive performances are shown in Table- 28-29 and Fig. 22-24.

From Table-28 the lowest mean value of age of 1st calving was in healthy (36.5±0.4 month) body condition and highest was in moderate (26.3±0.5 month) body condition which was differed significantly ($P<0.05$). The highest value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 22.6±0.3, 4.1±0.2, 789.8±54.0 and 34.7±2.5 respectively in healthy body condition and lowest values 19.2±0.4, 2.5±0.2, 487.8±43.4 and 23.8±2.3 were observed respectively in moderate body condition which were differed significantly ($P<0.001$), whereas age of puberty, post-partum heat period, service per conception, gestation length, calving interval and lactation length were not significantly ($P>0.05$) influenced by the body condition of cow. We observed that in all parameters healthy body condition of the cows was showed better performances

The results are similar to the results of Sarder *et al*. (1997) who reported that the fat animals (condition score=3) were the heaviest ones (276 kg) and produced the highest amount of milk (7.8 kg). The medium cows (condition score=2) required the shortest interval to post-partum cyclicity and had shortest calving to conception interval (124 and 127 days, respectively). Nonetheless, the effects of body condition on milk production and fertility parameters were not significant. BCS is a scale for estimating the amount of body fat in cows and had a good reflection on the reproduction (Wildman *et al*., 1982). Nazmul (2007) observed that cows having BCS>3.3 were inseminated earlier (82.4±72 days), conceived earlier (105.8±72 days), and had shorter calving interval (397±62.3 days) and fewer services per conception (2.1±2.3). The present study revealed that the higher the BCS, the better the reproductive performance. Mahbub *et al*. (2010) stated that the cows having BCS ≥3.6 (very good condition) of cows of Bogra district required fewer services per conception (1.6±0.7), while those with BCS 2.6-3.0 had more services per conception (1.9±0.6). The cows having BCS ≥3.6 (very good condition) produced highest (8.4±3.3) milk per day and the longest lactation length (273.8±19.5), whereas cows having BCS ≤2.5 (poor condition) showed lowest

(4.0±2.5) milk production and the shortest lactation length (240.1±30.8). Calves produced by the cows having BCS ≥3.6 had maximum birth weight (8.4±3.3).

Hossain *et al*. (2001) stated that BCS 3.5 or more of cows had shorter interval between calving and conception compare with cows having ≤2.5 BCS. Cows calving at good BCS were able to resume ovarian cyclicity within 60 days post-partum regardless of pre- and post-partum change in body weight (Randel, 1990 and Bolanos *et al*., 1997). Changes in BCS between days 7-10 before and Day 7 after calving may affect normal hypothalamo-pituitary function (Osawa *et al.*, 1996). Brosaster and Brosaster (1998) reported that condition score at calving is dependent upon pre- and post-partum feeding programme and early lactation performances of the cows. Cows with a body condition score of 3.5 have the shortest interval between calving and onset of post-partum oestrus (Ribeiro *et al*., 1997). Cows with poor body condition had lower LH pulse frequencies than did cows in good condition (Wright *et al*., 1992).

Results of some productive and reproductive parameters may vary with the study of above mentioned authors due to genetic combination, data collection error, selection of dairy cows and farmers error, small sample size, faulty feeding, breeding, management practices and environmental condition.

5.4.6 Effects of housing pattern

Effects of housing pattern and ANOVA on productive and reproductive performances are showed in Table- 30-31 and Fig. 25-27.

From Table-30 the highest value of lactation length, total lactation yield and total milk selling was 203.6±10.5, 902.1±177.5 and 39.5±7.0 respectively in Concrete housing pattern group and lowest values 166.4±9.2, 496.1±58.2 and 22.5±2.9 were observed respectively in Straw made group, which were differed significantly (P<0.05). Whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf and milk yield/d/cow were not significantly (P>0.05) influenced by the housing pattern. But average mean values of daily milk yield and gestation length were highest in concrete housing pattern group and the lowest values were found in straw made housing pattern group. Similarly the lowest values of age of puberty, age of first calving, post-partum heat period, service per conception and calving interval were found in cows of concrete housing pattern group among others groups, though there were no significant variation. We found in our observation that in all parameters of the cow concrete housing pattern group showed best performances.

More or less similar results were found by Alam *et al*. (2010). He observed age at puberty (21.2±3.7) of cows in tin sheds was significantly lower than those in half building and straw & mud building, while the differences in three groups were significant. Age at 1st service of tin shed cows was low (23.2±3.6) followed by half building and straw & mud building, and significant differences were found between the groups. Cows in half building required fewer services per pregnancy (1.6±0.6) followed by those in tin shed and straw made house & mud building, and significant differences were found between the groups. Age at 1st calving was lowest (33.0±4.0) in cows in tin shed building and highest (35.4±4.2) in the cows in straw and mud building while no significant difference was noticed between half building and tin shed. Calving to 1st service interval was lowest (128.2±28.4) in tin shed and highest (133.9±23.7) in the cows in straw and mud building, while no significant difference was seen between half building and tin shed. Cows in half building produced highest (6.8±3.4) daily milk yield and lowest (4.5±2.7) in straw and mud building, and the differences between the three groups were significant. Dry period was lowest (129.3±21.1) in cows in tin shed and highest (139.5±24.3) in straw and mud building and the differences between three groups were significant. Lactation length was highest (260.9±29.7) in tin shed and lowest (244.8±29.7) in the cows in straw and mud building while no significant difference was found between half building and tin shed. Calving interval was lowest (444.4±41.5) in cows in straw and mud building and highest (454.5±40.1) in half building whereas tin shed group is not significantly different from the other two groups. Birth weight of calves was highest (19.8±2.7) in tin shed and lowest (133.9±23.7) in the cows of straw made house and mud building, while no significant difference was found between half building semi-concrete and tin shed.

The productive and reproductive parameters considering the housing pattern of cows were similar to those of the above authors but some parameters differed. The variation of the present study with others may be due to many reasons, like age grouping of cows, breed, sample size, data error, management, humidity and temperature.

5.4.7 Effects of floor type of house

Effects of floor type and ANOVA on productive and reproductive performances are furnished in Table- 32-33 and Fig. 28-30.

In Table-32 the highest mean value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 22.6±0.4, 4.5±0.4, 920.6±85.8 and 41.6±4.1 respectively in concrete-concrete floor type of house and lowest values 20.3±0.6, 2.5±0.2, 493.4±51.9 and 21.5±2.4 were observed respectively in muddy-muddy floor type of house which were differed significantly ($P<0.001$). Whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval and lactation length were not significantly ($P>0.05$) influenced by the floor type of house. We observed that in all parameters of the cows concrete-concrete floor type of house was showed best performances among three groups of floor type of house.

More or less similar results were found by Hossain *et al*. (2005). He observed 10 % of the farmers provided half building and 90% used tin sheds and straw sheds to house their cattle: 80% provided open house, 13% closed and rest semi-closed, while 65% had brick floors and the rest unpaved floors. In another region of the same district, Hossain *et al*. (2004) observed that 63% farmers provided closed house and 63% used paved floors. Shamsuddin *et al*. (1995) studied reproductive performance of animals reared on different types of floors. The nutrition, condition and fertility were not affected markedly by the condition of floors. However, the incidence of reproductive diseases was lower in animals reared all the time on concrete floor (19%) than in animals on concrete floor only during night time (20%) and those always on the muddy floor (23%).

The productive and reproductive parameters considering the floor type of house of cows were similar to those of the above authors but some parameters differed. The variation of the present study with others may be due to many reasons, like age grouping of cows, breed, sample size, data error, management and environmental condition.

5.4.8 Effects of overall housing system

Effects of overall housing system and ANOVA on productive and reproductive performances are summarized in Table- 34-35 and Fig. 31-33.

In Table-34 the lowest mean value of calving interval was in good (13.2±0.2 month) housing system and highest was in poor (14.0±0.4 month) housing system which was differed significantly (P<0.05). The highest value of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling was 22.7±0.4, 4.6±0.4, 922.3±84.5 and 41.7±4.0 respectively in good housing system and lowest values 20.3±0.6, 2.5±0.2, 482.3±53.1 and 20.2±2.3 were observed respectively in poor housing system which were significantly (P<0.001) influenced by the overall housing system whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length and lactation length were not significantly (P>0.05) influenced by the overall housing system. Birth weight of calf were influenced by overall housing system of cow significantly (P<0.01). We observed that in all parameters of the cows good condition of overall housing system was showed best performances.

More or less similar results were found by Islam *et al*. (2010). He observed overall housing systems of cows had significant (P<0.05) effect on age at puberty, age at first service, age at first calving, service per conception, milk yield per day, milk yield per lactation, dry period, and birth weight of calf. Further he added considering all parameters it may be concluded that there was good reflection of different housing system on productive and reproductive performances and the cows reared in intensive housing system showed better performance. The findings are nearly similar to the above mentioned authors considering all the productive and reproductive parameters.

5.4.9 Effects of overall ventilation system

Effects of overall ventilation system and t-test on productive and reproductive performances are observed in Table- 36-37 and Fig. 34-36.

In Table-36 the highest mean value of calving interval was in moderate (14.6±0.6 month) ventilation system and lowest was in proper (13.4±0.2 month) ventilation system. The highest value of birth weight of calf was in proper (21.9±0.3) ventilation system and lowest value was in moderate (19.9±0.8) ventilation system. Calving interval and birth weight of calf were significantly (P<0.05) influenced by the overall ventilation system whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, milk yield/d/cow, lactation length, total lactation yield and total milk selling were not significantly (P>0.05) influenced by the overall ventilation system. Though the average mean value of daily milk yield had no significant variation, yet higher value of daily milk yield (3.8±0.2 liter) was observed in proper ventilation system than moderate ventilation system (2.7±0.3) We observed in all parameters of the cows proper ventilation system was showed better performances.

Alam *et al*. (2010) concluded that there was no good linkage of pattern of ventilation on productive and reproductive performances. The cows with good ventilation showed better services per conception and calving interval. Shamsuddin *et al*. (1995) studied the effect of ventilation on the condition scores, fertility and the incidence of reproductive disorders. The duration of postpartum anoestrus, days open, wastage days and service per pregnancy were lower in animals in free ventilation houses than those with restricted ventilation. Sainsbury (1981) reported that well ventilated houses had more light and remain drier and cooler than poorly ventilated houses. There is ample evidence that dry and cool environment favours the reproductive efficiency of the cow, but damp and humid environment caused by poor ventilation may result in poor fertility. The high incidence of reproductive disorder in the animals in badly ventilated houses may be due to high microbial activity in cows' environment.

The average values of productive and reproductive parameters considering the overall ventilation system of dairy cows were similar to those of the above authors but some parameters differed. The variation in some results may be due to many reasons like age grouping of cows, breed, sample size, data error, management, humidity temperature and other environmental factors.

5.4.10 Effects of feeding practices

Effects of feeding practices and ANOVA on productive and reproductive performances are presented in Table- 38-39 and Fig. 37-39.

In Table-38 the lowest mean value of age of puberty and age of 1st calving was 24.6±0.4 and 36.0±0.4 month respectively in stall feeding and highest was 27.8±0.9 and 39.9±0.8 month respectively in stall and tethering feeding which were differed significantly ($P<0.001$). The highest value of service per conception and gestation length was 1.9±0.1 and 283.1±0.6 respectively in stall and tethering and lowest values 1.1±0.0 and 279.6±0.4 were observed respectively in stall and grazing, which were also differed significantly ($P<0.001$). The highest value of milk yield/d/cow was in stall feeding (4.5±0.3) and lowest value was in stall and grazing (2.6±0.2). The highest value of lactation length, total lactation yield and total milk selling was

196.7±6.6, 886.5±68.3 and 40.7±3.2 respectively in stall feeding and lowest values 1.1±0.0 and 279.6±0.4 were observed respectively in stall and tethering, which were differed significantly ($P<0.001$). Whereas post-partum heat period, calving interval and birth weight of calf were not significantly ($P>0.05$) influenced by the feeding practices. We found in all parameters of the cow stall feeding practices showed best performances and lowest performances showed in stall and grazing feeding practices.

Similar results were found by other authors. Zero-grazed Danish cows produced 418 kg more milk (mean) than grazed Danish cows in a study made on herds with > 100 cows (Burow *et al.* 2011). In a British study (Haskell *et al.*, 2006) zero-grazed cows tended to have a higher milk production than grazed. In contrast, Herlin (1994) found no difference on milk production in a Swedish study comparing zero-grazing and grazing cows during or after the grazing season. In yet another Swedish study, Andersson (2012) found that that cows on production pasture had higher milk production then cows on exercise pasture.

The average values of productive and reproductive parameters considering the feeding practices of dairy cows were similar to those of the above authors but some parameters differed. The variation in some results may be due to many reasons like breed, sample size, data error, management, humidity temperature and other environmental factors.

5.4.11 Effects of roughages feeding

Effects of roughages feeding and t-test on productive and reproductive performances are summarized in Table- 40-41 and Fig. 40-42. In Table-40 the lowest mean value of age of puberty and age of 1st calving were 25.5±0.3 and 36.8±0.3 month respectively in straw and green grass feeding group and highest was 28.5±1.5 and 40.7±2.1 month respectively in straw, green grass and others feeding group, which were differed significantly ($P<0.05$). The highest value of birth weight of calf (21.9±0.3 kg) was in straw and green grass feeding group and lowest value (17.7±1.6 kg)was in straw, green grass and others feeding group, which was significantly ($P<0.01$) influenced by the roughages feeding. Whereas post-partum heat period, service per conception, gestation length, calving interval, milk yield/d/cow, lactation length, total lactation yield and total milk selling were not significantly ($P>0.05$) influenced by the roughages feeding. Though the average mean value of daily milk yield had no significant variation, yet higher value of daily milk yield (3.7±0.2 liter) was observed in straw and green grass feeding group than straw, green grass and others feeding group (1.9±0.5 liter). We observed in all parameters of the cows straw and green grass feeding group of roughages feeding showed better performances.

More or less similar results were found by other authors. Karume *et al.* (2013) stated the small scale farmers in the study area have limited resources available for feeding their dairy cattle. They do not have the luxury of being able to select the basal diet but use whatever is available at no or low cost. The available resources are essentially lowly digestible forages such as tropical pastures both green and mature, and agricultural by-products (straw) which are generally low in protein.

Gimbi (2006) observed green fodders are not available in sufficient quantities especially in extreme hot condition and most of the animals are under-fed. Other by-products (straw) are commonly used to overcome feed shortages, but don't meet the actual requirements of the animals. There is a strong relationship between nutrition, reproductive and productive performances in dairy cattle.

The average values of productive and reproductive parameters considering the roughages feeding of dairy cows were similar to those of the above authors but some parameters differed. The variation in some results may be due to many reasons like breed, sample size, data error, management, humidity temperature and other environmental factors.

5.4.12 Effects of feed quality

Effects of feed quality and ANOVA on productive and reproductive performances are furnished in Table- 42-43 and Fig. 43-45. In Table-42 the lowest mean value of age of puberty, age of 1st calving and post-partum heat period was 23.3±0.6 month, 34.1±0.7 month and 87.4±4.6 day respectively in good quality feed group and highest was 26.5±0.5 month, 38.5±0.6 month and 101.7±3.8 day respectively in poor quality feed group which were differed significantly ($P<0.001$, $P<0.05$). The highest values of birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were 25.8±0.7 kg, 8.2±0.5 liter, 1644.0±137.2 liter and 72.5±6.8 thousand taka respectively in good quality feed group and lowest values 19.1±0.4 kg, 1.6±0.1 liter, 306.5±22.6 liter and 14.3±1.1 thousand taka were observed respectively in poor quality feed group which were also differed significantly ($P<0.001$). Whereas service per conception, gestation length, calving interval and lactation length were not significantly (P>0.05) influenced by the concentrate feed quality. We found in all parameters of dairy cows the good quality feed group showed best performances.

The findings are nearly similar to the findings of Sarder and Rashid (2005) found that three quality of feed (Good, Fair, Poor) had significant (P<0.05) effect on reproductive and productive performance of dairy cows but good quality feed had shown the excellent performances, post partum heat period, days open, wastage days, service per conception, dry period and calving interval values were increased in feed quality of fair and poor.

Shamsuddin *et al.* (1995) observed the body weight, milk production and the fertility parameters following feeding of different grades of concentrate. Feeding grade 3 concentrate resulted in the lowest body weight. Daily average milk yield was highest in animals fed with grade-1 concentrate. The fertility parameters were best in animals fed with grade-1 concentrate and worst in grade-3 concentrate-fed animals. However, the difference in the body weight, milk production and fertility parameters was not significant between animals fed with different grades of concentrate. The feed supplied, in particular to the post-partum cows should be enough to maintain the cow, to support milk production, as well as to initiate the ovarian cyclicity (Montgomery *et al.*, 1985; Butler and Smith, 1989).

The mean value of some parameters were not exactly similar results to the above authors due to genetic combination of dairy cows, small sample size, data collection error, feeding, breeding and management error etc.

5.4.13 Effects of veterinary caring

Effects of veterinary caring and t-test on productive and reproductive performances are showed in Table- 44-45 and Fig. 46-48.

From Table-44 the lowest mean value of age of puberty, age of 1st calving, service per conception and calving interval were 25.0±0.4 month, 36.1±0.5 month. 1.2±0.0 and 13.2±0.2 month respectively in veterinarian group of veterinary caring and highest were 26.2±0.4 month, 37.8±0.5 month, 1.3±0.0 and 14.2±0.3 month respectively in quack doctor group of veterinary caring. The highest value of birth weight of calf , milk yield/d/cow, lactation length, total lactation yield and total milk selling were 23.0±0.5 kg, 4.6±0.3 liter, 200.7±6.1 day, 930.8±73.4 liter and 41.6±3.4 thousand taka respectively in veterinarian group of veterinary caring and lowest values 20.4±0.3 kg, 2.7±0.1 liter, 181.2±7.3 day, 485.9±27.8 liter and 21.9±1.3 thousand taka were observed respectively in quack doctor group of veterinary caring. Birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were significantly (P<0.001) influenced by the veterinary caring whereas post-partum heat period and gestation length were not significantly (P>0.05) influenced by the veterinary caring. Age of 1st calving, calving interval and lactation length were influenced by the veterinary caring significantly (P<0.01). Age of puberty and service per conception were influenced by the veterinary caring significantly (P<0.05).

Alam *et al.* (2010) found that daily milk production was highest (6.5±3.3 liter) in cows treated by an unqualified person and lowest (21.4±3.6 liter) in those treated by a veterinarian. He also observed that lactation length was highest (263.3±24.0 day) in cows treated by a locally trained person and lowest (251.2±34.4 day) in those treated by a veterinarian. This finding was not similar to our findings.

It may be concluded that there was good reflection of veterinary caring on productive and reproductive performance of dairy cows. We observed in all parameters of the cows, veterinarian group of veterinary caring was showed better performances.

5.4.14 Effects of breeding method

Effects of breeding method and t-test on productive and reproductive performances are represented in Table- 46-47 and Fig. 49-51.

From Table-46 the lowest mean value of age of puberty and age of 1st calving were 24.87±0.34 and 36.26±0.42 month, respectively in artificial insemination group of breeding method and highest was 26.63±0.45 and 37.82±0.52 month respectively in natural group of breeding method which were differed significantly (P<0.01, P<0.05). The highest value of milk yield/d/cow, lactation length, total lactation yield and total milk selling were 4.85±0.28 liter, 207.65±6.10 day, 974.61±62.45 liter and 43.93±2.92 thousand taka, respectively in artificial insemination group of breeding method and lowest values 2.10±0.08 liter, 169.38±7.05 day, 364.30±21.89 liter and 15.99±0.95 thousand taka were observed respectively in natural group of breeding method which had highly significant (P<0.001) differences. Whereas post-partum heat period, service per conception, gestation length, calving interval and birth weight of calf were not significantly (P>0.05) influenced by the breeding method. We observed in all parameters of cows artificial insemination group of breeding method showed better performances.

Islam *et al.* (2010) found that breeding method of cows had significant (P<0.05) effect on age at first calving, service per conception, post partum heat period, days open, wastage days, gestation length, milk yield per day, lactation length, milk yield per lactation, dry period and birth weight of calf. He also added that results showed the productive and reproductive parameters of dairy cows were influenced by breeding method. Considering all the productive and reproductive parameters dairy cows bred by artificial insemination (AI) showed the best performances among the breeding method except lactation length and calving interval. This may be due to the sincere ness to their dairy cows, better management, feeding of sufficient quality feed, disease control etc.

The accurate mean values of some parameters did not get due to genetic combination of dairy cows, small sample size, data collection error, harsh environment condition, feeding, breeding and management error etc.

5.4.15 Effects of social status of farmers

Effects of social status of farmers and t-test on productive and reproductive performances are summarized in Table- 48-49 and Fig. 52-54.

From Table-48 the highest value of birth weight of calf, milk yield/d/cow, lactation length, total lactation yield and total milk selling was 22.22±.33 kg, 3.92±.22 liter, 200.54±5.22 day, 788.46±50.36 liter and 35.29±2.31 thousand taka respectively in marginal group of social status of farmers and lowest values 20.09±.57 kg, 2.75±.30 liter, 158.94±10.07 day, 440.74±57.19 liter and 19.86±2.86 thousand taka were observed respectively in ultra poor group of social status of farmers which were differed significantly (P<0.01, P<0.001). Whereas age of 1st calving, post-partum heat period, service per conception, gestation length and calving interval were not significantly (P>0.05) influenced by the social status of farmers.

It may be concluded that there was good reflection of social status of farmers on productive and reproductive performances of dairy cows. We found in all parameters of the dairy cows marginal group of social status of farmers showed better performances. Probably marginal farmers were very conscious of cow rearing as it was their main livelihoods.

5.4.16 Effects of economic status (income per month) of farmers

Effects of economic status of farmers and ANOVA on productive and reproductive performances are furnished in Table- 50-51 and Fig. 55-57.

In Table-50 the lowest mean value of post-partum heat period was (85.0±3.2 day) in group of > 5000 to 10000 taka and highest was (101.9±4.3 day) in group of >10000 taka. The highest value of birth weight of calf (21.9±0.5 kg) was in group of > 5000 to 10000 taka and lowest value was (16.9±1.1 kg) in group of = or < 5000 taka. The highest value of milk yield/d/cow, lactation length, total lactation yield and total milk selling was 3.8±0.5 liter, 201.5±12.5 day, 805.2±87.6 liter and 36.63±3.81 thousand taka, respectively in group of >10000 taka and lowest values 2.1±0.2 liter, 152.0±12.6 day, 355.8±38.6 liter and 14.97±1.62 thousand taka were observed respectively in group of =or < 5000 taka. Birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were significantly ($P<0.001$) influenced by the economic status (income per month) of farmers whereas age of puberty, age of 1st calving , service per conception, gestation length and calving interval were not significantly ($P>0.05$) influenced by the economic status (income per month) of farmers. Post-partum heat period and lactation length were influenced by the economic status (income per month) of farmers significantly ($P<0.01$).

It may be concluded that there was good reflection of the economic status (income per month) of farmers on productive and reproductive performances of dairy cows. We found in maximum parameters of the cows, within the group of >10000 taka of economic status (income per month) of farmers showed best performances. Probably within the group of >10000 taka of economic status (income per month) of farmers were very conscious of cow rearing and they may invest more money than others group for cow rearing.

5.4.17 Effects of educational status of farmers

Effects of educational status of farmers and ANOVA on productive and reproductive performances are summarized in Table- 52-53 and Fig. 58-60.

From Table-52 the highest value of lactation length, total lactation yield and total milk selling was 226.9±10.9 day 978.3±118.7 liter and 41.7±4.9 thousand taka respectively in HSC & above group of educational status of farmers and lowest values 169.3±9.3 day in none, 590.5±42.5 liter and 27.0±2.0 thousand taka were observed respectively in primary group of educational status of farmers. lactation length and total lactation yield were significantly (P<0.01) influenced by the educational status of farmers whereas age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf and milk yield/d/cow were not significantly (P>0.05) influenced by the educational status of farmers, but average mean values of others parameters of the cows were nearest to the best performances values HSC & above group of educational status of farmers . Total milk selling was influenced by the educational status of farmers significantly (P<0.05).

Similar results were found by other authors. Monthly milk production and revenue per farm and per cow increased with the level of education of the farmer. However, LSM differences were significant only for milk production and revenue per cow, but not for monthly milk production and revenue per farm. Farmers with no education or primary school had significantly lower LSM values than those from farmers that had bachelor or higher degrees Yeamkong *et al.* (2010). Educational level of farmers may be an indicator of their ability to adopt appropriate technologies and management practices (Borisutsawat, 1996; Kanchanasinith, 1999; Thijae, 1999). Farmers that had a higher educational level may have had superior ability to access and understand information and technology, and may have been able to apply them more appropriately to their conditions than farmers with lower education.

It may be concluded that there was good reflection of the educational status of farmers on productive and reproductive performances of dairy cows. We found in maximum parameters of the dairy cows within the HSC & above group of educational status of farmers was showed best performances. Probably HSC and above educated farmers were very conscious of cow rearing and they may be more efficient to utilize their knowledge than others group of educational status of farmers for cow rearing.

5.4.18 Effects of occupational of farmers

Effects of occupational of farmers and ANOVA on productive and reproductive performances are showed in Table- 54-55 and Fig. 61-63.

In Table-54 the highest value of lactation length was in service holder (261.00±22.82 day) and lowest value was in others (178.33±14.841 day). lactation length were significantly (P<0.01) influenced by the occupation of farmers. Age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, calving interval, birth weight of calf, milk yield/d/cow, total lactation yield and total milk selling were not significantly (P>0.05) influenced by the occupation of farmers. Though the average mean value of daily milk yield had no significant variation, yet highest value of daily milk yield (4.28±0.86 liter) was observed in others group of occupation of farmers and lowest was (3.51±0.36 liter) in business group of occupation of farmers. Similarly average lowest mean value of age of puberty and age of 1st calving were 24.45±0.76 and 35.44±0.79 month respectively in others group of occupation of farmers and highest were 26.77±0.86 and 37.80±0.92 month respectively in service holder group of occupation of farmers.

It may be concluded that there was good reflection of the occupation of farmers on productive and reproductive performances of dairy cows. We found in maximum parameters of the cows of others group of occupation of farmers showed best performances. Probably others group of occupation of farmers were very conscious of cow rearing and they may be more efficient to utilize their maximum time in dairy cows nursing and management due to having no specific occupation like agriculture, business and service holder.

5.4.19 Effects of land owned by farmers

Effects of land owned by farmers and ANOVA on productive and reproductive performances are summarized in Table- 56-57 and Fig. 64-66.

In Table-56 the lowest mean value of calving interval was (13.3±0.2 month) in >33 decimals group of land owned by farmers and highest was (15.0±0.6 month) in <5 decimals group of land owned by farmers. The highest value of total lactation yield and total milk selling were 808.5±61.1 liter and 35.8±2.8 thousand taka, respectively in >33 decimals group of land owned by farmers and lowest values 465.0±61.9 liter and 22.5±3.1 thousand taka were observed respectively in <5 decimals group of land owned by farmers . Calving interval and total lactation yield were significantly (P<0.01) influenced by the land owned by farmers. Age of puberty, age of 1st calving, post-partum heat period, service per conception, gestation length, birth weight of calf, milk yield/d/cow and lactation length were not significantly (P>0.05) influenced by the land owned by farmers. Though the average mean value of daily milk yield had no significant variation, yet highest value of daily milk yield (4.0±0.3 liter) was observed in in >33 decimals group of land owned by farmers and lowest was (2.8±0.3 liter) in <5 decimals group of land owned by farmers. Similarly average lowest mean value age of 1st calving and post-partum heat period were 36.8±0.5 month and 89.2±2.7 day respectively in >33 decimals group of land owned by farmers and highest were 37.2±0.6 month and 97.7±4.8 day respectively in 5-33 decimals group of land owned by farmers. Total milk selling were influenced by the land owned by farmers significantly ($P<0.05$).

It may be concluded that there was good reflection of the land owned by farmers on productive and reproductive performances of dairy cows. We found in maximum parameters of the dairy cows, within > 33 decimals group of land owned by farmers showed best performances. Probably > 33 decimals group of land owners (farmers) were very conscious of cow rearing and they may be more solvent in the rural level and also they can spend more money for feeding, breeding, caring and management of their dairy cows than others land owners group.

5.4.20 Effects of sex of farmers

Effects of sex of farmers and t-test on productive and reproductive performances are presented in Table- 58-59 and Fig. 67-69. From Table-58 the lowest mean value of service per conception was (1.2.±0.0) in female and highest was (1.3±0.0) in male which was significantly ($P<0.05$) influenced by the sex of farmers. Whereas age of puberty, age of 1st calving, post-partum heat period, gestation length, calving interval, birth weight of calf, milk yield/d/cow, lactation length, total lactation yield and total milk selling were not significantly ($P>0.05$) influenced by the sex of farmers. Though the average mean value of daily milk yield had no significant variation, yet highest value of daily milk yield (3.7±0.2 liter) was observed in male farmers and lowest was (3.4±0.4 liter) in female farmers. Similarly average lowest mean value of age of puberty, age of 1st calving, post-partum heat period, gestation length and calving interval were 25.5±0.4 month, 36.7±0.6 month, 90.1±4.8 day, 280.4±0.4 day and 13.4±0.3 month, respectively in female farmers and highest were 25.6±0.3 month, 37.0±0.4 month, 93.3±2.6 day, 280.9±0.3 day and 13.5±0.2 month, respectively in male farmers. In maximum parameters of the cows female farmers showed best performances.

It may be concluded that there was good reflection of sex of farmers on productive and reproductive performances of dairy cows. We found in maximum parameters of the dairy cows, female farmers showed best performances. Probably female farmers were very conscious of cow rearing and they may spend more time for feeding, caring and management of their dairy cows than male farmers.

CHAPTER 6

STUDY-III

PRODUCTIVE PERFORMANCES OF BROILER FARMS IN OHOFP AREAS OF RAJSHAHI DISTRICT

CHAPTER 6

Study-III

Productive performances of broiler farms in OHOFP areas of Rajshahi district

6.1 INTRODUCTION

In One House One Farm Project (OHOFP) total 35288 farmers were involved and involvement in poultry trade was 2515 in Rajshahi district under 9 Upazila. The members of OHOFP could be able to take loan against specific agricultural trades i.e fisheries, poultry, livestock (dairy), nursery, vegetables and others under some terms and conditions of the government. The third highest amount of loan 204.10 lac taka (5.28%) was disbursed on poultry (broilers and layers) trade which showed in study-I (Chapter 4) in this thesis. In this back ground, this experiment (Study-III) had been undertaken.

Bangladesh is a developing and tropical country where broiler industry is growing rapidly with raising numerous broiler strains under the farming management. Broiler farming plays an important role in improving rural livelihood, food security and poverty reduction in rural and semi-urban communities in Bangladesh. Broiler production reveals the fact of minimum expense with maximum return. It can be mentioned here that small area of available land can be well utilized for commercial broiler farming in thickly populated country. Rahman *et al.* (2006) showed that commercial broiler farming provided employment opportunities for unemployed family members, improved socio-economic conditions and increased women empowerment among rural people of Bangladesh. So, there is a wide scope for raising various strains of broiler adaptable to the climatic condition of our country.

There is evidence that investments in small scale poultry farming generate handsome returns and contribute to poverty reduction and increased food security in regions where a large share of the population keeps some poultry birds (Jensen and Dolberg, 2003; Mack *et al*., 2005; PicaCiamarra and Otte, 2010). This is the case for South Asia. In Bangladesh, about 80 to 90 per cent of rural households are estimated to keep flocks of 3 to 10 birds; there are a total 120 thousand commercial broiler and layer farms, of which most are of small size (only about 4% of the broiler farms rear more than 3,000 bird) (Jensen and Dolberg, 2003; Dolberg, 2009).

Broiler industry is one of the important industries in Bangladesh in terms of Employment Avenue and source of protein supply at cheaper price for the nation. All categories of stakeholders should participate in policy formulation for the development of the poultry industry. Policy should be based on reliable and comprehensive field data. For the protection of national interest the government should be more active in implementation of poultry development policy in the country. Poultry farmers (broilers and layers) should be organized into group and follow the scientific management system (Raha 2013).

The estimated number of broilers available for consumption in Bangladesh during the year 2012-13 was 847,763 and total meat production was 1,561 tones. The per capita availability of broiler meat for the year 2012-13 was estimated at 1.39 kg per year (Integrated Sample Survey, 2012-13). Poultry sector is a dynamic industry. All over the world, efforts continue for expansion of production, new production methods and for new poultry products. Poultry farming has been a popular choice of vocation for small farmers. It is advantageous to such farmers as land and capital requirements are small, it starts returns with a regular income and it has potential for providing rural employment (Singh, 2003). Poultry development in Mizoram has taken a new turn in the late eighties with establishment of broiler farms in various places. Though there is no large scale poultry industry in Mizoram, almost 70.00 per cent of the farmers keep poultry for subsidiary income.

Broilers farming helps in generating employment. The broiler management system is not efficient to meet the ever increasing demand of the consumers. To enhance the productivity of the farms the management practices needs to be improved. There is a major role for the extension workers to provide management information through training, farm visits, to improve the knowledge level of the farmers in order to enhance profitability and productivity of broiler farms (Rahman, 2015).

Variables affecting broiler production applying pattern of closed house system are DOC, feed, medicine (drugs, vaccines and vitamins) and input variables such as the cost of DOC, feed and electricity which give highly significant effect on the cost of production (Pakage *et al.*, 2015).

The growth of broilers sector is positive and impressive. Now this sector is an integral part of the farming system in Bangladesh and it has created direct, indirect employment opportunities including support services. Development of poultry (broilers and layers) has generated considerable employment through the production and the marketing of poultry and poultry related products in Bangladesh. Its steady growth results in attaining country's economic growth, which contribute in (i) rural poverty reduction (ii) new employment generation (iii) improve food security and supply of protein in rural poor people meals.

After considering above all things, the following objectives had been undertaken.

Objectives:

- To find out the effects of breeds, chick quality, farm size, overall housing and ventilation system and overall management condition of farm on productive performances of broilers in project areas.
- To observe the influence of socio-economic condition, education, occupation, land owning, family size and sex of farmers on productive performances of broilers in project areas.

6.2 MATERIALS AND METHODS

Data were collected from the farmers (members) of 9 Upazila of Rajshahi district, Bangladesh during July 2013 to June 2015.

6.2.1 Data collection

Carefully prepared questionnaire were used for the purpose of information collection (Appendix-II) and also for getting general (socio-economic) information of farmers, managemental, productive parameters of broilers farm from project areas in 9 Upazila of Rajshahi district, Bangladesh.

6.2.2 Population study

60 broiler farms (total 30250 no. of birds) involving 60 farmers from 9 Upazila in Rajshahi district were interviewed with carefully prepared questionnaire. Table- 60 shows Upazila wise distribution of broiler farms and total no, of birds in Rajshahi district.

Table-60: Upazila wise distribution of broiler farms and birds in Rajshahi district

Sl. no	Upazila	Breeds of broilers						Total no. of farms	Total no. of birds
		Cob 500	No. of birds	Hubbard Classic	No. of birds	Ross 308	No. of birds		
1	Bagha	8	3300	0	0	0	0	8	3300
2	Bagmara	2	1050	0	0	0	0	2	1050
3	Charghat	9	3700	1	350	0	0	10	4050
4	Durgapur	7	3850	1	1000	0	0	8	4850
5	Godagari	8	3600	1	500	0	0	9	4100
6	Mohanpur	2	1700	0	0	1	1000	3	2700
7	Paba	9	4100	1	500	0	0	10	4600
8	Puthia	3	1300	0	0	0	0	3	1300
9	Tanore	3	2000	1	400	3	1900	7	4300
Total		**51**	**24600**	**5**	**2750**	**4**	**2900**	**60**	**30250**

6.2.3 Factors considered for the study

Breed of broiler, chick quality, farm size, housing pattern, floor type of broiler house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, education, occupation, land owned by farmers, family size and sex of farmers were considered as factors and classified as below.

6.2.3.1 Breeds of broilers

Data of three breeds reared by farmers in our study areas of Rahshahi district were collected. These were Cob 500, Hubbard Classic and Ross 308.

Broilers breed were classified as following group

Group-I : Cob 500 (51 farms and 24600 no. of birds)
Group-II : Hubbard Classic (5 farms and 2750 no. of birds)
Group-III: Ross 308 (4 farms and 2900 no. of birds)

6.2.3.2 Chick quality of broilers

The chick of broiler classified into 3 groups according to their quality.

Group- I (Excellent quality chick): The day old chick (DOC) shows best movement, no problem in whole body and look most bright in nature.

Group- II (Good quality chick): The day old chick shows better movement, no problem in whole body and look brighter in nature.

Group- III (Poor quality chick): The day old chick shows slow movement, slight problem in whole body and look less bright in nature.

6.2.3.3 Farm size

According to farm size broiler farms were divided into the following groups:

Group- I : <400 broilers in a farm
Group- II : 400-600 broilers in a farm
Group- III : >600 broilers in a farm

6.2.3.4 Housing pattern

According to housing pattern the broiler farms were divided into the following three groups:

Group-I (Semi Paca Housing) : Broilers house built of brick and tin.
Group-II (Tin Shade Housing) : Broilers house built of tin, bamboo and others.
Group-III (Straw Made Housing) : Broilers house were built of straw, bamboo and others.

6.2.3.5 Floor type of broiler house

According to floor type of broiler house the broiler farms were divided into the following 2 groups:

Group-I (Macha with polythin and litter): Broilers were housed on macha with polythin and litter

Group-II (Floor with litter): Broilers were housed on the floor with litter.

6.2.3.6 Overall housing system

According to overall housing system the broiler farms were divided into the following 3 groups:

Group-I (Good) : Broilers were housed in overall good housing system.

Group-II (Medium) : Broilers were housed in overall medium housing system.

Group-III (Poor) : Broilers were housed in overall poor housing system.

6.2.3.7 Overall ventilation system

According to overall ventilation system the broiler farms were divided into the following 3 groups:

Group-I (Excellent ventilation): Broilers were housed in overall proper (best) ventilation system. There was sufficient air flow

Group-II (Medium ventilation): Broilers were housed in overall medium ventilation system. There was moderate air flow.

Group-III (Poor ventilation): Broilers were housed in overall poor ventilation system. There was very limited air flow.

6.2.3.8 Feed quality

According to supplied feed quality the broiler farms were divided into the following 3 groups:

Group-I (Poor quality feed) : Broilers were fed poor quality feed which were not so standard quality of feed.

Group-II (Medium quality feed): Broilers were fed medium quality feed which were better standard quality of feed.

Group-III (Good quality feed) : Broilers were fed good quality feed which were best standard quality of feed.

6.2.3.9 Social status of farmers

According to social status of farmers the broiler farms were divided into the following 2 groups:

Group-I (Ultra poor): Broilers were reared by ultra poor farmers. They could not meet basic needs. They were in limited income (<5000 tk.per month), land (< 5 decimals) and social status

Group-II (Marginal): Broilers were reared by marginal categories' farmers. They could meet basic needs. They were not in limited income (<5000 tk.per month), land (< 5 decimals),and social status.

6.2.3.10 Economic status of farmers

According to economic status of farmers the broiler farms were divided into the following 3 groups:

Group-I (< 10000 taka): Broilers were reared by the farmers whose income was less than 10000 taka.

Group-II (10000 -15000 taka): Broilers were reared by the farmers whose income was within 10000-15000 taka.

Group-III (> 15000 taka): Broilers were reared by the farmers whose income was greater than 15000 taka.

6.2.3.11 Educational status of farmers

According to educational status of farmers the broiler farms were divided into the following 4 groups:

Group-I (None): Broilers were reared by the farmers whose education was none or only could sign.

Group-II (Primary): Broilers were reared by the farmers whose education was primary level.

Group-III (Secondary): Broilers were reared by the farmers whose education was secondary level.

Group-IV (HSC & above): Broilers were reared by the farmers whose education was HSC and above.

6.2.3.12 Occupational status of farmers

According to occupational status of farmers the broiler farms were divided into the following 2 groups:

Group-I (Agriculture): Broilers were reared by the farmers whose occupation was agriculture.

Group-II (Business): Broilers were reared by the farmers whose occupation was business.

6.2.3.13 Land owned by farmers

According to land owned by farmers the broiler farms were divided into the following 3 groups:

Group-I (= or < 10 decimals): Broilers were reared by the farmers who were the owner of equal to of less than 10 decimals land.

Group-II (> 10 to = or< 50 decimals): Broilers were reared by the farmers who were the owner of greater than 10 to equal to or less than 50 decimals land.

Group-III (> 50 decimals): Broilers were reared by the farmers who were the owner of greater than 50 decimals land.

6.2.3.14 Family size of farmers

According to family size of farmers the broiler farms were divided into the following 3 groups:

Group-I (<4 member): Broilers were reared by the farmers whose had less than 4 family members.

Group-II (4-5 member): Broilers were reared by the farmers whose had 4-5 family members.

Group-III (>5 member): Broilers were reared by the farmers whose had greater than 5 family members.

6.2.3.15 Sex of farmers

According to sex of farmers the broiler farms were divided into the following 2 groups:

Group-I (Male) : Broilers were reared by male farmers (n= 51 i.e. male 51)

Group-II (Female) : Broilers were reared by female farmers (n= 9 i.e. female 9)

6.2.4 Productive parameters of broilers in broiler farms

The following productive parameters were used in our study-III. These are defined as:

Feed intake per broiler (kg): On an average every broiler intakes supplied balance feed in a month measured in kg is called feed intake per broiler (kg).

Body weight gain per broiler (kg): Average live body weight of a broiler at marketing age (up to 28-32 days) measured in kg is called body weight gain per broiler (kg).

FCR: Total feed intake by broiler divided with total body weight gain by that broiler in kg or lbs. within same time is called FCR. It is the most essential dependent factor in broiler production.

Production cost per broiler (tk): Every broiler needs some cost from starting to selling time estimated in taka is called production cost per broiler (tk). Starting to selling time of broiler in our study was 28-32 days.

Total production cost/batch (th.tk): Total amount of producing cost from starting to selling time of total broilers estimated in thousand taka is called total production cost (th.tk).

Selling price per broiler (tk): The amount of money counting in taka got by farmer per broiler at selling time is called selling price per broiler (tk). It was dependent on market value of live broilers.

Total selling price/batch (th.tk): The total amount of money counting in thousand taka got by farmer from the broiler stock at selling time is called total selling price/batch (th.tk). It was also dependent on market value of live broilers.

Profit per broiler (tk): Subtracting production cost per broiler (tk) from selling price per broiler (tk) is called profit per broiler (tk).

Net profit/batch (th.tk): Subtracting total production cost (th.tk) from total selling price/batch (th.tk) in the broiler farm is called net profit/batch(th.tk) in that broiler farm.

6.2.5 Statistical analyses

Data were statistically analysed to calculate the effect of breed of broilers, chick quality of broilers, farm size, housing pattern, floor type of house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, educational status of farmers, occupational status of farmers, land owned by farmers, family size and sex of farmers. The mean and Std Error of Mean (S.E) for feed intake per broiler, body weight gain per broiler, FCR, production cost per broiler, total production cost, selling price per broiler, total selling price/batch , profit broiler and net profit/batchwere calculated by using IBM SPSS Statistics Version 20 program. Factors were tested by Duncan Multiple Range Test (DMRT) to determine the effect of different factors (Steel and Torrie, 1980). Univariate Analysis of Variance was used to test significance of different factors. Some factors were also tested by Independent Samples Test (t-test). The statistical model used to estimate the components of variance was as follows:

$Y_{abcdefghijklmno}=\mu+B_a+C_b+D_c+E_d+F_e+G_f+H_g+I_h+J_i+K_j+L_k+M_l+N_m+O_n+P_o+e_{abcdefghijklmno}$

$Y_{abcdefghijklmno}$ = individual observation

μ = grand mean

B_a= effect of breed of broilers (a = 1-3)

C_b = effect of chick quality of broilers (b = 1-3)

D_c = effect of farm size (c = 1-3)

E_d = effect of housing pattern (d = 1-3)

F_e = effect of floor type of broiler house (e = 1-2)

G_f = effect of overall housing system (f = 1-3)

H_g= effect of overall ventilation system (g = 1-3)

I_h = effect of feed quality (h = 1-3)

J_i = effect of social status of farmers (i = 1-2)

k_j = effect of economic status of farmers (j = 1-3)

L_k = effect of educational status of farmers (k = 1-4)

M_l = effect of occupational status of farmers (l = 1-2)

N_m = effect of land owned by farmers (m = 1-3)

O_n = effect of family size of farmers (n = 1-3)

P_o = effect of sex of farmers (o= 1-2)

$e_{abcdefghijklmno}$ = random error associated with $Y_{abcdefghijklmno}$

Mean effects were systematically included in the model. Random effects were assumed independently and identically distributed. General Linear Model (GLM) test i.e univariate (Post Hoc) for multiple comprises for observed mean was performed.

Fig. 70: Brioler farms of OHOFP under Paba and Bagha Upazila of Rajshahi district

6.3 Results

In total of 60 broilers farms, studied for the effect of breeds of broiler, chick quality, farm size, housing pattern, floor type of broiler house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, education, occupation, land owned by farmers, family size and sex of farmers were considered as factors on productive performances of broilers; which had been fined out under OHOFP in 9 Upazilas of Rajshahi district, Bangladesh. Mean tests results, t-tests and one way ANOVA tests are presented in Table 61-90 and Figure- 71-115.

6.3.1. Effect of broiler strain

Effect of broiler strain on productive performances in broilers farm and ANOVA are showed in Table-61-62 and Fig. 71-73. In Table-61 the highest mean value of body weight gain was in both Cob 500 and Hubbard classic as (1.75±0.02) and lowest was in Ross 308 (1.45±0.02). The FCR was better in Hubbard Classic (1.72±0.02) and the FCR was not good in Ross 308 (2.16±0.02). Selling price per broiler was high in Cob 500 (218.55±2.52) and was low in Ross 308 (193.75±1.75). Profit per broiler was highest in Cob 500 (27.29±2.28) and was very low in Ross 308 (2.75±0.25). Feed intake per broiler was highest in Ross 308 (3.13±0.05) and was lowest in Cob 500 (3.00±0.02). Production cost per broiler was high in Hubbard classic (198.23±3.12) and was low in Ross 308 (191.00±1.55). Total production cost/batch was high in Ross 308 (138.51±30.62) and was low in Cob 500 (93.36±6.33). Total selling price/batch was highest in Ross 308 (149.78±33.30) and was low in Cob 500 (104.84±6.91). Net profit/batch was highest in Cob 500 (12.48±1.18) and was low in Ross 308 (9.06±7.16). Body weight gain, FCR, selling price per broiler and profit broiler were significantly influenced by breed ($P < 0.001$), but feed intake per broiler, production cost per broiler, total production cost, total selling price/batch and net profit/batch were not significantly influenced by breed ($P>0.05$).

6.3.2. Effect of chick quality of broilers

Effect of chick quality of broilers on productive performances in broilers farm and ANOVA are furnished in Table- 63-64 and Fig. 74-76. In Table-63 the highest mean value of body weight gain was in excellent quality chick (1.84±0.02 kg) and lowest was in poor quality chick (1.67±0.04 kg). The FCR was better in excellent quality chick (1.61±0.02) and the FCR was not good in poor quality chick (1.81±0.05). Selling price per broiler was high in excellent quality chick (233.82±4.00) and was low in poor quality chick (97.57±3.18). Profit per broiler was highest in excellent quality chick (44.47±3.50) and was very low in poor quality chick (6.71±0.64). Net profit/batch was highest in excellent quality chick (20.83±2.26) and was low in poor quality chick (2.76±0.48). Feed intake per broiler was highest in good quality chick (3.02±0.02) and was lowest in excellent quality chick (2.96±0.04). Production cost per broiler was high in good quality chick (99.67±7.19) and the production cost per broiler was low in excellent quality chick (190.55±2.24). Total production cost/batch was high in good quality chick (99.67±7.19) and was low in poor quality chick (85.47±12.20). Total selling was highest in excellent quality chick (117.94±16.18) and was low in poor quality chick (87.44±12.43).

Body weight gain, FCR, Selling price per broiler, profit broiler and net profit/batch were significantly influenced by chick quality of broilers (P<0.001), but feed intake/broiler, production cost per broiler, total production cost and total selling price/batch were not significantly influenced by chick quality of broilers (P>0.05).

6.3.3. Effect of farm size of broilers

Effect of farm size of broilers on productive performances in broilers farm and ANOVA are observed in Table-65-66 and Fig. 77-79. In Table-65 total production cost was high where >600 broilers exist (191.63±6.61) and were low where <400 broilers exist (52.16±2.79). Total selling was highest where >600 broilers exist (213.24±8.56) and were low where <400 broilers exist (59.35±2.91). Net profit/batch was highest where >600 broilers exist (24.38±2.90) and were low where <400 broilers exist (7.41±0.94). Feed intake per broiler was highest where >600 broilers exist (3.01±0.05) and were lowest where <400 broilers exist (2.99±0.03). Body weight gain was highest where >600 broilers exist (1.82±0.03) and lowest where 400-600 broilers exist (1.72±0.02). The FCR was better where >600 broilers exist (1.66±0.03) and the FCR was not good where 400-600 broilers exist (1.75±0.02). Production cost per broiler was high where >600 broilers exist (197.40±2.03) and were low where 400-600 broilers exist (191.36±1.32). Selling price per broiler was high where <400 broilers exist (220.87±5.41) and were low where 400-600 broilers exist (216.00±3.00). Profit per broiler was highest where <400 broilers exist (28.53±4.11) and was very low where >600 broilers (24.90±2.79).

Total production cost/batch, total selling price/batch and net profit/batch were significantly influenced by farm size (P < 0.001) but feed intake per broiler, weight gain, FCR, production cost per broiler, selling price per broiler and profit broiler were not significantly influenced by farm size (P>0.05).

6.3.4. Effect of housing pattern of broilers

Effect of housing pattern of broilers on productive performances in broilers farm and ANOVA are showed in Table-67-68 and Fig. 80-82. From Table-67 the feed intake per broiler was highest in straw made house (3.09±0.04 kg) and was lowest in tin shade house (2.98±0.02 kg). Body weight gain was highest in semi paca house (1.77±0.03 kg) and lowest in straw made house (1.47±0.02 kg). The FCR was better in tin shade house (1.72±0.02) and the FCR was not good in straw made house (2.10±0.01). Total production cost/batch was high in semi paca house (105.67±14.07 th.tk) and was low in straw made house (78.52±6.14 th.tk). Selling price per broiler was high in tin shade house (219.62±3.03 taka) and was low in straw made house (198.89±2.77 taka). Profit per broiler and net profit/batch was highest in tin shade house as (26.62±2.62 taka), (12.96±1.47 th.taka) and was very low in straw made house as (6.00±1.26 taka), (2.41±0.53 th.tk).

Feed intake per broiler, body weight gain per broiler, FCR, selling price, profit broiler and net profit/batch were differed significantly (P<0.05, P<0.001, P<0.01) whereas production cost, total production cost and total selling price/batch were not significantly influenced by housing pattern (P>0.05).

6.3.5. Effect of floor type of broilers

Effect of floor type of broilers on productive performances in broilers farm and t-test are summarized in Table-69-70 and Fig. 83-85. In Table-69 the feed intake per broiler was highest for floor with litter (3.00±0.02) and was lowest for macha with polythin and litter (2.99±0.08). Body weight gain was highest for macha with polythin and litter (1.76±0.02) and lowest for floor with litter (1.75±0.02). The FCR was better for macha with polythin and litter (1.70±0.06) and the FCR was not good for floor with litter (1.73±0.02). Production cost per broiler was high for macha with polythin and litter (194.39±6.64) and was low for floor with litter (192.65±1.22). Total production cost/batch was high for macha with polythin and litter (111.01±25.89) and was low for floor with litter (96.39±6.27). Selling price per broiler was high for Floor with litter (218.04±2.40) and was low for macha with polythin and litter (216.00±7.12). All the parameters were not significantly influenced by floor type of broiler (P>0.05).

Table-61: Effect of broiler strain at marketing age (up to 28-32 days)

Productive performances	Broiler strains				Sig. level
	Cob 500	Hubbard Classic	Ross 308	Total	
Feed intake/broiler (kg)	3.00±0.02 n=51	3.00±0.00 n=5	3.13±0.05 n=4	3.01±0.02 n=60	NS
Body weight gain/broiler (kg)	1.75±0.02[b] n=51	1.75±0.02[b] n=5	1.45±0.02[a] n=4	1.73±0.02 n=60	***
FCR	1.73±0.02[a] n=51	1.72±0.02[a] n=5	2.16±0.02[b] n=4	1.75±0.02 n=60	***
Production cost/broiler (tk)	192.39±1.39 n=51	198.32±3.12 n=5	191.00±1.55 n=4	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	93.36±6.33 n=51	108.24±21.72 n=5	138.51±30.62 n=4	97.61±6.09 n=60	NS
Selling price/broiler (tk)	218.55±2.52[b] n=51	218.00±4.32[b] n=5	193.75±1.75[a] n=4	216.85±2.31 n=60	*
Total selling price/batch (th.tk)	104.84±6.91 n=51	118.83±25.26 n=5	149.78±33.30 n=4	109.00±6.64 n=60	NS
Profit/broiler (tk)	27.29±2.28[b] n=51	20.80±2.63[b] n=5	2.75±0.25[a] n=4	25.12±2.10 n=60	**
Net profit/batch (th.tk)	12.48±1.18 n=51	12.00±4.21 n=5	9.06±7.16 n=4	12.21±1.14 n=60	NS

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-62: Analysis of variance for effect of broiler strain at marketing age

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between Groups	.059	2	.030	1.645	.202
	Within Groups	1.025	57	.018		
Body weight gain/broiler (kg)	Between Groups	.326	2	.163	10.920	.000
	Within Groups	.851	57	.015		
FCR	Between Groups	.689	2	.345	21.175	.000
	Within Groups	.928	57	.016		
Production cost/broiler (tk)	Between Groups	173.800	2	86.900	.962	.388
	Within Groups	5151.249	57	90.373		
Total production cost/batch (th.tk)	Between Groups	8180.015	2	4090.008	1.897	.159
	Within Groups	122907.159	57	2156.266		
Selling price/broiler (tk)	Between Groups	2288.273	2	1144.136	3.926	.025
	Within Groups	16611.377	57	291.428		
Total selling price/batch (th.tk)	Between Groups	8014.876	2	4007.438	1.543	.222
	Within Groups	147992.011	57	2596.351		
Profit/broiler (tk)	Between Groups	2336.045	2	1168.023	4.989	.010
	Within Groups	13344.138	57	234.108		
Net profit/batch (th.tk)	Between Groups	43.603	2	21.802	.274	.761
	Within Groups	4533.670	57	79.538		

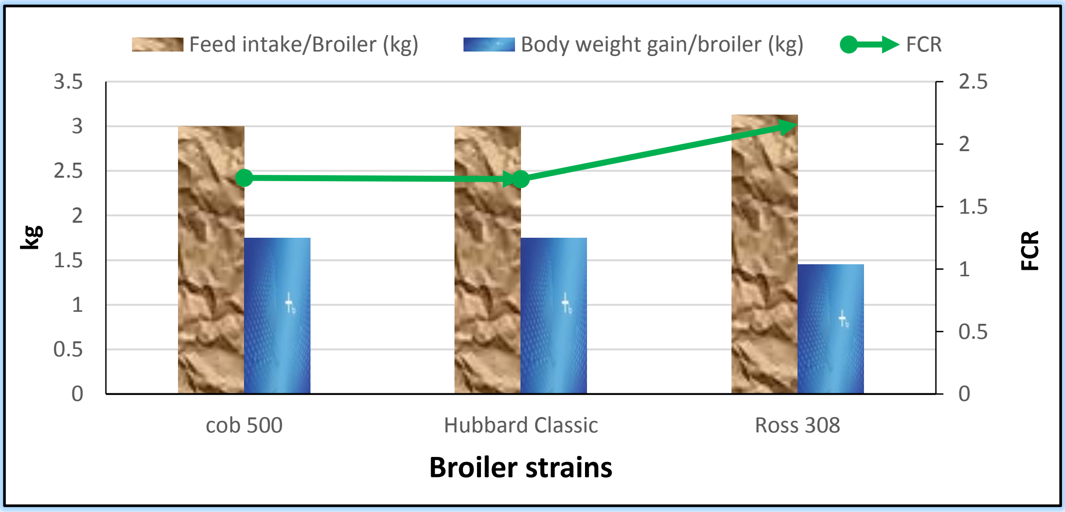

Fig. 71: Breed effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

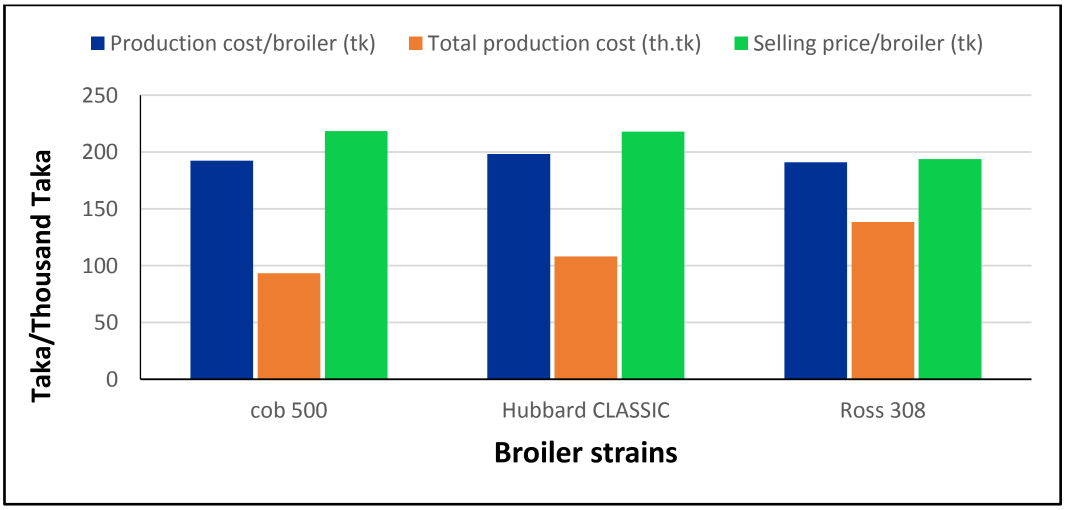

Fig. 72: Breed effect on production cost (tk), total production cost (th.tk) and selling price (tk)

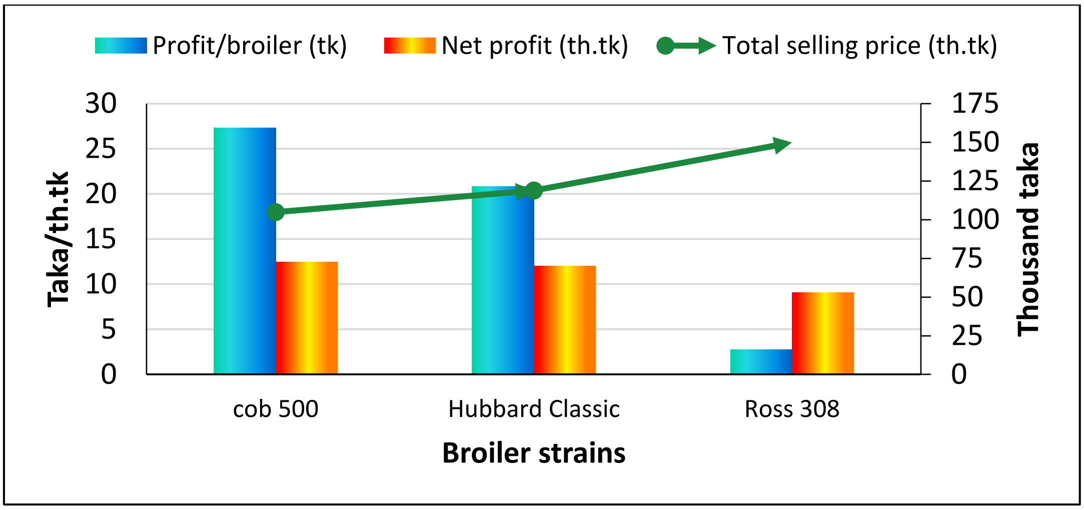

Fig. 73: Breed effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

Table-63: Effect of chick quality of broilers at marketing age (up to 28-32 days)

Productive performances	Chick quality			Sig. level
	Poor quality chick	Good quality chick	Excellent quality chick	
Feed intake/Broiler (kg)	3.01±0.03 n=7	3.02±0.02 n=36	2.96±0.04 n=17	NS
Body weight gain/broiler (kg)	1.67±0.04[a] n=7	1.72±0.02[a] n=36	1.84±0.02[b] n=17	***
FCR	1.81±0.05[b] n=7	1.76±0.02[b] n=36	1.61±0.02[a] n=17	***
Production cost/broiler (tk)	192.07±3.07 n=7	193.99±1.65 n=36	190.55±2.24 n=17	NS
Total production cost/batch (th.tk)	85.47±12.20 n=7	99.67±7.19 n=36	98.23±14.67 n=17	NS
Selling price/broiler (tk)	197.57±3.18[a] n=7	214.36±2.13[b] n=36	233.82±4.00[c] n=17	***
Total selling price/batch (th.tk)	87.44±12.43 n=7	109.50±7.94 n=36	117.94±16.18 n=17	NS
Profit/broiler (tk)	6.71±0.64[a] n=7	22.19±1.12[b] n=36	44.47±3.50[c] n=17	***
Net profit/batch (th.tk)	2.76±0.48[a] n=7	11.231.05[b] n=36	20.83±2.26[c] n=17	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka *** = Significant at 0.1% levels and NS=Non-significant.

Table-64: Analysis of variance for chick quality of broilers at marketing age

Dependent variables	Sources of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler Total gain (kg)	Between Groups	.040	2	.020	1.072	.349
	Within Groups	1.070	57	.019		
Body weight gain/broiler (kg	Between Groups	.209	2	.104	8.646	.001
	Within Groups	.688	57	.012		
FCR	Between Groups	.316	2	.158	12.096	.000
	Within Groups	.744	57	.013		
Production cost/broiler (tk)	Between Groups	140.649	2	70.325	.773	.466
	Within Groups	5184.400	57	90.954		
Total production cost/batch /tatch (th.tk)	Between Groups	1191.238	2	595.619	.261	.771
	Within Groups	129895.937	57	2278.876		
Selling price/broiler (tk)	Between Groups	7654.093	2	3827.046	20.755	.000
	Within Groups	10510.490	57	184.395		
Total selling price/ /batch (th.tk)	Between Groups	4614.951	2	2307.476	.837	.438
	Within Groups	157168.766	57	2757.347		
Profit/broiler (tk)	Between Groups	8895.297	2	4447.649	51.472	.000
	Within Groups	4925.303	57	86.409		
Net profit/batch (th.tk)	Between Groups	1890.255	2	945.127	19.365	.000
	Within Groups	2781.976	57	48.807		

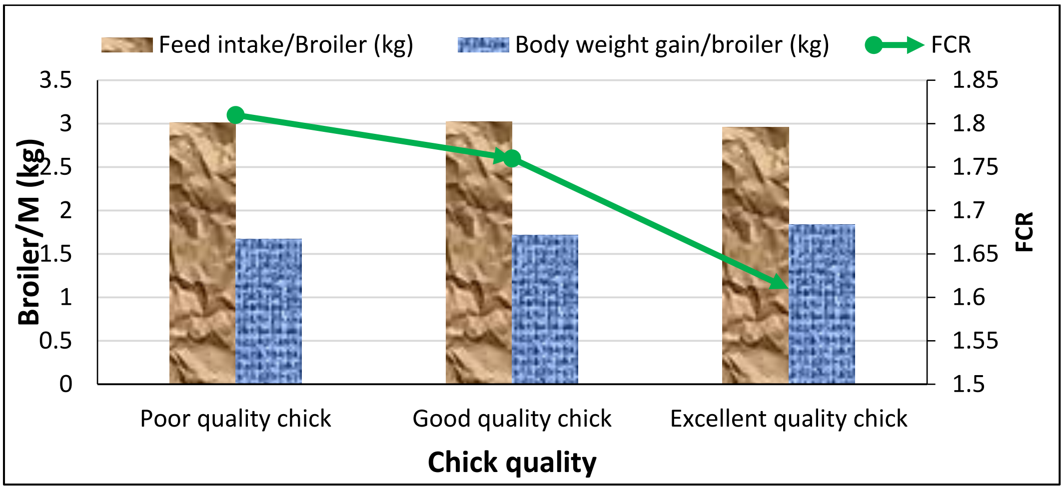

Fig. 74: Chick quality effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

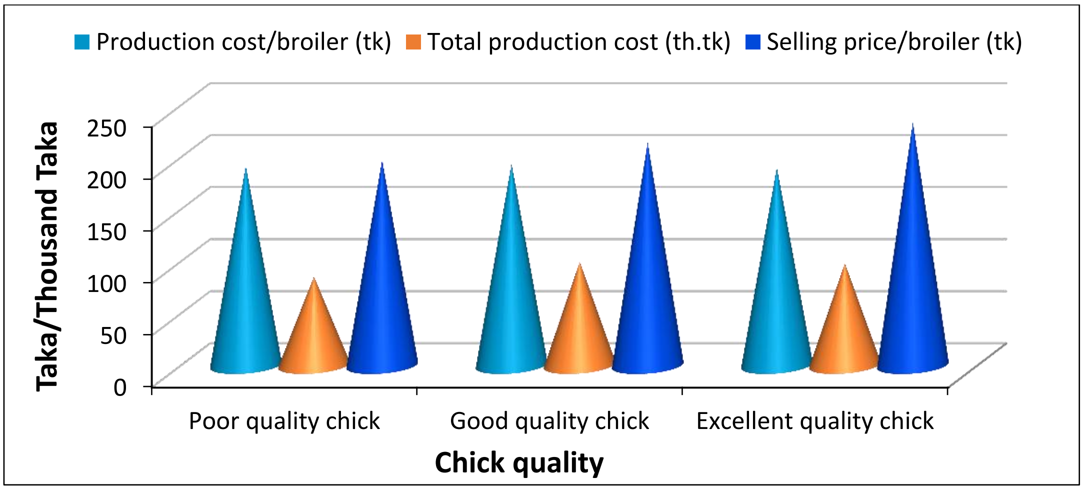

Fig. 75: Chick quality effect on production cost (tk), total production cost (th.tk) and selling price (tk).

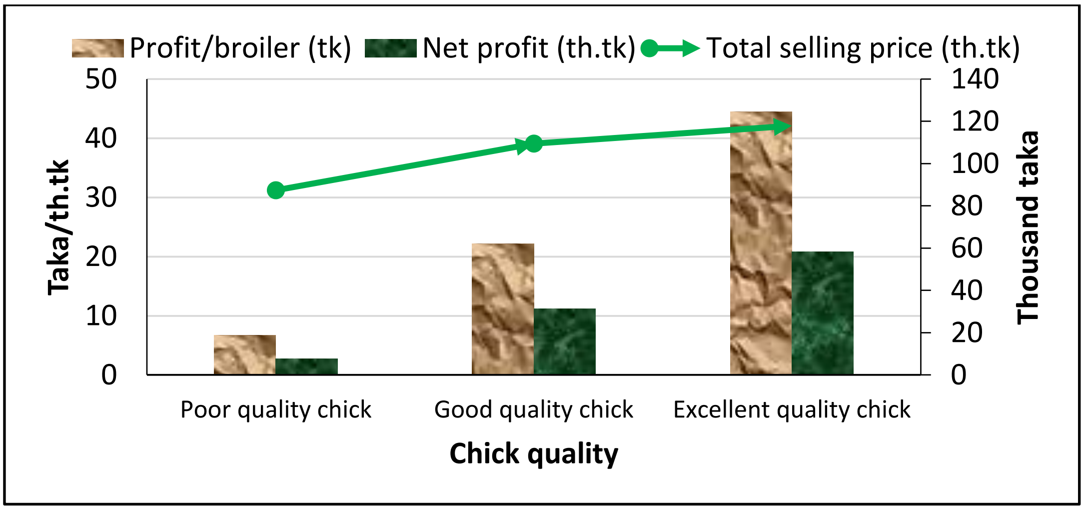

Fig. 76: Chick quality effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk).

Table-65: Effect of farm size at marketing age (up to 28-32 days) of broiler

Productive performances	Farm size on productive performances			Sig. level
	<400 broilers	400-600 broilers	>600 broilers	
Feed intake/Broiler (kg)	2.99±0.03 n=15	3.00±0.02 n=35	3.01±0.05 n=10	NS
Body weight gain/broiler (kg)	1.76±0.02 n=15	1.72±0.02 n=35	1.82±0.03 n=10	NS
FCR	1.71±0.03 n=15	1.75±0.02 n=35	1.66±0.03 n=10	NS
Production cost/broiler (tk)	193.06±3.51 n=15	191.36±1.32 n=35	197.40±2.03 n=10	NS
Total production cost/batch (th.tk)	52.16±2.79[a] n=15	90.22±1.89[b] n=35	191.63±6.61[c] n=10	***
Selling price/broiler (tk)	220.87±5.41 n=15	216.00±3.00 n=35	220.20±3.36 n=10	NS
Total selling price/batch (th.tk)	59.35±2.91[a] n=15	101.04±2.16[b] n=35	213.24±8.56[c] n=10	***
Profit/broiler (tk)	28.53±4.11 n=15	26.43±2.82 n=35	24.90±2.79 n=10	NS
Net profit/batch (th.tk)	7.41±0.94[a] n=15	12.08±1.27[a] n=35	24.38±2.90[b] n=10	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *** = Significant at 0.1% levels and NS=Non-significant.

Table-66: Analysis of variance for farm size at marketing age

Dependent variables	Sources of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between Groups	.003	2	.001	.066	.936
	Within Groups	1.107	57	.019		
Body weight gain/broiler (kg	Between Groups	.075	2	.038	2.603	.083
	Within Groups	.822	57	.014		
FCR	Between Groups	.076	2	.038	2.216	.118
	Within Groups	.983	57	.017		
Production cost/broiler (tk)	Between Groups	285.098	2	142.549	1.612	.208
	Within Groups	5039.951	57	88.420		
Total production cost/batch (th.tk)	Between Groups	121285.946	2	60642.973	352.675	.000
	Within Groups	9801.228	57	171.951		
Selling price/broiler (tk)	Between Groups	311.250	2	155.625	.497	.611
	Within Groups	17853.333	57	313.216		
Total selling price/batch (th.tk)	Between Groups	147842.391	2	73921.196	302.232	.000
	Within Groups	13941.326	57	244.585		
Profit/broiler (tk)	Between Groups	85.395	2	42.698	.177	.838
	Within Groups	13735.205	57	240.969		
Net profit/batch (th.tk)	Between Groups	1793.387	2	896.694	17.754	.000
	Within Groups	2878.843	57	50.506		

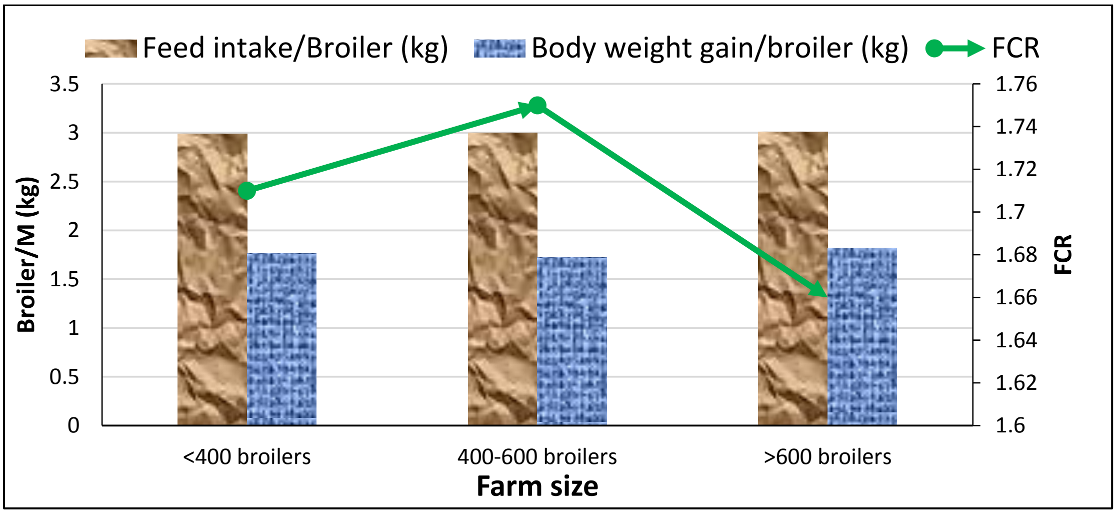

Fig. 77: Farm size effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

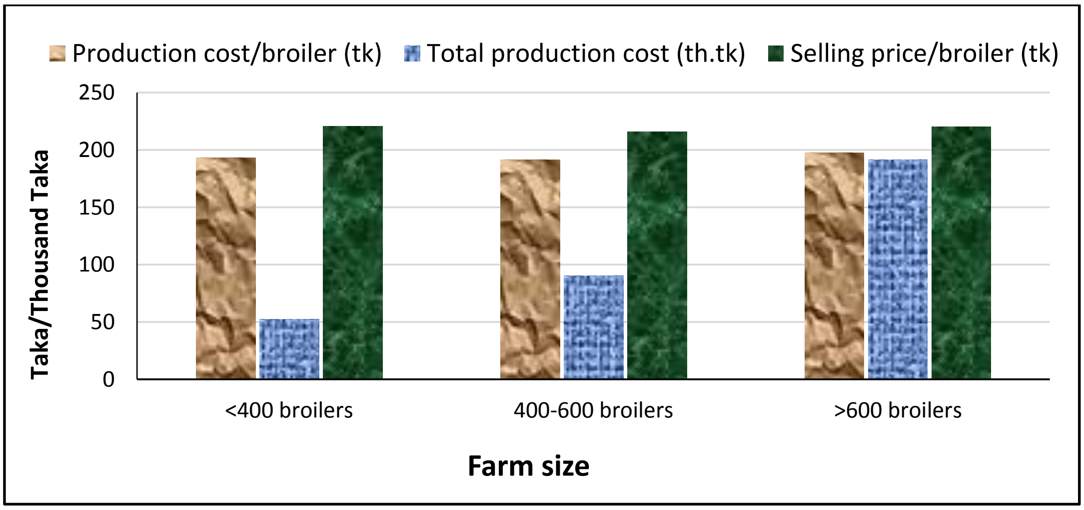

Fig. 78: Farm size effect on production cost (tk), total production cost (th.tk) and selling price (tk)

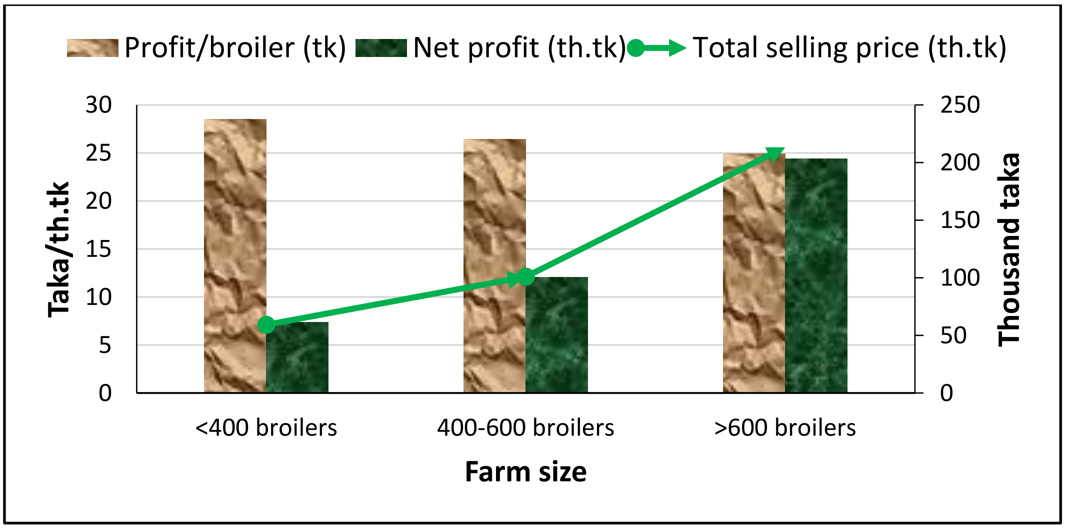

Fig. 79: Farm size effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

Table-67: Effect of housing pattern at marketing age (up to 28-32 days) of broiler

Productive parameters	Housing pattern				Sig. level
	Semi Paca Housing	Tin Shade Housing	Straw Made Housing	Total	
Feed intake/Broiler (kg)	3.03±0.04[ab] n=12	2.98±0.02[a] n=39	3.09±0.04[b] n=9	3.01+0.02 n=60	*
Body weight gain/broiler (kg)	1.77±0.04[b] n=12	1.74±0.02[b] n=39	1.47±0.02[a] n=9	1.71±0.02 n=60	***
FCR	1.72±0.04[a] n=12	1.72±0.02[a] n=39	2.10±0.01[b] n=9	1.78±0.02 n=60	***
Production cost/broiler (tk)	192.08±2.50 n=12	192.99±1.67 n=39	192.89±2.17 n=9	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	105.67±14.07 n=12	99.53±8.13 n=39	78.52±6.14 n=9	97.61±6.09 n=60	NS
Selling price/broiler (tk)	212.50±3.97[b] n=12	219.62±3.03[b] n=39	198.89±2.77[a] n=9	215.08±2.34 n=60	**
Total selling price/batch (th.tk)	116.96±15.65 n=12	111.92±9.04 n=39	80.92±6.32 n=9	108.71±6.86 n=60	NS
Profit/broiler (tk)	20.43±4.66[b] n=12	26.62±2.62[b] n=39	6.00±1.26[a] n=9	22.29±2.15 n=60	**
Net profit/batch (th.tk)	11.59±2.85[b] n=12	12.96±1.47[b] n=39	2.41±0.53[a] n=9	12.96±1.15 n=60	**

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-68: Analysis of variance for housing pattern at marketing age

Dependent variables	Source of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between Groups	.101	2	.051	2.629	.051
	Within Groups	1.096	57	.019		
Body weight gain/broiler (kg	Between Groups	.594	2	.297	21.400	.000
	Within Groups	.791	57	.014		
FCR	Between Groups	1.116	2	.558	32.781	.000
	Within Groups	.971	57	.017		
Production cost/broiler (tk)	Between Groups	7.806	2	3.903	.042	.959
	Within Groups	5317.243	57	93.285		
Total production cost/batch (th.tk)	Between Groups	4203.964	2	2101.982	.944	.395
	Within Groups	126883.958	57	2226.034		
Selling price/broiler (tk)	Between Groups	3241.464	2	1620.732	5.697	.006
	Within Groups	16215.120	57	284.476		
Total selling price/batch (th.tk)	Between Groups	8385.018	2	4192.509	1.511	.229
	Within Groups	158107.709	57	2773.819		
Profit/broiler (tk)	Between Groups	3163.999	2	1582.000	6.848	.002
	Within Groups	13168.645	57	231.029		
Net profit/batch (th.tk)	Between Groups	818.601	2	409.301	5.445	.007
	Within Groups	4284.831	57	75.172		

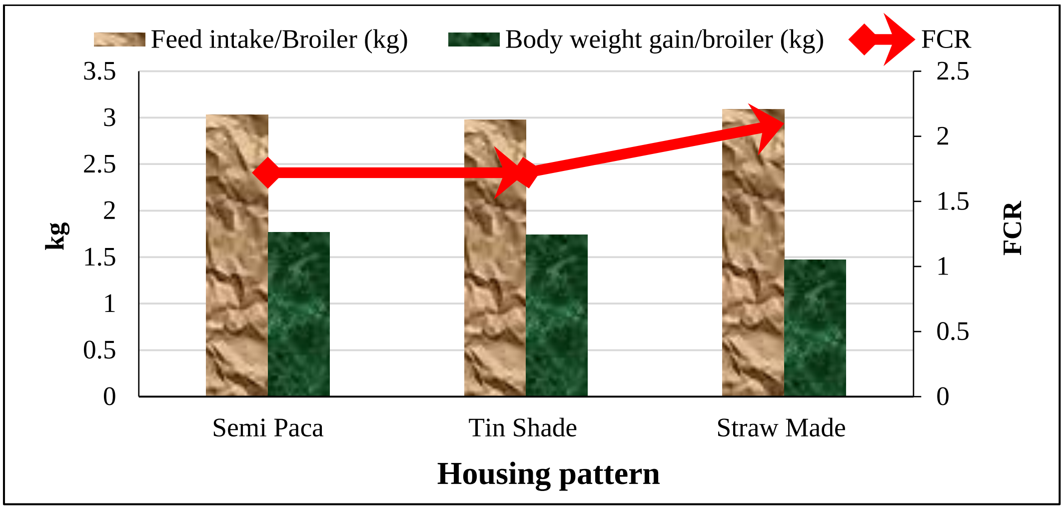

Fig. 80: Housing pattern effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

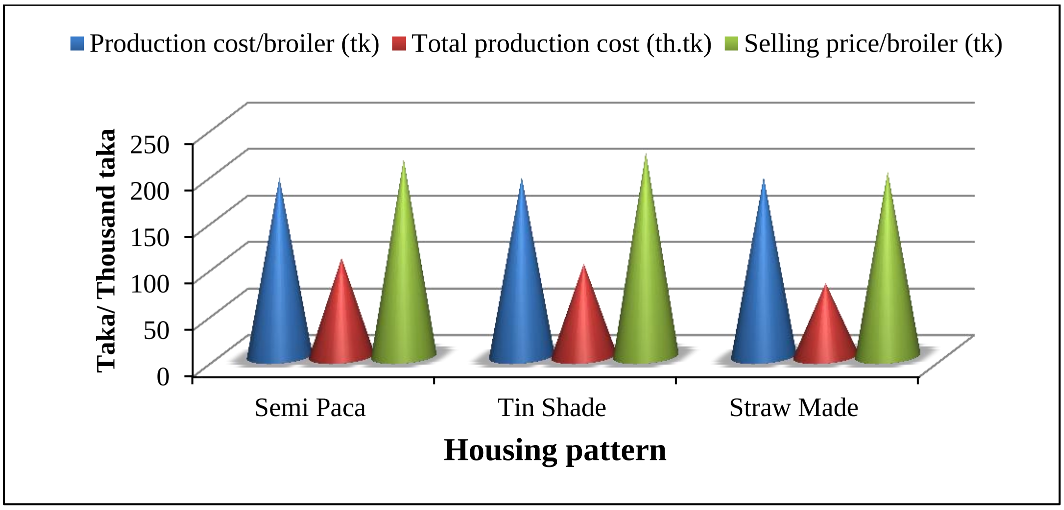

Fig. 81: Housing pattern effect on production cost (tk), total production cost (th.tk) and selling price (tk)

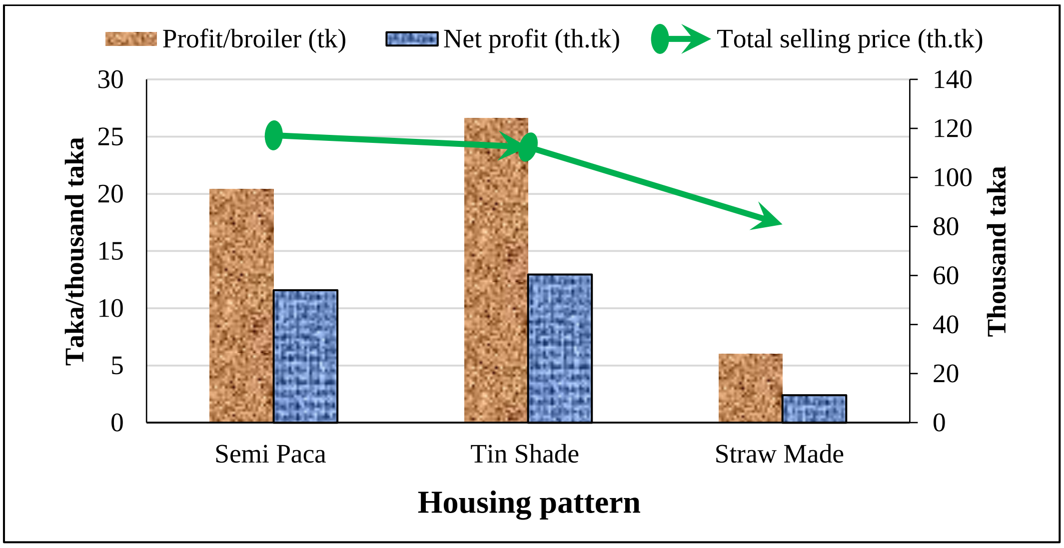

Fig. 82: Housing pattern effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

Table-69: Effect of floor type of broilers house at marketing age (up to 28-32 days)

Floor type broiler house	Floor type			Sig. level
	Macha with polythin and litter	Floor with litter	Total	
Feed intake/Broiler (kg)	2.99±0.08 n=5	3.00±0.02 n=55	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.76±0.02 n=5	1.75±0.02 n=55	1.75±0.02 n=60	NS
FCR	1.70±0.06 n=5	1.73±0.02 n=55	1.72±0.02 n=60	NS
Production cost/broiler (tk)	194.39±6.64 n=5	192.65±1.22 n=55	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	111.01±25.89 n=5	96.39±6.27 n=55	97.61±6.09 n=60	NS
Selling price/broiler (tk)	216.60±7.12 n=5	218.04±2.40 n=55	217.92±2.27 n=60	NS
Total selling price/batch (th.tk)	121.94±28.30 n=5	108.17±6.98 n=55	109.32±6.76 n=60	NS
Profit/broiler (tk)	23.40±4.93 n=5	27.00±2.11 n=55	26.70±1.98 n=60	NS
Net profit/batch (th.tk)	13.00±4.12 n=5	12.96±1.21 n=55	12.96±1.15 n=60	NS

Values are mean ±S.E. S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=thousand taka, NS=Non-significant.

Table-70: t-test for floor type of broilers house at marketing age

Dependent variables	t-value	df	P-value	Mean difference	Std. Error difference
Feed intake/Broiler (kg)	-.169	58	.866	-.01091	.06460
Body weight gain/broiler (kg)	.235	58	.815	.01364	.05807
FCR	-.415	58	.680	-.02616	.06305
Production cost/broiler (tk)	.389	58	.699	1.73982	4.46983
Total production cost/batch (th.tk)	.661	58	.511	14.62618	22.12305
Selling price/broiler (tk)	-.174	58	.863	-1.43636	8.26409
Total selling price/batch (th.tk)	.559	58	.578	13.76173	24.60336
Profit/broiler (tk)	-.500	58	.619	-3.60000	7.19488
Net profit/batch (th.tk)	.009	58	.993	.03725	4.19235

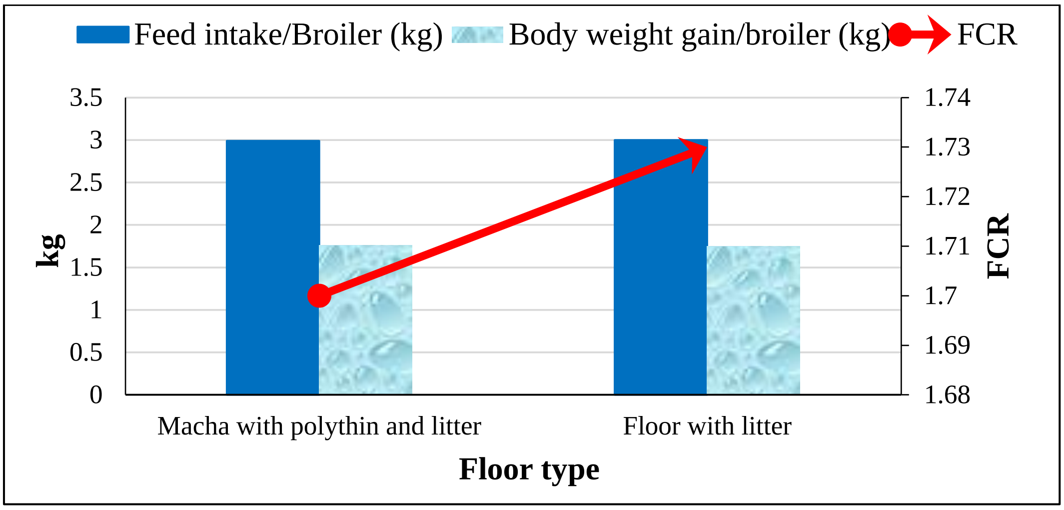

Fig. 83: Floor type effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

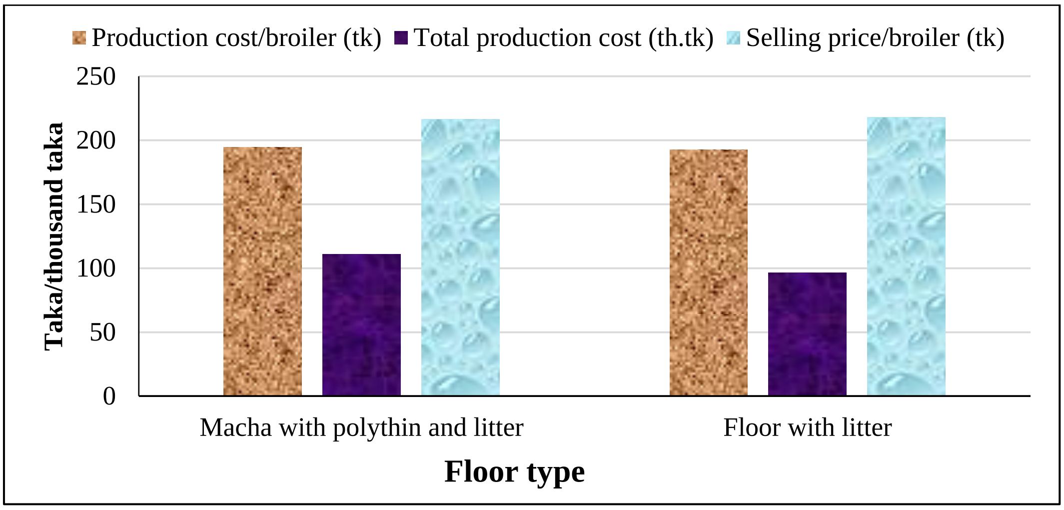

Fig. 84: Floor type effect on production cost (tk), total production cost (th.tk) and selling price (tk)

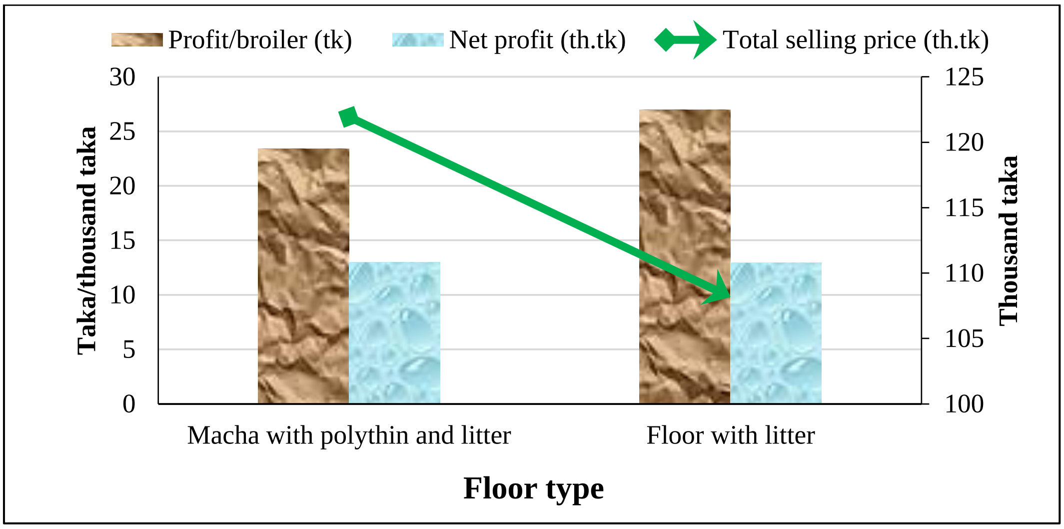

Fig. 85: Floor type effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

6.3.6. Effect of overall housing system

Effect of overall housing system of broilers on productive performances in broilers farm and ANOVA are showed in Table-71-72 and Fig. 86-88. In Table-71 the highest mean value of body weight gain was in good housing system (1.79±0.02 kg) and lowest was in poor housing system (1.63±0.04 kg). The average value of FCR was lowest in good housing system (1.68±0.02) and highest in poor housing system (1.87±0.05). Selling price per broiler was high in good housing system (223.18±2.58) and was low in poor housing system (204.14±2.71). Profit per broiler was highest in good housing system (31.50±2.46 taka) and was very low in poor housing system (10.57±2.29 taka). Net profit/batch was highest in good housing system (14.99±1.37 th.tk) and was low in poor housing system (4.76±0.48 th.tk). Feed intake per broiler was highest in both poor and medium quality housing system (3.04±0.04 kg) and was lowest in good quality overall housing system (2.99±0.02 kg). Production cost per broiler was high in poor quality housing system (194.86±1.47 taka) and the production cost per broiler was low in medium quality housing system (191.56±3.21 taka). Total production cost/batch was high in medium quality housing system (99.13±16.44 th.tk) and was low in poor quality housing system (94.66±8.90 th.tk). Total selling price/batch was highest in good quality housing system (111.57±8.16 th.tk) and was low in poor quality housing system (98.28±8.96 th.tk).

Body weight gain, FCR, Selling price/broiler, profit/broiler and net profit/batch were significantly ($P< 0.001$, $P<0.01$) influenced by overall housing system, but feed intake/broiler, production cost/broiler, total production cost and total selling price/batch were not significantly influenced by overall housing pattern ($P>0.05$).

6.3.7. Effect of overall ventilation system

Effect of overall ventilation system of broilers on productive performances in broilers farm and ANOVA are represented in Table-73-74 and Fig. 89-91. In Table-74 the highest mean value of body weight gain was in excellent ventilation system (1.85±0.03 kg) and lowest was in poor ventilation system (1.67±0.04 kg). The average value of FCR was lowest in excellent ventilation system (1.60±0.03) and highest in poor ventilation system (1.81±0.05). Selling price per broiler was high in excellent ventilation system (236.69±4.91 taka) and was low in poor ventilation system (197.57±3.18 taka). Profit per broiler was highest in excellent ventilation system (49.54±3.44 taka) and was very low in poor ventilation system (6.71±0.64 taka). Net profit/batch was highest in excellent ventilation system (20.08±2.37 th.tk) and was low in poor ventilation system (2.76±0.48 th.tk). Feed intake per broiler was highest in medium ventilation system (3.01±0.02 kg) and was lowest in excellent ventilation system (2.97±0.05 kg). Production cost per broiler was high in medium ventilation system (194.39±1.52 taka) and lowest in excellent ventilation system (188.26±2.45 taka). Total production cost/batch was high in medium ventilation system (105.57±7.87 th.tk) and was low in poor ventilation system (85.47±12.20 th.tk). Total selling price/batch was highest in medium ventilation system (116.45±8.82 th.tk) and was low in poor ventilation system (87.44±12.43 th.tk). Body weight gain, FCR, selling price/broiler, profit/broiler and net profit/batch were significantly ($P < 0.001$) influenced by overall ventilation system, but feed intake/broiler, production cost/broiler, total production cost and total selling price/batch were not significantly influenced by overall ventilation system ($P>0.05$).

6.3.8. Effect of feed quality

Effect of feed quality of broilers on productive performances in broilers farm and ANOVA are summarized in Table-75-76 and Fig. 92-94. From Table-75 the highest mean value of body weight gain was in excellent quality feed (1.81±0.02 kg) and lowest was in poor ventilation system (1.67±0.04 kg). The average value of FCR was lowest in excellent quality feed (1.65±0.02) and highest in poor quality feed (1.81±0.05). Selling price per broiler was high in excellent quality feed (228.50±2.82 taka) and was low in poor quality feed (197.57±3.18 taka). Profit per broiler was highest in excellent quality feed (37.38±2.31 taka) and was very low in poor quality feed (6.71±0.64 taka). Net profit/batch was highest in excellent quality feed (18.34±1.53 th.tk) and was low in poor quality feed (2.76±0.48 th.tk). Feed intake per broiler was highest in medium quality feed (3.02±0.02 kg) and was lowest in excellent quality feed (2.98±0.03 kg). Production cost per broiler was high in medium quality feed (193.75±1.19) and the production cost per broiler was low in poor quality feed (192.07±3.07). Total production cost/batch was high in excellent quality feed (101.45±9.64) and was low in poor quality feed (85.47±12.20). Total selling price/batch was highest in excellent quality feed (118.72±10.69) and was low in poor quality feed (87.44±12.43). Body weight gain, FCR, Selling price/broiler, profit/broiler and net profit/batch were significantly ($P < 0.001$)influenced by feed quality, but feed intake/broiler, production cost/broiler, total production cost and total selling price/batch were not significantly influenced by feed quality ($P>0.05$).

6.3.9. Effect of social status of farmers

Effect of social status of farmers on productive performances in broilers farm and t-test are represented in Table-77-78 and Fig. 95-97. In Table-77 the average value of FCR was lowest in ultra poor farmers (1.61±0.04) and highest in marginal farmers (1.74±0.02), total production cost was high in marginal farmers (102.40±6.66 th.tk) and low in ultra poor farmers (66.44±9.07 th.tk) and profit broiler was highest in ultra poor farmers (39.13±6.42 taka) and very low in marginal farmers (24.79±1.95 taka).

Feed intake per broiler was highest in marginal farmers (3.01±0.02 kg) and lowest in ultra poor farmers (2.93±0.06 kg), the highest mean value of body weight gain per broiler was in ultra poor farmers (1.82±0.03 kg) and lowest in marginal farmers (1.74±0.02 kg), production cost per broiler was high in marginal farmers (193.33±1.28) and low in ultra poor farmers (189.31±3.99), selling price per broiler was high in ultra poor farmers (227.63±8.05 taka) and low in poor marginal farmers (216.42±2.27 taka), total selling price/batch was highest in marginal farmers (114.07±7.47) and low in ultra poor farmers (78.47±9.31) and net profit/batch was highest in marginal farmers (13.03±1.29) and low in ultra poor farmers (12.53±2.23).

FCR, total production cost and profit/broiler were significantly influenced by social status of farmers (P < 0.001), but was not significant with feed intake/broiler, body weight gain, production cost/broiler, selling price/broiler, total selling price/batch and net profit/batch were not significantly influenced by social status of farmers (P>0.05).

6.3.10. Effect of economic status of farmers

Effect of economic status of farmers on productive performances in broilers farm and ANOVA are furnished in Table-79-80 and Fig. 98-100. From Table-79 the feed intake per broiler was highest (3.04±0.02 kg) in the group of 10000-15000 taka and was lowest (2.94±0.04 kg) in the group of >15000 taka. Production cost per broiler was high (195.58±1.68) in 10000-15000 taka group and the production cost per broiler was low (189.21±2.16) in >15000 taka group. The highest mean value of body weight gain per broiler was (1.78±0.03 kg) in <10000 taka group and lowest was (1.73±0.02 kg) in 10000-15000 taka group. The average value of FCR was lowest (1.68±0.04) in <10000 taka and highest (1.76±0.02) in 10000-15000 taka. Total production cost/batch was high in >15000 taka (111.25±13.45) and was low in <10000 taka (79.69±9.03). Selling price per broiler was high in 10000-15000 taka (219.79±2.82) and was low in >15000 taka (211.18±3.06). Total selling price/batch was highest in >15000 taka (124.19±15.65) and was low in <10000 taka (90.84±10.23). Profit per broiler was highest in <10000 taka (30.31±4.98) and was very low in >15000 taka (23.27±3.38). Net profit/batch was highest in group >15000 taka (14.22±3.02) and was low in group 10000-15000 (11.84±2.23).

Feed intake/broiler and production cost/broiler were significantly influenced by economic status of farmers (P< 0.05), but body weight gain, FCR, total production cost, selling price/broiler, total selling price/batch, profit/broiler and net profit/batch were not significantly influenced by economic status of farmers (P>0.05).

Table-71 : Effect of overall housing system at marketing age (up to 28-32 days) of broiler

Productive performances	Overall housing system				Sig. level
	Poor	Medium	Good	Total	
Feed intake/Broiler (kg)	3.04±0.04 n=7	3.00±0.04 n=13	2.99±0.02 n=40	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.63±0.04[a] n=7	1.68±0.03[a] n=13	1.79±0.02[b] n=40	1.75±0.02 n=60	***
FCR	1.87±0.05[b] n=7	1.79±0.04[b] n=13	1.68±0.02[a] n=40	1.72±0.02 n=60	***
Production cost/broiler (tk)	194.86±1.47 n=7	191.56±3.21 n=13	192.83±1.52 n=40	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	94.66±8.90 n=7	99.13±16.44 n=13	97.63±7.40 n=40	97.61±6.09 n=60	NS
Selling price/broiler (tk)	204.14±2.71[a] n=7	209.15±5.07[a] n=13	223.18±2.58[b] n=40	217.92±2.27 n=60	**
Total selling price/batch (th.tk)	98.28±8.96 n=7	108.34±18.49 n=13	111.57±8.16 n=40	109.32±6.76 n=60	NS
Profit/broiler (tk)	10.57±2.29[a] n=7	20.62±2.47[ab] n=13	31.50±2.46[b] n=40	26.70±1.98 n=60	***
Net profit/batch (th.tk)	4.76±1.03[a] n=7	11.14±2.58[b]	14.99±1.37[b] n=40	12.96±1.15 n=60	**

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-72: Analysis of variance for overall housing system at marketing age

Dependent variables	Sources of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between groups	.015	2	.007	.380	.685
	Within groups	1.095	57	.019		
Body weight gain/broiler (kg	Between groups	.229	2	.115	9.777	.000
	Within groups	.668	57	.012		
FCR	Between groups	.302	2	.151	11.359	.000
	Within groups	.758	57	.013		
Production cost/broiler (tk)	Between groups	49.728	2	24.864	.269	.765
	Within groups	5275.321	57	92.549		
Total production cost/batch (th.tk)	Between groups	90.755	2	45.377	.020	.980
	Within groups	130996.420	57	2298.183		
Selling price/broiler (tk)	Between groups	3432.259	2	1716.129	6.640	.003
	Within groups	14732.324	57	258.462		
Total selling price/batch (th.tk)	Between groups	1067.779	2	533.890	.189	.828
	Within groups	160715.938	57	2819.578		
Profit/broiler (tk)	Between groups	3223.809	2	1611.904	8.670	.001
	Within groups	10596.791	57	185.909		
Net profit/batch (th.tk)	Between groups	677.803	2	338.902	4.836	.011
	Within groups	3994.427	57	70.078		

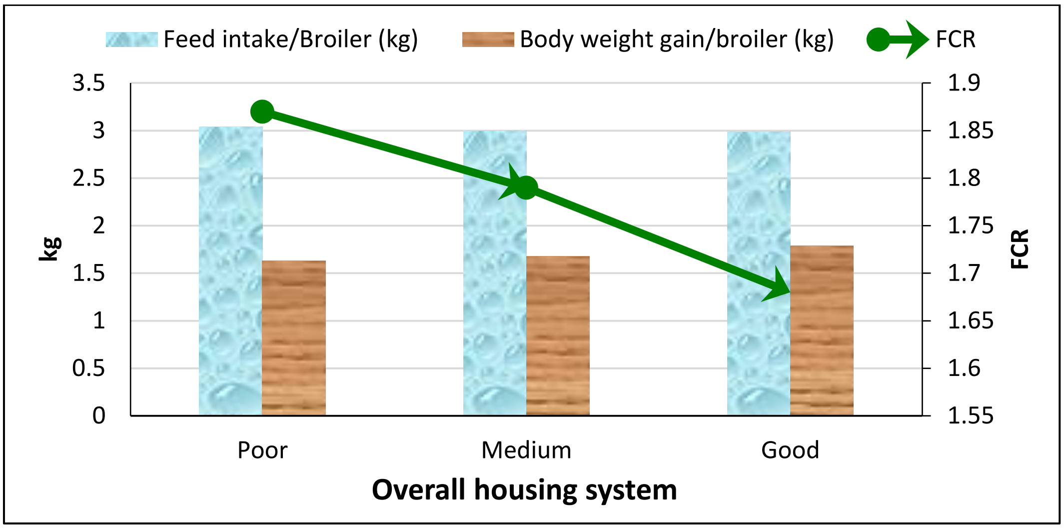

Fig. 86: Overall housing effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

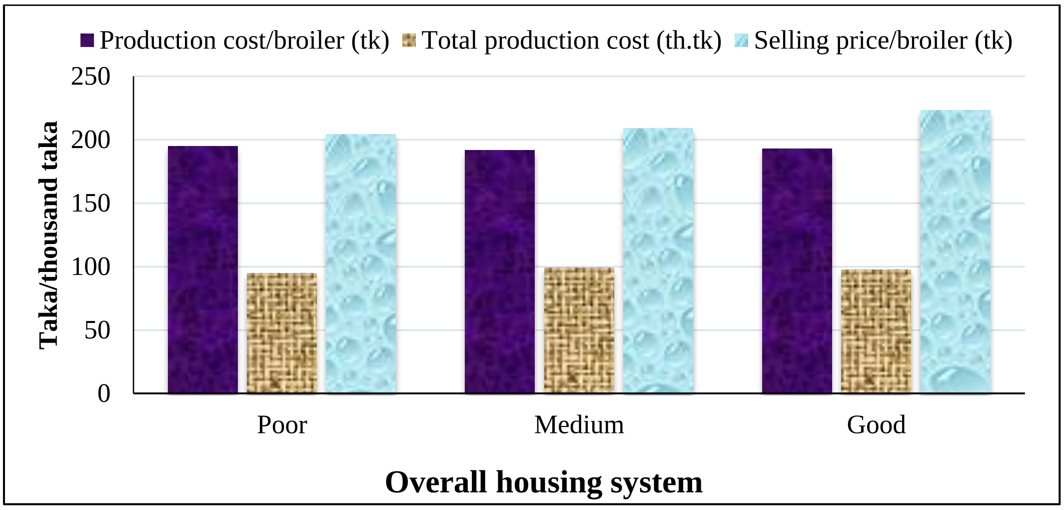

Fig. 87: Overall housing effect on production cost (tk), total production cost (th.tk) and selling price (tk)

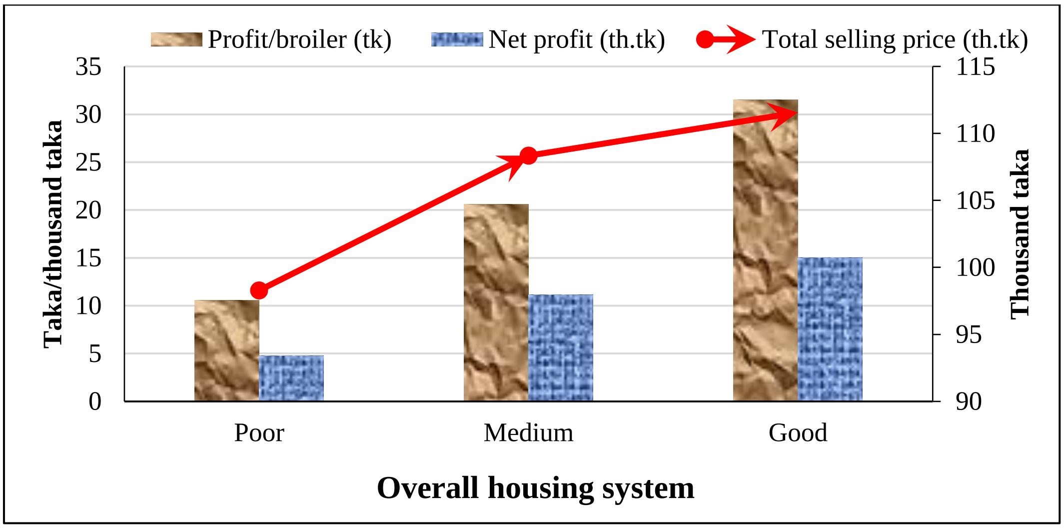

Fig. 88: Overall housing effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

Table-73: Effect of overall ventilation system at marketing age (up to 28-32 days) of broiler

Productive performances	Overall ventilation system				Sig. level
	Poor ventilation	Medium ventilation	Excellent ventilation	Total	
Feed intake/Broiler (kg)	3.01±0.03 n=7	3.01±0.02 n=40	2.97±0.05 n=13	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.67±0.04[a] n=7	1.73±0.02[a] n=40	1.85±0.03[c] n=13	1.75±0.02 n=60	***
FCR	1.81±0.05[b] n=7	1.75±0.02[b] n=40	1.60±0.03[a] n=13	1.72±0.02 n=60	***
Production cost/broiler (tk)	192.07±3.07 n=7	194.39±1.52 n=40	188.26±2.45 n=13	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	85.47±12.20 n=7	105.57±7.87 n=40	79.65±11.44 n=13	97.61±6.09 n=60	NS
Selling price/broiler (tk)	197.57±3.18[a] n=7	215.38±2.00[b] n=40	236.69±4.91[c] n=13	217.92±2.27 n=60	***
Total selling price/batch (th.tk)	87.44±12.43 n=7	116.45±8.82 n=40	99.16±13.22 n=13	109.32±6.76 n=60	NS
Profit/broiler (tk)	6.71±0.64[a] n=7	22.78±1.06[b] n=40	49.54±3.44[c] n=13	26.70±1.98 n=60	***
Net profit/batch (th.tk)	2.76±0.48[a] n=7	12.43±1.24[b] n=40	20.08±2.37[c] n=13	12.96±1.15 n=60	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, ***=Significant at 0.1% levels and NS=Non-significant.

Table-74: Analysis of variance for overall ventilation system at marketing age

Dependent variables	Sources of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between groups	.020	2	.010	.525	.595
	Within groups	1.090	57	.019		
Body weight gain/broiler (kg	Between groups	.206	2	.103	8.473	.001
	Within groups	.692	57	.012		
FCR	Between groups	.272	2	.136	9.842	.000
	Within groups	.788	57	.014		
Production cost/broiler (tk)	Between groups	372.893	2	186.446	2.146	.126
	Within groups	4952.157	57	86.880		
Total production cost/batch (th.tk)	Between groups	7757.828	2	3878.914	1.793	.176
	Within groups	123329.347	57	2163.673		
Selling price/broiler (tk)	Between groups	7738.725	2	3869.362	21.154	.000
	Within groups	10425.859	57	182.910		
Total selling price/batch (th.tk)	Between groups	6725.908	2	3362.954	1.236	.298
	Within groups	155057.809	57	2720.312		
Profit/broiler (tk)	Between groups	10192.966	2	5096.483	80.080	.000
	Within groups	3627.634	57	63.643		
Net profit/batch (th.tk)	Between groups	1397.252	2	698.626	12.159	.000
	Within groups	3274.978	57	57.456		

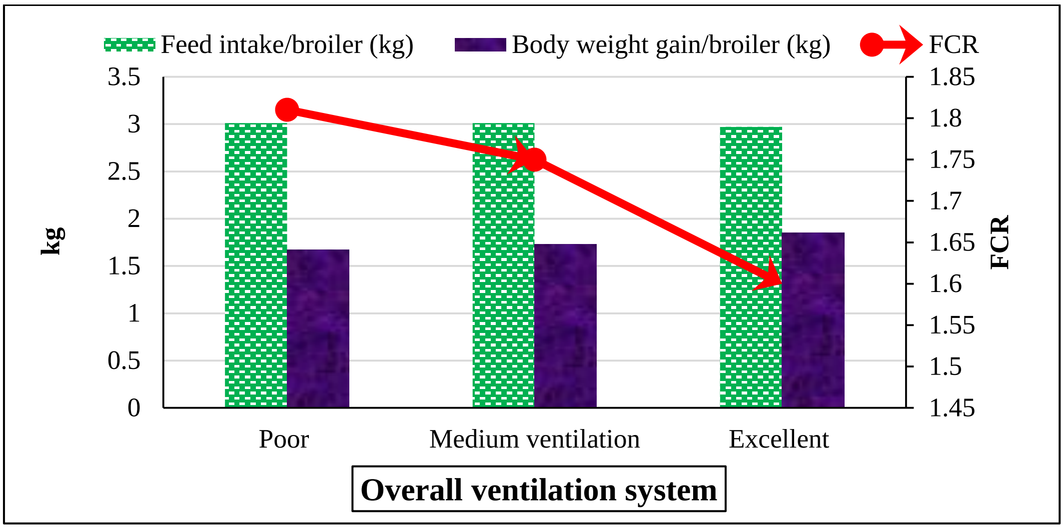

Fig.. 89: Overall ventilation effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

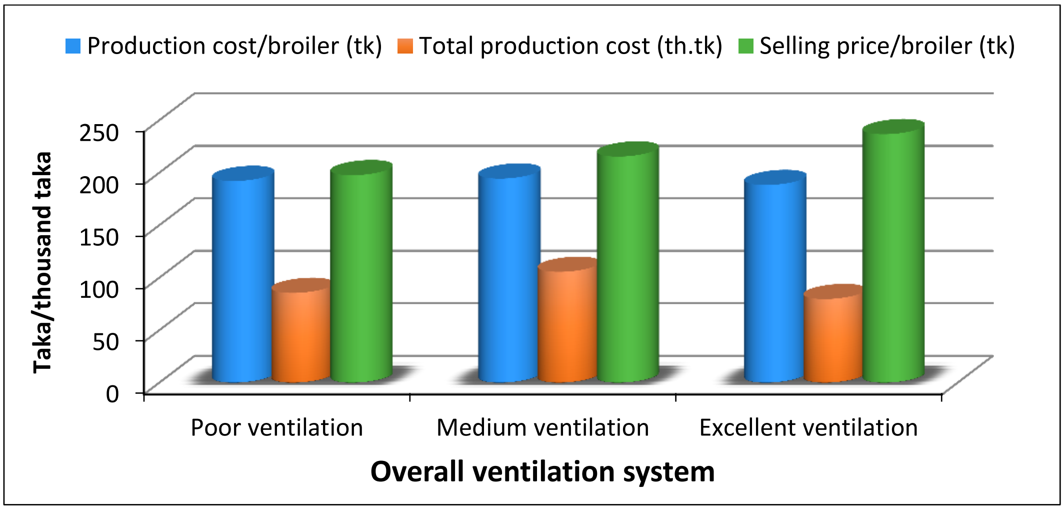

Fig. 90: Overall ventilation effect on production cost (tk), total production cost (th.tk) and selling price (tk)

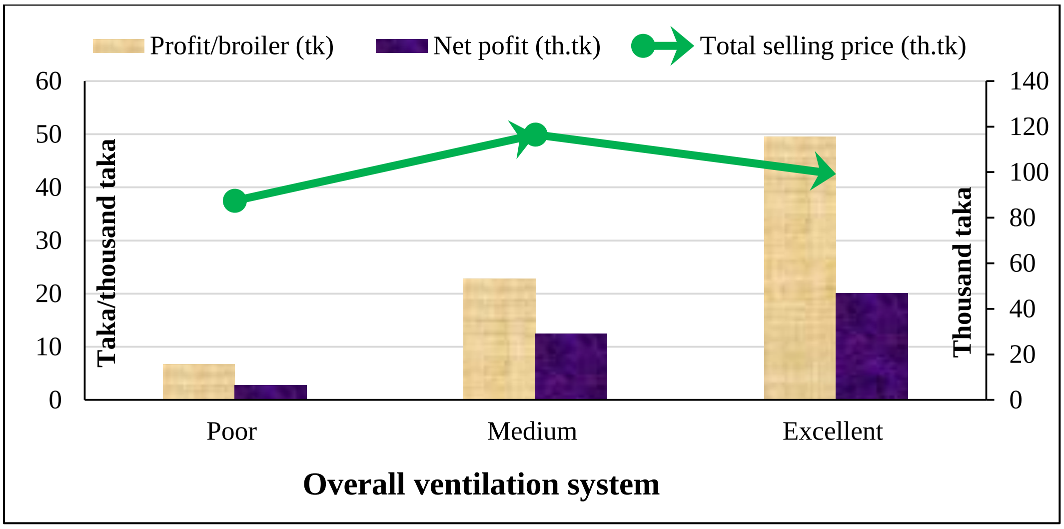

Fig. 91: Overall ventilation effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

Table-75: Effect of feed quality at marketing age (up to 28-32 days) of broiler

Productive performances	Feed quality				Sig. level
	Poor quality feed	Medium quality feed	Excellent quality feed	Total	
Feed intake/Broiler (kg)	3.01±0.03 n=7	3.02±0.02 n=21	2.98±0.03 n=32	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.67±0.04[a]	1.68±0.02[a]	1.81±0.02[b]	1.75±0.02	***
FCR	1.81±0.05[b]	1.81±0.03[b]	1.65±0.02[a]	1.72±0.02	***
Production cost/broiler (tk)	192.07±3.07	193.75±1.19	192.32±2.08	192.79±1.23	NS
Total production cost/batch (th.tk)	85.47±12.20	95.79±8.59	101.45±9.64	97.61±6.09	NS
Selling price/broiler (tk)	197.57±3.18[a]	208.57±1.91[b]	228.50±2.82[c]	217.92±2.27	***
Total selling price/batch (th.tk)	87.44±12.43	102.29±9.10	118.72±10.69	109.32±6.76	NS
Profit/broiler (tk)	6.71±0.64[a]	17.10±0.58[b]	37.38±2.31[c]	26.70±1.98	***
Net profit/batch (th.tk)	2.76±0.48[a]	8.16±0.67[b]	18.34±1.53[c]	12.96±1.15	***

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, ***=Significant at 0.1% levels and NS=Non-significant.

Table-76: Analysis of variance for feed quality at marketing age

Dependent variables	Sources of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between groups	.025	2	.012	.645	.528
	Within groups	1.085	57	.019		
Body weight gain/broiler (kg	Between groups	.250	2	.125	11.005	.000
	Within groups	.647	57	.011		
FCR	Between groups	.358	2	.179	14.543	.000
	Within groups	.702	57	.012		
Production cost/broiler (tk)	Between groups	29.800	2	14.900	.160	.852
	Within groups	5295.249	57	92.899		
Total production cost/batch (th.tk)	Between groups	1572.886	2	786.443	.346	.709
	Within groups	129514.289	57	2272.181		
Selling price/broiler (tk)	Between groups	8315.726	2	4157.863	24.064	.000
	Within groups	9848.857	57	172.787		
Total selling price/batch (th.tk)	Between groups	7216.307	2	3608.154	1.331	.272
	Within groups	154567.410	57	2711.709		
Profit/broiler (tk)	Between groups	8379.862	2	4189.931	43.896	.000
	Within groups	5440.738	57	95.452		
Net profit/batch (th.tk)	Between groups	2139.315	2	1069.657	24.071	.000
	Within groups	2532.916	57	44.437		

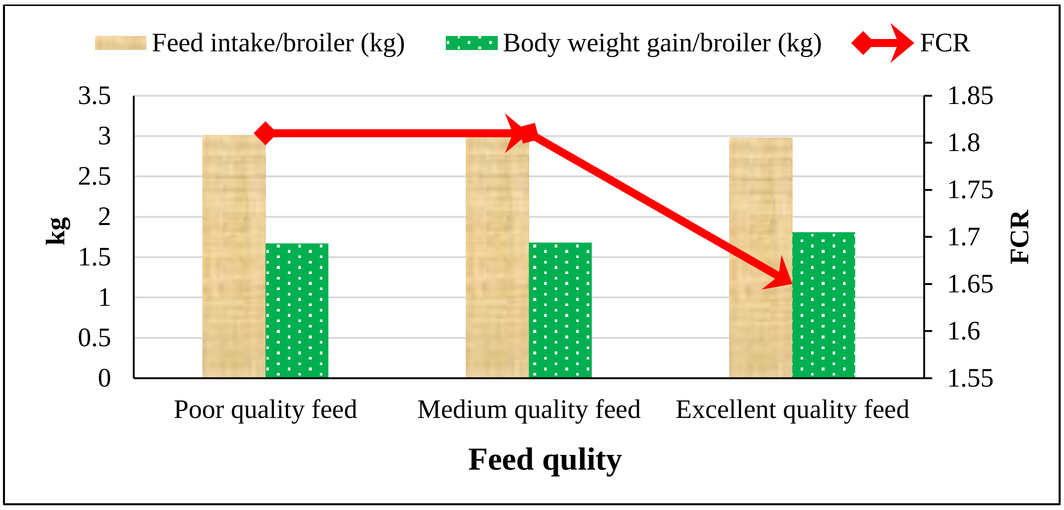

Fig. 92: Feed quality effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

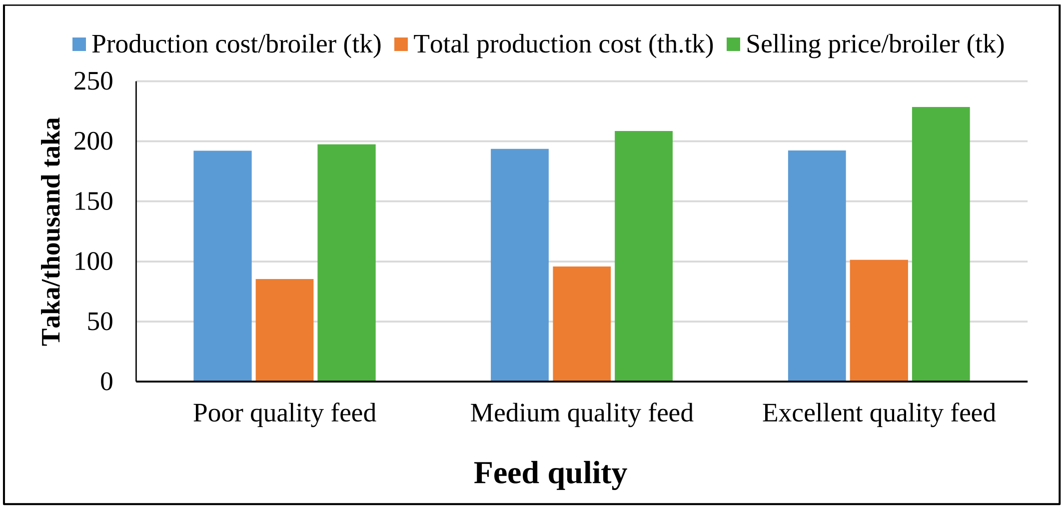

Fig. 93: Feed quality effect on production cost (tk), total production cost (th.tk) and selling price (tk)

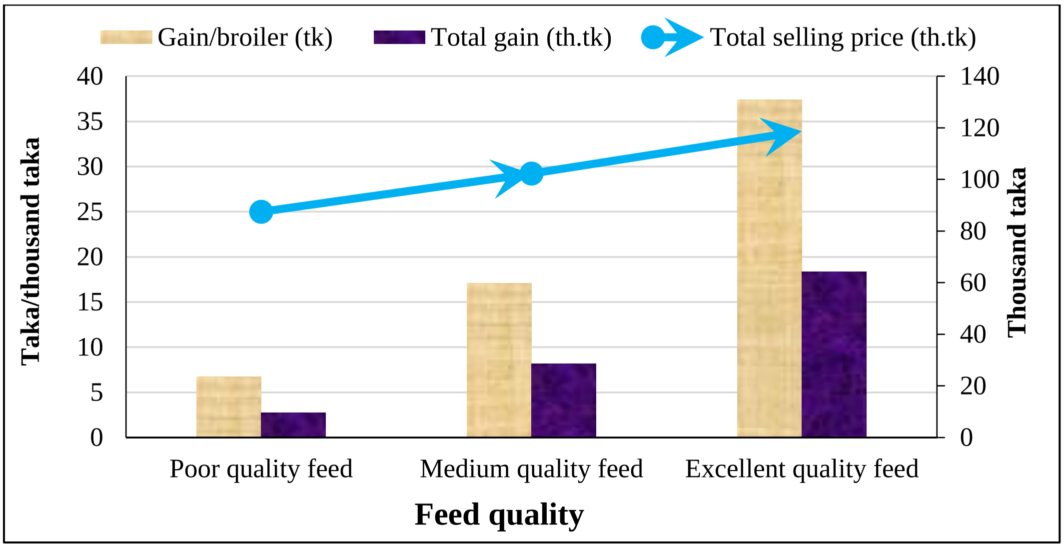

Fig. 94: Feed quality effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk).

Table-77: Effect of social status of farmers at marketing age (up to 28-32 days) of broiler

Productive performances	Social status			Sig. level
	Ultra poor	Marginal	Total	
Feed intake/Broiler (kg)	2.93±0.06 n=8	3.01±0.02 n=52	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.82±0.03 n=8	1.74±0.02 n=52	1.75±0.02 n=60	NS
FCR	1.61±0.04 n=8	1.74±0.02 n=52	1.72±0.02 n=60	**
Production cost/broiler (tk)	189.31±3.99 n=8	193.33±1.28 n=52	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	66.44±9.07 n=8	102.40±6.66 n=52	97.61±6.09 n=60	*
Selling price/broiler (tk)	227.63±8.05 n=8	216.42±2.27 n=52	217.92±2.27 n=60	NS
Total selling price/batch (th.tk)	78.47±9.31 n=8	114.07±7.47 n=52	109.32±6.76 n=60	NS
Profit/broiler (tk)	39.13±6.42 n=8	24.79±1.95 n=52	26.70±1.98 n=60	*
Net profit/batch (th.tk)	12.53±2.23 n=8	13.03±1.29 n=52	12.96±1.15 n=60	NS

Values are mean ±S.E. S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels and NS=Non-significant.

Table-78: t-test for effect of social status of farmers at marketing age of broiler

Dependent variables	t-value	df	P-value	Mean difference	Std. Error difference
Feed intake/Broiler (kg)	-1.687	58	.097	-.08654	.05129
Body weight gain/broiler (kg)	1.788	58	.079	.08221	.04598
FCR	-2.660	58	.010	-.12893	.04847
Production cost/broiler (tk)	-1.115	58	.269	-4.01615	3.60054
Total production cost/batch (th.tk)	-2.064	58	.044	-35.96731	17.42628
Selling price/broiler (tk)	1.708	58	.093	11.20192	6.55798
Total selling price/batch (th.tk)	-1.825	58	.073	-35.60055	19.50543
Profit/broiler (tk)	2.582	58	.012	14.33654	5.55198
Net profit/batch (th.tk)	-.145	58	.885	-.49506	3.40799

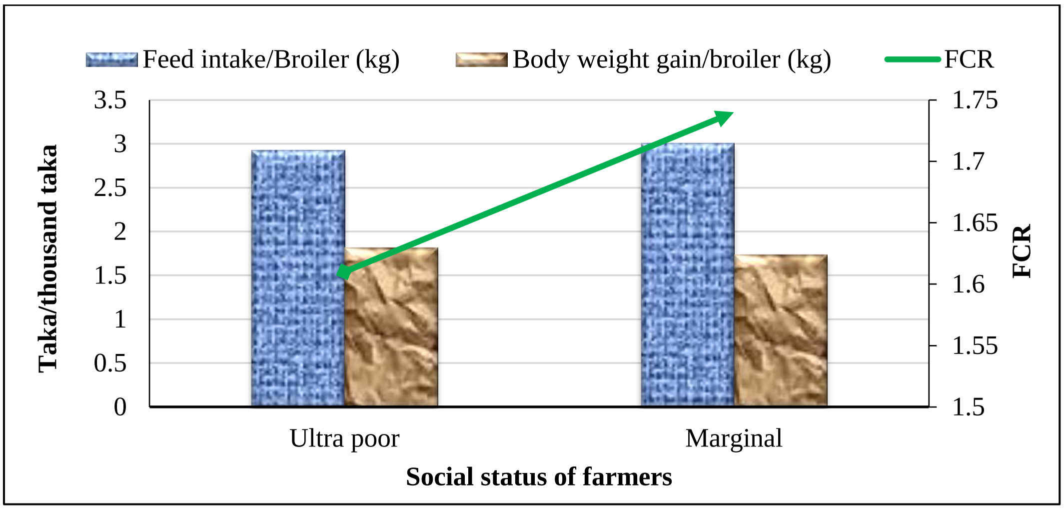

Fig. 95: Social status effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

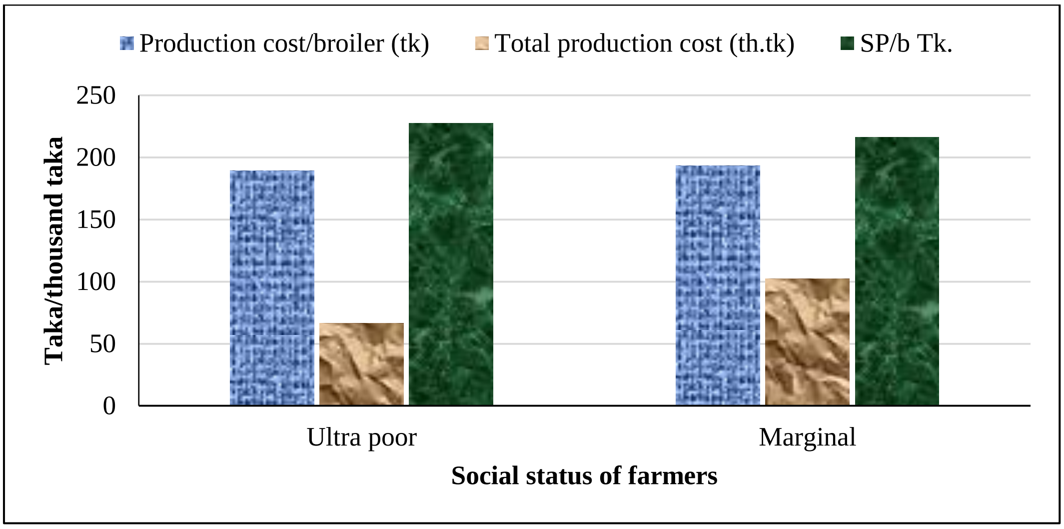

Fig. 96: Social status effect on production cost (tk), total production cost/batch (th.tk) and selling price (tk)

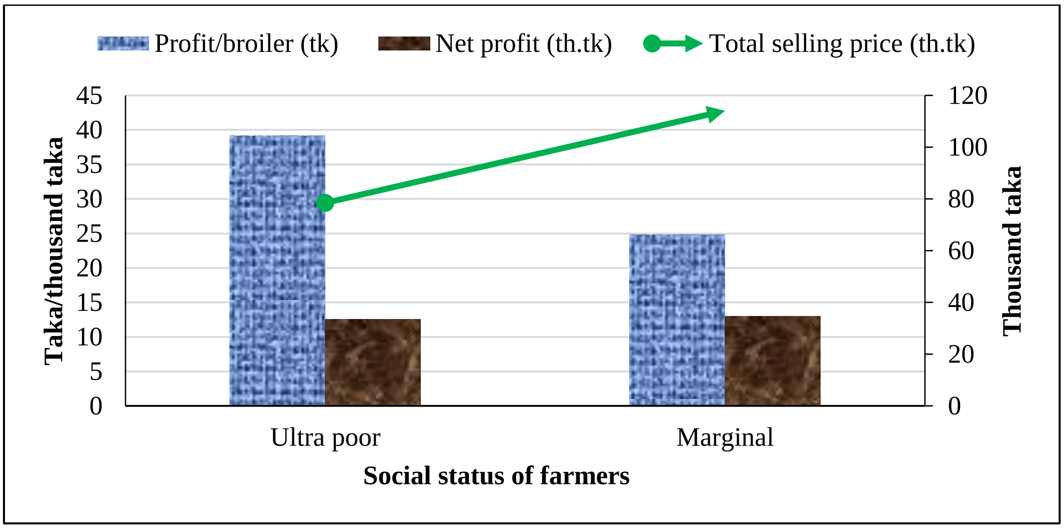

Fig. 97: Social status effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

Table-79: Effect of economic status of farmers at marketing age (up to 28-32 days)

Productive performances	Economic status				Sig. level
	< 10000 taka	10000 -15000 taka	> 15000 taka	Total	
Feed intake/Broiler (kg)	2.96±0.04[ab] n=16	3.04±0.02[b] n=33	2.94±0.04[a] n=11	3.00±0.02 n=60	*
Body weight gain/broiler (kg)	1.78±0.03 n=60	1.73±0.02 n=60	1.74±0.03 n=60	1.75±0.02 n=60	NS
FCR	1.68±0.04 n=60	1.76±0.02 n=60	1.70±0.04 n=60	1.72±0.02 n=60	NS
Production cost/broiler (tk)	189.50±2.28[a] n=60	195.58±1.68[b] n=60	189.21±2.16[a] n=60	192.79±1.23 n=60	*
Total production cost/batch (th.tk)	79.69±9.03 n=60	101.74±8.91 n=60	111.25±13.45 n=60	97.61±6.09 n=60	NS
Selling price/broiler (tk)	218.69±5.82 n=60	219.79±2.82 n=60	211.18±3.06 n=60	217.92±2.27 n=60	NS
Total selling price/batch (th.tk)	90.84±10.23 n=60	113.32±9.79 n=60	124.19±15.65 n=60	109.32±6.76 n=60	NS
Profit/broiler (tk)	30.31±4.98 n=60	26.09±2.44 n=60	23.27±3.38 n=60	26.70±1.98 n=60	NS
Net profit/batch (th.tk)	11.84±2.23 n=60	13.09±1.52 n=60	14.22±3.02 n=60	12.96±1.15 n=60	NS

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of farms, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels and NS=Non-significant.

Table-80: Analysis of variance of economic status of farmers at marketing age

Dependent variables	Source of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/broiler (kg)	Between groups	.108	2	.054	3.080	.054
	Within groups	1.002	57	.018		
Body weight gain/broiler (kg	Between groups	.021	2	.010	.675	.513
	Within groups	.876	57	.015		
FCR	Between groups	.082	2	.041	2.396	.100
	Within groups	.978	57	.017		
Production cost/broiler (tk)	Between groups	571.950	2	285.975	3.429	.039
	Within groups	4753.099	57	83.388		
Total production cost/batch (th.tk)	Between groups	7747.251	2	3873.626	1.790	.176
	Within groups	123339.923	57	2163.858		
Selling price/broiler (tk)	Between groups	623.994	2	311.997	1.014	.369
	Within groups	17540.589	57	307.730		
Total selling price/batch (th.tk)	Between groups	8422.858	2	4211.429	1.565	.218
	Within groups	153360.859	57	2690.541		
Profit/broiler (tk)	Between groups	350.253	2	175.127	.741	.481
	Within groups	13470.347	57	236.322		
Net profit/batch (th.tk)	Between groups	37.894	2	18.947	.233	.793
	Within groups	4634.336	57	81.304		

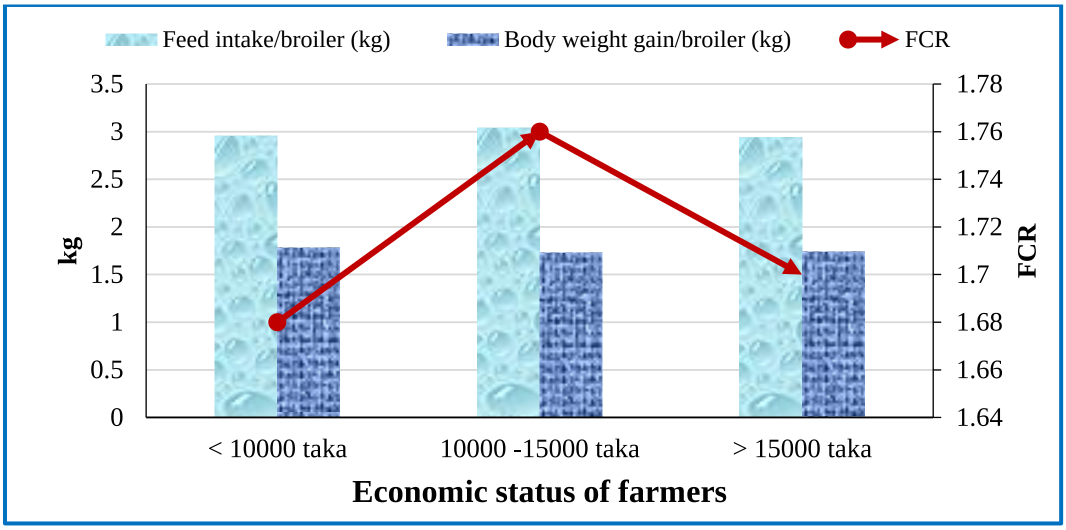

Fig. 98: Economic status effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR.

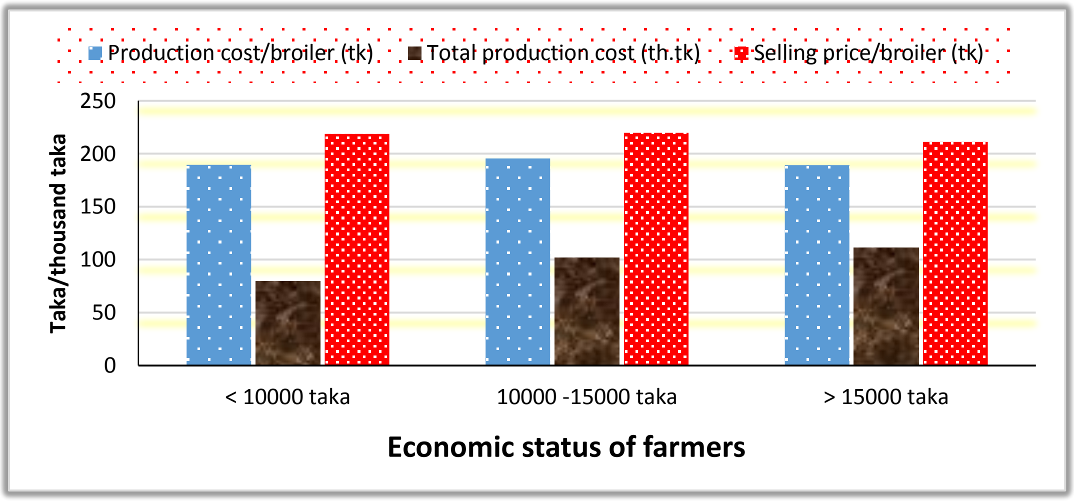

Fig. 99: Economic status effect on production cost (tk), total production cost/batch (th.tk) and selling price (tk).

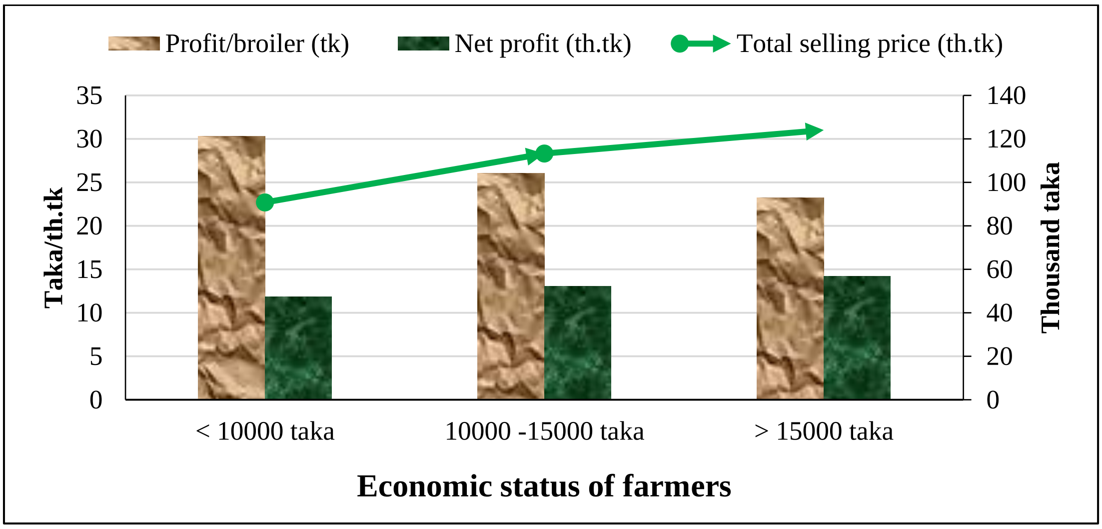

Fig. 100: Economic status effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk).

6.3.11. Effect of educational status of farmers

Effect of educational status of farmers on productive performances in broilers farm and ANOVA are showed in Table-81-82 and Fig. 101-103. From Table-81 the highest mean value of body weight gain per broiler was in none education group (1.81±0.04 kg) and lowest was in secondary education group (1.68±0.03 kg). The average value of FCR was lowest in primary education group (1.68±0.03) and highest in secondary group (1.80±0.03). Net profit/batch was highest in none education group (16.16±2.99) and was low in secondary education group (8.18±1.28). Feed intake per broiler was highest in none education group (3.06±0.04) and was lowest in primary group (2.96±0.03). Production cost per broiler was high in none education group (192.66±1.68) and was low in primary group (191.67±1.93). Total production cost/batch was high in none education group (110.72±20.04) and was low in secondary group (76.14±4.70). Selling price per broiler was high in none education group (221.38±7.52) and was low in secondary education group (211.94±3.52). Total selling price/batch was highest in none education group (125.65±21.37) and was low in secondary group (83.75±5.05). Profit per broiler was highest in primary group (30.60±3.58) and was very low in secondary group (21.06±3.17).

Body weight gain per broiler, FCR and net profit/batch were significantly influenced by educational status of farmers ($P<0.05$), but feed intake/broiler, production cost/broiler, total production cost/batch, selling price/broiler, total selling price/batch , profit/broiler were not significantly influenced by educational status of farmers ($P>0.05$).

6.3.12 Effect of occupational status of farmers

Effect of occupational status of farmers on productive performances in broilers farm and t-test are summarized in Table-83-84 and Fig. 104-106. In Table-83 the feed intake per broiler was highest who were involved in business (3.01±0.03) and was lowest who were involved in agriculture (2.99±0.02). Body weight gain was highest who were involved in business (1.75±0.02 kg) and lowest who were involved in agriculture (1.74±0.02 kg). The FCR was better who were involved in business (1.72±0.02) and not good who were involved in agriculture (1.73±0.02). Production cost per broiler was high who were involved in business (194.75±1.69) and was low who were involved in agriculture (190.23±1.66). Total production cost/batch was high who were involved in business (103.55±8.70) and was low who were involved in agriculture (89.83±8.17). Selling price per broiler was high who were involved in business (221.06±3.23) and was low who were involved in agriculture (213.81±2.95). All the parameters were not significantly influenced by occupational status of farmers of broilers (P>0.05).

6.3.13 Effect of land owned by farmers

Effect of land owned by farmers on productive performances in broilers farm and ANOVA are presented in Table-85-86 and Fig. 107-109. From Table-85 the highest value of feed intake per broiler was (3.09±0.04 kg) in = or <10 decimal farmers group and was lowest (2.96±0.05 kg) in >10 to=or <50 decimal farmers group. Production cost per broiler was high in =or <10 decimal group (196.71±2.98) and was low in >10 to = or <50 decimal group (188.14±2.73). The highest value of body weight gain per broiler was in =or <10 decimal group (1.81±0.05 kg) and lowest was in >50 decimal group (1.72±0.02 kg). The average value of FCR was lowest in >10 to =or <50 decimal group (1.66±0.04) and highest in >50 decimals group (1.75±0.02). Total production cost/batch was high in = or <10 decimal group (108.48±25.20) and was low in >10 to = or <50 decimal group (77.97±5.17). Selling price per broiler was highest in = or <10 decimal (228.29±8.53) and was lowest in >50 decimal group (215.45±2.36). Total selling price/batch was highest in = or <10 decimal group (121.77±26.40) and was low in >10 to = or <50 decimal group (90.30±5.73). Profit per broiler was highest in = or <10 decimal group (32.86±7.07) and was very low in >50 decimal group (21.06±3.17). Net profit/batch was highest in =or <10 decimal group (14.63±2.95) and was low in >50 decimal group (12.67±1.55). Feed intake/broiler and production cost/broiler were significantly influenced by land owned of farmers ($P < 0.05$), but body weight gain per broiler, FCR, total production cost/batch, selling price/broiler, total selling price/batch, profit/broiler and net profit/batch were not significantly influenced by land owned by farmers (P>0.05).

6.3.14 Effect of family size of broiler farmers

Effect of family size on productive performances in broilers farm and ANOVA are showed in Table-87-88 and Fig. 110-112. From Table-87 the feed intake per broiler was highest when family contains <4 members (3.02±0.04) and was lowest when family contain >5 members (2.98±0.04). Body weight gain was highest when family contains <4 members (1.77±0.04) and lowest when family contains >5 members (1.70±0.04). The FCR was better when family contains 4-5 members (1.72±0.02) and the FCR was not good when family contains >5 members (1.77±0.04). Production cost per broiler was high when family contains 4-5 members (193.58±1.63) and was low when family contains >5 members (190.80±2.73). Total production cost/batch was high when family contains <4 members (101.37±15.86) and was low when family contains >5 members (88.16±11.32). Selling price per broiler was high when family contains 4-5 members (219.91±3.07) and was low when family contains >5 members (213.36±4.93). All the parameters were not significantly influenced by family size of broiler farmers (P>0.05).

6.3.15. Effect of sex of farmers

Effect of sex of farmers on productive performances in broilers farm and t-test are observed in Table-89-90 and Fig. 113-115. From Table-89 the highest value of body weight gain per broiler was in female (1.83±0.04 kg) and lowest was in male (1.73±0.02 kg). The highest value of feed intake per broiler was in female (3.06±0.05 kg) and lowest in male (2.99±0.02 kg). The average value of FCR was lowest in female (1.68±0.03) and highest in male (1.73±0.02). Production cost per broiler was higher in male (193.03±1.37) and was lower in female (191.44±2.67). Total production cost/batch was high in female (104.36±18.92) and was low in male (96.41±6.41). Selling price per broiler was highest in female (222.56±6.00) and was lowest in male (217.10±2.45). Total selling price/batch was highest in female (119.17±20.78) and was low in male (107.58±7.13). Profit per broiler was highest in female (32.33±5.38) and was very low in male (25.71±2.11). Net profit/batch was highest in female (16.18±3.09) and was low in male (12.39±1.23).

Only body weight gain per broiler was significantly influenced by sex of farmers (P<0.05), but feed intake/broiler, FCR, production cost/broiler, total production cost/batch, selling price/broiler, total selling price/batch, profit/broiler and net profit/batch were not significantly influenced by sex of farmers (P>0.05).

Table-81: Effect of educational status of farmers at marketing age (up to 28-32 days) of broiler

Productive performances	Educational status				Sig. level
	None	Primary	Secondary	HSC & above	
Feed intake/Broiler (kg)	3.06±0.04 n=8	2.96±0.03 n=25	3.00±0.03 n=16	3.05±0.04 n=11	NS
Body weight gain/broiler (kg)	1.81±0.04[b] n=8	1.76±0.[02ab] n=25	1.68±0.03[a] n=16	1.77±0.03[ab] n=11	*
FCR	1.69±0.03[a] n=8	1.68±0.03[a] n=25	1.80±0.03[b] n=16	1.73±0.03[ab] n=11	*
Production cost/broiler (tk)	192.66±3.24 n=8	191.67±1.93 n=25	191.79±2.33 n=16	196.91±2.96 n=11	NS
Total production cost/batch (th.tk)	110.72±20.04 n=8	101.89±9.48 n=25	76.14±4.70 n=16	109.57±18.73 n=11	NS
Selling price/broiler (tk)	221.38±7.52 n=8	220.04±4.08 n=25	211.94±3.52 n=16	219.27±3.37 n=11	NS
Total selling price/batch (th.tk)	125.65±21.37 n=8	115.15±10.55 n=25	83.75±5.05 n=16	121.38±20.95 n=11	NS
Profit/broiler (tk)	29.88±5.69 n=8	30.60±3.58 n=25	21.06±3.17 n=16	23.73±2.75 n=11	NS
Net profit/batch (th.tk)	16.16±2.99[b] n=8	14.98±1.96[b] n=25	8.18±1.28[a] n=16	12.99±2.90 n=11	*

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other ($P<0.05$). S.E=Std Error of Mean, n=No. of farms, FCR=Feed Conversion Ratio, th.=Taka, th.=Thousand, kg= Kilogram, * = Significant at 5% levels and NS=Non-significant.

Table-82: Analysis of variance of Educational Status of Farmers at marketing age

Dependent Variables	Source of variance	Sum of Squares	df	Mean Square	F-value	P-value.
Feed intake/Broiler (kg)	Between groups	.102	3	.034	1.892	.141
	Within groups	1.008	56	.018		
Body weight gain/broiler (kg)	Between groups	.129	3	.043	3.147	.032
	Within groups	.768	56	.014		
FCR	Between groups	.139	3	.046	2.828	.047
	Within groups	.920	56	.016		
Production cost/broiler (tk)	Between groups	234.865	3	78.288	.861	.467
	Within groups	5090.185	56	90.896		
Total production cost/batch (th.tk)	Between groups	10784.992	3	3594.997	1.673	.183
	Within groups	120302.182	56	2148.253		
Selling price/broiler (tk)	Between groups	800.629	3	266.876	.861	.467
	Within groups	17363.954	56	310.071		
Total selling price/batch (th.tk	Between groups	15044.789	3	5014.930	1.914	.138
	Within groups	146738.928	56	2620.338		
Profit/broiler (tk)	Between groups	1066.606	3	355.535	1.561	.209
	Within groups	12753.994	56	227.750		
Net profit/batch (th.tk)	Between groups	548.946	3	182.982	2.485	.070
	Within groups	4123.285	56	73.630		

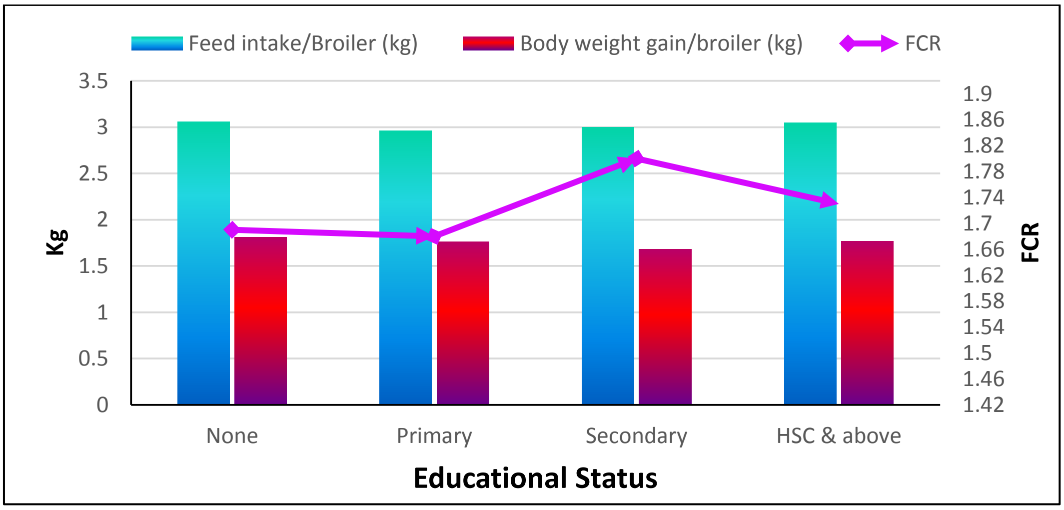

Fig. 101: Educational status effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

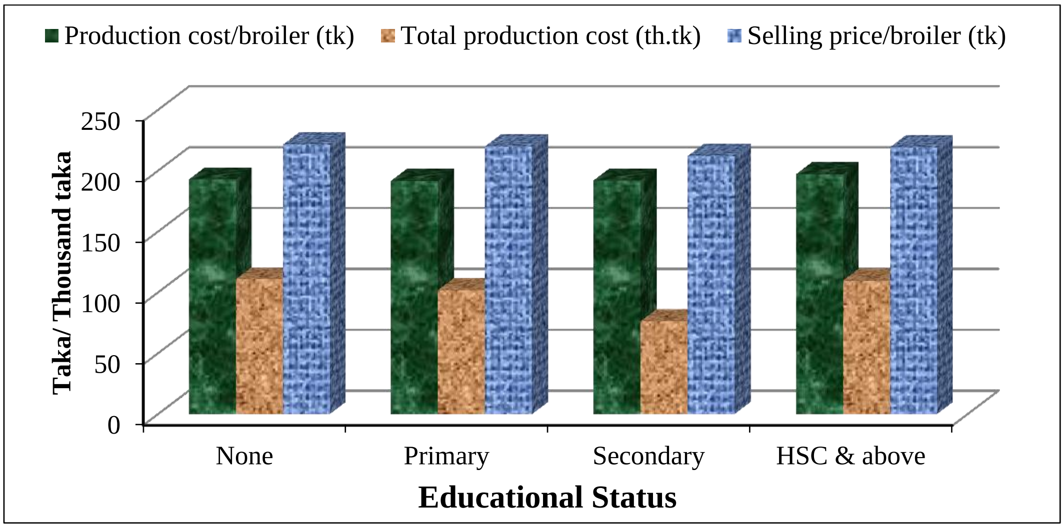

Fig. 102: Educational status effect on production cost (tk), total production cost/batch (th.tk) and selling price (tk).

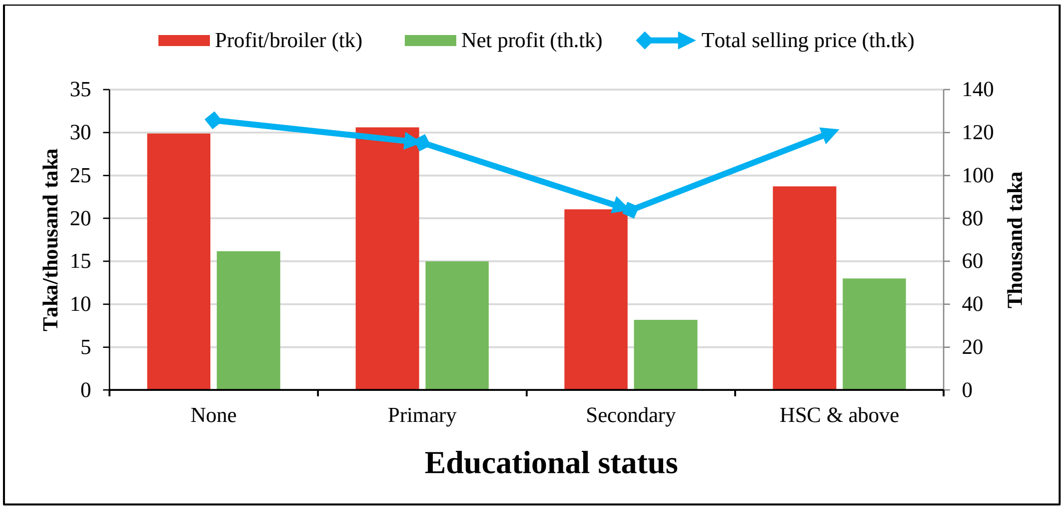

Fig. 103: Educational status effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk).

Table-83: Effect of occupational status of farmers at marketing age (up to 28-32 days)

Productive performances	0ccupational status			Sig. level
	Agriculture	Business	Total	
Feed intake/Broiler (kg)	2.99±0.02 n=26	3.01±0.03 n=34	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.74±0.02 n=26	1.75±0.02 n=34	1.75±0.02 n=60	NS
FCR	1.73±0.02 n=26	1.72±0.02 n=34	1.72±0.02 n=60	NS
Production cost/broiler (tk)	190.23±1.66 n=26	194.75±1.69 n=34	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	89.83±8.17 n=26	103.55±8.70 n=34	97.61±6.09 n=60	NS
Selling price/broiler (tk)	213.81±2.95 n=26	221.06±3.23 n=34	217.92±2.27 n=60	NS
Total selling price/batch (th.tk)	100.21±8.94 n=26	116.29±9.72 n=34	109.32±6.76 n=60	NS
Profit/broiler (tk)	24.65±3.03 n=26	28.26±2.61 n=34	26.70±1.98 n=60	NS
Net profit/batch (th.tk)	11.21±1.63 n=26	14.30±1.58 n=34	12.96±1.15 n=60	NS

Values are mean ±S.E. S.E=Std Error of Mean, n=No. of farms, FCR=Feed Conversion Ratio, th.=Taka, th.=Thousand, kg= Kilogram and NS=Non-significant.

Table-84 : t-test for effect of occupation status of farmers at marketing age

Dependent variables	t-value	df	P-value	Mean difference	Std. Error difference
Feed intake/Broiler (kg)	-.472	58	.639	-.01697	.03597
Body weight gain/broiler (kg)	-.388	58	.699	-.01256	.03236
FCR	.035	58	.972	.00125	.03522
Production cost/broiler (tk)	-1.867	58	.067	-4.52595	2.42453
Total production cost/batch (th.tk)	-1.120	58	.267	-13.72489	12.25374
Selling price/broiler (tk)	-1.607	58	.113	-7.25113	4.51112
Total selling price/batch (th.tk)	-1.183	58	.242	-16.08263	13.59649
Profit/broiler (tk)	-.904	58	.370	-3.61086	3.99355
Net profit/batch (th.tk)	-1.339	58	.186	-3.08269	2.30298

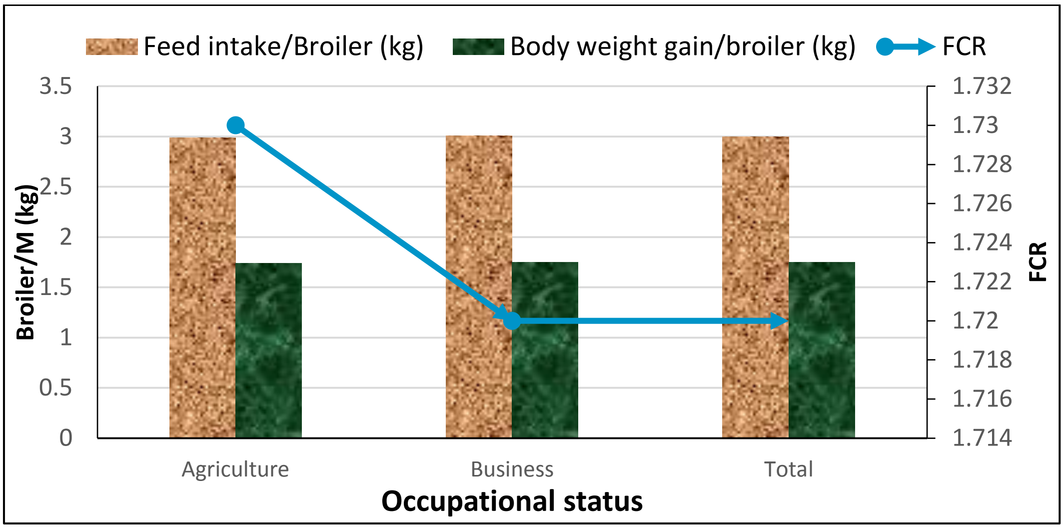

Fig. 104: Occupational status effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR.

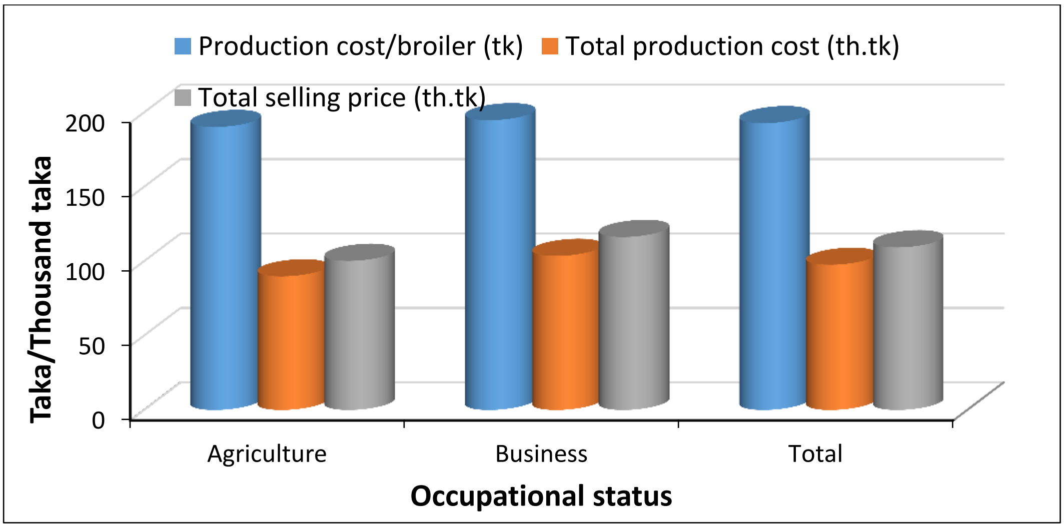

Fig. 105: Occupational status effect on production cost (tk), total production cost/batch (th.tk) and selling price (tk).

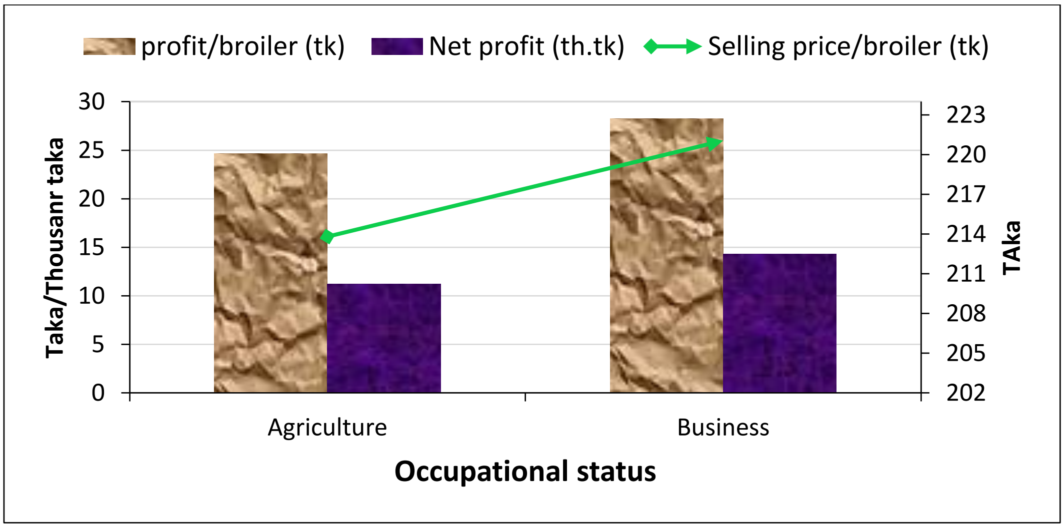

Fig. 106: Occupational status effect on profit-broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk).

Table-85: Effect of land owned by farmers at marketing age (up to 28-32 days) of broiler

Productive performances	Land owned by farmers			Sig. level
	= or < 10 decimals	> 10 to = or < 50 decimals	> 50 decimals	
Feed intake/Broiler (kg)	3.09±0.04[b] n=7	2.95±0.05[a] n=13	3.00±0.02[ab] n=40	*
Body weight gain/broiler (kg)	1.81±0.05 n=7	1.78±0.04 n=13	1.72±0.02 n=40	NS
FCR	1.71±0.03 n=7	1.66±0.04 n=13	1.75±0.02 n=40	NS
Production cost/broiler (tk)	196.71±2.98[b] n=7	188.14±2.73[a] n=13	193.62±1.47[ab] n=40	*
Total production cost/batch (th.tk)	108.48±25.20 n=7	77.97±5.17 n=13	102.09±7.75 n=40	NS
Selling price/broiler (tk)	228.29±8.53 n=7	219.92±5.88 n=13	215.45±2.36 n=40	NS
Total selling price/batch (th.tk)	121.77±26.40 n=7	90.30±5.73 n=13	113.32±8.81 n=40	NS
Profit/broiler (tk)	32.86±7.07 n=7	32.62±4.85 n=13	23.70±2.11 n=40	NS
Net profit/batch (th.tk)	14.63±2.95 n=7	12.95±1.88 n=13	12.67±1.55 n=40	NS

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other (P<0.05). S.E=Std Error of Mean, n=No. of farms, FCR=Feed Conversion Ratio, th.=Taka, th.=Thousand, kg= Kilogram, * = Significant at 5% levels and NS=Non-significant.

Table-86: Analysis of variance of land owned by farmers at marketing age

Dependent Variables	Source of variance	Sum of Squares	df	Mean Square	F-value	Sig. level
Feed intake/Broiler (kg)	Between groups	.088	2	.044	2.457	.095
	Within groups	1.022	57	.018		
Body weight gain/broiler (kg)	Between groups	.072	2	.036	2.475	.093
	Within groups	.825	57	.014		
FCR	Between groups	.070	2	.035	2.001	.145
	Within groups	.990	57	.017		
Production cost/broiler (tk)	Between groups	416.617	2	208.309	2.419	.098
	Within groups	4908.432	57	86.113		
Total production cost/batch (th.tk)	Between groups	6641.783	2	3320.892	1.521	.227
	Within groups	124445.391	57	2183.252		
Selling price/broiler (tk)	Between groups	1048.332	2	524.166	1.746	.184
	Within groups	17116.252	57	300.285		
Total selling price/batch (th.tk	Between groups	6430.602	2	3215.301	1.180	.315
	Within groups	155353.115	57	2725.493		
Profit/broiler (tk)	Between groups	1080.266	2	540.133	2.417	.098
	Within groups	12740.334	57	223.515		
Net profit/batch (th.tk)	Between groups	22.770	2	11.385	.140	.870
	Within groups	4649.461	57	81.569		

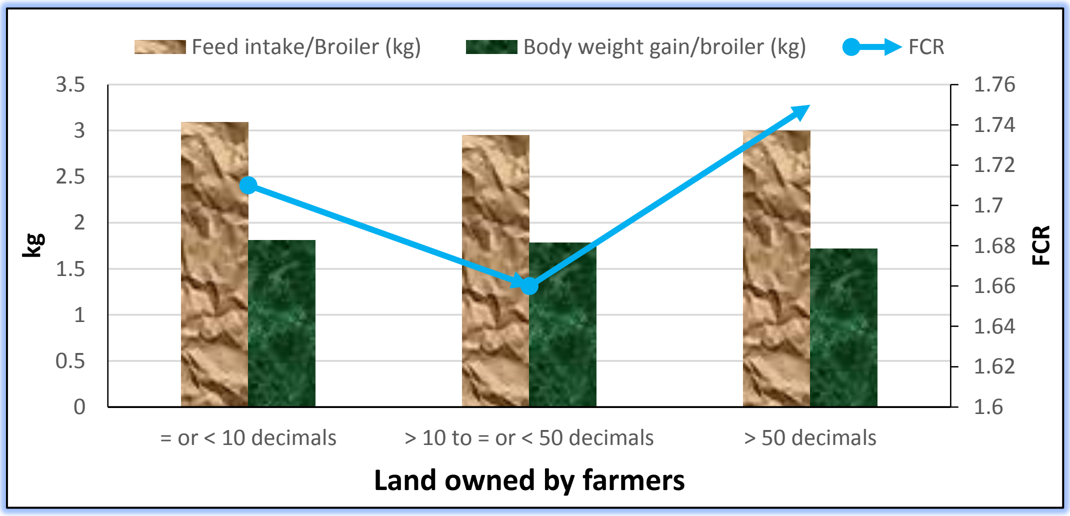

Fig. 107: Land owning effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

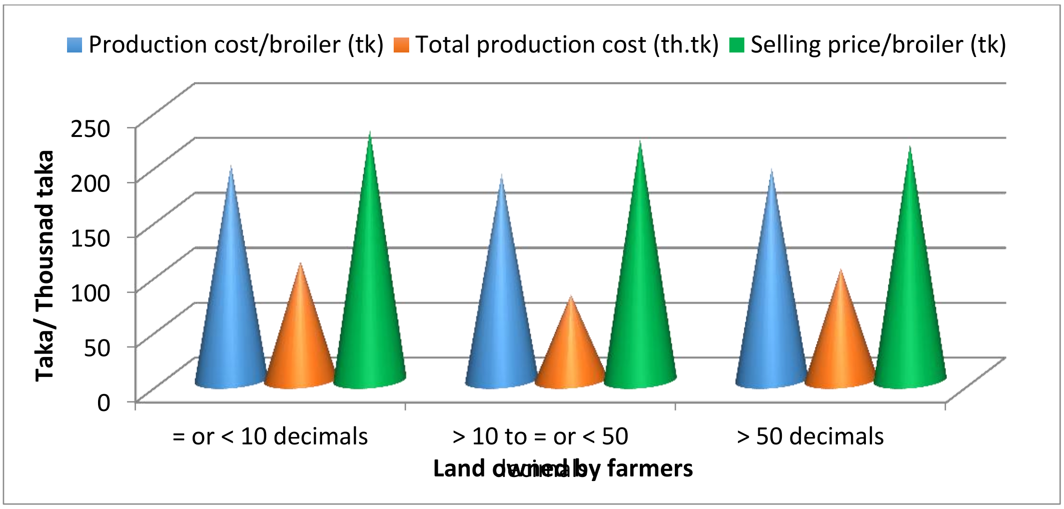

Fig. 108: Land owning effect on production cost (tk), total production cost/batch (th.tk) and selling price (tk)

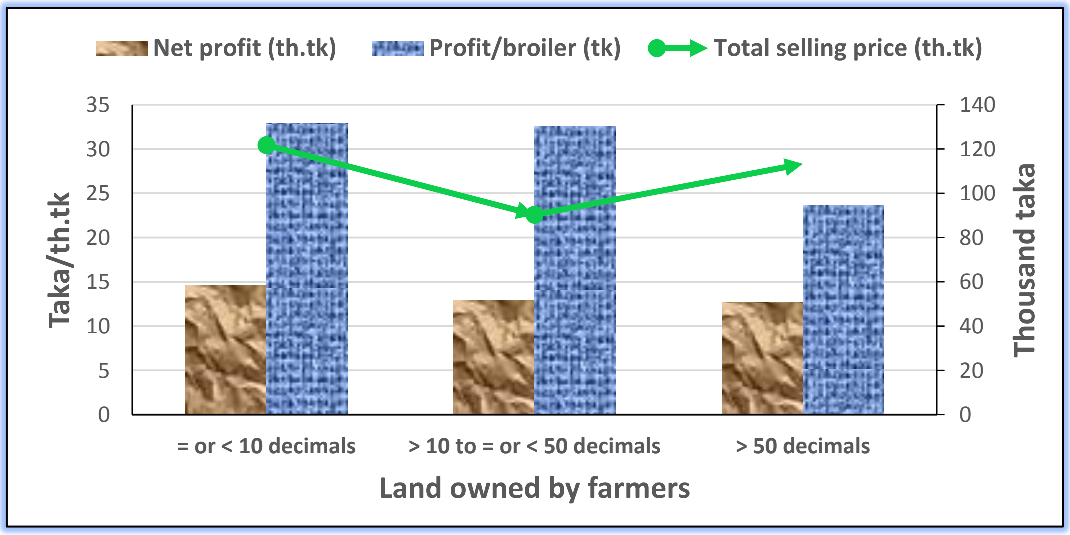

Fig. 109: Land owning effect on profit/broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk).

Table-87: Effect of family size at marketing age (up to 28-32 days) of broiler

Productive performances	Family size on productive performances				Sig. level
	<4 member	4-5 member	>5 member	Total	
Feed intake/broiler (kg)	3.02±0.04 n=13	3.00±0.02 n=33	2.98±0.04 n=14	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.77±0.04 n=13	1.76±0.02 n=33	1.70±0.04 n=14	1.75±0.02 n=60	NS
FCR	1.72±0.03 n=13	1.71±0.02 n=33	1.77±0.04 n=14	1.72±0.02 n=60	NS
Production cost/broiler (tk)	192.95±2.62 n=13	193.58±1.63 n=33	190.80±2.73 n=14	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	101.37±15.86 n=13	100.13±7.96 n=33	88.16±11.32 n=14	97.61±6.09 n=60	NS
Selling price/broiler (tk)	217.77±4.66 n=13	219.91±3.07 n=33	213.36±4.93 n=14	217.92±2.27 n=60	NS
Total selling price/batch (th.tk)	113.50±17.79 n=13	112.85±8.83 n=33	97.12±12.24 n=14	109.32±6.76 n=60	NS
Profit/broiler (tk)	28.00±3.34 n=13	27.48±2.86 n=33	23.64±4.23 n=14	26.70±1.98 n=60	NS
Net profit/batch (th.tk)	13.95±2.58 n=13	13.86±1.64 n=33	9.92±1.87 n=14	12.96±1.15 n=60	NS

Values are mean ±S.E S.E=Std Error of Mean, n=No. of farms, FCR=Feed Conversion Ratio, th.=Taka, th.=Thousand, kg= Kilogram and NS=Non-significant.

Table-88: Analysis of variance for family size at marketing age

Dependent variables	Sources of variance	Sum of Squares	df	Mean Square	F-value	P-value
Feed intake/Broiler (kg)	Between groups	.009	2	.005	.240	.787
	Within groups	1.101	57	.019		
Body weight gain/broiler (kg)	Between groups	.048	2	.024	1.601	.211
	Within groups	.849	57	.015		
FCR	Between groups	.034	2	.017	.955	.391
	Within groups	1.025	57	.018		
Production cost/broiler (tk)	Between groups	76.274	2	38.137	.414	.663
	Within groups	5248.775	57	92.084		
Total production cost/batch (th.tk)	Between groups	1643.980	2	821.990	.362	.698
	Within groups	129443.194	57	2270.933		
Selling price/broiler (tk)	Between groups	422.334	2	211.167	.678	.511
	Within groups	17742.249	57	311.268		
Total selling price/batch (th.tk	Between groups	2723.508	2	1361.754	.488	.616
	Within groups	159060.209	57	2790.530		
Profit/broiler (tk)	Between groups	173.143	2	86.572	.362	.698
	Within groups	13647.457	57	239.429		
Net profit/batch (th.tk)	Between groups	169.048	2	84.524	1.070	.350
	Within groups	4503.183	57	79.003		

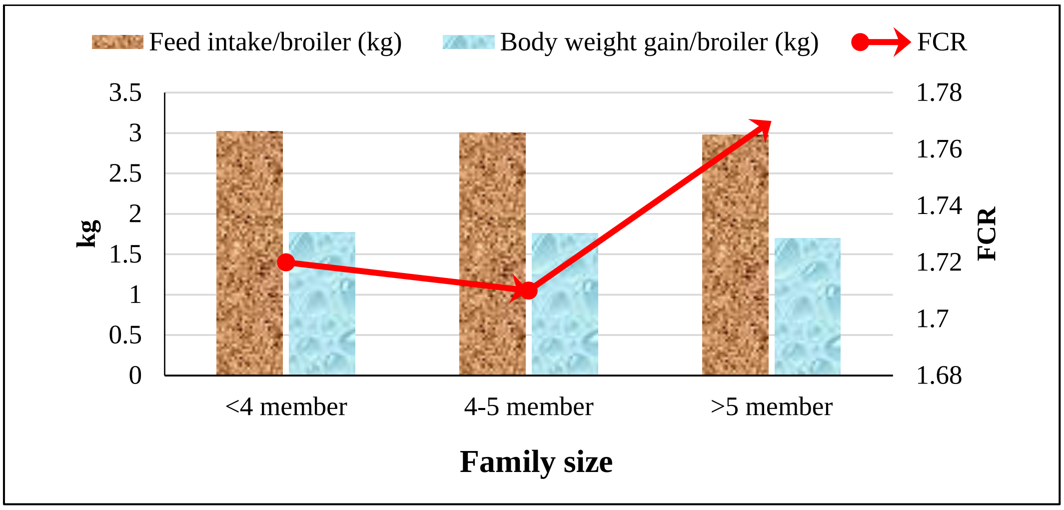

Fig. 110: Family size effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR.

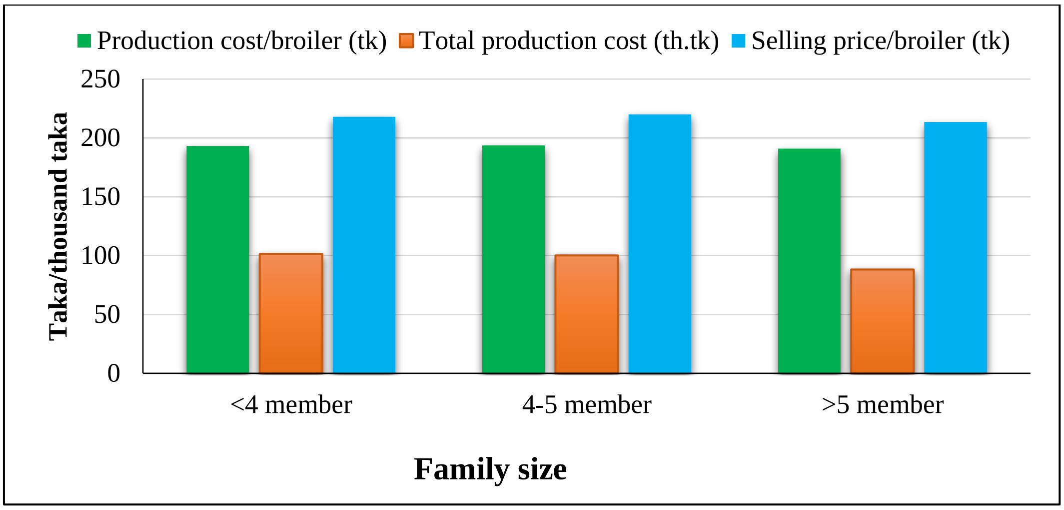

Fig. 111: Family size effect on production cost (tk), total production cost/b (th.tk) and selling price (tk)

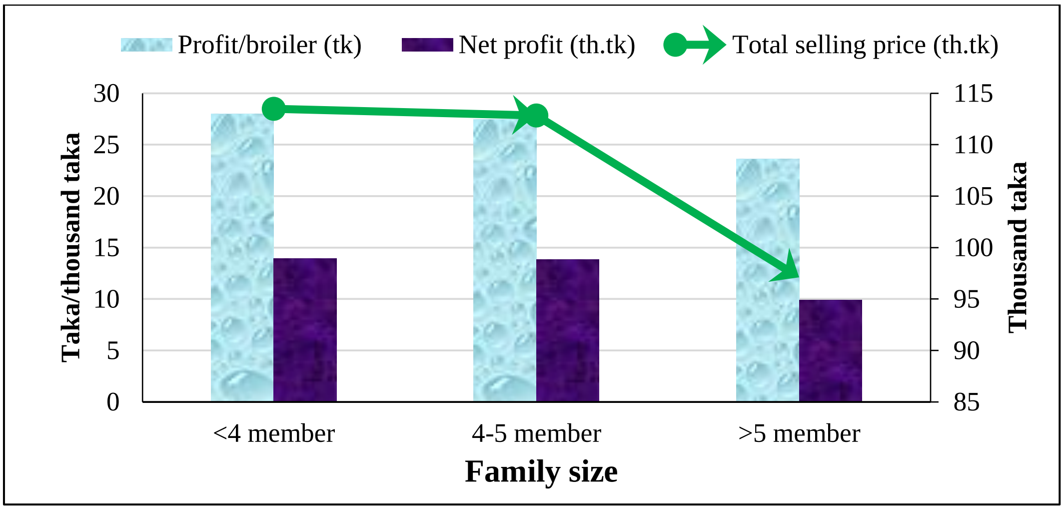

Fig. 112: Family size effect on profit/broiler (tk), net profit/b (th.tk) and total selling price/b (th.tk).

Table-89: Effect of sex of farmers at marketing age (up to 28-32 days) of broiler

Productive performances	Sex of farmers			Sig. level
	Male	Female	Total	
Feed intake/Broiler (kg)	2.99±0.02 n=51	3.06±0.05 n=9	3.00±0.02 n=60	NS
Body weight gain/broiler (kg)	1.73±0.02 n=51	1.83±0.04 n=9	1.75±0.02 n=60	*
FCR	1.73±0.02 n=51	1.68±0.03 n=9	1.72±0.02 n=60	NS
Production cost/broiler (tk)	193.03±1.37 n=51	191.44±2.67 n=9	192.79±1.23 n=60	NS
Total production cost/batch (th.tk)	96.41±6.41 n=51	104.36±18.92 n=9	97.61±6.09 n=60	NS
Selling price/broiler (tk)	217.10±2.45 n=51	222.56±6.00 n=9	217.92±2.27 n=60	NS
Total selling price/batch (th.tk)	107.58±7.13 n=51	119.17±20.78 n=9	109.32±6.76 n=60	NS
Profit/broiler (tk)	25.71±2.11 n=51	32.33±5.38 n=9	26.70±1.98 n=60	NS
Net profit/batch (th.tk)	12.39±1.23 n=51	16.18±3.09 n=9	12.96±1.15 n=60	NS

Values are mean ±S.E. S.E=Std Error of Mean, n=No. of farms, FCR=Feed Conversion Ratio, th.=Taka, th.=Thousand, kg= Kilogram, * = Significant at 5% levels and NS=Non-significant.

Table-90 : t-test for effect of sex of farmers at marketing age

Dependent variables	Dependent variables	Dependent variables	Dependent variables	Dependent variables	Dependent variables
Feed intake/Broiler (kg)	-1.326	58	.190	-.06536	.04928
Body weight gain/broiler (kg)	-2.185	58	.033	-.09444	.04322
FCR	1.190	58	.239	.05748	.04829
Production cost/broiler (tk)	.459	58	.648	1.58673	3.45804
Total production cost/batch (th.tk)	-.463	58	.645	-7.94641	17.15670
Selling price/broiler (tk)	-.858	58	.394	-5.45752	6.35809
Total selling price/batch (th.tk)	-.609	58	.545	-11.58665	19.03443
Profit/broiler (tk)	-1.202	58	.234	-6.62745	5.51282
Net profit/batch (th.tk)	-1.180	58	.243	-3.78412	3.20675

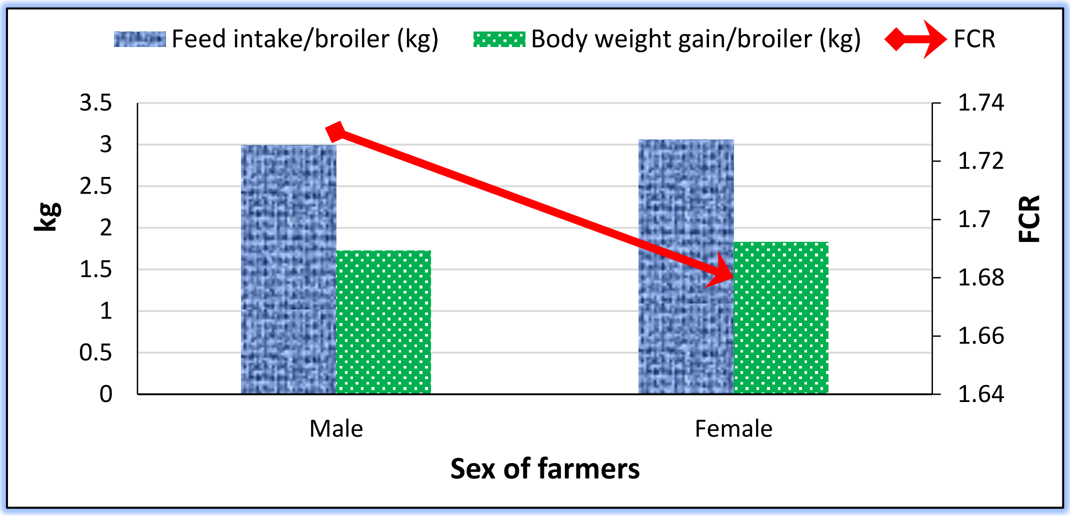

Fig. 113: Sex effect on feed intake/broiler (kg), body weight gain/broiler (kg) and FCR

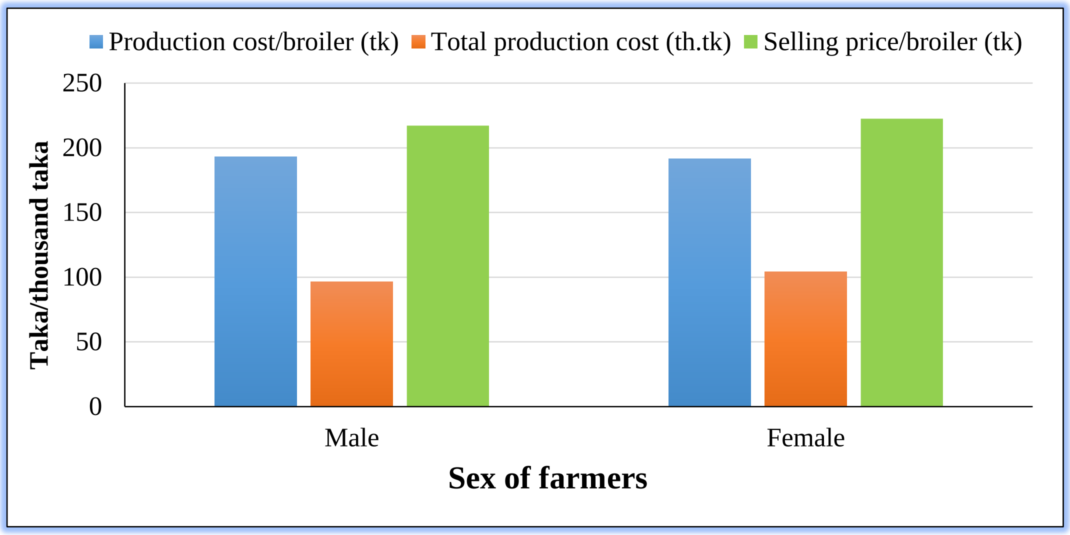

Fig. 114: Sex effect on production cost (tk), total production cost/batch (th.tk) and selling price (tk)

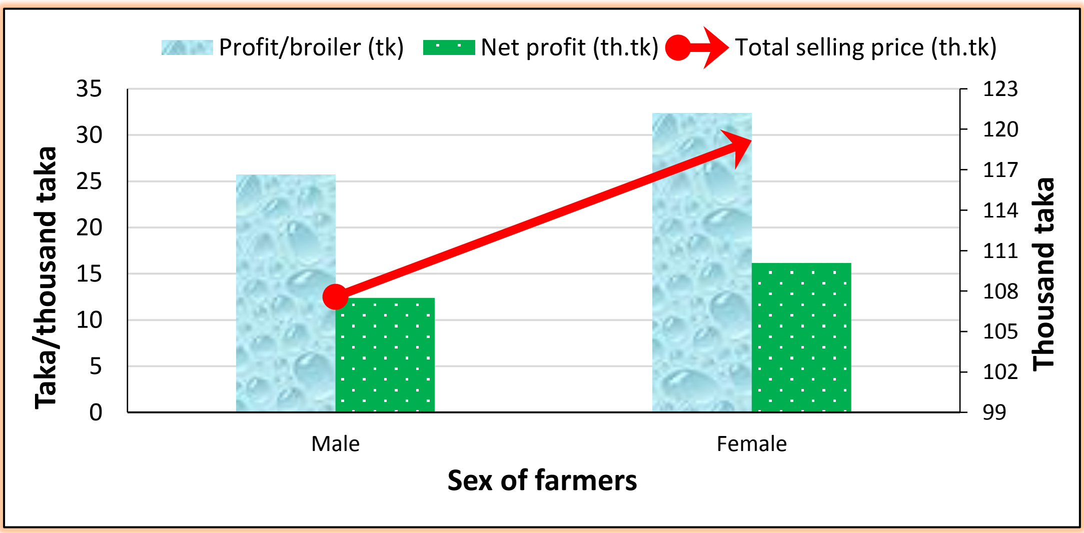

Fig. 115: Sex effect on profit broiler (tk), net profit/batch(th.tk) and total selling price/batch (th.tk)

6.4 DISCUSSION

Most of the influencing factors viz. breeds of broiler, chick quality, farm size, housing pattern, floor type of broiler house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, education, occupation, land owned by farmers, family size and sex of farmers were considered as factors on productive parameters viz. feed intake per broiler, body weight gain per broiler, FCR, production cost per broiler, total production cost/batch, selling price per broiler, total selling price/batch, profit broiler and net profit. In total of 60 broiler farms under OHOFP in 9 Upazila of Rajshahi district were studied and followed up from July 2013 to June 2015. Our study and findings are discussed below.

6.4.1 Effects of broiler strain on productive performances in broiler farms

Effect of broiler strain on productive performances in broilers farm and ANOVA are showed in Table-61-62 and Fig. 71-73. In Table-61 body weight gain was highest in both Cob 500 and Hubbard Classic as (1.75±0.02 kg) and lowest was in Ross 308 (1.45±0.02 kg) which was significantly ($P<.001$) difference. The mean values of FCR was better in Cob 500 (1.73±0.02) and not good in Ross 308 (2.16±0.02) which was also significantly ($P<.001$) difference. Selling price per broiler was highest in Cob 500 (218.55±2.52 taka) and lowest in Ross 308 (193.75±1.75 taka), profit broiler was highest in Cob 500 (27.29±2.28 taka) and was very low in Ross 308 (2.75±0.25 taka) which were also differed significantly ($P<0.05$, $P<0.01$). Feed intake per broiler was highest in Ross 308 (3.13±0.05 kg) and was lowest in Cob 500 (3.00±0.02 kg), production cost per broiler was high in Hubbard classic (198.23±3.12 taka) and lowest in Ross 308 (191.00±1.55 taka), total production cost/batch was highest in Ross 308 (138.51±30.62) and lowest in Cob 500 (93.36±6.33), total selling price/batch was highest in Ross 308 (149.78±33.30) and lowest in Cob 500 (104.84±6.91) and net profit/batch was highest in Cob 500 (12.48±1.18) and lowest in Ross 308 (9.06±7.16), though these productive parameters were not differed significantly ($P>0.05$).

Our findings were more or less similar to Hossain *et al.* (2011). They concluded that Cob 500 broiler strain has supported comparatively better growth responses in terms of body weight, feed efficiency, net profit/batch and lower cost of production than those of Hubbard Classic and MPK strains.

Cob 500 broiler strain achieved heavier body weight and higher weight gain than the other strains. Our results are in agreement with the reports of several other previous researchers (Gonzales *et al.,* 1998; Sarker *et al*., 2001 & 2002; Abdullah *et al.*, 2010), who found similar variations in rearing different strains under experimental conditions.

Feed conversion ratio (FCR) of the Cob 500 broiler strain was found to be superior to other strains in this study. This performance might be partly due to the capacity of this strain (Cob 500) to consume greater quantities of feed, resulting in higher intakes and hence greater live weight, weight gain and improved FCR than in other broiler strains. The improved FCR of Cob 500 birds indicates that this strain is more efficient in converting feed to meat more rapidly than in other strains. Our findings are in agreement with the report of Abdullah *et al.* (2010) who found similar FCR value in Hubbard classic strain of broiler during the rearing period. Gonzales *et al.* (1998) also reported that FCR value may be differed due to the interaction of genotype amongst the strains, and found the highest FCR values in several strains including Hubbard classic strain of broilers. FCR values of this study indicated that improved feed efficiency showed by Cob 500 broiler strains, then inferior trend of FCR values was followed by Hubbard Classic and Ross 308 strains.

It may be concluded that Cob 500 breed of broilers show the best performance than Hubbard Classic and Ross 308 broilers in our study. The differences of the productive performances of the broiler strains may be explained by different factors, for example, genotype, feed, sex, strains, environmental conditions, climatic effects and so on. So, Cob 500 broiler strain may be recommended as economic and more suitable for rearing under OHOFP areas of Rajshahi district, Bangladesh.

6.4.2. Effect of chick quality of broilers

Effect of chick quality of broilers on productive performances in broilers farm and ANOVA are showed in Table- 63-64 and Fig. 74-76. In Table-63 the highest mean value of body weight gain was in excellent quality chick (1.84±0.02 kg) and lowest was in poor quality chick (1.67±0.04 kg). The FCR was better in excellent quality chick (1.61±0.02) and the FCR was not good in poor quality chick (1.81±0.05). Selling price per broiler was high in excellent quality chick (233.82±4.00) and was low in poor quality chick (97.57±3.18). Profit per broiler was highest in excellent quality chick (44.47±3.50) and was very low in poor quality chick (6.71±0.64). Net profit/batch was highest in excellent quality chick (20.83±2.26) and was lowest in poor quality chick (2.76±0.48). These productive parameters were significantly (P < 0.001) effected by chick quality of broilers. Feed intake per broiler was highest in good quality chick (3.02±0.02) and was lowest in excellent quality chick (2.96±0.04). Production cost per broiler was high in good quality chick (99.67±7.19) and the production cost per broiler was low in excellent quality chick (190.55±2.24). Total production cost/batch was high in good quality chick (99.67±7.19) and was low in poor quality chick (85.47±12.20). Total selling was highest in excellent quality chick (117.94±16.18) and was low in poor quality chick (87.44±12.43). But, these were not significantly affected by the chick quality of broilers (P>0.05).

In our study we observed excellent quality of chick showed best performances than others. It may be due to the day old chick (DOC) of this group shows best movement, no problem in whole body and look most bright in nature. Furthermore it may be due to highly taking care of DOC at the time of hatching and carrying by producing company.

6.4.3 Effect of farm size of broilers

Effect of farm size of broilers on productive performances in broilers farm and ANOVA are shown in Table-65-66 and Fig. 77-79. In Table-65 total production cost/batch was highest where >600 broilers exist (191.63±6.61) and was lowest where <400 broilers exist (52.16±2.79). Total selling price/batch was highest where >600 broilers exist (213.24±8.56) and lowest where <400 broilers exist (59.35±2.91). Net profit/batch was highest where >600 broilers exist (24.38±2.90) and lowest where <400 broilers exist (7.41±0.94). Feed intake per broiler was highest where >600 broilers exist (3.01±0.05) and were lowest where <400 broilers exist (2.99±0.03). Body weight gain was highest where >600 broilers exist (1.82±0.03) and lowest where 400-600 broilers exist (1.72±0.02). The FCR was better where >600 broilers exist (1.66±0.03) and the FCR was not good where 400-600 broilers exist (1.75±0.02). Production cost per broiler was high where >600 broilers exist (197.40±2.03) and were low where 400-600 broilers exist (191.36±1.32). Selling price per broiler was high where <400 broilers exist (220.87±5.41) and were low where

400-600 broilers exist (216.00±3.00). Profit per broiler was highest where <400 broilers exist (28.53±4.11) and was very low where >600 broilers (24.90±2.79). Total production cost/batch, total selling price/batch and net profit/batch were significantly influenced by farm size (P < 0.001) but feed intake per broiler, weight gain, FCR, production cost per broiler, selling price per broiler and profit broiler were not significantly influenced by farm size (P>0.05).

Kawsar *et al.* (2013) found that feed consumption and FCR had decreasing trends with increasing size of the flock. This findings are similar to our findings.

Ali *et al.* 2014 observed same results, they found that the productive performances and the profitability of broiler farming seemed to be losing concern and/or smaller amount of profit in case of farm size of 700 broilers or less.

In our study we observed the farm size of >600 broilers in a farm showed best performance than <400 broilers and 400-600 broilers rearing in a farm. It may be due to same management cost irrespective of farm size of broilers.

6.4.4 Effect of housing pattern of broilers

Effect of housing pattern of broilers on productive performances in broilers farm and ANOVA are shown in Table-67-68 and Fig. 80-82. In Table-67 the feed intake per broiler was highest in straw made house (3.09±0.04 kg) and was lowest in tin shade house (2.98±0.02 kg). Body weight gain was highest in semi paca house (1.77±0.03 kg) and lowest in straw made house (1.47±0.02 kg). The FCR was better in tin shade house (1.72±0.02) and the FCR was not good in straw made house (2.10±0.01). Total production cost/batch was high in semi paca house (105.67±14.07 th.tk) and was low in straw made house (78.52±6.14 th.tk). Selling price per broiler was high in tin shade house (219.62±3.03 taka) and was low in straw made house (198.89±2.77 taka). Profit per broiler and net profit/batch was highest in tin shade house as (26.62±2.62 taka), (12.96±1.47 th.tk) and was very low in straw made house as (6.00±1.26 taka), (2.41±0.53 th.tk).

Feed intake per broiler, body weight gain per broiler, FCR, selling price, profit broiler and net profit/batch were differed significantly (P<0.05, P<0.001, P<0.01) whereas production cost, total production cost/batch and total selling price/batch were not significantly influenced by housing pattern (P>0.05).

In our study we observed that average mean values of maximum productive parameters were highest in semi-paca house which showed best performance than tin shade and straw made house. It may be because of semi-pacca house is very comfortable for broilers rearing.

6.4.5 Effect of floor type of broilers

Effect of floor type of broilers on productive performances in broilers farm and t-test are shown in Table-69-70 and Fig. 83-85. In Table-69 the feed intake per broiler was highest for floor with litter (3.00±0.02) and was lowest for macha with polythin and litter (2.99±0.08). Body weight gain was highest for macha with polythin and litter (1.76±0.02) and lowest for floor with litter (1.75±0.02). The FCR was better for macha with polythin and litter (1.70±0.06) and the FCR was not good for floor with litter (1.73±0.02). Production cost per broiler was high for macha with polythin and litter (194.39±6.64) and was low for floor with litter (192.65±1.22). Total production cost/batch was high for macha with polythin and litter (111.01±25.89) and was low for floor with litter (96.39±6.27). Selling price per broiler was high for Floor with litter (218.04±2.40) and was low for macha with polythin and litter (216.00±7.12).

All the parameters were not significantly influenced by floor type of broiler hose (P>0.05).

Though, we found non-significant variation within the average values of productive parameters, macha with polythin and litter type of floor of broilers house showed better performances than floor with litter type of floor of broilers house. It may be due to macha with polythin and litter type of floor of broilers house is more comfortable for broiler rearing.

6.4.6 Effect of overall housing system

Effect of overall housing system of broilers on productive performances in broilers farm and ANOVA are shown in Table-71-72 and Fig. 86-88. In Table-71 the highest mean value of body weight gain was in good housing system (1.79±0.02 kg) and lowest was in poor housing system (1.63±0.04 kg). The average value of FCR was lowest in good housing system (1.68±0.02) and highest in poor housing system (1.87±0.05). Selling price per broiler was high in good housing system (223.18±2.58) and was low in poor housing system (204.14±2.71). Profit per broiler was highest in good housing system (31.50±2.46 taka) and was very low in poor housing system (10.57±2.29 taka). Net profit/batch was highest in good housing system (14.99±1.37 th.tk) and was low in poor housing system (4.76±0.48 th.tk). Feed intake per broiler was highest in both poor and medium quality housing system (3.04±0.04 kg) and was lowest in good quality overall housing system (2.99±0.02 kg). Production cost per broiler was high in poor quality housing system (194.86±1.47 taka) and the production cost per broiler was low in medium quality housing system (191.56±3.21 taka). Total production cost/batch was high in medium quality housing system (99.13±16.44 th.tk) and was low in poor quality housing system (94.66±8.90 th.tk). Total selling price/batch was highest in good quality housing system (111.57±8.16 th.tk) and was low in poor quality housing system (98.28±8.96 th.tk).

Body weight gain, FCR, Selling price/broiler, profit/broiler and net profit/batch were significantly ($P< 0.001$, $P<0.01$) influenced by overall housing system, but feed intake/broiler, production cost/broiler, total production cost/batch and total selling price/batch were not significantly influenced by overall housing pattern ($P>0.05$).

We found overall good housing system of broilers showed best performance than others in our study. It may be due to broilers get more space to move, feel comfort and get free air flow in this type of good housing system.

6.4.7 Effect of overall ventilation system

Effect of overall ventilation system of broilers on productive performances in broilers farm and ANOVA are shown in Table-73-74 and Fig. 89-91. In Table-74 the highest mean value of body weight gain was in excellent ventilation system (1.85±0.03 kg) and lowest was in poor ventilation system (1.67±0.04 kg). The average value of FCR was lowest in excellent ventilation system (1.60±0.03) and highest in poor ventilation system (1.81±0.05). Selling price per broiler was high in excellent ventilation system (236.69±4.91 taka) and was low in poor ventilation system (197.57±3.18 taka). Profit per broiler was highest in excellent ventilation system (49.54±3.44 taka) and was very low in poor ventilation system (6.71±0.64 taka). Net profit/batch was highest in excellent ventilation system (20.08±2.37 th.tk) and was low in poor ventilation system (2.76±0.48 th.tk). Feed intake per broiler was highest in medium ventilation system (3.01±0.02 kg) and was lowest in excellent ventilation system (2.97±0.05 kg). Production cost per broiler was high in medium ventilation system (194.39±1.52 taka) and lowest in excellent ventilation system (188.26±2.45 taka). Total production cost/batch was high in medium ventilation system (105.57±7.87 th.tk) and was low in poor ventilation system (85.47±12.20 th.tk). Total selling price/batch was highest in medium ventilation system (116.45±8.82 th.tk) and was low in poor ventilation system (87.44±12.43 th.tk).

Body weight gain, FCR, selling price/broiler, profit/broiler and net profit/batch were significantly ($P<0.001$) influenced by overall ventilation system, but feed intake/broiler, production cost/broiler, total production cost/batch and total selling price/batch were not significantly influenced by overall ventilation system ($P>0.05$).

We found overall excellent ventilation system of broilers showed best performances than medium and poor ventilation system in our study. It may be due to broilers feel more comfort and get free air flow in this type of excellent ventilation system.

6.4.8 Effect of feed quality

Effect of feed quality of broilers on productive performances in broilers farm and ANOVA are shown in Table-75-76 and Fig. 92-94. In Table-75 the highest mean value of body weight gain was in excellent quality feed (1.81±0.02 kg) and lowest was in poor ventilation system (1.67±0.04 kg). The average value of FCR was lowest in excellent quality feed (1.65±0.02) and highest in poor quality feed (1.81±0.05). Selling price per broiler was high in excellent quality feed (228.50±2.82 taka) and was low in poor quality feed (197.57±3.18 taka). Profit per broiler was highest in excellent quality feed (37.38±2.31 taka) and was very low in poor quality feed (6.71±0.64 taka). Net profit/batch was highest in excellent quality feed (18.34±1.53 th.tk) and was low in poor quality feed (2.76±0.48 th.tk). Feed intake per broiler was highest in medium quality feed (3.02±0.02 kg) and was lowest in excellent quality feed (2.98±0.03 kg). Production cost per broiler was high in medium quality feed (193.75±1.19) and the production cost per broiler was low in poor quality feed (192.07±3.07). Total production cost/batch was high in excellent quality feed

(101.45±9.64) and was low in poor quality feed (85.47±12.20). Total selling price/batch was highest in excellent quality feed (118.72±10.69) and was low in poor quality feed (87.44±12.43).

Body weight gain, FCR, Selling price/broiler, profit/broiler and net profit/batch were significantly (P<0.001) influenced by feed quality, but feed intake/broiler, production cost/broiler, total production cost/batch and total selling price/batch were not significantly influenced by feed quality (P>0.05).

We found excellent quality feed of broilers showed best performances than medium and poor feed quality in our study. It may be due to broilers get sufficient balance feed and essential feed ingredients from excellent quality feed.

6.4.9 Effect of social status of farmers

Effect of social status of farmers on productive performances in broilers farm and t-test are shown in Table-77-78 and Fig. 95-97. In Table-77 the average value of FCR was lowest in ultra poor farmers (1.61±0.04) and highest in marginal farmers (1.74±0.02), total production cost/batch was high in marginal farmers (102.40±6.66 th.tk) and low in ultra poor farmers (66.44±9.07 th.tk) and profit broiler was highest in ultra poor farmers (39.13±6.42 taka) and very low in marginal farmers (24.79±1.95 taka); which were differed significantly (P<0.01, P<0.05). Feed intake per broiler was highest in marginal farmers (3.01±0.02 kg) and lowest in ultra-poor farmers (2.93±0.06 kg), the highest mean value of body weight gain per broiler was in ultra-poor farmers (1.82±0.03 kg) and lowest in marginal farmers (1.74±0.02 kg), production cost per broiler was high in marginal farmers (193.33±1.28) and low in ultra-poor farmers (189.31±3.99), selling price per broiler was high in ultra-poor farmers (227.63±8.05 taka) and low in poor marginal farmers (216.42±2.27 taka), total selling price/batch was highest in marginal farmers (114.07±7.47) and low in ultra-poor farmers (78.47±9.31) and net profit/batch was highest in marginal farmers (13.03±1.29) and low in ultra-poor farmers (12.53±2.23) which were not differed significantly (P>0.05).

In our study we observed that average mean values of maximum productive parameters were highest in ultra-poor group of farmers which showed best performance than marginal group of farmers. It may be due to ultra-poor group of farmers are very much conscious in broilers farming and they spend more time for taking care of flock/birds and their overall management activities.

6.4.10 Effect of economic status of farmers

Effect of economic status of farmers on productive performances in broilers farm and ANOVA are shown in Table-79-80 and Fig. 98-100. In Table-79 the feed intake per broiler was highest (3.04±0.02 kg) in the group of 10000-15000 taka and was lowest (2.94±0.04 kg) in the group of >15000 taka. Production cost per broiler was high (195.58±1.68) in 10000-15000 taka group and the production cost per broiler was low (189.21±2.16) in >15000 taka group. The highest mean value of body weight gain per broiler was (1.78±0.03 kg) in <10000 taka group and lowest was (1.73±0.02 kg) in 10000-15000 taka group. The average value of FCR was lowest (1.68±0.04) in <10000 taka and highest (1.76±0.02) in 10000-15000 taka. Total production cost/batch was high in >15000 taka (111.25±13.45) and was low in <10000 taka (79.69±9.03). Selling price per broiler was high in 10000-15000 taka (219.79±2.82) and was low in >15000 taka (211.18±3.06). Total selling price/batch was highest in >15000 taka (124.19±15.65) and was low in <10000 taka (90.84±10.23). Profit per broiler was highest in <10000 taka (30.31±4.98) and was very low in >15000 taka (23.27±3.38). Net profit/batch was highest in group >15000 taka (14.22±3.02) and was low in group 10000-15000 (11.84±2.23).

Feed intake/broiler and production cost/broiler were significantly influenced by economic status of farmers ($P < 0.05$), but body weight gain, FCR, total production cost/batch, selling price/broiler, total selling price/batch, profit/broiler and net profit/batch were not significantly influenced by economic status of farmers ($P > 0.05$).

We found in our study that the farmers who are in the group of <10000 taka income showed best performance than others monthly income group like 10000-15000 taka and >15000 taka. It may be due to the farmers of this group are very sincere in broilers rearing and it may be the main business of the group of <10000 taka income.

6.4.11 Effect of educational status of farmers

Effect of educational status of farmers on productive performances in broilers farm and ANOVA are shown in Table-81-82 and Fig. 101-103. In Table-81 the highest mean value of body weight gain per broiler was in none education group (1.81±0.04

kg) and lowest was in secondary education group (1.68±0.03 kg). The average value of FCR was lowest in primary education group (1.68±0.03) and highest in secondary group (1.80±0.03). Net profit/batch was highest in none education group (16.16±2.99) and was low in secondary education group (8.18±1.28). Feed intake per broiler was highest in none education group (3.06±0.04) and was lowest in primary group (2.96±0.03). Production cost per broiler was high in none education group (192.66±1.68) and was low in primary group (191.67±1.93). Total production cost/batch was high in none education group (110.72±20.04) and was low in secondary group (76.14±4.70). Selling price per broiler was high in none education group (221.38±7.52) and was low in secondary education group (211.94±3.52). Total selling price/batch was highest in none education group (125.65±21.37) and was low in secondary group (83.75±5.05). Profit per broiler was highest in primary group (30.60±3.58) and was very low in secondary group (21.06±3.17).

Body weight gain per broiler, FCR and net profit/batch were significantly influenced by educational status of farmers ($P < 0.05$), but feed intake/broiler, production cost/broiler, total production cost/batch, selling price/broiler, total selling price/batch, profit/broiler were not significantly influenced by educational status of farmers ($P>0.05$).

In our study we observed that average mean values of maximum productive parameters were highest in none education group of farmers which showed best performance than others educational group of farmers. It may be due to none education group of farmers are very much conscious and sincere in broilers rearing and they spend more time for taking care of flock/birds and their overall management activities.

6.4.12 Effect of occupational status of farmers of broilers

Effect of occupational status of farmers on productive performances in broilers farm and t-test are shown in Table-83-84 and Fig. 104-106. In Table-83 the feed intake per broiler was highest who were involved in business (3.01±0.03) and was lowest who were involved in agriculture (2.99±0.02). Body weight gain was highest who were involved in business (1.75±0.02 kg) and lowest who were involved in agriculture (1.74±0.02 kg). The FCR was better who were involved in business (1.72±0.02) and not good who were involved in agriculture (1.73±0.02). Production cost per broiler was high who were involved in business (194.75±1.69) and was low who were involved in agriculture (190.23±1.66). Total production cost/batch was high who were involved in business (103.55±8.70) and was low who were involved in agriculture (89.83±8.17). Selling price per broiler was high who were involved in business (221.06±3.23) and was low who were involved in agriculture (213.81±2.95).

All the parameters were not significantly influenced by occupational status of farmers of broilers (P>0.05).

Though, we found non-significant variation within the average values of all productive parameters, the business group of occupational status of farmers showed better performances than agriculture group of occupational status of farmers. It may be due to business group of occupational status of farmers are conscious and sincere in broilers farming and also they may spend more money in broiler rearing as main business than agriculture group of farmers.

6.4.13 Effect of land owned by farmers

Effect of land owned by farmers on productive performances in broilers farm and ANOVA are shown in Table-85-86 and Fig. 107-109. In Table-85 the highest value of feed intake per broiler was (3.09±0.04 kg) in = or <10 decimal farmers group and was lowest (2.96±0.05 kg) in >10 to=or <50 decimal farmers group. Production cost per broiler was high in =or <10 decimal group (196.71±2.98) and was low in >10 to = or <50 decimal group (188.14±2.73). The highest value of body weight gain per broiler was in =or <10 decimal group (1.81±0.05 kg) and lowest was in >50 decimal group (1.72±0.02 kg). The average value of FCR was lowest in >10 to =or <50 decimal group (1.66±0.04) and highest in >50 decimals group (1.75±0.02). Total production cost/batch was high in = or <10 decimal group (108.48±25.20) and was low in >10 to = or <50 decimal group (77.97±5.17). Selling price per broiler was highest in = or <10 decimal (228.29±8.53) and was lowest in >50 decimal group (215.45±2.36). Total selling price/batch was highest in = or <10 decimal group (121.77±26.40) and was low in >10 to = or <50 decimal group (90.30±5.73). Profit per broiler was highest in = or <10 decimal group (32.86±7.07) and was very low in >50 decimal group

(21.06±3.17). Net profit/batch was highest in =or <10 decimal group (14.63±2.95) and was low in >50 decimal group (12.67±1.55).

Feed intake/broiler and production cost/broiler were significantly influenced by land owned of farmers (P < 0.05), but body weight gain per broiler, FCR, total production cost/batch, selling price/broiler, total selling price/batch, profit/broiler and net profit/batch were not significantly influenced by land owned by farmers (P>0.05).

Though, we found maximum non-significant variation within the average values of productive parameters, >10 to= or <50 decimal group of farmers showed best performance than others. It may be due to this group of land owners are conscious and sincere in broilers farming.

6.4.14 Effect of family size of broiler farmers

Effect of family size on productive performances in broilers farm and ANOVA are shown in Table-87-88 and Fig. 110-112. In Table-87 the feed intake per broiler was highest when family contains <4 members (3.02±0.04 kg) and was lowest when family contain >5 members (2.98±0.04 kg). Body weight gain was highest when family contains <4 members (1.77±0.04 kg) and lowest when family contains >5 members (1.70±0.04 kg). The FCR was better when family contains 4-5 members (1.72±0.02) and the FCR was not good when family contains >5 members (1.77±0.04). Production cost per broiler was high when family contains 4-5 members (193.58±1.63) and was low when family contains >5 members (190.80±2.73). Total production cost/batch was high when family contains <4 members (101.37±15.86) and was low when family contains >5 members (88.16±11.32). Selling price per broiler was high when family contains 4-5 members (219.91±3.07) and was low when family contains >5 members (213.36±4.93). Profit per broiler was highest 28.00±3.34 taka in <4 member group of family size and lowest 23.64±4.23 in in >5 member group of family size. All the parameters were not significantly influenced by family size of broiler farmers (P>0.05).

Though, we found non-significant variation within the average values of all productive parameters, the family of farmers when contains <4 members showed better performances than others in maximum productive parameters. It may be due to farmers of <4 members group of family size are conscious and sincere in broilers farming and also they may have less family burden.

6.4.15 Effect of sex of farmers

Effect of sex of farmers on productive performances in broilers farm and t-test are shown in Table-89-90 and Fig. 113-115. In Table-89 the highest value of body weight gain per broiler was in female (1.83±0.04 kg) and lowest was in male (1.73±0.02 kg). The highest value of feed intake per broiler was in female (3.06±0.05 kg) and lowest in male (2.99±0.02 kg). The average value of FCR was lowest in female (1.68±0.03) and highest in male (1.73±0.02). Production cost per broiler was higher in male (193.03±1.37) and was lower in female (191.44±2.67). Total production cost/batch was high in female (104.36±18.92) and was low in male (96.41±6.41). Selling price per broiler was highest in female (222.56±6.00) and was lowest in male (217.10±2.45). Total selling price/batch was highest in female (119.17±20.78) and was low in male (107.58±7.13). Profit per broiler was highest in female (32.33±5.38) and was very low in male (25.71±2.11). Net profit/batch was highest in female (16.18±3.09) and was low in male (12.39±1.23).

Only body weight gain per broiler was significantly influenced by sex of farmers ($P<0.05$), but feed intake/broiler, FCR, production cost/broiler, total production cost/batch, selling price/broiler, total selling price/batch, profit/broiler and net profit/batch were not significantly influenced by sex of farmers ($P>0.05$).

Though, we found non-significant variation within the average mean values of all productive parameters except body weight gain per broiler, the female farmers showed better performances than male farmers. It may be due to female farmers are conscious and sincere in broilers farming and also they may spend more time in broilers rearing.

CHAPTER 7

STUDY-IV

PRODUCTIVE PERFORMANCES OF LAYER FARMS IN OHOFP AREAS OF RAJSHAHI DISTRICT

CHAPTER 7

Study-IV

Productive performances of layer farms in OHOFP areas of Rajshahi district

7.1 INTRODUCTION

The current poultry farming is established with the domesticated fowl used for both meat and egg production. This farming also includes birds like chicken, turkey, duck, goose, ostrich, quail, pheasant, guinea fowl and peafowl. Chickens are the most popular poultry worldwide irrespective of culture and religion (Roenigk, 1999; Aho, 2001), because of high nutritive values of poultry products. Chicken meat and eggs are the major protein source for consumers in most of the countries around the world, and poultry contributes about 22 to 27 percent of the total animal protein supply in Bangladesh (Ahmed & Haque, 1990). Poultry is a promising sector for poverty reduction in Bangladesh.

The poultry farming has now turned into one of the most important division of agriculture throughout the world. It is expanding rapidly as a dynamic industry in South Asian countries like Bangladesh, India and Pakistan. The tremendous role of commercial layers and broilers is to meet the increasing demand of the population for protein by the meats and eggs. Poultry is basically a source of economical, palatable and healthy food protein (Mahesar *et al.*, 2010). In Bangladesh, poultry industry is playing a vital role in the economy of the country and providing employment for about 1.5 million people.

In the context of Bangladesh, Deshi (Local) chickens are reared in the villages mainly by the women whereas the exotic chickens are used as farm animals reared both in villages and urban areas. The exotic chickens are commercially reared because they are high yielding (eggs and meat) than the indigenous breeds (Hossain, 1992).

Poultry production and poultry related industry contributes most significantly to the total livestock sector in Bangladesh. Poultry is in the top position of the livestock sector, contributing 21% of the total livestock contribution (Khan and Roy, 2003), 20% of the protein consumed originates from poultry (90% chicken followed by ducks 8% and a small number of quail, pigeons and geese) (Das *et al.*, 2008). It is estimated that there are about 140 million chickens and 13 million ducks in the total poultry population (DLS, 2000) are scattered throughout rural areas in Bangladesh. Ansarey (2012) reported about the prospects of poultry industry in Bangladesh. The poultry is an integral part of the farming system in Bangladesh and it has created direct, indirect employment opportunity including support services for about 6 million people. Development of poultry has generated considerable employment through the production and the marketing of poultry and poultry related products in Bangladesh. Its steady growth results in attaining country's economic growth, which contribute in (i) rural poverty reduction (ii) new employment generation and (iii) improve food security and (iv) supply of protein in people meals. In the early 90s, a number of private parent stock poultry farms started their operations to produce commercial broiler and layer Day Old Chicks (DOC). Since 1995, a significant annual average growth rate of 15-20% in commercial poultry has been achieved until 2007 and slow downed after due to Avian Influenza (AI) outbreak. The government is getting interested in this sector and is encouraging both urban and rural people to work here and enhance capacity. People in rural areas are getting attracted to this sector and taking it up a business.

Poultry eggs provide a valuable source of high quality proteins, minerals and vitamins required for normal growth especially for children (DARSA, 2004).

Bangladesh has made considerable progress in egg production in the last three decades. High quality chicks, equipment, vaccines and medicines are available. Technically and professionally competent guidance is available to the farmers. The management practices have improved and disease and mortality incidences are much reduced. Many institutions are providing training to entrepreneurs. The per capita egg availability at present is 41 eggs; while as per BBS (Bangladesh Bureau of Statistics) (2010) information about 182 eggs per person per year are required to balance the common vegetarian diet. Layer farming i.e layers production has been given considerable importance in national policy of Bangladesh and has a good scope for further development.

Saleque *et al.* (2010) mentioned that the availability of egg is much lower than requirement in Bangladesh. He observed per person per year demand of eggs is 104, but supply is only 36 eggs.

Layers farming is emerging as a strong agro-based industry in Bangladesh. It is also potential source of income generation and create employment opportunities for the educated, non-educated and unemployed youths and distress women. Presently poultry meat and eggs provides the cheapest quality animal protein to the millions of people. There are around 1.5 lac small, medium and large scale poultry farms in Bangladesh and poultry population are approximately 246 million.

After considering above all things the present experiment (Study-IV) had been undertaken the following objectives.

Objectives:

- To find out the effects of breeds, chick quality, farm size, age, overall housing and ventilation system and overall management condition of farm on productive performances of layers in project areas.

- To observe the influence of socio-economic condition, education, occupation, land owning and sex of farmers on productive performances of layers under 'One House One Farm Project' in Rajshahi District, Bangladesh.

7.2 MAERIALS AND METHODS

Data were collected from the farmers of 6 Uazila of Rajshahi district, Bangladesh during July 2013 to June 2015.

7.2.1 Data collection

Carefully prepared questionnaire were used for the purpose of information collection (Appendix-1I) and also for getting general (socio-economic) information of farmers, management, productive parameters of layers farm from project areas in 6 Upazilas of Rajshahi district, Bangladesh.

7.2.2 Population study

22 layer farms (total 17050 layer chickens) involving 22 farmers from 6 Upazilas in Rajshahi district were interviewed with carefully prepared questionnaire. Table-91 shows Upazila wise layer farms and total no, of layer chickensin Rajshahi district.

Table-91: Upazila wise layer farms including chicken numbers under bracket in Rajshahi district.

Sl. No	Upazila	Breed of layers						Total farms	Total chickens
		Hyline Brown	Hisex Brown	Hyline White	Bovans White	Navogen Brown	Deshi or Local		
1	Bagha	0	1(500)	0	0	0	0	1	500
2	Bagmara	6(4250)	1(1100)	1(500)	0	1(1000)	0	9	6850
3	Charghat	0	1(800)	0	0	1(1000)	0	2	1800
4	Godagari	0	1(1100)	0	0	0	2(100)	3	1200
5	Mohanpur	0	0	0	1(700)	0	0	1	700
6	Paba	0	1(1800)	3(2500)	2(1700)	0	0	6	6000
	Total	**6(4250)**	**5(5300)**	**4(3000)**	**3(2400)**	**2(2000)**	**2(100)**	**22**	**17050**

Parenthesis indicate no. of chicken

7.2.3 Factors considered for the study

Breed of layers, chick quality of layers, farm size, age of layers, housing pattern, floor type of laying house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, education, occupation, land owned by farmers and sex of farmers were considered as factors and classified as below.

7.2.3.1 Breed of layers

Data of six breeds reared by farmers in this study areas of Rahshahi district were collected. These were Hyline Brown, Hisex Brown, Hyline White, Bovans White, Navogen Brown and Deshi or Local

.Layers breed were classified as following 6 groups

Group-I : Hyline Brown (6 farms and 4250 no. of layer chickens)
Group-II : Hisex Brown (5 farms and 5300 no. of layer chickens)
Group-III : Hyline White (4 farms and 3000 no. of layer chickens)
Group-IV : Bovans White (3 farms and 2400 no. of layer chickens)
Group-V : Navogen Brown (2 farms and 2000 no. of layer chickens)
Group-VI : Deshi or Local (2 farms and 100 no. of layer chickens)

7.2.3.2 Chick quality of layers

According to quality of day old chicks (DOC) the layer farms were divided into three groups:

Group-I: **Poor quality chick:** The day old chick shows slow movement, slight problem in whole body and look less bright in nature.

Group-II: **Good quality chick:** The day old chick shows better movement, no problem in whole body and look more bright in nature.

Group-III: **Excellent quality chick:** The day old chick (DOC) shows best movement, no problem in whole body and look most bright in nature.

7.2.3.3 Farm size

According to farm size layer farms were divided into the following 3 groups:

Group- I : = or < 500 layers
Group- II : > 500 to < 1000 layers
Group- III : = or > 1000 layers

7.2.3.4 Age of layers

According to age of layers, layer farms were divided into the following 4 groups:

Group- I : = or < 6 month
Group- II : > 6 to 12 month
Group- III : >12 to 18 month
Group- IV : >18 month

7.2.3.5 Housing pattern

According to housing pattern the layer farms were divided into the following three groups:

Group-I (Semi Paca Housing) **:** Layers house built of brick and tin.

Group-II (Tin Shade Housing) **:** Layers house built of tin, bamboo and others.

Group-III (Straw Made Housing) **:** Layers house were built of straw, bamboo and others.

7.2.3.6 Floor type of layer house

According to floor type of layer house the layer farms were divided into the following 3 groups:

Group-I (Macha with bamboo)**:** Layers were housed on macha with bamboo

Group-II (Floor with litter)**:** Layers were housed on the floor with litter.

Group-III (Bamboo or iron made case)**:** Layers were housed within bamboo or iron made case.

7.2.3.7 Overall housing system

According to overall housing system the layer farms were divided into the following 3 groups:

Group-III (Poor) **:** Layers were housed in overall poor housing system.

Group-II (Medium) **:** Layers were housed in overall medium housing system.

Group-I (Good) **:** Layers were housed in overall good housing system.

7.2.3.8 Overall ventilation system

According to overall ventilation system the layer farms were divided into the following 3 groups:

Group-III (Poor ventilation): Layers were housed in overall poor ventilation system. There was very limited air flow.

Group-II (Moderate ventilation): Layers were housed in overall medium ventilation system. There was moderate air flow.

Group-I (Proper ventilation): Layers were housed in overall proper (best) ventilation system. There was sufficient air flow

7.2.3.9 Feed quality

According to supplied feed quality the layer farms were divided into the following 3 groups:

Group-I (Poor quality feed) : Layers were fed poor quality feed which were not so standard quality of feed.

Group-II (Medium quality feed): Layers were fed medium quality feed which were better standard quality of feed.

Group-III (Excellent quality feed) : Layers were fed excellent quality feed which were best standard quality of feed.

7.2.3.10 Social status of farmers

According to social status of farmers the layer farms were divided into the following 2 groups:

Group-I (Ultra poor): Layers were reared by ultra-poor farmers. They could not meet basic needs. They were in limited income (<5000 tk. per month), land (< 5 decimals) and social status

Group-II (Marginal): Layers were reared by marginal categories' farmers. They could meet basic needs. They were not in limited income (<5000 tk. per month), land (< 5 decimals),and social status.

7.2.3.11 Economic status of farmers

According to economic status of farmers the layer farms were divided into the following 3 groups:

Group-I (< 5000 taka)**:** Layers were reared by the farmers whose income per month was less than 5000 taka.

Group-II (5000 to 10000 taka)**:** Layers were reared by the farmers whose income per month was within 5000-10000 taka.

Group-III (> 10000 taka)**:** Layers were reared by the farmers whose income per month was greater than 10000 taka.

7.2.3.12 Educational status of farmers

According to educational status of farmers the layer farms were divided into the following 3 groups:

Group-I (Primary): Layers were reared by the farmers whose education was primary level.

Group-II (Secondary): Layers were reared by the farmers whose education was secondary level.

Group-III (HSC & above): Layers were reared by the farmers whose education was HSC and above.

7.2.3.13 Occupational status of farmers

According to occupational status of farmers the layer farms were divided into the following 2 groups:

Group-I (Agriculture): Layers were reared by the farmers whose occupation was agriculture.

Group-II (Business): Layers were reared by the farmers whose occupation was business.

Group-III (Service holder): Layers were reared by the farmers whose occupation was service.

Group-IV (Others): Layers were reared by the farmers whose occupation was others.

7.2.3.14 Land owned by farmers

According to land owned by farmers the layer farms were divided into the following 3 groups:

Group-I (< 5 decimals): Layers were reared by the farmers who were the owner of less than 5 decimals land.

Group-II (5 - 33 decimals): Layers were reared by the farmers who were the owner of 5-33 decimals land.

Group-III (> 33 decimals): Layers were reared by the farmers who were the owner of greater than 33 decimals land.

7.2.3.15 Sex of farmers

According to sex of farmers the layer farms were divided into the following 2 groups:

Group-I (Male): Layers were reared by male farmers.

Group-II (Female): Layers were reared by male farmers.

7.2.4 Productive parameters of layer farms

The following productive parameters were used in this study-IV. These are defined as:

Feed intake per layer per month (kg): On an average every layer intakes supplied balance feed in a month measured in kg is called feed intake per layer per month (kg).

Egg mass per layer per month (kg): Produced egg mass of a layer within a month measured in kg is called egg mass per layer per month (kg). Generally egg mass is used for better comparisons of flocks or strains of birds. To calculate egg mass it is first necessary to determine the average weight of eggs by weighing representative samples of the eggs produced in same period.

FCR: Total feed intake by layer divided with total egg mass by that layer in kg or lbs. within same time is called FCR. It is the most essential dependent factor in layer production.

Egg productivity (%): It is the percentage value of produced eggs in a month.

Production cost per layer per month (tk): Every layer needs some cost within a month estimated in taka is called production cost per layer per month (tk).

Total production cost/m (th.tk): Total amount of producing cost within a month of total layers estimated in thousand taka is called total production cost/m (th.tk).

Selling price of egg per layer per month (tk): The amount of money counting in taka got by selling produced eggs by farmer in a month per layer is called selling price of egg per layer per month (tk). It was dependent on market value of eggs.

Total selling price/m (th.tk): The total amount of money counting in thousand taka got by farmer from the layer stock within a month, here it is called total selling price/m (th.tk). It was also dependent on market value of eggs.

Profit per layer per month (tk): Subtracting production cost per layer per month (tk) from selling price of eggs per layer per month (tk) is called profit per layer (tk).

Net profit/m (th.tk): Subtracting total production cost/m (th.tk) from total selling price/m of eggs (th.tk) in the layer farm is called net profit/m (th.tk) in that layer farm.

6.2.5 Statistical analyses

Data were statistically analysed to calculate the effect of layer breed, chick quality of layers, farm size, age of layers, housing pattern, floor type of house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, educational status of farmers, occupational status of farmers, land owned by farmers and sex of farmers. The mean and Std Error of Mean (S.E) for feed intake per layer per month, egg mass layer per month, FCR, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m, profit per layer per month and net profit/m were calculated by using IBM SPSS Statistics Version 20 program. Factors were tested by Duncan Multiple Range Test (DMRT) to determine the effect of different factors (Steel and Torrie, 1980). Univariate Analysis of Variance was used to test significance of different factors. Some factors were also tested by Independent Samples Test (t-test). The statistical model used to estimate the components of variance was as follows:

$Y_{abcdefghijklmno} = \mu + B_a + C_b + D_c + E_d + F_e + G_f + H_g + I_h + J_i + K_j + L_k + M_l + N_m + O_n + P_o + e_{abcdefghijklmno}$

$Y_{abcdefghijklmno}$ = individual observation

μ = grand mean

B_a= effect of layer breed (a = 1-6)

C_b = effect of chick quality of layers (b = 1-3)

D_c = effect of farm size (c = 1-3)

E_d = effect of age of layers (d = 1-4)

F_e = effect of housing pattern (e = 1-3)

G_f = effect of floor type of layer house (f = 1-3)

H_g= effect of overall housing system (g = 1-3)

I_h = effect of overall ventilation system (h = 1-3)

J_i = effect of feed quality (i = 1-3)

k_j = effect of social status of farmers (j = 1-2)

L_k = effect of economic status of farmers (k = 1-3)

M_l = effect of educational status of farmers (l = 1-3)

N_m = effect of occupational status of farmers (m = 1-4)

O_n = effect of land owned by farmers (n = 1-3)

P_o = effect of sex of farmers (o= 1-2)

$e_{abcdefghijklmno}$= random error associated with $Y_{abcdefghijklmno}$

Mean effects were systematically included in the model. Random effects were assumed independently and identically distributed. General Linear Model (GLM) test i.e. Univariate (Post Hoc) for multiple comprises for observed mean was performed.

Fig. 116: Layer farms of OHOFP under Charghat Upazila in Rajshahi district

Fig. 117:Layer farms of OHOFP under Paba Upazila in Rajshahi district

7.3 RESULTS

In total of 22 layers farms, studied for the effect of layer breed, chick quality, farm size, age of layers, housing pattern, floor type of layer house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, education, occupation, land owned by farmers and sex of farmers were considered as factors on productive performances of layer farms; which had been fined out under OHOFP in 6 Upazilas of Rajshahi district, Bangladesh. Mean tests results, t-tests and one way ANOVA tests are presented in Table 92-121 and Figure-118-162.

7.3.1 Effects of layer breed (strain) on productive performances in layer farms

Effects of layer breed (strain) on productive performances in layer farms and ANOVA are shown in Table-92-93 and Fig.118-120. In Table-92 the highest value of feed intake per layer per month was in Navogen Brown (3.60±0.00 kg) and was lowest in Deshi or Local breed (1.50±0.50 kg). Egg mass per layer per month was highest in Navogen Brown (1.81±0.03 kg) and was lowest in Deshi or Local breed (0.84±0.17 kg). Egg productivity (%) was highest in Navogen Brown (95.00±2.00) and was lowest in Deshi or Local breed (50.00±10.00). Production cost per layer per month was highest in Navogen Brown (148.20±1.80) and was lowest in Deshi or Local breed (55.00±18.00). Total production cost/m was highest in Hisex Brown (150.44±29.52) and was lowest in Deshi or Local breed (2.75±0.90). Selling price of egg per layer was highest in both Hyline Brown and Bovans White (196.00±0.00) and was lowest in Deshi or Local breed (93.75±18.75). Gain per broiler was highest in Hyline Brown (60.18±4.29) and was very low in Hisex Brown (24.30±6.78). The average value of FCR was lowest in deshi or local (1.74±0.25) and highest in Hisex Brown (2.28±0.13). Total selling price/m of egg per layer was highest in Navogen Brown (182.28±11.76) and was lowest in Deshi or Local breed (4.69±0.94). Net profit/m was highest in Hyline Brown (41.13±4.35) and was lowest in Deshi or Local breed (1.94±0.04).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month and profit per layer per month were significantly influenced by the breed ($P<0.001$, $P<0.01$, $P<0.05$), but FCR, total selling price/m and net profit/m were not significantly influenced by breed ($P>0.05$).

Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer and profit per layer were significantly influenced by breed (P<0.001), but FCR, total selling price/m and net profit were not significantly influenced by breed (P>0.05).

7.3.2 Effect of chick quality of layers

Effects of chick quality on productive performances in layer farms and ANOVA are shown in Table-94-95 and Fig.121-123. In Table-94 the highest value of feed intake per layer was in good quality chick (3.57±0.03 kg) and was lowest in poor quality chick (1.50±0.50 kg). Egg mass per layer was highest in good quality chick (1.68±0.04 kg) and was lowest in poor quality chick (0.84±0.17 kg). The average value of FCR was lowest in poor quality chick (1.74±0.25) and highest in good quality chick (2.14±0.06). Egg productivity (%) was highest in excellent quality chick (91.29±0.89) and was lowest in poor quality (50.00±10.00). Production cost per layer was high in good quality chick (146.84±1.60) and was low in poor quality chick (50.00±10.00). Total production cost/m was high in good quality chick (137.87±12.29) and was low in poor quality chick (2.75±0.90). Selling price of egg per layer was highest in excellent quality chick (190.46±2.87 taka) and was lowest in poor quality chick (93.75±18.75 taka). Total selling price/m was highest in good quality (172.72±16.00) and was low in poor quality chick (4.69±0.94). Profit per layer per month was highest in excellent quality chick (58.06±4.85 taka) and was very low in poor quality chick (38.75±0.75 taka). Net profit/m was highest in excellent quality (35.26±3.21 th.tk) and was lowest in poor quality chick of layer (1.94±0.04 th.tk).

Feed intake per layer per month, egg mass per layer per month, FCR, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m, profit per layer per month and net profit were significantly influenced by chick quality of layers (P<0.001, P<0.05).

7.3.3 Effect of farm size of layers

Effects of farm size on productive performances in layer farms and ANOVA are shown in Table-96-97 and Fig.124-126. In Table-96 the highest value of feed intake per layer per month was in = or >1000 layers group of farm size (3.53±0.04 kg) and was lowest in = or <500 layers group of farm size (2.67±0.52 kg). Egg mass per layer per month was highest in = or >1000 layers group of farm size (1.69±0.05 kg) and was lowest in = or <500 layers group of farm size (1.32±0.20 kg). Egg productivity

(%) was highest in >500 to <1000 layers group of farm size (91.38±1.63) and was lowest in = or <500 layers group of farm size (73.40±10.08). Production cost per layer per month was highest in = or > 1000 layers group of farm size (145.21±1.15 taka) and was lowest in = or < 500 layers group of farm size (105.82±22.74 taka). Total production cost/m was high in = or > 1000 layers group of farm size (162.29±11.45) and was low in = or < 500 layers group of farm size (42.07±16.46). Selling price of egg per layer per month was highest in > 500 to < 1000 layers group of farm size (191.00±5.00 taka) and was lowest in = or < 500 layers group of farm size (147.34±22.73 taka). Total selling price/m was highest in = or > 1000 layers group of farm size (203.93±10.05) and was low in = or < 500 layers group of farm size (55.59±20.81). Net profit/m was highest in = or > 1000 layers (41.65±5.96) and was low in = or < 500 layers (13.52±5.53). The average value of FCR was lowest in = or < 500 layers (1.96±0.14) and highest in = or > 1000 layers (2.11±0.08). Profit per layer was highest in > 500 to < 1000 layers (52.29±6.84) and was very low in = or > 1000 layers (37.40±5.06).

Feed intake per layer per month, egg mass per layer per month, egg productivity (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m and net profit were significantly influenced by farm size of layers (P<0.05, P<0.001) but FCR and profit per layer per month were not significantly influenced by farm size of layers (P>0.05).

7.3.4 Effect of age of layers

Effects of age of layers on productive performances in layer farms and ANOVA are shown in Table-98-99 and Fig.127-129. In Table-98 the highest value of feed intake per layer was in = or < 6 month age group (3.55±0.05 kg) and was lowest in >18 month age group (2.30±1.30 kg). Egg mass per layer was highest in >6 to 12 month age group (1.70±0.02 kg) and was lowest in >18 month age group (1.00±0.33 kg). Egg productivity (%) was highest in >6 to 12 month age group (92.27±1.00) and was lowest in >18 month age group (55.00±15.0). Production cost per layer was high in = or < 6 month age group (143.63±1.35) and was low in >18 month age group (88.80±51.8). Selling price of egg per layer was highest in = or < 6 month age group (189.4.04±5.00) and was lowest in >18 month age group (111.00±36.00). Net profit/m was highest in >6 to 12 month (38.47±3.71) and was low in >18 month (4.45±2.55). The average value of FCR was lowest in >6 to 12 month age group (2.02±0.04) and highest in = or <6 month age group (2.13±0.08). Total production cost/m was high in >6 to 12 month (121.54±13.21) and was low in >12 to 18 month

(41.92±38.27). Total selling price/m was highest in >6 to 12 month (160.00±15.62) and was low in >12 to 18 month (49.60±43.97). Profit per layer was highest in >6 to 12 month (47.70±4.40) and was very low in >18 month (22.20±15.80).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer, selling price of egg per layer and net profit were significantly influenced by age of layers (P<0.05, P<0.001 & P<0.05) but FCR, total production cost/m, total selling price/m and profit per layer per month were not significantly influenced by age of layers (P>0.05).

7.3.5 Effect of housing pattern of layer farms

Effects of housing pattern on productive performances in layer farms and ANOVA are shown in Table-100-101 and Fig.130-132. In Table-100 the highest value of feed intake per layer per month was in tin shade house (3.53±0.03 kg) and was lowest in straw made house (1.50±0.50 kg). Egg mass per layer per month was highest in semi-paca house (1.69±0.02 kg) and was lowest in straw made house (0.84±0.17 kg). Egg productivity (%) was highest in semi-paca house (91.13±0.79) and was lowest in straw made house (55.00±18.00). Production cost per layer per month was high in tin shade house (142.39±2.04) and was lowest in straw made house (55.00±18.00). Total production cost/m was high in tin shade house (121.81±10.07) and was so lowest in straw made house (2.75±0.90). Selling price of egg per layer was highest in semi-paca house (188.59±3.11) and was lowest in straw made house (93.75±18.75). Total selling price/m was highest in tin shade house (155.84±12.18) and was low in straw made house (4.69±0.94). Net profit/m was highest in semi-paca house (36.43±5.33) and was low in straw made house (1.94±0.04). The average value of FCR was lowest in straw made house (1.74±0.25) and highest in tin shade house (2.13±0.06). Profit per layer per month was highest in semi-paca house (47.71±5.30 taka) and was low in straw made house (38.75±0.75 taka).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m and net profit were significantly influenced by housing pattern of layer (P<0.001, P<0.01 & P<0.05) but FCR and profit per layer per month were not significantly influenced by housing pattern of layers farm (P>0.05).

Table-92: Effect of layer chicken breed on productive performances

Productive performances	Layer chicken breed							Sig. level
	Hyline Brown	Hisex Brown	Hyline White	Bovans White	Navogen Brown	Deshi or Local	Total	
Feed intake/ layer/m (kg)	3.38±0.09^{b} n=6	3.57±0.07^{b} n=5	3.45±0.15^{b} n=4	3.50±0.05^{b} n=3	3.60±0.00^{b} n=2	1.50±0.50^{a} n=2	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	1.68±0.00^{bc} n=6	1.58±0.07^{b} n=5	1.68±0.04^{bc} n=4	1.74±0.00^{bc} n=3	1.81±0.03^{c} n=2	0.84±0.17^{a} n=2	1.60±0.06 n=22	***
FCR	2.01±0.06 n=6	2.28±0.13 n=5	2.06±0.09 n=4	2.02±0.03 n=3	1.99±0.04 n=2	1.74±0.25 n=2	2.05±0.05 n=22	NS
Egg productivity /m (%)	93.00±0.00^{b} n=6	84.00±4.00^{b} n=5	91.75±2.14^{b} n=4	93.00±0.00^{b} n=3	95.00±2.00^{b} n=2	50.00±10.00^{a} n=2	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	135.82±4.29^{b} n=6	147.00±3.88^{b} n=5	138.38±7.82^{b} n=4	145.28±2.36^{b} n=3	148.20±1.80^{b} n=2	55.00±18.00^{a} n=2	133.89±5.97 n=22	***
Total production cost/m (th.tk)	96.36±14.92^{b} n=6	150.44±29.52^{b} n=5	104.16±24.25^{b} n=4	114.57±20.65^{b} n=3	145.99±2.51^{b} n=2	2.75±0.90^{a} n=2	108.55±12.20 n=22	*
Selling price of egg/ layer/m (tk)	196.00± 0.00^{c} n=6	171.30±8.57^{b} n=5	182.55±4.77^{bc} n=4	196.00±0.00^{c} n=3	185.00±11.00^{bc} n=2	93.75±18.75^{a} n=2	177.65±6.61 n=22	***
Total selling price/m (th.tk)	137.49±18.63 n=6	177.55±38.95 n=5	134.90±27.78 n=4	155.23±29.64 n=3	182.28±11.76 n=2	4.69±0.94 n=2	140.54±14.98 n=22	NS
Profit/layer/m (tk)	60.18±4.29^{c} n=6	24.30±6.78^{a} n=5	44.18±7.28^{abc} n=4	50.72±2.36^{bc} n=3	36.80±9.20^{ab} n=2	38.75±0.75^{abc} n=2	43.75±3.64 n=22	**
Net profit/m (th.tk)	41.13±4.35 n=6	27.11±10.96 n=5	30.74±±5.52 n=4	40.66±9.08 n=3	36.30±9.25 n=2	1.94±0.04 n=2	31.99±3.81 n=22	NS

Values are mean ±S.E. ^{abc} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-93: Analysis of variance of layer chicken breed on productive performances

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	7.268	5	1.454	20.194	.000
	Within groups	1.152	16	.072		
Egg mass/layer/m (kg)	Between groups	1.369	5	.274	23.310	.000
	Within groups	.188	16	.012		
FCR	Between groups	.496	5	.099	2.356	.088
	Within groups	.674	16	.042		
Egg productivity/m (%)	Between groups	3325.250	5	665.050	18.260	.000
	Within groups	582.750	16	36.422		
Production cost/layer/m (tk)	Between groups	14208.334	5	2841.667	19.992	.000
	Within groups	2274.193	16	142.137		
Total production cost/m (tk.tk)	Between groups	35039.870	5	7007.974	3.323	.030
	Within groups	33738.931	16	2108.683		
Selling price of egg/layer/m (tk)	Between groups	17514.620	5	3502.924	20.857	.000
	Within groups	2687.155	16	167.947		
Total selling price/m (th.tk)	Between groups	48074.947	5	9614.989	2.768	.055
	Within groups	55569.595	16	3473.100		
Profit/layer/m (tk)	Between groups	3804.770	5	760.954	5.267	.005
	Within groups	2311.598	16	144.475		
Net profit/m (th.tk)	Between groups	2694.819	5	538.964	2.154	.111
	Within groups	4003.468	16	250.217		

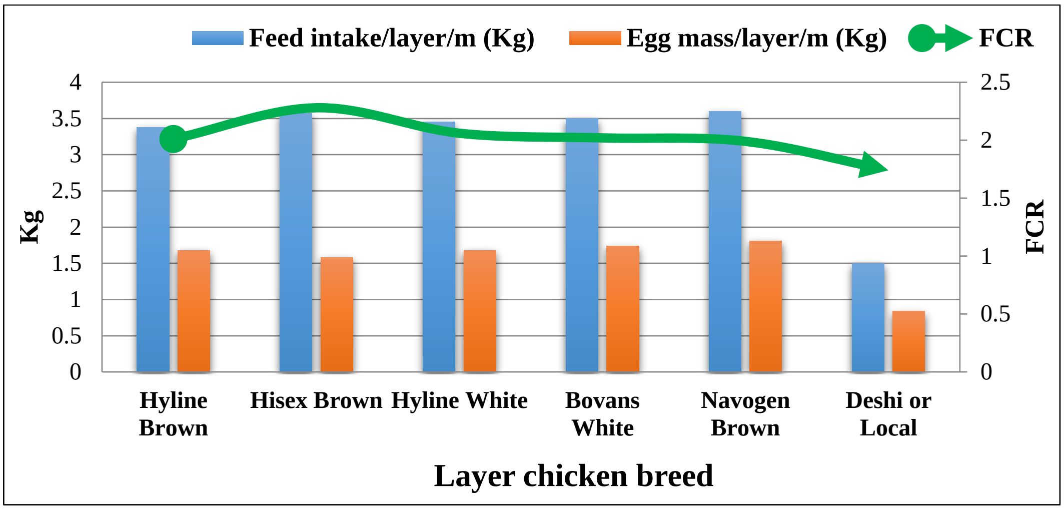

Fig. 118: Breed effect on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR.

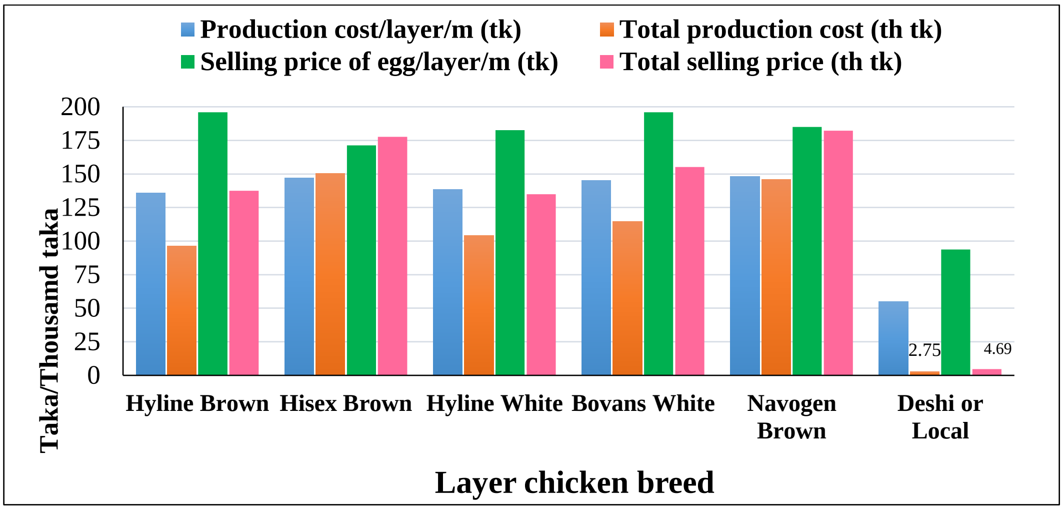

Fig. 119: Breed effect on production cost, total production cost/m, selling price and total selling price/m.

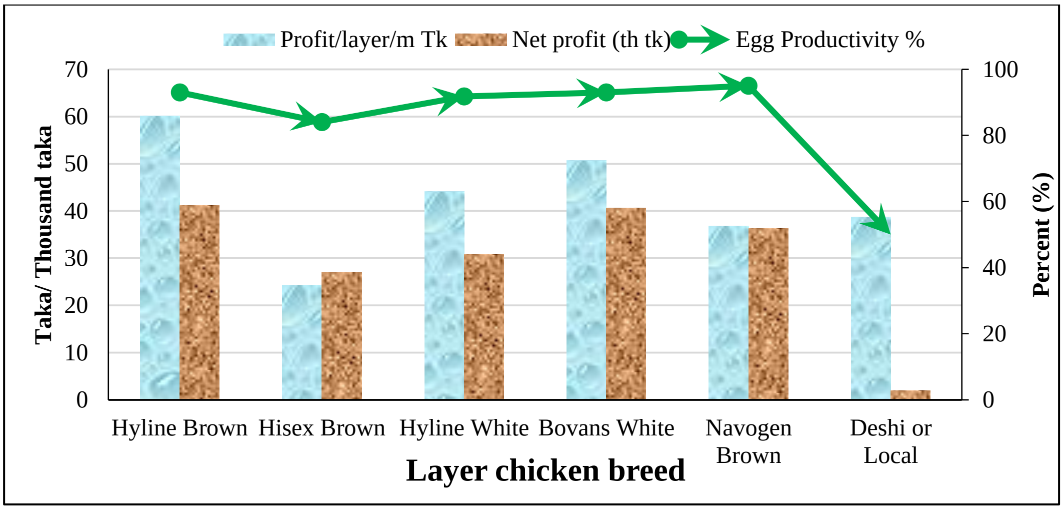

Fig. 120: Breed effect on gain/layer/month tk. net profit/m th.tk and egg productivity/m (%)

Table--94 : Effect of chick quality on productive performances of layer

Productive performances	Chick quality				Sig. level
	Poor	Good	Excellent	Total	
Feed intake/ layer/m (kg)	1.50±0.50^{a} n=2	3.57±0.03^{b} n=13	3.32±0.10^{b} n=7	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	0.84±0.17^{a} n=2	1.68±0.04^{b} n=13	1.67±0.02^{b} n=7	1.60±0.06 n=22	***
FCR	1.74±0.25^{a} n=2	2.14±0.06^{c} n=13	1.99±0.06^{ab} n=7	2.05±0.05 n=22	*
Egg productivity /m (%)	50.00± 10.00^{a}n=2	90.38±2.06^{b} n=13	91.29±0.89^{b} n=7	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	55.00±18.00^{a} n=2	146.84±1.60^{c} n=13	132.39±4.34^{b} n=7	133.89±5.97 n=22	***
Total production cost/m (th.tk)	2.75±0.90^{a} n=2	137.87±12.29^{b} n=13	84.33±13.40^{b} n=7	108.55±12.20 n=22	***
Selling price of egg/ layer/m (tk)	93.75±18.75^{a} n=2	183.65±4.71^{b} n=13	190.46±2.87^{b} n=7	177.65±6.61 n=22	***
Total selling price/m (th.tk)	4.69±0.94^{a} n=2	172.72±16.00^{b} n=13	119.59±15.62^{b} n=7	140.54±14.98 n=22	***
Profit/layer/m (tk)	38.75±0.75^{ab} n=2	36.82±4.40^{a} 13	58.06±4.85^{b} n=7	43.75±3.64 n=22	*
Net profit/m (th.tk)	1.94±0.04^{a} n=2	34.85±5.24^{b} n=13	35.26±3.21^{b} n=7	31.99±3.81 n=22	*

Values are mean ±S.E. ^{ab} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-95: Analysis of variance for chick quality on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	7.399	2	3.699	68.829	.000
	Within groups	1.021	19	.054		
Egg mass/layer/m (kg)	Between groups	1.272	2	.636	42.545	.000
	Within groups	.284	19	.015		
FCR	Between groups	.328	2	.164	3.692	.044
	Within groups	.843	19	.044		
Egg productivity/m (%)	Between groups	3015.495	2	1507.747	32.098	.000
	Within groups	892.505	19	46.974		
Production cost/layer/m (tk)	Between groups	14642.569	2	7321.284	75.602	.000
	Within groups	1839.958	19	96.840		
Total production cost/m (tk.tk)	Between groups	37672.021	2	18836.010	11.505	.001
	Within groups	31106.780	19	1637.199		
Selling price of egg/layer/m (tk)	Between groups	15695.180	2	7847.590	33.086	.000
	Within groups	4506.594	19	237.189		
Total selling price/m (th.tk)	Between groups	53449.225	2	26724.612	10.116	.001
	Within groups	50195.318	19	2641.859		
Profit/layer/m (tk)	Between groups	2109.447	2	1054.723	5.001	.018
	Within groups	4006.920	19	210.891		
Net profit/m (th.tk)	Between groups	1987.059	2	993.530	4.007	.035
	Within groups	4711.228	19	247.959		

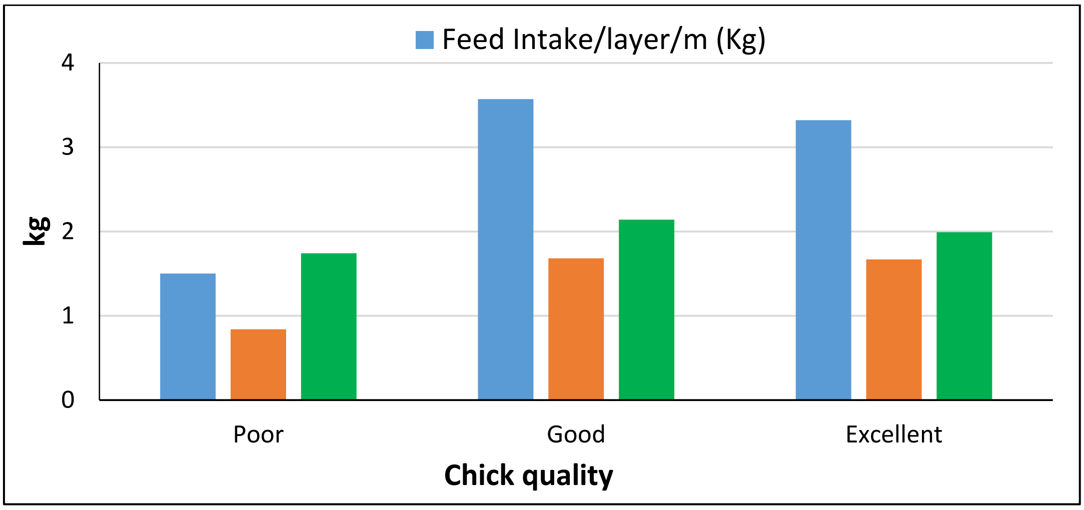

Fig. 121: Chick quality effect .on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR.

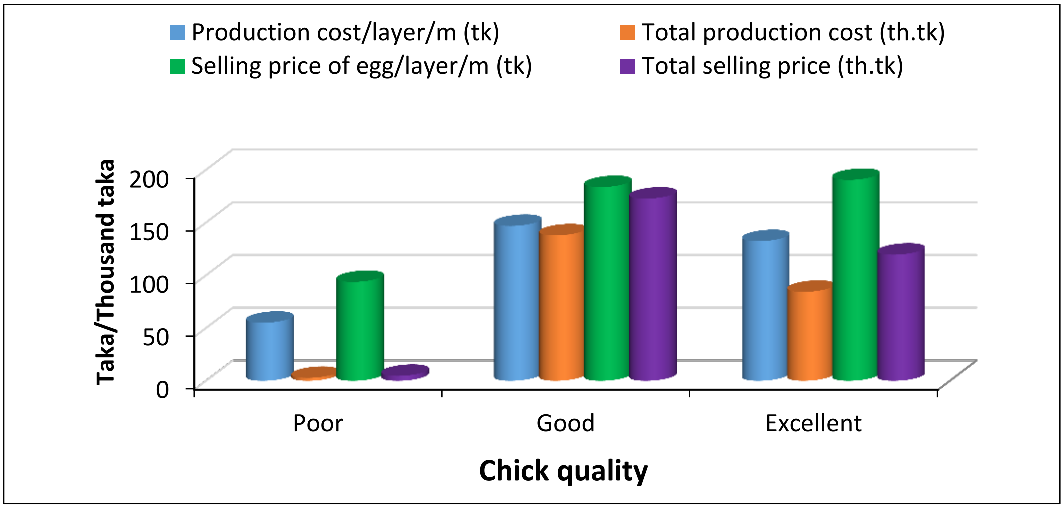

Fig. 122: Chick quality effect on production cost, total production cost/m, selling price and total selling price/m.

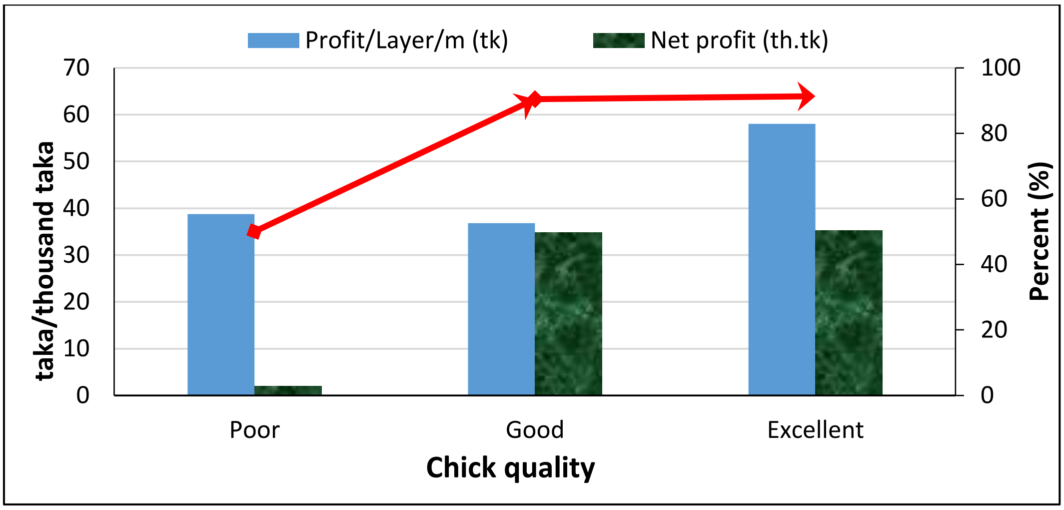

Fig. 123: Chick quality effect on gain /layer/month tk. net profit/m th.tk and egg productivity/m (%)

Table-96: Effect of farm size on productive performances of layer

Productive performances	Farm size				Sig. level
	≤500 layers	> 500 to < 1000 layers	≥1000 layers	Total	
Feed intake/ layer/m (kg)	2.67±0.52[a] n=5	3.43±0.08[b] n=8	3.53±0.04[b] n=9	3.30±0.14 n=22	*
Egg mass/ layer/m (kg)	1.32±0.20[a] n=5	1.67±0.03[b] n=8	1.69±0.05[b] n=9	1.60±0.06 n=22	*
FCR	1.96±0.14 n=5	2.05±0.06 n=8	2.11±0.08 n=9	2.05±0.05 n=22	NS
Egg productivity /m (%)	73.40±10.08[a] n=5	91.38±1.63[b] n=8	90.67±2.71[b] n=9	87.00±2.91 n=22	*
Production cost/ layer/m (tk)	105.82±22.74[a] n=5	138.71±3.70[b] n=8	145.21±1.15[b] n=9	133.89±5.97 n=22	*
Total production cost/m (th.tk)	42.07±16.46[a] n=5	89.66±7.30[b] n=8	162.29±11.45[c] n=9	108.55± 12.20n=22	***
Selling price of egg/ layer/m (tk)	147.34±22.73[a] n=5	191.00±5.00[b] n=8	182.61±5.56[b] n=9	177.65±6.61 n=22	*
Total selling price/m (th.tk)	55.59±20.81[a] n=5	122.32±8.20[b] n=8	203.93± 15.05[c]n=9	140.54±14.98 n=22	***
Profit/layer/m (tk)	41.52±5.82 n=5	52.29±6.84 n=8	37.40±5.06 9	43.75±3.64 n=22	NS
Net profit/m (th.tk)	13.52±5.53[a] n=5	32.66±4.19[b] n=8	41.65±5.96[b] n=9	31.99±3.81 n=22	**

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-97: Analysis of variance for farm size on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	2.612	2	1.306	4.273	.029
	Within groups	5.808	19	.306		
Egg mass/layer/m (kg)	Between groups	.503	2	.252	4.538	.024
	Within groups	1.053	19	.055		
FCR	Between groups	.074	2	.037	.642	.537
	Within groups	1.096	19	.058		
Egg productivity/m (%)	Between groups	1198.925	2	599.463	4.204	.031
	Within groups	2709.075	19	142.583		
Production cost/layer/m (tk)	Between groups	5278.702	2	2639.351	4.476	.026
	Within groups	11203.824	19	589.675		
Total production cost/m (tk.tk)	Between groups	50940.039	2	25470.019	27.128	.000
	Within groups	17838.762	19	938.882		
Selling price of egg/layer/m (tk)	Between groups	6240.774	2	3120.387	4.247	.030
	Within groups	13961.001	19	734.790		
Total selling price/m (th.tk)	Between groups	74901.729	2	37450.864	24.756	.000
	Within groups	28742.814	19	1512.780		
Profit/layer/m (tk)	Between groups	971.732	2	485.866	1.794	.193
	Within groups	5144.635	19	270.770		
Net profit/m (th.tk)	Between groups	2548.597	2	1274.298	5.835	.011
	Within groups	4149.690	19	218.405		

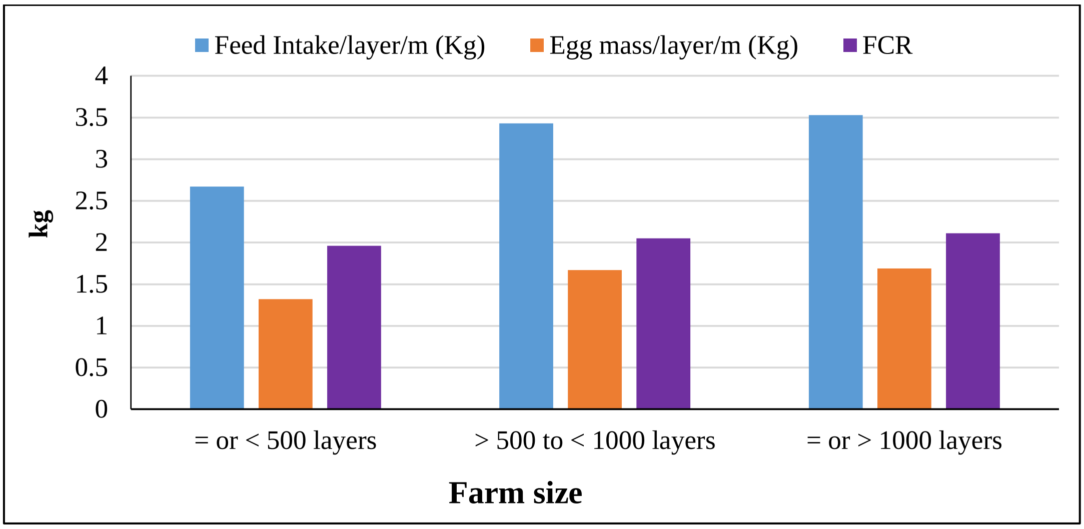

Fig. 124: Farm size effect on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR

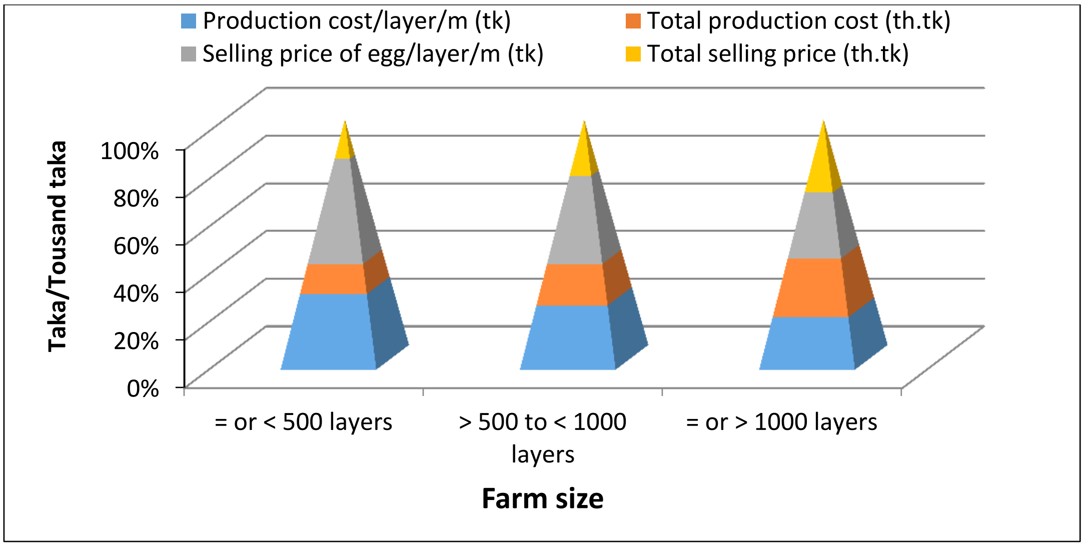

Fig. 125: Farm size effect on production cost, total production cost/m, selling price and total selling price/m

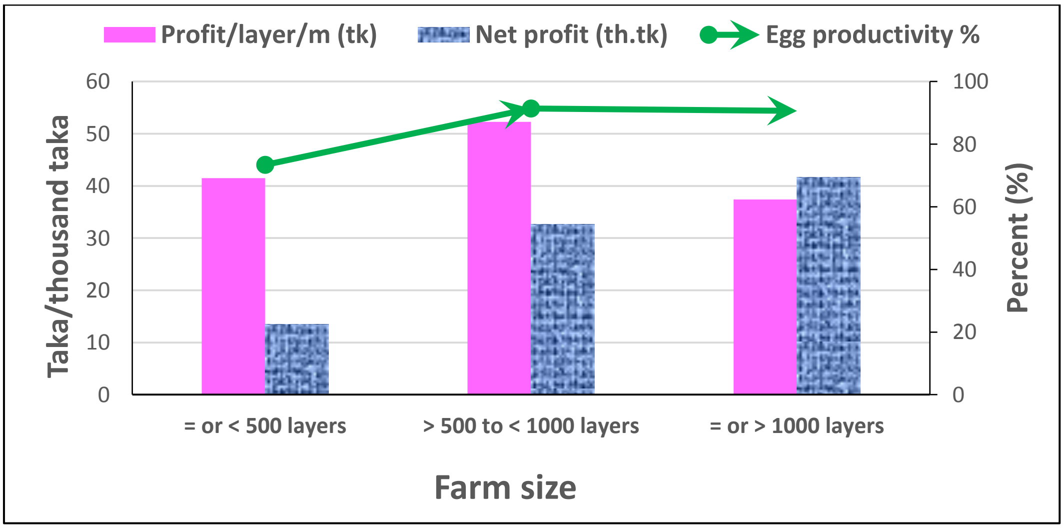

Fig. 126:Farm size effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-98: Effect of age of layers on productive performances

Productive performances	Age of layers					Sig. level
	= or < 6month	>6 to 12 month	>12 to 18 month	>18 month	Total	
Feed intake/ layer/m (kg)	3.55±0.05[b] n=3	3.44±0.06[b] n=15	2.88±0.88[ab] n=2	2.30±1.30[a] n=2	3.30±0.14 n=22	*
Egg mass/ layer/m (kg)	1.67±0.04[c] n=3	1.70±0.02[c] n=15	1.35±0.34[b] n=2	1.00±0.33[a] n=2	1.60±0.06 n=22	***
FCR	2.13±0.08 n=3	2.02±0.04 n=15	2.10±0.12 n=2	2.11±0.62 n=2	2.05±0.05 n=22	NS
Egg productivity /m (%)	90.00±1.73[c] n=3	92.27±1.00[c] n=15	75.00±15.00 n=2	55.00±15.00[a] n=2	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	143.63±1.35[c] n=3	140.14±2.82[c] n=15	117.50±44.50[ab] n=2	88.80±51.80[a] n=2	133.89±5.97 n=22	*
Total production cost/m (th.tk)	108.55±26.96 n=3	121.54±13.21 n=15	41.92±38.27 n=2	77.83±75.98 n=2	108.55±12.20 n=22	NS
Selling price of egg/ layer/m (tk)	189.00±4.04[b] n=3	187.85±3.32[b] n=15	150.75±38.25[b] n=2	111.00±36.00[a] n=2	177.65±6.61 n=22	***
Total selling price/m (th.tk)	142.70±34.63 n=3	160.00±15.62 n=15	49.60±43.97 n=2	82.29±78.54 n=2	140.54±14.98 n=22	NS
Profit/layer/m (tk)	45.37±3.83 n=3	47.70±4.40 n=15	33.25±6.25 n=2	22.20±15.80 n=2	43.75±3.64 n=22	NS
Net profit/m (th.tk)	34.15±8.01[b] n=3	38.47±3.71[b] n=15	7.68±5.70[a] n=2	4.45±2.55[a] n=2	31.99±3.81 n=22	**

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-99: Analysis of variance for age of layers on productive performances

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	2.843	3	.948	3.058	.055
	Within groups	5.577	18	.310		
Egg mass/layer/m (kg)	Between groups	1.023	3	.341	11.511	.000
	Within groups	.533	18	.030		
FCR	Between groups	.041	3	.014	.216	.884
	Within groups	1.130	18	.063		
Egg productivity/ m (%)	Between groups	2779.067	3	926.356	14.770	.000
	Within groups	1128.933	18	62.719		
Production cost/layer/m (tk)	Between groups	5474.840	3	1824.947	2.984	.059
	Within groups	11007.686	18	611.538		
Total production cost/m (tk.tk)	Between groups	13295.861	3	4431.954	1.438	.265
	Within groups	55482.940	18	3082.386		
Selling price of egg/layer/m (tk)	Between groups	12277.712	3	4092.571	9.297	.001
	Within groups	7924.062	18	440.226		
Total selling price/m (th.tk)	Between groups	29025.982	3	9675.327	2.334	.108
	Within groups	74618.560	18	4145.476		
Profit/layer/m (tk)	Between groups	1391.578	3	463.859	1.767	.189
	Within groups	4724.789	18	262.488		
Net profit/m (th.tk)	Between groups	3342.849	3	1114.283	5.977	.005
	Within groups	3355.438	18	186.413		

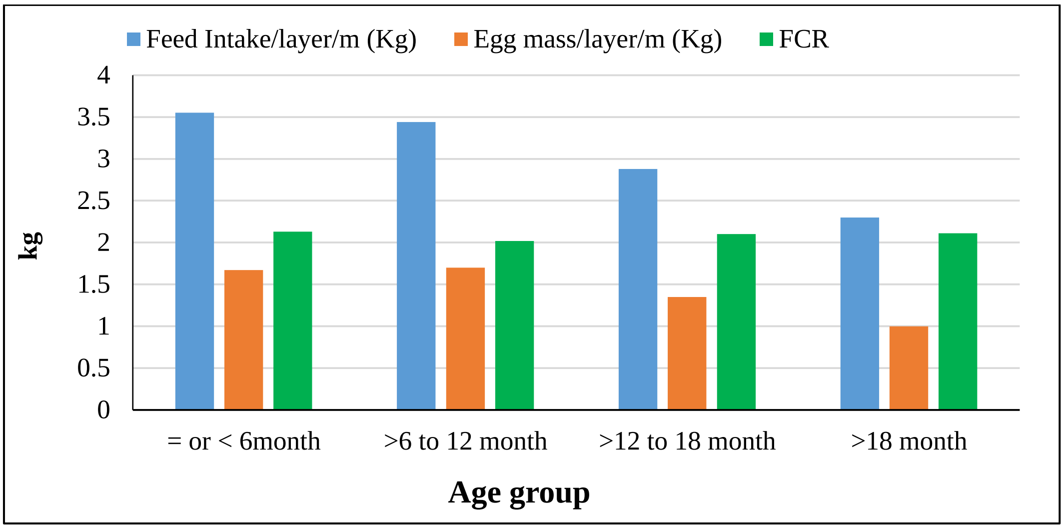

Fig. 127: Age effect.on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR

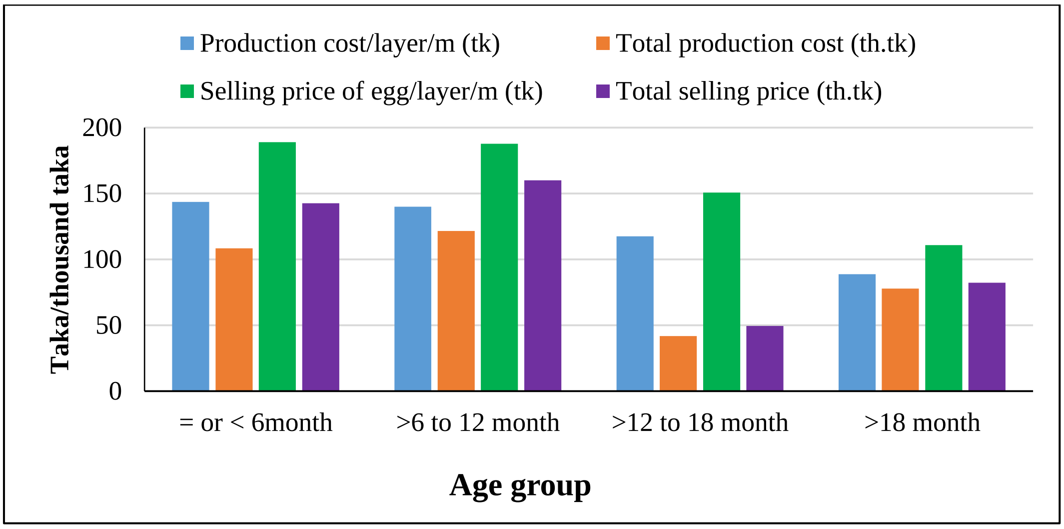

Fig. 128: Age effect on production cost, total production cost/m, selling price and total selling price

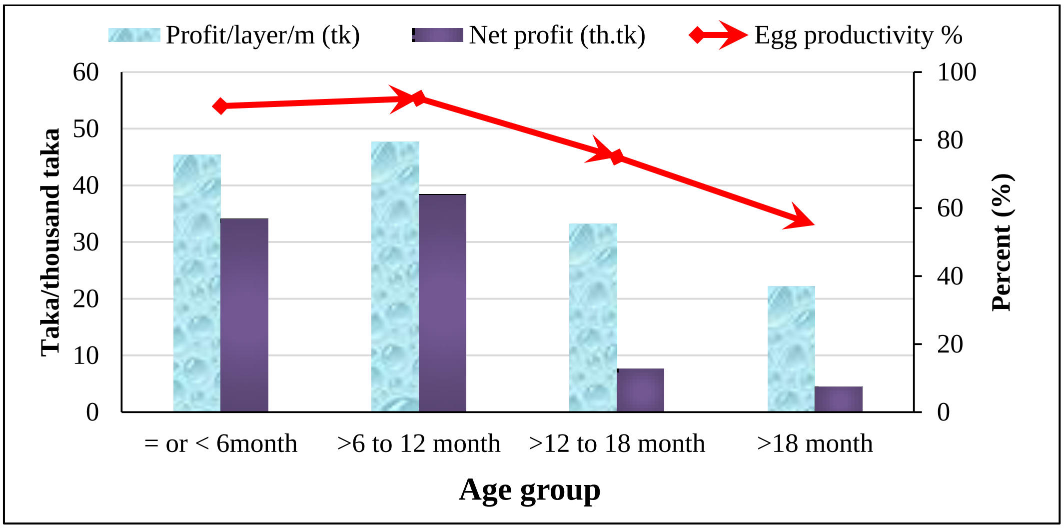

Fig. 129: Age effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-100: Effect of housing pattern on productive performances of layer

Productive performances	Housing pattern				Sig. level
	Semi-paca House	Tin Shade House	Straw Made House	Total	
Feed intake/ layer/m (kg)	3.41±0.10[b] n=8	3.53±0.03[b] n=12	1.50±0.50[a] n=2	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	1.69±0.02[b] n=8	1.67±0.04[b] n=12	0.84±0.17[a] n=2	1.60±0.06 n=22	***
FCR	2.02±0.06 n=8	2.13±0.06 n=12	1.74±0.25 n=2	2.05±0.05 n=22	NS
Egg productivity /m (%)	91.13±0.79[b] n=8	90.42±2.23[b] n=12	50.00±10.00[a] n=2	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	140.88±5.32[b] n=8	142.39±2.04[b] n=12	55.00±18.00[a] n=2	133.89±5.97 n=22	***
Total production cost/m (th.tk)	115.12±23.35[b] n=8	121.81±10.07[b] n=12	2.75±0.90[a] n=2	108.55±12.20 n=22	**
Selling price of egg/ layer/m (tk)	188.59±3.11[b] n=8	184.33±5.06[b] n=12	93.75±18.75[a] n=2	177.65±6.61 n=22	***
Total selling price/m (th.tk)	151.56±27.83[b] n=8	155.84±12.18[b] n=12	4.69±0.94[a] n=2	140.54±14.98 n=22	**
Profit/layer/m (tk)	47.71±5.30 n=8	41.95±5.72 n=12	38.75±0.75 n=2	43.75±3.64 n=22	NS
Net profit/m (th.tk)	36.43±5.33[b] n=8	34.03±4.84[b] n=12	1.94±0.04[a] n=2	31.99±3.81 n=22	*

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-101: Analysis of variance for housing pattern on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	7.189	2	3.594	55.466	.000
	Within groups	1.231	19	.065		
Egg mass/layer/m (kg)	Between groups	1.275	2	.638	43.055	.000
	Within groups	.281	19	.015		
FCR	Between groups	.281	2	.140	2.996	.074
	Within groups	.890	19	.047		
Egg productivity/ m (%)	Between groups	3014.208	2	1507.104	32.038	.000
	Within groups	893.792	19	47.042		
Production cost/layer/m (tk)	Between groups	13704.076	2	6852.038	46.857	.000
	Within groups	2778.451	19	146.234		
Total production cost/m (tk.tk)	Between groups	24842.460	2	12421.230	5.371	.014
	Within groups	43936.341	19	2312.439		
Selling price of egg/layer/m (tk)	Between groups	15571.454	2	7785.727	31.948	.000
	Within groups	4630.320	19	243.701		
Total selling price/m (th.tk)	Between groups	40690.779	2	20345.389	6.140	.009
	Within groups	62953.763	19	3313.356		
Profit/layer/m (tk)	Between groups	214.671	2	107.336	.346	.712
	Within groups	5901.696	19	310.616		
Net profit/m (th.tk)	Between groups	2013.857	2	1006.929	4.084	.033
	Within groups	4684.430	19	246.549		

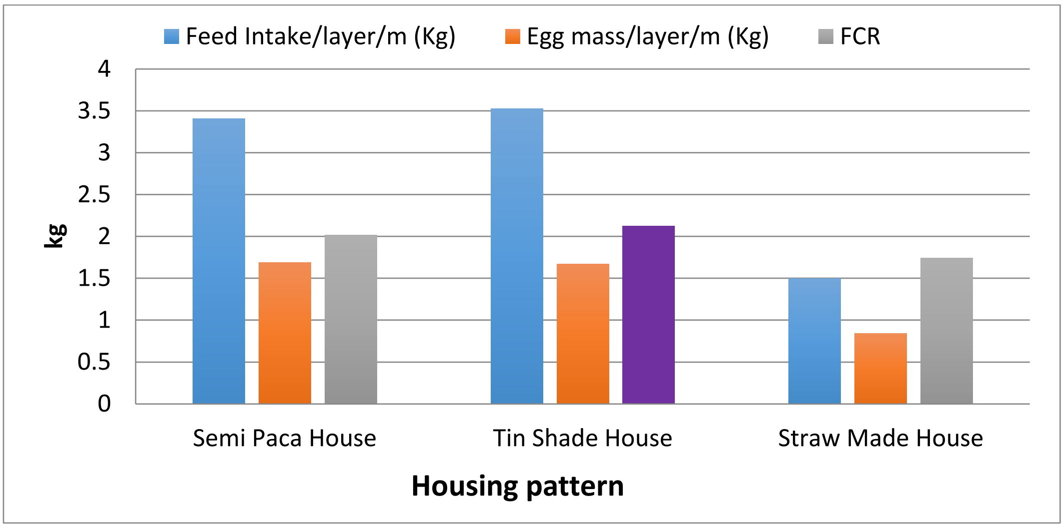

Fig. 130:Housing pattern effect on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR

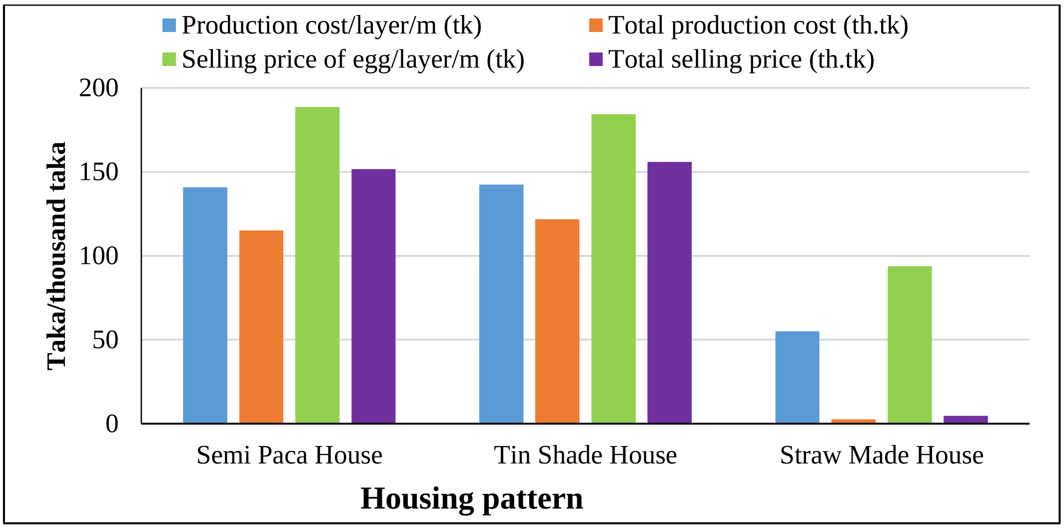

Fig. 131:Housing pattern effect on production cost, total production cost/m, selling price and total selling price/m.

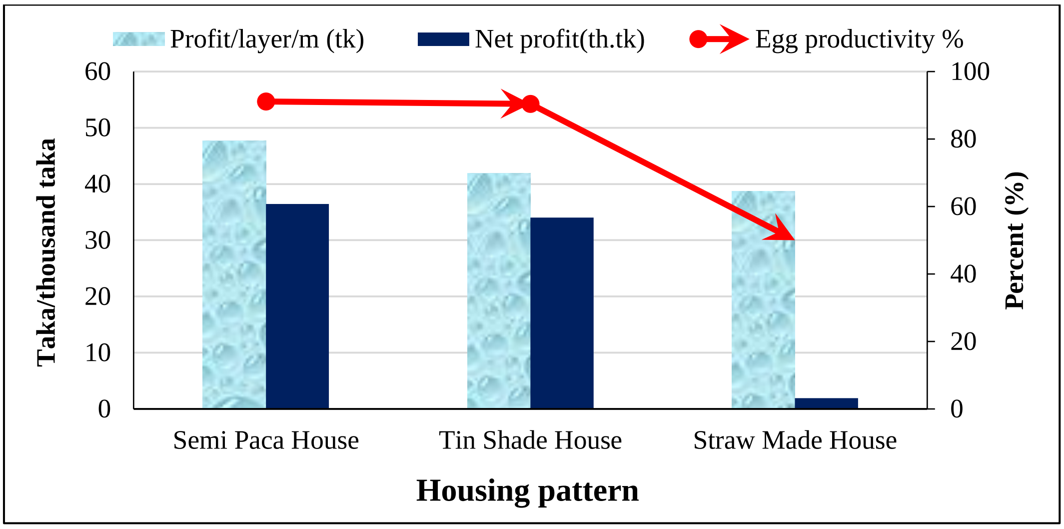

Fig.132: Housing pattern effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

7.3.6 Effect of floor type of layer farms

Effects of floor type on productive performances in layer farms and ANOVA are shown in Table-102-103 and Fig.133-135. In Table-102 the highest value of feed intake per layer was highest (3.60±0.00 kg) in macha with bamboo floor type of laying house and was lowest (2.55±0.64 kg) in floor with litter type of laying house. Egg mass per layer was highest in bamboo or iron made case (1.72±0.01) and was lowest in floor with litter (1.24±0.24). The average value of FCR was lowest in floor with litter (1.97±0.17) and highest in macha with bamboo (2.56±0.17). Egg productivity (%) was highest in bamboo or iron made case (92.75±0.53) and was lowest in floor with litter (70.00±12.31). Production cost per layer was high in macha with bamboo (142.50±1.90) and was low in floor with litter (98.35±26.08). Selling price of egg per layer was highest in bamboo or iron made case (189.98±2.26) and was lowest in floor with litter (141.38±28.68). Profit per layer was highest in bamboo or iron made case (48.28±3.64) and was very low in macha with bamboo (9.00±2.60). Net profit/m was highest in bamboo or iron made case (38.55±3.29) and was lowest in macha with bamboo (7.77±0.77). Total production cost/m was high in macha with bamboo floor type of laying house (130.05±23.77) and was low in floor with litter (49.78±29.71). Total selling price/m was highest in bamboo or iron made case (159.11±15.28) and was low in floor with litter (67.62±40.55).

Feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, selling price of egg per layer, profit per layer and net profit were significantly influenced by floor type of laying house ($P<0.05$, $P<0.001$ & $P<0.01$) but total production cost/m and total selling price/m were not significantly influenced by floor type of laying house ($P>0.05$).

7.3.7 Effect of overall housing system of layer farms

Effects of overall housing system on productive performances in layer farms and ANOVA are shown in Table-104-105 and Fig.136-138. In Table-104 the highest value of feed intake per layer was in medium group of overall housing system (3.60±0.15 kg) and was lowest in poor housing system (1.50±0.50 kg). Egg mass per layer was highest in medium housing system (1.72±0.03 kg) and was lowest in poor housing system (0.84±0.17 kg). Egg productivity (%) was highest in medium housing system (91.50±1.50) and was lowest in poor housing system (50.00±10.00). Production cost per layer was high in medium housing system (152.55±9.45) and was low in poor housing system (55.00±18.00). Total production cost/m was high in good housing system (122.41±11.72) and was low in poor housing system (2.75±0.90). Selling price of egg per layer was highest in medium housing system (192.50±3.50) and was lowest in poor housing system (93.75±18.75). Total selling price/m was highest in good housing system (158.51±13.85) and was low in poor housing system

(4.69±0.94). Net profit/m was highest in good housing system (36.10±3.71) and was low in poor housing system (1.94±0.04). The average value of FCR was lowest in poor housing system (1.74±0.25) and highest in medium housing system (2.11±0.12). Profit per layer was highest in good housing system (44.73±4.31) and was lowest in poor housing system (38.75±0.75).

Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were significantly influenced by overall housing of layers farm (P<0.001, P<,0.01 & P<0.05) but FCR and profit per layer were not significantly influenced by overall housing pattern of layers farm (P>0.05).

7.3.8 Effect of overall ventilation system of layer farms

Effects of overall ventilation system on productive performances in layer farms and ANOVA are shown in Table-106-107 and Fig.139-141. In Table-106 the highest value of feed intake per layer was in proper ventilation system (3.49±0.05 kg) and was lowest in poor ventilation system (2.20±0.76). Egg mass per layer was highest in Proper ventilation system (1.72±0.01 kg) and was lowest in poor ventilation system (1.00±0.19). Egg productivity (%) was highest in proper ventilation system (92.94±0.50) and was lowest in poor ventilation system (56.67±8.82). Production cost per layer was high in Proper ventilation system (143.35±2.42) and was low in Poor ventilation system (83.53±30.37). Selling price of egg per layer was highest in proper ventilation system (191.09±2.14) and was lowest in poor ventilation system (111.50±20.79). Total selling price/m was highest in proper ventilation system (164.49±14.56) and was low in poor ventilation system (56.73±52.05). Net profit/m was highest in proper ventilation system (39.62±3.30) and was low in poor ventilation system (3.63±1.69). The average value of FCR was lowest in proper ventilation system (2.03±0.03) and highest in medium ventilation system (2.16±0.17). Total production cost/m was high in proper ventilation system (124.87±12.21) and was low in poor ventilation system (53.11±50.36). Profit per layer was highest in proper ventilation system (47.75±3.54) and was very low in poor ventilation system (27.97±10.79).

Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, selling price of egg per layer, total selling price/m and net profit/m were significantly influenced by overall ventilation system (P<0.001 & P<0.05) but FCR, total production cost/m and profit per layer were not significantly influenced by overall ventilation system (P>0.05).

7.3.9 Effect of feed quality of layers

Effects of feed quality of layers on productive performances in layer farms and ANOVA are shown in Table-108-109 and Fig.142-144. In Table-108 the highest value of feed intake per layer was in Medium quality feed (3.57±0.03) and was lowest in Poor quality feed (1.50±0.50). Egg mass per layer was highest in excellent quality feed (1.69±0.01) and was lowest in Poor quality feed (0.84±0.17). The average value of FCR was lowest in Poor quality feed (1.74±0.25) and highest in Medium quality feed (2.15±0.06). Egg productivity (%) was highest in excellent quality feed (92.00±0.63) and was lowest in Poor quality feed (50.00±10.00). Production cost per layer was high in Medium quality feed (146.46±1.53) and was low in Poor quality feed (55.00±18.00). Total production cost/m was high in Medium quality feed (132.83±12.45) and was low in Poor quality feed (2.75±0.90). Selling price of egg per layer was highest in excellent quality feed (191.87±2.96) and was lowest in Poor quality feed (93.75±18.75). Total selling price/m was highest in Medium quality feed (166.56±16.05) and was low in Poor quality feed (4.69±0.94). Profit per layer was highest in excellent quality feed (61.01±4.56) and was very low in Medium quality feed (37.077±4.08). Net profit/m was highest in excellent quality feed (37.94±2.09) and was low in Poor quality feed (1.94±0.04).

Feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, profit per layer and net profit/m were significantly influenced by feed quality of layers ($P<0.001$).

7.3.10 Effect of social status of layer farmers

Effects of social status of farmers on productive performances in layer farms and t-test are shown in Table-110-111 and Fig.145-147. In Table-110 the highest value of feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, net profit/m and profit per layer was in marginal group of social status of farmers as 3.48±0.05, 1.68±0.02, 2.09±0.05, 90.70±1.35, 141.78±2.37, 119.13±10.78, 186.04±3.25, 154.13±12.88, 34.99±3.52 and 44.25±3.99 respectively and was lowest in ultra poor group of social status of farmers as 1.50±0.50, 0.84±0.17, 1.74±0.25, 50.00±10.00, 55.00±18.00, 2.75±0.90, 93.75±18.75, 4.69±0.94, 1.94±0.04 and 38.75±0.75 respectively.

Feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, and net profit/m were significantly ($P<0.001$, $P<0.05$ & $P<0.01$) influenced by social status of farmers in layers farm but profit per layer were not significantly influenced by social status of farmers in layers farm ($P>0.05$).

Table-102 : Effect of floor type of laying house on productive performances

Productive performances	Floor type of laying house				Sig. level
	Macha with bamboo	Floor with litter	Bamboo or iron made case	Total	
Feed intake/ layer/m (kg)	3.60±0.00[b] n=2	2.55±0.64[a] n=4	3.45±0.05[b] n=16	3.30±0.14 n=22	*
Egg mass/ layer/m (kg)	1.41±0.09[ab] n=2	1.24±0.24[a] n=4	1.72±0.01[b] n=16	1.60±0.06 n=22	***
FCR	2.56±0.17[b] n=2	1.97±0.17[a] n=4	2.01±0.03[a] n=16	2.05±0.05 n=22	**
Egg productivity /m (%)	75.00±5.00[a] n=2	70.00±12.31[a] n=4	92.75±0.53[b] n=16	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	142.50±1.90[b] n=2	98.35±26.08[a] n=4	141.70±2.98[b] n=16	133.89±5.97 n=22	**
Total production cost/m (th.tk)	130.05±23.77 n=2	49.78±29.71 n=4	120.56±12.91 n=16	108.55±12.20 n=22	NS
Selling price of egg/ layer/m (tk)	151.50±4.50[a] n=2	141.38±28.68[a] n=4	189.98±2.26[b] n=16	177.65±6.61 n=22	**
Total selling price/m (th.tk)	137.82±23.00 n=2	67.62±40.55 n=4	159.11±15.28 n=16	140.54±14.98 n=22	NS
Profit/layer/m (tk)	9.00±2.60[a] n=2	43.03±3.76[b] n=4	48.28±3.64[b] n=16	43.75±3.64 n=22	**
Net profit/m (th.tk)	7.77±0.77[a] n=2	17.84±10.93[ab] n=4	38.55±3.29[c] n=16	31.99±3.81 n=22	**

Values are mean ±S.E. [abc] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-103: Analysis of variance for floor type of laying house on productive performances

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	2.790	2	1.395	4.708	.022
	Within groups	5.630	19	.296		
Egg mass/layer/m (kg)	Between groups	.809	2	.405	10.293	.001
	Within groups	.747	19	.039		
FCR	Between groups	.570	2	.285	9.006	.002
	Within groups	.601	19	.032		
Egg productivity/ m (%)	Between groups	1973.000	2	986.500	9.687	.001
	Within groups	1935.000	19	101.842		
Production cost/layer/m (tk)	Between groups	6177.349	2	3088.675	5.695	.012
	Within groups	10305.177	19	542.378		
Total production cost/m (tk.tk)	Between groups	17050.493	2	8525.246	3.131	.067
	Within groups	51728.309	19	2722.543		
Selling price of egg/layer/m (tk)	Between groups	9064.103	2	4532.051	7.731	.003
	Within groups	11137.672	19	586.193		
Total selling price/m (th.tk)	Between groups	26804.936	2	13402.468	3.314	.058
	Within groups	76839.606	19	4044.190		
Profit/layer/m (tk)	Between groups	2745.290	2	1372.645	7.736	.003
	Within groups	3371.077	19	177.425		
Net profit/m (th.tk)	Between groups	2663.038	2	1331.519	6.269	.008
	Within Groups	4035.249	19	212.382		

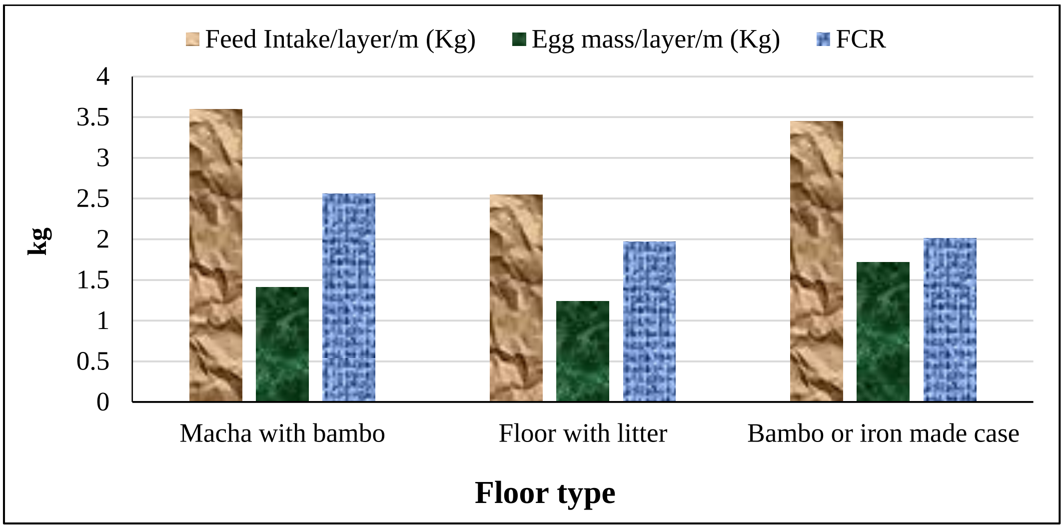

Fig. 133:Floor type effect on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR.

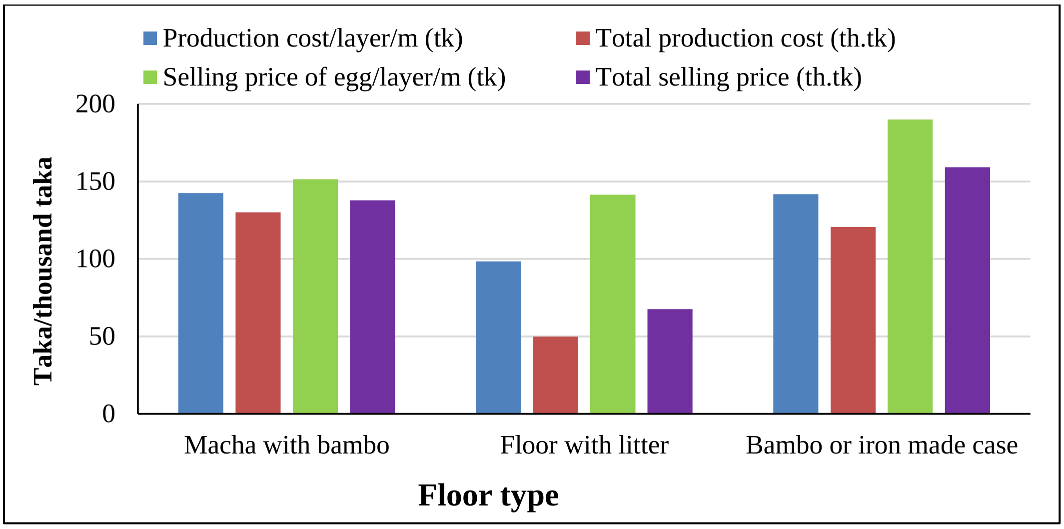

Fig. 134:Floor type effect on production cost, total production cost/m, selling price and total selling price/m.

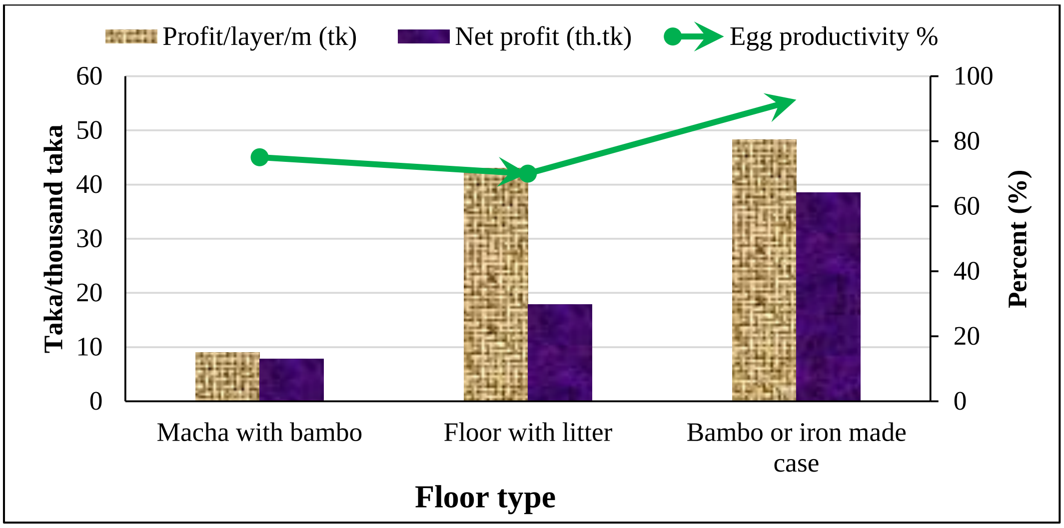

Fig. 135Floor type effect on profit /layer/month, net profit/m and egg productivity/m (%)

Table-104 : Effect of overall housing system on productive performances of layer

Productive performances	Overall housing system				Sig. level
	Poor	Medium	Good	Total	
Feed intake/ layer/m (kg)	1.50±0.50[a] n=2	3.60±0.15[b] n=2	3.47±0.05[b] n=18	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	0.84±0.17[a] n=2	1.72±0.03[b] n=2	1.67±0.03[b] n=18	1.60±0.06 n=22	***
FCR	1.74±0.25 n=2	2.11±0.12 n=2	2.08±0.05 n=18	2.05±0.05 n=22	NS
Egg productivity /m (%)	50.00±10.00[a] n=2	91.50±1.50[b] n=2	90.61±1.50[b] n=18	87.00±2.91 22	***
Production cost/ layer/m (tk)	55.00±18.00[a] n=2	152.55±9.45[b] n=2	140.59±2.36[b] n=18	133.89±5.97 n=22	***
Total production cost/m (th.tk)	2.75±0.90[a] n=2	89.68±9.49[b] n=2	122.41±11.72[b] n=18	108.55±12.20 n=22	**
Selling price of egg/ layer/m (tk)	93.75±18.75[a] n=2	192.50±3.50[b] n=2	185.32±3.57[b] n=18	177.65±6.61 n=22	***
Total selling price/m (th.tk)	4.69±0.94[a] n=2	114.70±21.14[b] n=2	158.51±13.85[b] n=18	140.54±14.98 n=22	**
Profit/layer/m (tk)	38.75±0.75 n=2	39.95±12.95 n=2	44.73±4.31 n=18	43.75±3.64 n=22	NS
Net profit/m (th.tk)	1.94±0.04[a] n=2	25.02±11.65[ab] n=2	36.10±3.71[b] n=18	31.99±3.81 n=22	*

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-105: Analysis of variance for overall housing system on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between Groups	7.160	2	3.580	53.984	.000
	Within Groups	1.260	19	.066		
Egg mass/layer/m (kg)	Between Groups	1.276	2	.638	43.129	.000
	Within Groups	.281	19	.015		
FCR	Between Groups	.224	2	.112	2.251	.133
	Within Groups	.946	19	.050		
Egg productivity/ m (%)	Between Groups	3013.222	2	1506.611	31.992	.000
	Within Groups	894.778	19	47.094		
Production cost/layer/m (tk)	Between Groups	13950.737	2	6975.369	52.347	.000
	Within Groups	2531.789	19	133.252		
Total production cost/m (tk.tk)	Between Groups	26556.026	2	13278.013	5.975	.010
	Within Groups	42222.775	19	2222.251		
Selling price of egg/layer/m (tk)	Between Groups	15577.465	2	7788.732	32.002	.000
	Within Groups	4624.310	19	243.385		
Total selling price/m (th.tk)	Between Groups	44057.871	2	22028.936	7.024	.005
	Within Groups	59586.671	19	3136.141		
Profit/layer/m (tk)	Between Groups	96.187	2	48.093	.152	.860
	Within Groups	6020.181	19	316.852		
Net profit/m (th.tk)	Between Groups	2207.528	2	1103.764	4.670	.022
	Within Groups	4490.759	19	236.356		

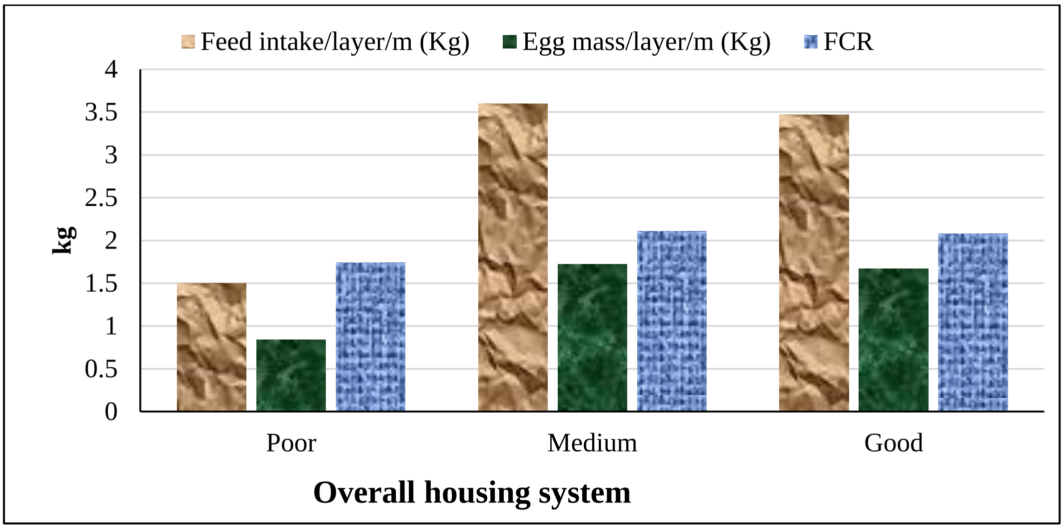

Fig. 136:Overall housing system effect on feed intake/layer/month (kg), egg mass/layer/month (kg) and FCR.

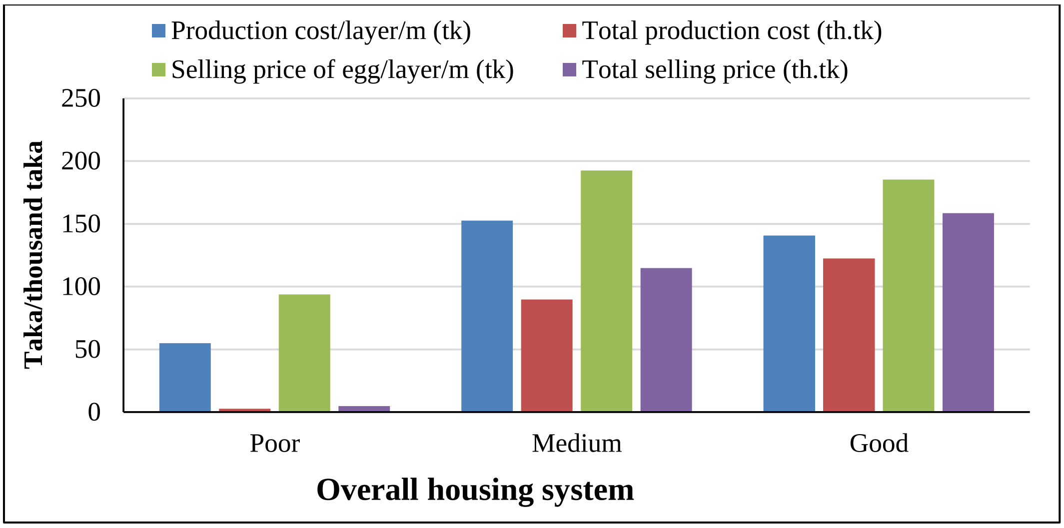

Fig. 137:Overall housing system effect on production cost, total production cost/m, selling price and total selling price/m.

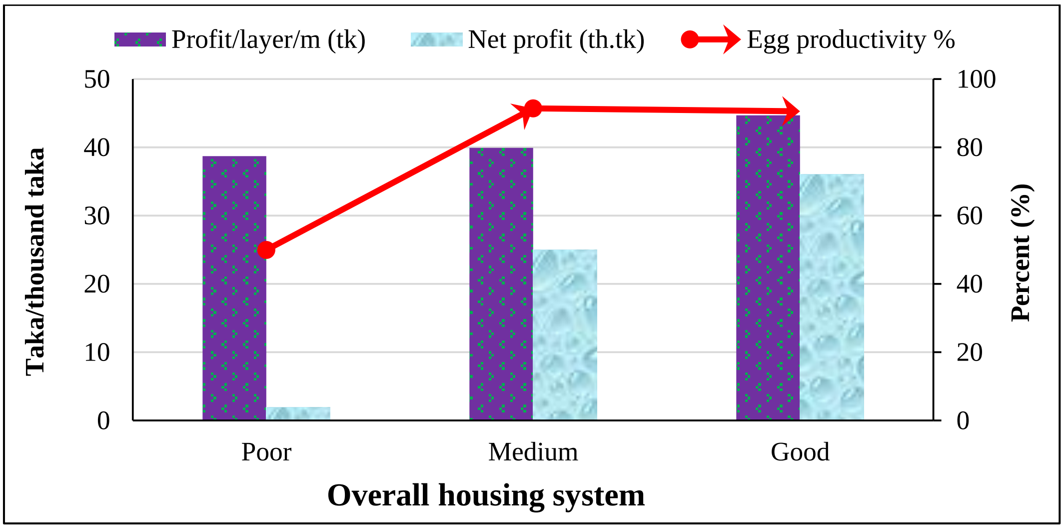

Fig. 138:Overall housing system effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-106 : Effect of overall ventilation system on productive performances of layer

Productive performances	Overall ventilation system				Sig. level
	Poor	Moderate	Proper	Total	
Feed intake/ layer/m (kg)	2.20±0.76[a] n=3	3.40±0.20[b] n=3	3.49±0.05[b] n=16	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	1.00±0.19[a] n=3	1.58±0.04[b] n=3	1.72±0.01[b] n=16	1.60±0.06 n=22	***
FCR	2.07±0.36 n=3	2.16±0.17 n=3	2.03±0.03 n=16	2.05±0.05 n=22	NS
Egg productivity /m (%)	56.67±8.82[a] n=3	85.67±2.96[b] n=3	92.94±0.50[b] n=16	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	83.53±30.37[a] n=3	133.83±9.20[b] n=3	143.35±2.42[b] n=16	133.89±5.97 n=22	***
Total production cost/m (th.tk)	53.11±50.36 n=3	76.98±14.92 n=3	124.87±12.21 n=16	108.55±12.20 n=22	NS
Selling price of egg/ layer/m (tk)	111.50±20.79[a] n=3	172.07±8.11[b] n=3	191.09±2.14[b] n=16	177.65±6.61 n=22	***
Total selling price/m (th.tk)	56.73±52.05[a] n=3	96.61±9.12[ab] n=3	164.49±14.56[b] n=16	140.54±14.98 n=22	*
Profit/layer/m (tk)	27.97±10.79 n=3	38.23±14.79 n=3	47.75±3.54 n=16	43.75±3.64 n=22	NS
Net profit/m (th.tk)	3.63±1.69[a] n=3	19.63±6.53[a] n=3	39.62±3.30[b] n=16	31.99±3.81 n=22	***

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-107: Analysis of variance for overall ventilation system on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	4.223	2	2.111	9.557	.001
	Within groups	4.198	19	.221		
Egg mass/layer/m (kg)	Between groups	1.300	2	.650	48.093	.000
	Within groups	.257	19	.014		
FCR	Between groups	.042	2	.021	.358	.704
	Within groups	1.128	19	.059		
Egg productivity/ m (%)	Between groups	3329.729	2	1664.865	54.702	.000
	Within groups	578.271	19	30.435		
Production cost/layer/m (tk)	Between groups	9038.311	2	4519.155	11.534	.001
	Within groups	7444.216	19	391.801		
Total production cost/m (tk.tk)	Between groups	16474.112	2	8237.056	2.992	.074
	Within groups	52304.690	19	2752.878		
Selling price of egg/layer/m (tk)	Between groups	16112.739	2	8056.369	37.434	.000
	Within groups	4089.036	19	215.212		
Total selling price/m (th.tk)	Between groups	36038.884	2	18019.442	5.064	.017
	Within groups	67605.658	19	3558.193		
Profit/layer/m (tk)	Between groups	1094.242	2	547.121	2.070	.154
	Within groups	5022.126	19	264.322		
Net profit/m (th.tk)	Between groups	3803.826	2	1901.913	12.485	.000
	Within groups	2894.461	19	152.340		

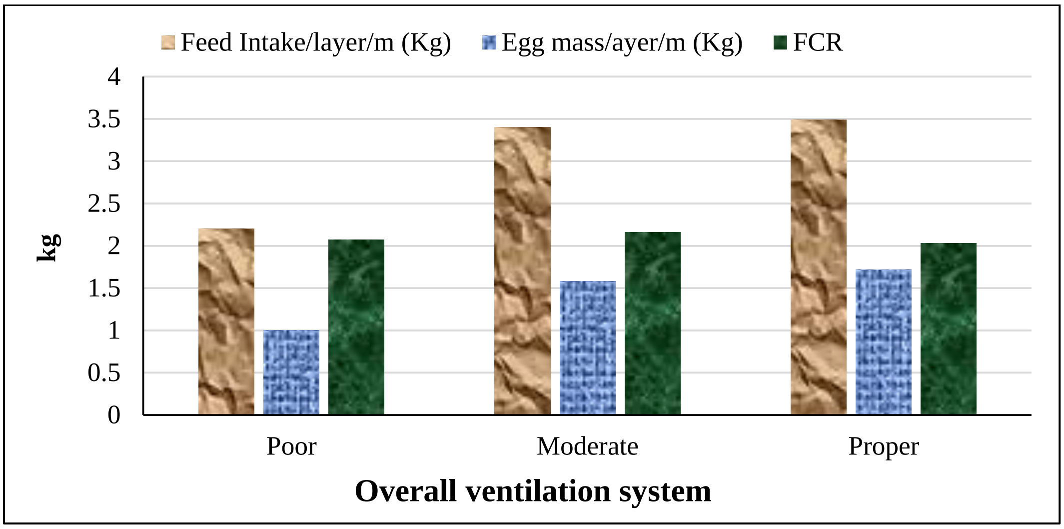

Fig. 139: Overall ventilation system effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR

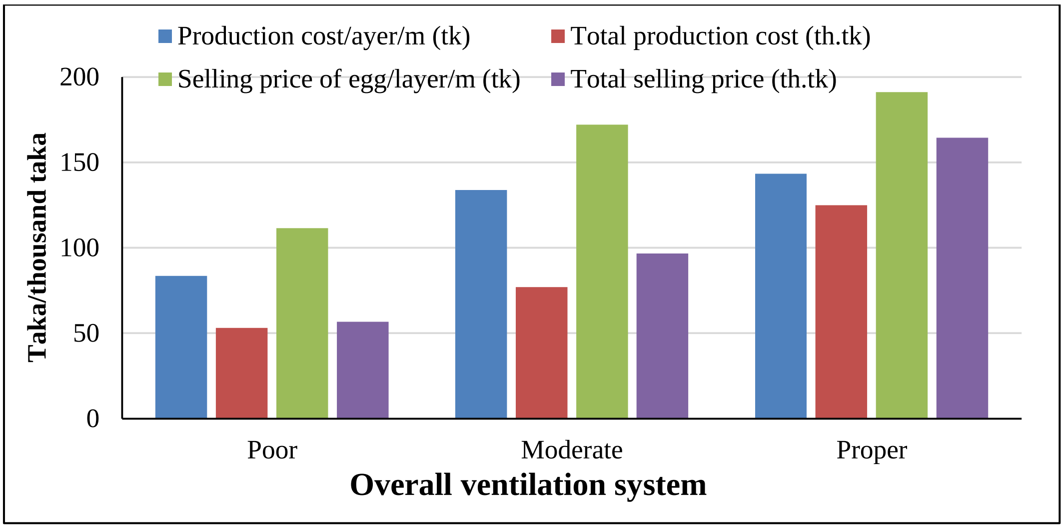

Fig. 140: Overall ventilation system effect on production cost, total production cost/m, selling price and total selling price/m.

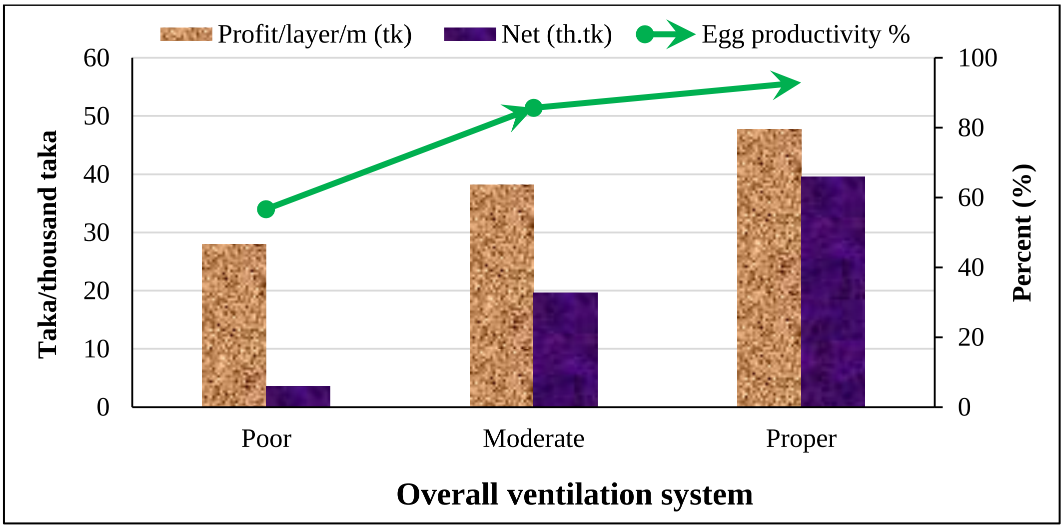

Fig. 141: Overall system ventilation effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-108: Effect of feed quality used by farmers on productive performances of layer

Productive performances	Feed quality used by farmers				Sig. level
	Poor quality feed	Medium quality feed	Excellent quality feed	Total	
Feed intake/ layer/m (kg)	1.50±0.50[a] n=2	3.57±0.03[b] n=14	3.28±0.10[b] n=6	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	0.84±0.17[a] n=2	1.67±0.03[b] n=14	1.69±0.01[b] n=6	1.60±0.06 n=22	***
FCR	1.74±0.25[a] n=2	2.15±0.06[b] n=14	1.94±0.05[ab] n=6	2.05±0.05 n=22	*
Egg productivity /m (%)	50.00±10.00[a] n=2	90.14±1.92[b] n=14	92.00±0.63[b] n=6	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	55.00±18.00[a] n=2	146.46±1.53[c] n=14	130.86±4.81[b] n=6	133.89±5.97 n=22	***
Total production cost/m (th.tk)	2.75±0.90[a] n=2	132.83±12.45[b] n=14	87.18±15.50[b] n=6	108.55±12.20 n=22	**
Selling price of egg/ layer/m (tk)	93.75±18.75[a] n=2	183.54±4.36[b] n=14	191.87±2.96[b] n=6	177.65±6.61 n=22	***
Total selling price/m (th.tk)	4.69±0.94[a] n=2	166.56±16.05[b] n=14	125.11±17.29[b] n=6	140.54±14.98 n=22	**
Profit/layer/m (tk)	38.75±0.75[a] n=2	37.07±4.08[a] n=14	61.01±4.56[b] n=6	43.75±3.64 n=22	**
Net profit/m (th.tk)	1.94±0.04[a] n=2	33.73±4.98[b] n=14	37.94±2.09[b] n=6	31.99±3.81 n=22	*

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-109: Analysis of variance for feed quality used by farmers on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/layer/m (kg)	Between groups	7.488	2	3.744	76.346	.000
	Within groups	.932	19	.049		
Egg mass/layer/m (kg)	Between groups	1.273	2	.637	42.682	.000
	Within groups	.283	19	.015		
FCR	Between groups	.405	2	.202	5.024	.018
	Within groups	.765	19	.040		
Egg productivity/ m (%)	Between groups	3026.286	2	1513.143	32.607	.000
	Within groups	881.714	19	46.406		
Production cost/layer/m (tk)	Between groups	14715.987	2	7357.994	79.139	.000
	Within groups	1766.539	19	92.976		
Total production cost/m (tk.tk)	Between groups	33381.796	2	16690.898	8.959	.002
	Within groups	35397.005	19	1863.000		
Selling price of egg/layer/m (tk)	Between groups	15776.084	2	7888.042	33.864	.000
	Within groups	4425.690	19	232.931		
Total selling price/m (th.tk)	Between groups	47818.773	2	23909.386	8.137	.003
	Within groups	55825.770	19	2938.198		
Profit/layer/m (tk)	Between groups	2461.547	2	1230.773	6.398	.008
	Within groups	3654.821	19	192.359		
Net profit/m (th.tk)	Between groups	2060.519	2	1030.260	4.221	.030
	Within Groups	4637.768	19	244.093		

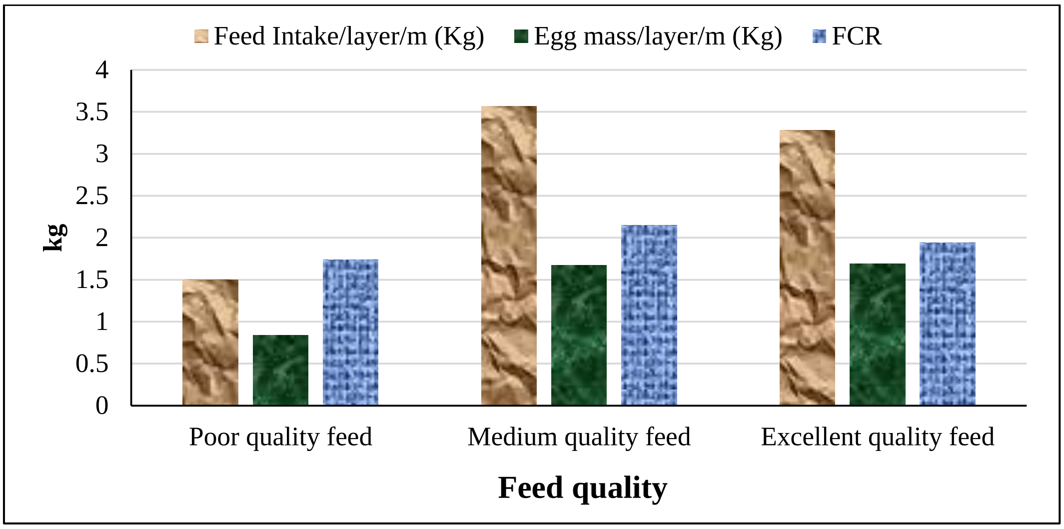

Fig. 142 Feed quality effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR

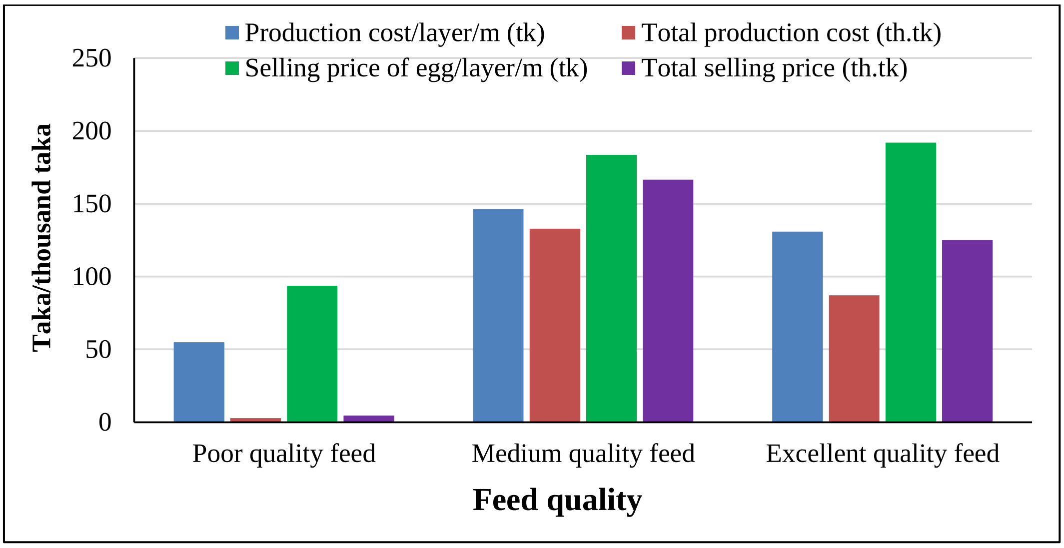

Fig. 143: Feed quality effect on production cost, total production cost/m, selling price and total selling price/m

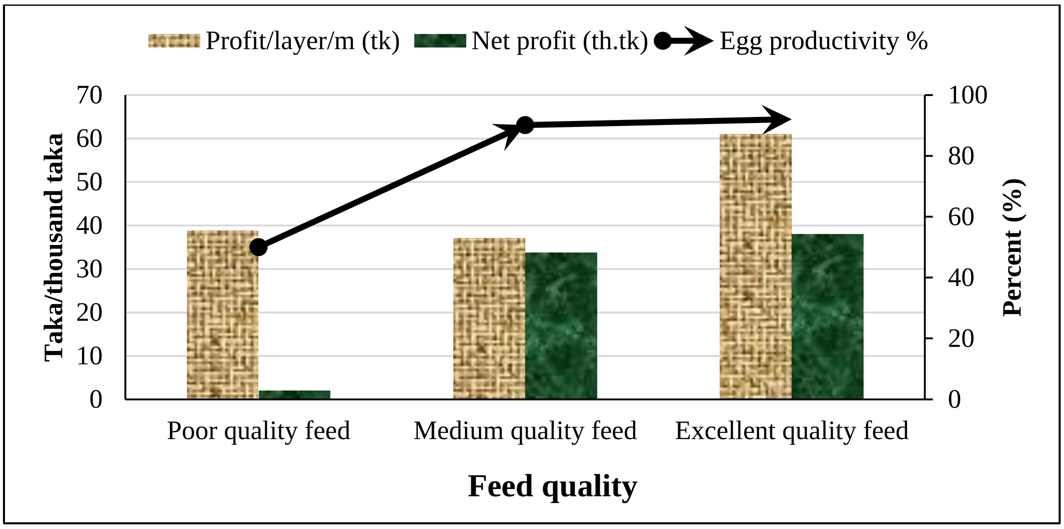

Fig. 144: Feed quality effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-110: Effect of social status of farmers on productive performances of layer

Productive performances	Social status of farmers			Sig. level
	Ultra poor	Marginal	Total	
Feed intake/ layer/m (kg)	1.50±0.50[a] n=2	3.48±0.05[b] n=20	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	0.84±0.17[a] n=2	1.68±0.02[b] n=20	1.60±0.06 n=22	***
FCR	1.74±0.25[a] n=2	2.09±0.05[b] n=20	2.05±0.05 n=22	*
Egg productivity /m (%)	50.00±10.00[a] n=2	90.70±1.35[b] n=20	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	55.00±18.00[a] n=2	141.78±2.37 n=20	133.89±5.97 n=22	***
Total production cost/m (th.tk)	2.75±0.90[a] n=2	119.13±10.78[b] n=20	108.55±12.20 n=22	**
Selling price of egg/ layer/m (tk)	93.75±18.75[a] n=2	186.04±3.25[b] n=20	177.65±6.61 n=22	***
Total selling price/m (th.tk)	4.69±0.94[a] n=2	154.13±12.88[b] n=20	140.54±14.98 n=22	**
Profit/layer/m (tk)	38.75±0.75[a] n=2	44.25±3.99[b] n=20	43.75±3.64 n=22	NS
Net profit/m (th.tk)	1.94±0.04[a] n=2	34.99±3.52[b] n=20	31.99±3.81 n=22	**

Values are mean ±S.E, [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-111: t-test for effect of social status of farmers on productive performances in layer

Dependent variables	t-value	df	P-value	Mean Difference	Std. Error Difference
Feed intake/ layer/m (kg)	-10.504	20	.000	-1.98000	.18849
Egg mass/ layer/m (kg)	-9.461	20	.000	-.83650	.08841
FCR	-2.172	20	.042	-.35050	.16137
Egg productivity /m (%)	-8.198	20	.000	-40.700	4.964
Production cost/ layer/m (tk)	-9.909	20	.000	-86.78250	8.75839
Total production cost/m (th.tk)	-3.340	20	.003	-116.38464	34.84462
Selling price of egg/ layer/m (tk)	-8.103	20	.000	-92.28500	11.38959
Total selling price/m (th.tk)	-3.589	20	.002	-149.43700	41.63717
Profit/layer/m (tk)	-.426	20	.675	-5.50250	12.91070
Net profit/m (th.tk)	-2.904	20	.009	-33.05250	11.38330

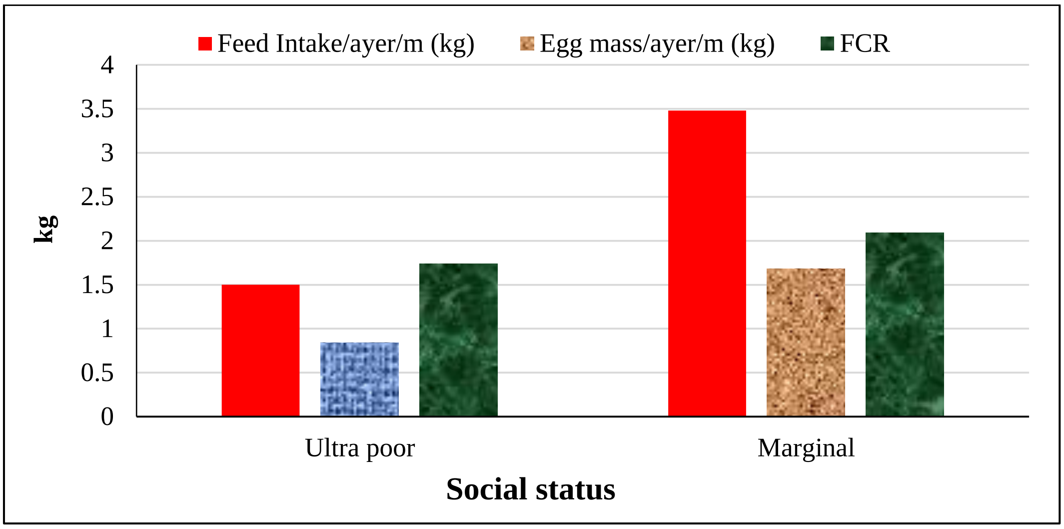

Fig. 145: Social status effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR

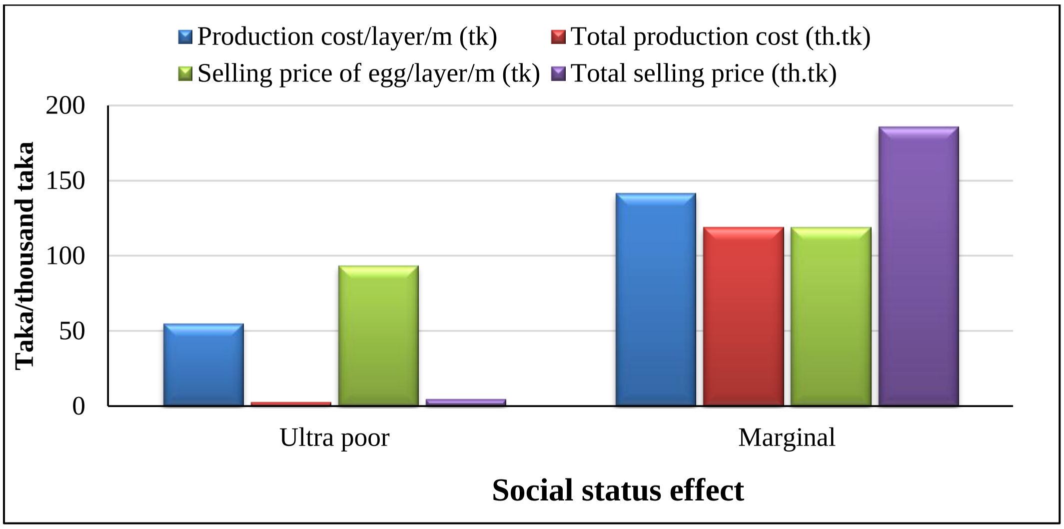

Fig. 146:Social status effect on production cost, total production cost/m, selling price and total selling price/m

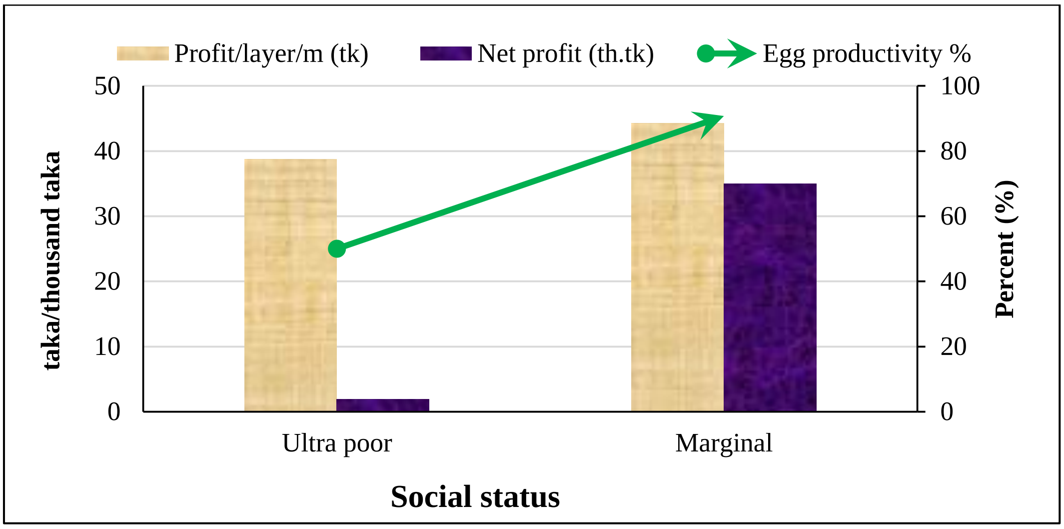

Fig. 147:Social status effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

7.3.11 Effect of economic status of layer farmers

Effects of economic status of farmers on productive performances in layer farms and ANOVA are shown in Table-112-113 and Fig.148-150. In Table-112 the highest value of feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, net profit/m and profit per layer was highest in > 10000 taka monthly income group as (3.49±0.05), (1.69±0.02), (91.79±1.13), (142.68±2.72), (119.18±13.85), (187.04±3.40), (154.40±16.70), (35.22±4.18), (44.36±4.76) respectively and was lowest in <5000 taka monthly income group as (1.50±0.50), (0.84±0.17), (50.00±10.00), (55.00±18.00), (2.75±0.90), (93.75±18.75), (4.69±0.94), (1.94±0.04) and (38.75±0.75) respectively. On the other hand the highest and lowest value of FCR was as (2.12±0.13) and (1.74±0.25) in the farmers who income 5000 to10000 taka and < 5000 taka accordingly. Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were significantly ($P<0.001$, $P<0.01$ & $P<0.05$) influenced by economic status of layer farmers but FCR and profit per layer were not significantly influenced by economic status of layer farmers ($P>0.05$).

7.3.12 Effect of educational status of layer farmers

Effects of educational status of farmers on productive performances in layer farms and ANOVA are shown in Table-114-115 and Fig.151-153. In Table-114 the highest value of feed intake per layer per month was highest (3.41±0.10 kg) in HSC & above education level and was lowest in primary level (3.12±0.43 kg). Egg mass per layer per month was highest in secondary level (1.65±0.09 kg) and was lowest in primary level (1.49±0.17 kg). The average value of FCR was lowest in secondary level (2.02±0.02) and highest in HSC & above (2.11±0.11). Egg productivity (%) was highest in secondary level (89.88±4.32) and was lowest in primary level (81.50±8.55). Production cost per layer was high in HSC & above (139.66±5.15) and was low in HSC & above (125.91±18.10). Selling price of egg per layer was highest in HSC & above (182.46±5.85) and was lowest in primary level (168.00±19.65). Total selling price/m was highest in HSC & above (157.10±28.34) and was low in primary level (110.64±26.19). Profit per layer per month was highest in secondary level

(45.94±4.83) and was very low in primary level (42.09±7.43). Average mean values of all the parameters as feed intake per layer per month, egg mass per layer per month, FCR, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m, profit per layer per month and net profit/m were not significantly influenced by educational status of farmers (P >0.05).

7.3.13 Effect of occupation of farmers on layer farms

Effects of occupational status of farmers on productive performances in layer farms and ANOVA are shown in Table-116-117 and Fig.154-156. In Table-116 the highest mean values of profit per layer per month was highest in farmers who are involved in other activities (60.84±5.08 taka) and was lowest who are involved in business (37.09±5.04 taka). Feed intake per layer per month was highest who are involved in business (3.55±0.04 kg) and was lowest who are involved in agriculture (2.88±0.45 kg). Egg mass per layer per month was highest who are involved in business (1.71±0.03 kg) and was lowest who are involved in agriculture (1.41±0.19 kg). The average value of FCR was lowest who are involved in agriculture (1.98±0.10) and highest who are involved in service (2.26±0.27). Egg productivity (%) was highest who are involved in other activities (92.25±0.75) and was lowest who are involved in agriculture (78.17±9.29). Production cost per layer was high who are involved in business (146.52±2.13) and was low who are involved in agriculture (116.49±20.02). Total production cost/m was high who are involved in business (139.51±16.50) and was low who are involved in agriculture (83.06±28.29). Selling price of egg per layer was highest who are involved in other activities (191.55±4.45) and was lowest who are involved in agriculture (160.75±21.76). Total selling price/m was highest who are involved in business (175.57±21.29) and was low who are involved in agriculture (110.25±37.48). Net profit/m was highest who are involved in other activities (37.49±2.98) and was low who are involved in service (1.94±0.04).

Only average mean values of profit per layer per month were significantly influenced by occupational status of farmers (P < 0.05) but feed intake per layer per month, egg mass per layer per month, FCR, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m and net profit/m were not significantly influenced by occupational status of farmers in layer farms (P >0.05).

7.3.14 Effect of land owned by layer farmers

Effects of land owned by farmers on productive performances in layer farms and ANOVA are shown in Table-118-119 and Fig.157-159. In Table-118 the highest value of feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were highest in >33 decimals land owner as (3.48±0.05), (1.69±0.03), (91.40±1.62), (142.28±2.49), (131.57±12.60), (187.50±3.65), (170.66±14.75) and (39.09±4.01) respectively and was lowest in <5 decimals land owner as (2.55±0.64), (1.23±0.24), (68.25±11.61), (101.10±27.64), (50.22±27.63), (134.88±26.25), (60.16±32.03) and (9.94±6.00) respectively. But the highest and lowest value of FCR and profit per layer per month were (2.08±0.13) &49.70±6.70and (1.98±0.19) &33.78±7.59for the farmers who are the owners of 5-33 decimals and <5 decimals land respectively. Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were significantly influenced by land owned of layer farmers ($P<0.05$ & $P<0.001$) butFCR and profit per layer were not significantly influenced by land owned of by farmers ($P >0.05$).

7.3.15 Effect of sex of farmers on layer farms

Effects of sex of farmers on productive performances in layer farms and t-test are shown in Table-120 & 121 and Fig. 1160-162. In Table-120 the highest value of feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, selling price of egg per layer per month, FCR, total production cost/m, total selling price/m, profit per layer and net profit/m were for male farmers as (3.46±0.05), (1.67±0.03), (90.06±1.53), (140.54±2.68), (185.57±3.67), (2.09±0.096), (117.74±12.39), (153.03±14.82), (45.03±4.60) and (35.29±4.06) respectively and were lowest for female (2.76±0.54), (1.38±0.23), (76.60±11.33), (111.28±23.68), (150.70±24.33), (1.94±0.11), (77.31±32.17), (98.07±40.15), (39.42±3.38), (20.76±8.38) respectively. Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month and selling price of egg per layer per month were significantly influenced by sex of farmers ($P<0.05$) but FCR, total production cost/m, total selling price/m, profit per layer per month and net profit/m were not significantly ($P >0.05$) influenced by sex of farmers.

Table-112: Effect of economic status (monthly income) of farmers on productive performances of layer

Productive performances	Economic status (monthly income) of farmers				Sig. level
	< 5000 taka	5000 to 10000 taka	> 10000 taka	Total	
Feed intake/ layer/m (kg)	1.50±0.50[a] n=2	3.45±0.09[b] n=6	3.49±0.05[b] n=14	3.30±0.14 n=22	***
Egg mass/ layer/m (kg)	0.84±0.17[a] n=2	1.65±0.07[b] n=6	1.69±0.02[b] n=14	1.60±0.06 n=22	***
FCR	1.74±0.25 n=2	2.12±0.13 n=6	2.07±0.04 n=14	2.05±0.05 n=22	NS
Egg productivity /m (%)	50.00±10.00[a] n=2	88.17±3.68[b] n=6	91.79±1.13[b] n=14	87.00±2.91 n=22	***
Production cost/ layer/m (tk)	55.00±18.00[a] n=2	139.69±5.02[b] n=6	142.68±2.72[b] n=14	133.89±5.97 n=22	***
Total production cost/m (th.tk)	2.75±0.90[a] n=2	119.03±17.55[b] n=6	119.18±13.85[b] n=14	108.55±12.20 n=22	*
Selling price of egg/ layer/m (tk)	93.75±18.75[a] n=2	183.70±7.87[b] n=6	187.04±3.40[b] n=14	177.65±6.61 n=22	***
Total selling price/m (th.tk)	4.69±0.94[a] n=2	153.48±20.24[b] n=6	154.40±16.70[b] n=14	140.54±14.98 n=22	**
Profit/layer/m (tk)	38.75±0.75 n=2	44.01±8.03 n=6	44.36±4.76 n=14	43.75±3.64 n=22	NS
Net profit/m (th.tk)	1.94±0.04[a] n=2	34.46±7.12[b] n=6	35.22±4.18[b] n=14	31.99±3.81 n=22	*

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-113: Analysis of variance of economic status (monthly income) of farmers on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/ layer/m (kg)	Between groups	7.136	2	3.568	52.784	.000
	Within groups	1.284	19	.068		
Egg mass/layer/m (kg)	Between groups	1.280	2	.640	43.954	.000
	Within groups	.277	19	.015		
FCR	Between groups	.235	2	.117	2.382	.119
	Within groups	.936	19	.049		
Egg productivity/ m (%)	Between groups	3066.810	2	1533.405	34.635	.000
	Within groups	841.190	19	44.273		
Production cost/layer/m (tk)	Between groups	13730.566	2	6865.283	47.399	.000
	Within groups	2751.961	19	144.840		
Total production cost/m (tk.tk)	Between groups	24628.071	2	12314.036	5.299	.015
	Within groups	44150.730	19	2323.723		
Selling price of egg/layer/m (tk)	Between groups	15531.317	2	7765.659	31.592	.000
	Within groups	4670.457	19	245.814		
Total selling price/m (th.tk)	Between groups	40606.128	2	20303.064	6.119	.009
	Within groups	63038.415	19	3317.811		
Profit/layer/m (tk)	Between groups	55.561	2	27.781	.087	.917
	Within groups	6060.806	19	318.990		
Net profit/m (th.tk)	Between groups	1988.766	2	994.383	4.012	.035
	Within groups	4709.521	19	247.870		

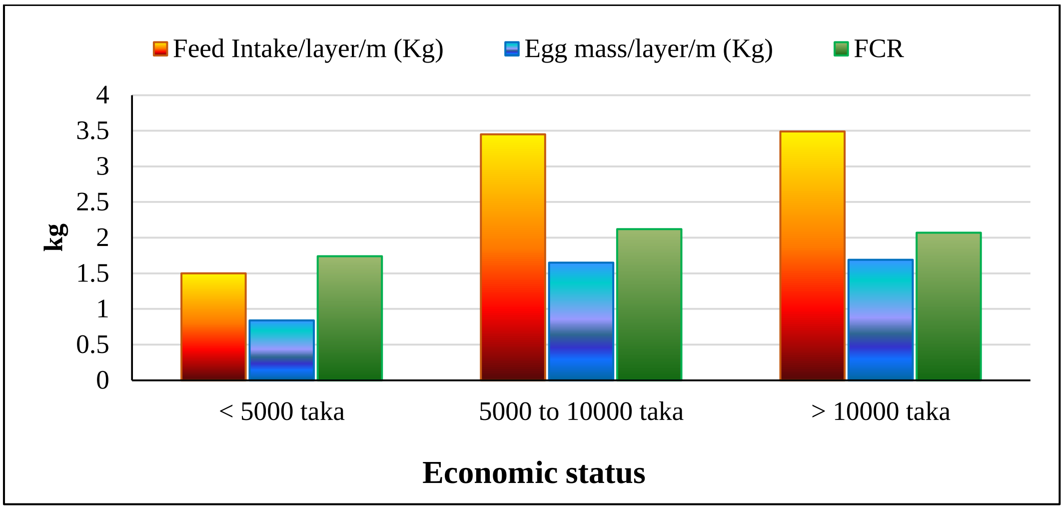

Fig. 148: Economic status effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR

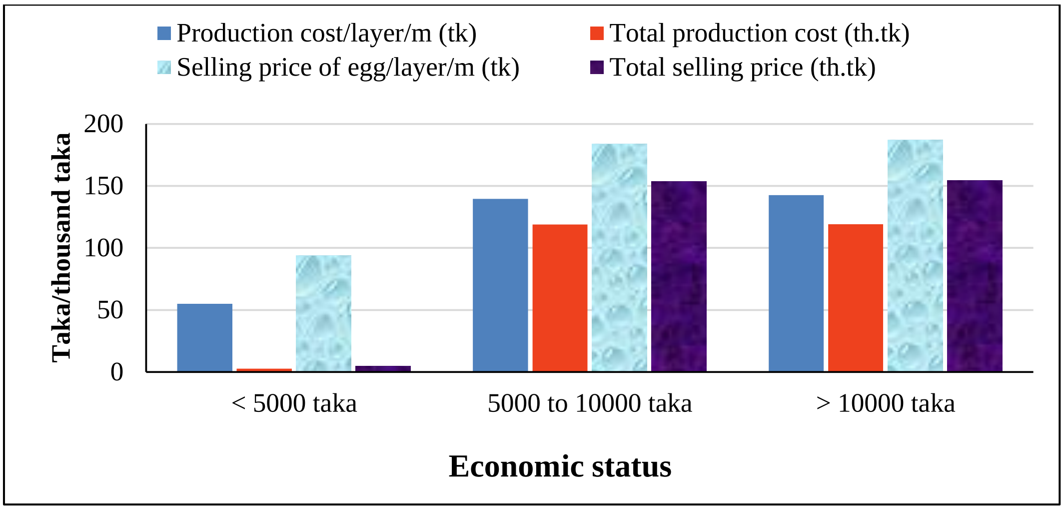

Fig. 149: Economic status effecton production cost, total production cost/m, selling price and total selling price/m

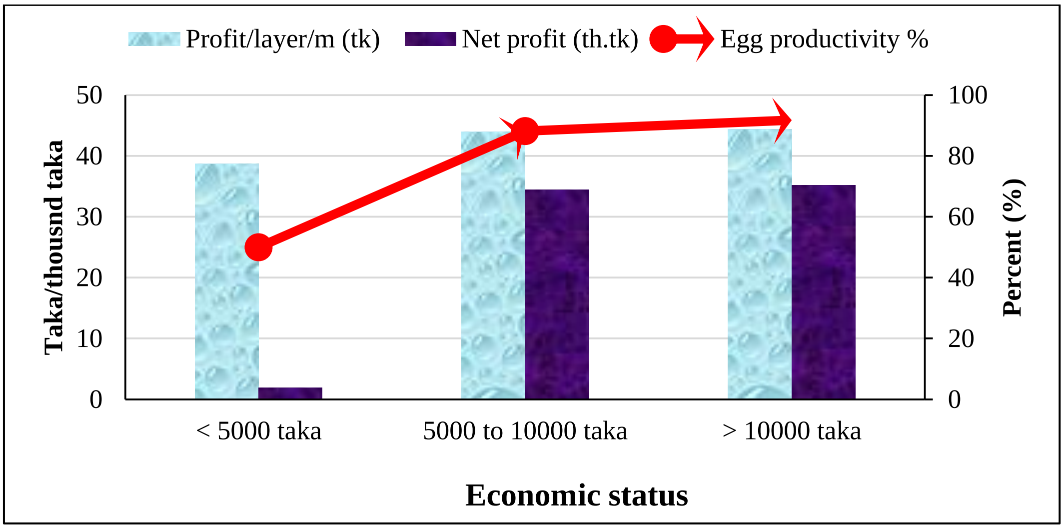

Fig. 150: Economic status effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-114 : Effect of educational status of farmers on productive performances of layer

Feed intake/ layer/m (kg) Egg mass/ layer/m (kg)	Educational status				Sig. level
	Primary	Secondary	HSC & above	Total	
FCR	3.12±0.43 n=6	3.33±0.19 n=8	3.41±0.10 n=8	3.30±0.14 n=22	NS
Egg productivity /m (%)	1.49±0.17 n=6	1.65±0.09 n=8	1.64±0.05 n=8	1.60±0.06 n=22	NS
Production cost/ layer/m (tk)	2.03±0.12 n=6	2.02±0.02 n=8	2.11±0.11 n=8	2.05±0.05 n=22	NS
Total production cost/m (th.tk)	81.50±8.55 n=6	89.88±4.32 n=8	88.25±2.71 n=8	87.00±2.91 n=22	NS
Selling price of egg/ layer/m (tk)	125.91±18.10 n=6	134.12±8.99 n=8	139.66±5.15 n=8	133.89±5.97 n=22	NS
Total selling price/m (th.tk)	85.85±20.93 n=6	111.31±18.44 n=8	122.82±23.84 n=8	108.55±12.20 n=22	NS
Profit/layer/m (tk)	168.00±19.65 n=6	180.06±10.27 n=8	182.46±5.85 n=8	177.65±6.61 n=22	NS
Net profit/m (th.tk)	110.64±26.19 n=6	146.41±23.24 n=8	157.10±28.34 n=8	140.54±14.98 n=22	NS
Feed intake/ layer/m (kg)	42.09±7.43 n=6	45.94±4.83 n=8	42.81±7.43 n=8	43.75±3.64 n=22	NS
Egg mass/ layer/m (kg)	24.79±6.90 n=6	35.09±6.03 n=8	34.28±7.08 n=8	31.99±3.81 n=22	NS

Values are mean ±S.E, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka and NS=Non-significant.

Table-115: Analysis of variance of educational status of farmers on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/ layer/m (kg)	Between groups	.308	2	.154	.361	.702
	Within groups	8.112	19	.427		
Egg mass/layer/m (kg)	Between groups	.095	2	.048	.619	.549
	Within groups	1.461	19	.077		
FCR	Between groups	.034	2	.017	.280	.759
	Within groups	1.137	19	.060		
Egg productivity/ m (%)	Between groups	260.125	2	130.063	.677	.520
	Within groups	3647.875	19	191.993		
Production cost/layer/m (tk)	Between groups	648.658	2	324.329	.389	.683
	Within groups	15833.869	19	833.362		
Total production cost/m (tk.tk)	Between groups	4783.279	2	2391.639	.710	.504
	Within groups	63995.522	19	3368.185		
Selling price of egg/layer/m (tk)	Between groups	790.577	2	395.289	.387	.684
	Within groups	19411.198	19	1021.642		
Total selling price/m (th.tk)	Between groups	7833.510	2	3916.755	.777	.474
	Within groups	95811.032	19	5042.686		
Profit/layer/m (tk)	Between Groups	62.126	2	31.063	.097	.908
	Within Groups	6054.241	19	318.644		
Net profit/m (th.tk)	Between Groups	429.663	2	214.832	.651	.533
	Within Groups	6268.624	19	329.928		

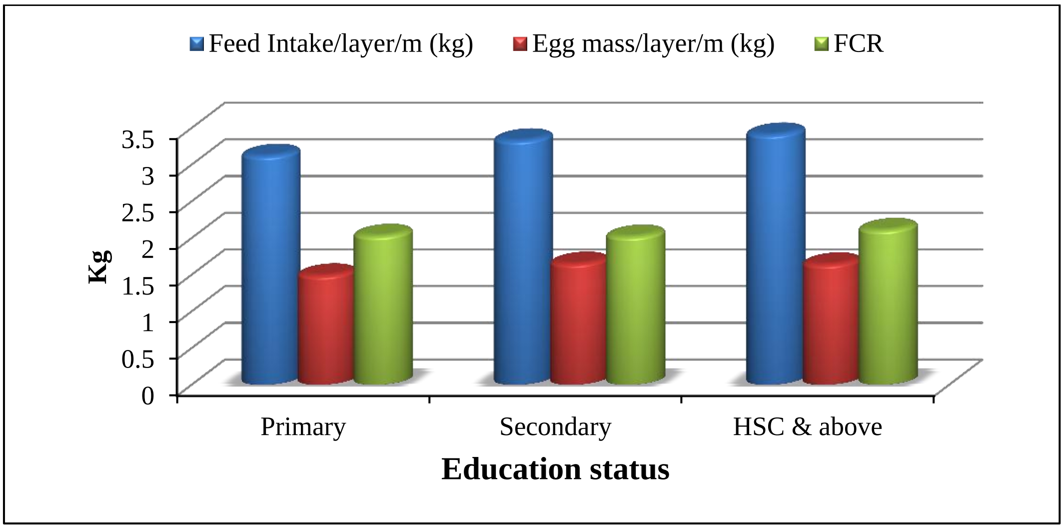

Fig. 151: Education status effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR.

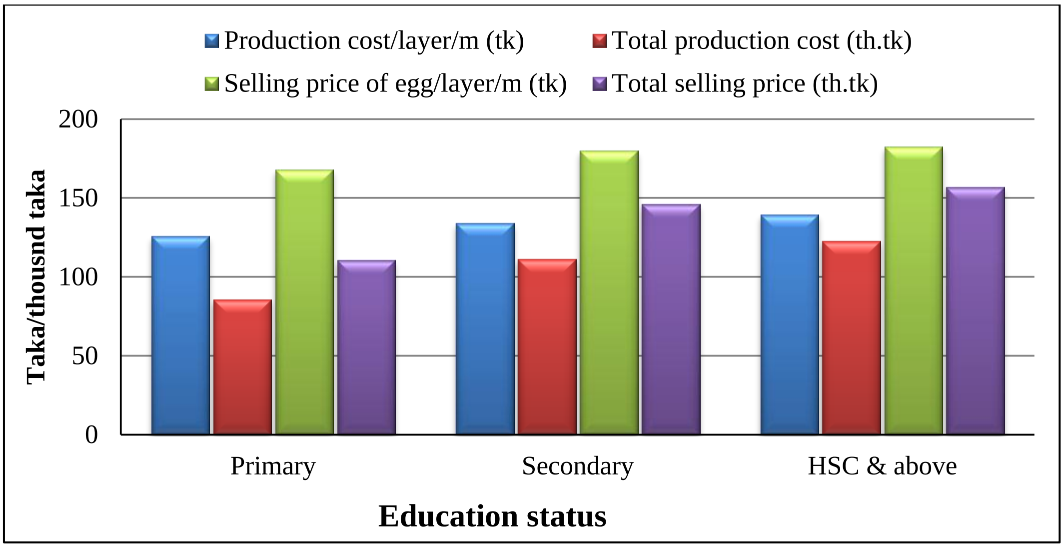

Fig. 152:Education status effecton production cost, total production cost/m, selling price and total selling pric

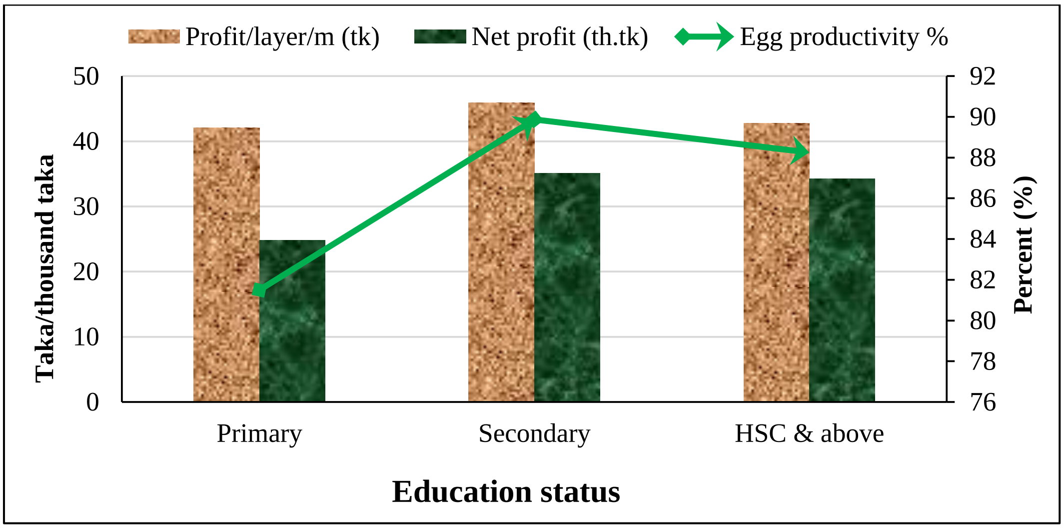

Fig. 153: Education status effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-116: Effect of occupations of farmers on productive performances of layer

Productive performances	Occupations of farmers					Sig. level
	Agriculture	Business	Service	Others	Total	
Feed intake/ layer/m (kg)	2.88±0.45 n=6	3.55±0.04 n=9	3.40±0.20 n=3	3.30±0.12 n=4	3.30±0.14 n=22	NS
Egg mass/ layer/m (kg)	1.41±0.19 n=6	1.71±0.03 n=9	1.53±0.11 n=3	1.70±0.03 n=4	1.60±0.06 n=22	NS
FCR	1.98±0.10 n=6	2.09±0.05 n=9	2.26±0.27 n=3	1.94±0.04 n=4	2.05±0.05 n=22	NS
Egg productivity /m (%)	78.17±9.29 n=6	91.78±1.69 n=9	83.33±6.89 n=3	92.25±0.75 n=4	87.00±2.91 n=22	NS
Production cost/ layer/m (tk)	116.49±20.02 n=6	146.52±2.13 n=9	135.07±6.04 n=3	130.71±7.15 n=4	133.89±5.97 n=22	NS
Total production cost/m (th.tk)	83.06±28.29 n=6	139.51±16.50 n=9	96.12±28.85 n=3	86.48±20.89 n=4	108.55±12.20 n=22	NS
Selling price of egg/ layer/m (tk)	160.75±21.76 n=6	183.61±4.80 n=9	175.00±14.57 n=3	191.55±4.45 n=4	177.65±6.61 n=22	NS
Total selling price/m (th.tk)	110.25±37.48 n=6	175.57±21.29 n=9	118.16±22.16 n=3	123.96±23.74 n=4	140.54±14.98 n=22	NS
Profit/layer/m (tk)	44.26 ± 2.24^{ab} n=6	37.09 ± 5.04^{a} n=9	39.93 ± 19.23^{ab} n=3	60.84 ± 5.08^{c} n=4	43.75±3.64 n=22	*
Net profit/m (th.tk)	27.19±9.31 n=6	36.06±6.16 n=9	22.04±9.61 n=3	37.49±2.98 n=4	31.99±3.81 n=22	NS

Values are mean ±S.E. ^{abc} with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% and NS=Non-significant.

Table-117: Analysis of variance of occupations of farmers on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/ layer/m (kg)	Between groups	1.676	3	.559	1.491	.251
	Within groups	6.744	18	.375		
Egg mass/layer/m (kg)	Between groups	.368	3	.123	1.857	.173
	Within groups	1.189	18	.066		
FCR	Between groups	.225	3	.075	1.426	.268
	Within groups	.946	18	.053		
Egg productivity/ m (%)	Between groups	824.194	3	274.731	1.604	.224
	Within groups	3083.806	18	171.323		
Production cost/layer/m (tk)	Between groups	3295.646	3	1098.549	1.500	.249
	Within groups	13186.881	18	732.604		
Total production cost/m (tk.tk)	Between groups	14936.085	3	4978.695	1.664	.210
	Within groups	53842.716	18	2991.262		
Selling price of egg/layer/m (tk)	Between groups	2827.381	3	942.460	.976	.426
	Within groups	17374.394	18	965.244		
Total selling price/m (th.tk)	Between groups	19150.470	3	6383.490	1.360	.287
	Within groups	84494.072	18	4694.115		
Profit/layer/m (tk)	Between groups	1611.850	3	537.283	2.147	.130
	Within groups	4504.518	18	250.251		
Net profit/m (th.tk)	Between groups	705.414	3	235.138	.706	.561
	Within groups	5992.873	18	332.937		

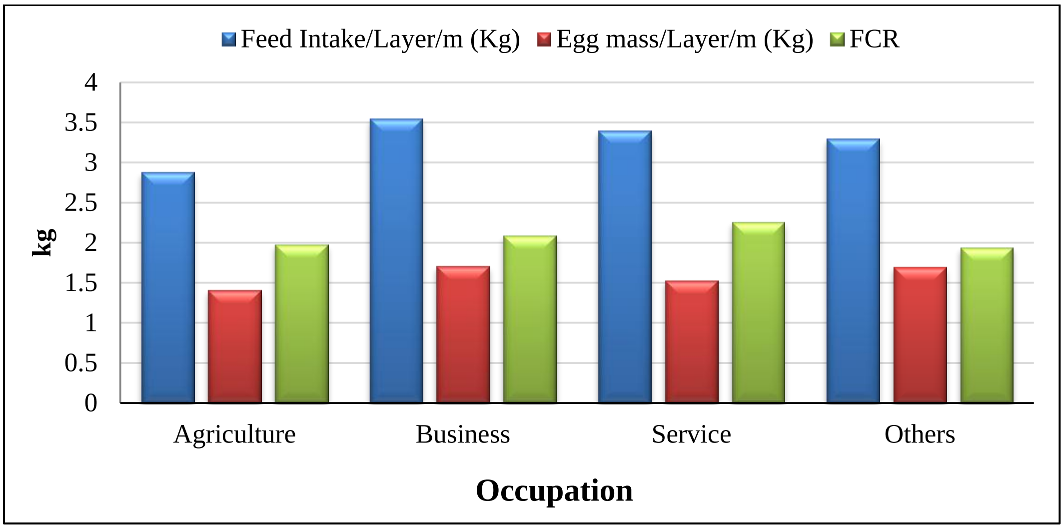

Fig. 154: Occupation status effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR.

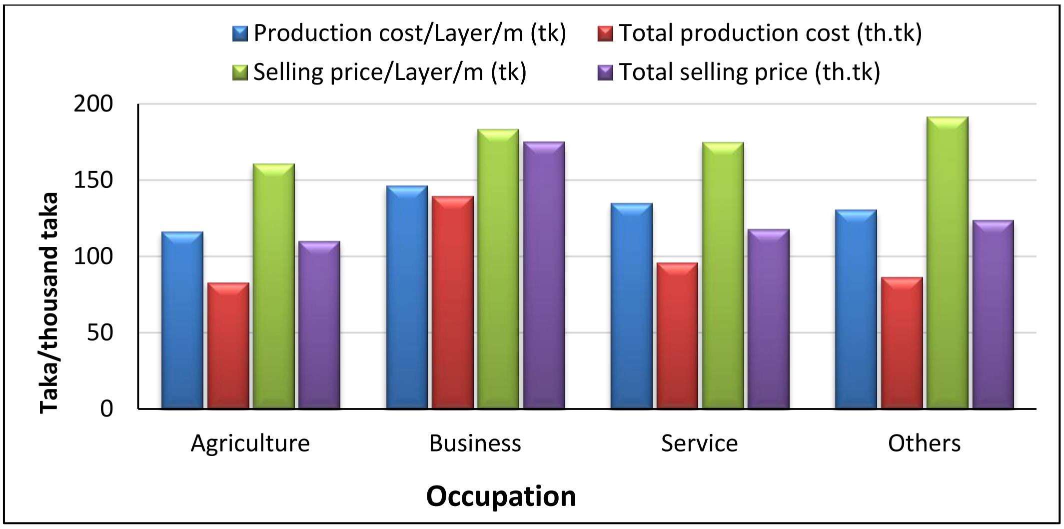

Fig. 155:Occupation status effect on production cost, total production cost/m, selling price and total selling price/m

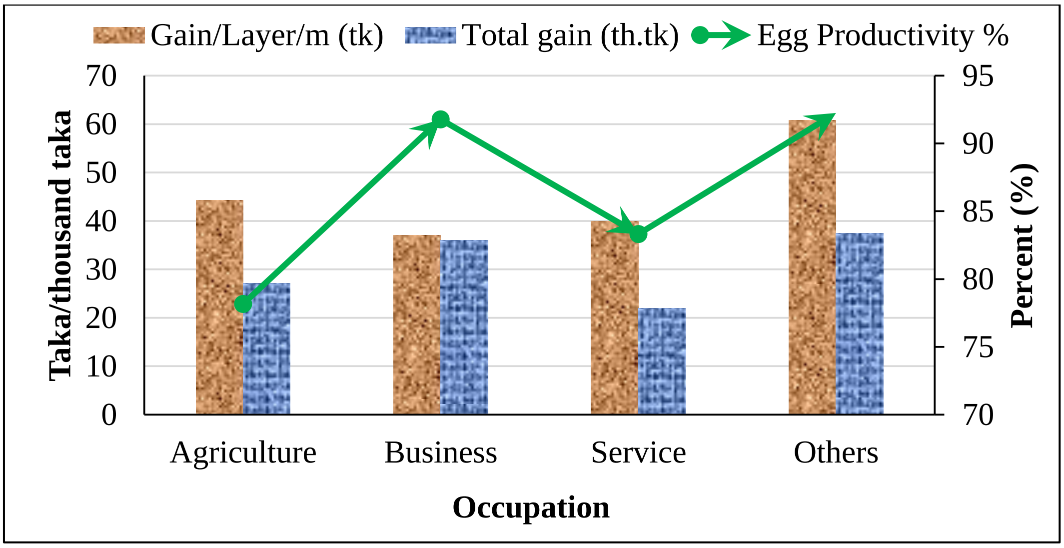

Fig. 156: Occupation status effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table-118: Effect of land owned by farmers on productive performances of layer

Productive performances	Land owned by farmers				Sig. level
	< 5 decimals	5 - 33 decimals	> 33 decimals	Total	
Feed intake/ layer/m (kg)	2.55±0.64[a] n=4	3.40±0.20[b] n=3	3.48±0.05[b] n=15	3.30±0.14 n=22	*
Egg mass/ layer/m (kg)	1.23±0.24[a] n=4	1.64±0.03[b] n=3	1.69±0.03[b] n=15	1.60±0.06 n=22	**
FCR	1.98±0.19 n=4	2.08±0.13 n=3	2.07±0.05 n=15	2.05±0.05 n=22	NS
Egg productivity /m (%)	68.25±11.61[a] n=4	90.00±1.73[b] n=3	91.40±1.62[b] n=15	87.00±2.91 n=22	**
Production cost/ layer/m (tk)	101.10[a]±27.64 n=4	135.70±10.39[b] n=3	142.28±2.49[b] n=15	133.89±5.97 n=22	*
Total production cost/m (th.tk)	50.22±27.63[a] n=4	71.25±9.37[ab] n=3	131.57±12.60[b] n=15	108.55±12.20 n=22	*
Selling price of egg/ layer/m (tk)	134.88±26.25[a] n=4	185.40±5.41[b] n=3	187.50±3.65[b] n=15	177.65±6.61 n=22	*
Total selling price/m (th.tk)	60.16±32.03[a] n=4	97.15±9.66[ab] n=3	170.66±14.75[b] n=15	140.54±14.98 n=22	**
Profit/layer/m (tk)	33.78±7.59 n=4	49.70±6.70 n=3	45.22±4.69 n=15	43.75±3.64 n=22	NS
Net profit/m (th.tk)	9.94±6.00[a] n=4	25.89±3.53[ab] n=3	39.09±4.01[b] n=15	31.99±3.81 n=22	**

Values are mean ±S.E. [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels, **=Significant at 1% levels and NS=Non-significant.

Table-119: Analysis of variance of land owned by farmers on productive performances of layer

Dependent variables	Source of variances	Sum of Squares	df	Mean Square	F-value	P-value
Feed Intake/ layer/m (kg)	Between groups	2.766	2	1.383	4.648	.023
	Within groups	5.654	19	.298		
Egg mass/layer/m (kg)	Between groups	.678	2	.339	7.323	.004
	Within groups	.879	19	.046		
FCR	Between groups	.025	2	.012	.207	.815
	Within groups	1.145	19	.060		
Egg productivity/ m (%)	Between groups	1723.650	2	861.825	7.496	.004
	Within groups	2184.350	19	114.966		
Production cost/layer/m (tk)	Between groups	5365.607	2	2682.804	4.585	.024
	Within groups	11116.919	19	585.101		
Total production cost/m (tk.tk)	Between groups	25731.448	2	12865.724	5.679	.012
	Within groups	43047.353	19	2265.650		
Selling price of egg/layer/m (tk)	Between groups	8954.327	2	4477.164	7.563	.004
	Within groups	11247.448	19	591.971		
Total selling price/m (th.tk)	Between groups	45101.743	2	22550.872	7.319	.004
	Within groups	58542.799	19	3081.200		
Profit/layer/m (tk)	Between groups	536.771	2	268.385	.914	.418
	Within groups	5579.597	19	293.663		
Net profit/m (th.tk)	Between groups	2813.046	2	1406.523	6.878	.006
	Within groups	3885.241	19	204.486		

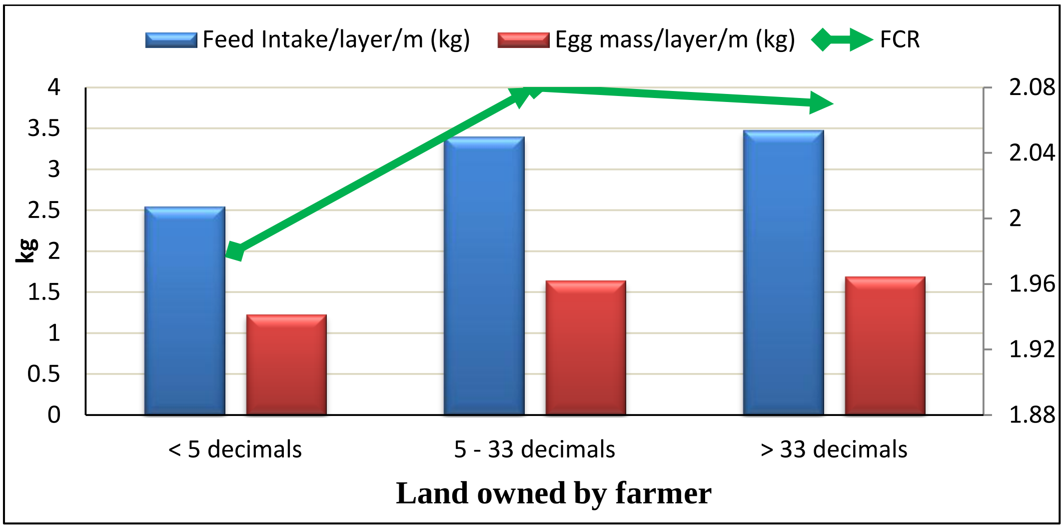

Fig. 157: Land owning effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR.

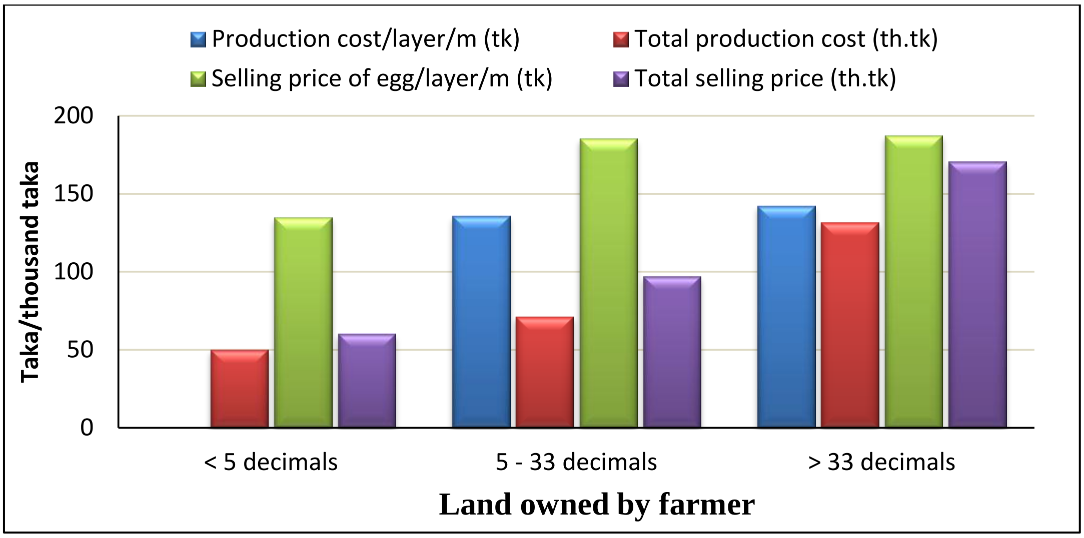

Fig. 158: Land owning effect on production cost, total production cost/m, selling price and total selling price/m

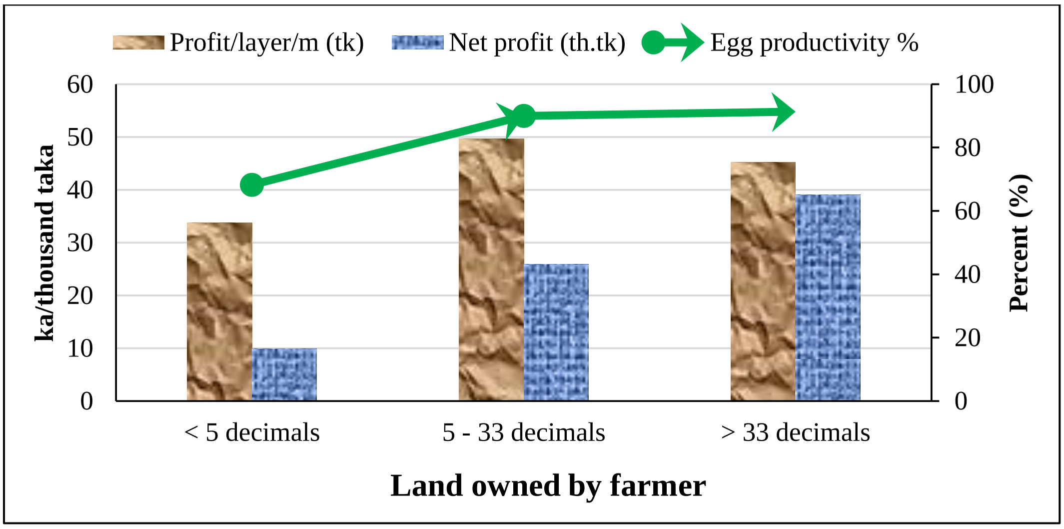

Fig. 159: Land owning effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

Table 120: Effect of sex of farmers on productive performances of layer

Productive performances	Sex of farmers			Sig. level
	Male	Female	Total	
Feed intake/ layer/m (kg)	3.46±0.05[b] n=17	2.76±0.54[a] n=5	3.30±0.14 n=n=22	*
Egg mass/ layer/m (kg)	1.67±0.03[b] n=17	1.38±0.23[a] n=5	1.60±0.06 n=22	*
FCR	2.09±0.06[b] n=17	1.94±0.11[a] n=5	2.05±0.05 n=22	NS
Egg productivity /m (%)	90.06±1.53[b] n=17	76.60±11.33[a] n=5	87.00±2.91 n=22	*
Production cost/ layer/m (tk)	140.54±2.68[b] n=17	111.28±23.68[a] n=5	133.89±5.97 n=22	*
Total production cost/m (th.tk)	117.74±12.39[b] n=17	77.31±32.17[a] n=5	108.55±12.20 n=22	NS
Selling price of egg/ layer/m (tk)	185.57±3.67[b] n=17	150.70±24.33[a] n=5	177.65±6.61 n=22	*
Total selling price/m (th.tk)	153.03±14.82[b] n=17	98.07±40.15[a] n=5	140.54±14.98 n=22	NS
Profit/layer/m (tk)	45.03±4.60[b] n=17	39.42±3.38[a] n=5	43.75±3.64 n=22	NS
Net profit/m (th.tk)	35.29±4.06[b] n=17	20.76±8.38[a] n=5	31.99±3.81 n=22	NS

Values are mean ±S.E, [ab] with different super script letters in the same row differed significantly with each other, S.E= Std Error of Mean, n=No. of observation of farm, m= month, kg= Kilogram, tk=Taka, th.tk=Thousand Taka, *=Significant at 5% levels and NS=Non-significant.

Table-121: t-test for the effect of sex of farmers on productive performances of layer

Dependent variables	t-value	df	P-value	Mean difference	Std. Error difference
Feed intake/ layer/m (kg)	2.403	20	.026	.69882	.29077
Egg mass/ layer/m (kg)	2.250	20	.036	.28529	.12678
FCR	1.264	20	.221	.14965	.11843
Egg productivity /m (%)	2.089	20	.050	13.459	6.443
Production cost/ layer/m (tk)	2.241	20	.037	29.26412	13.05695
Total production cost/m (th.tk)	1.422	20	.170	40.42799	28.43163
Selling price of egg/ layer/m (tk)	2.462	20	.023	34.87059	14.16463
Total selling price/m (th.tk)	1.593	20	.127	54.96094	34.49996
Profit/layer/m (tk)	.637	20	.532	5.60647	8.80803
Net profit/m (th.tk)	1.666	20	.111	14.53259	8.72490

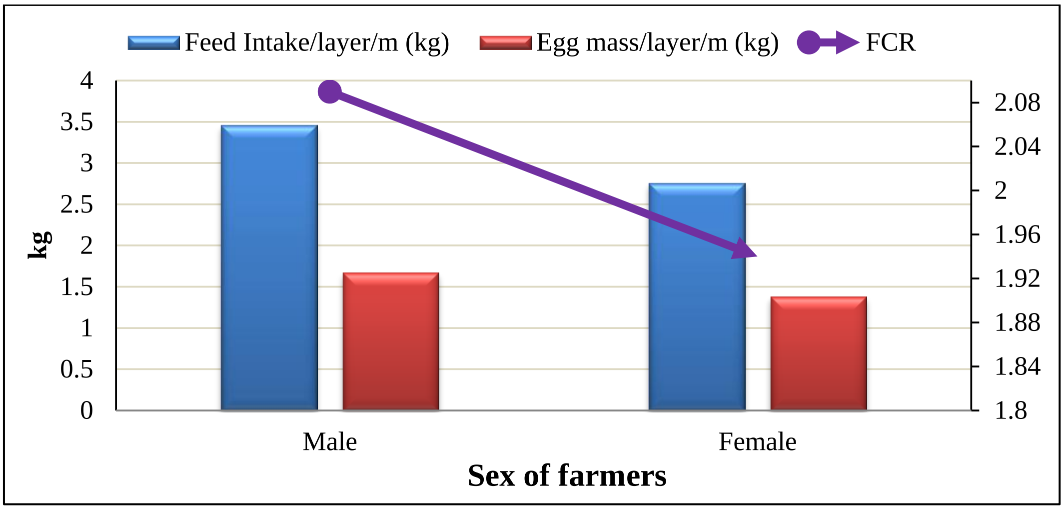

Fig. 160: Sex effect on feed intake/layer/m (kg), egg mass/layer/m (kg) and FCR

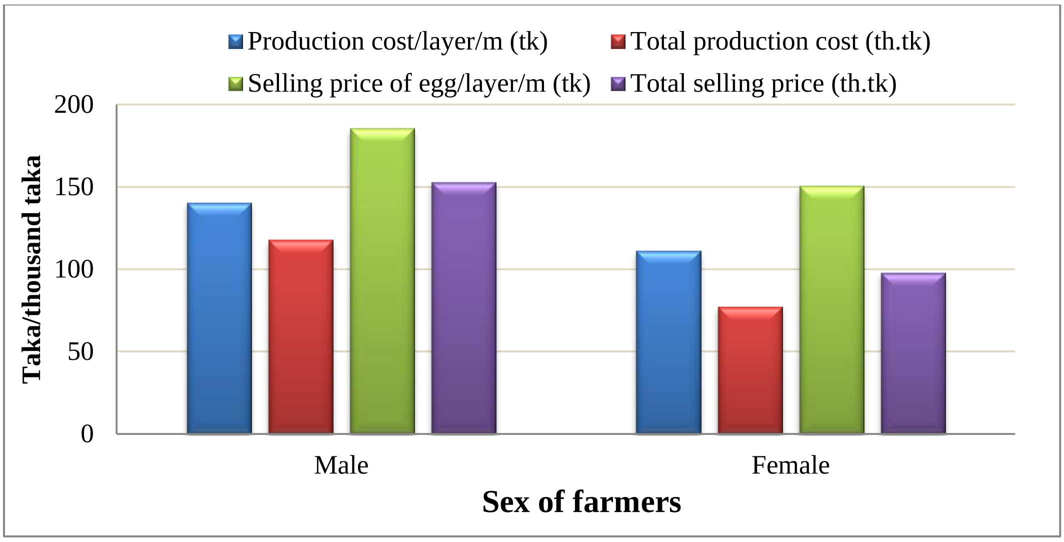

Fig. 161: Sex effect on production cost, total production cost/m, selling price and total selling price/m

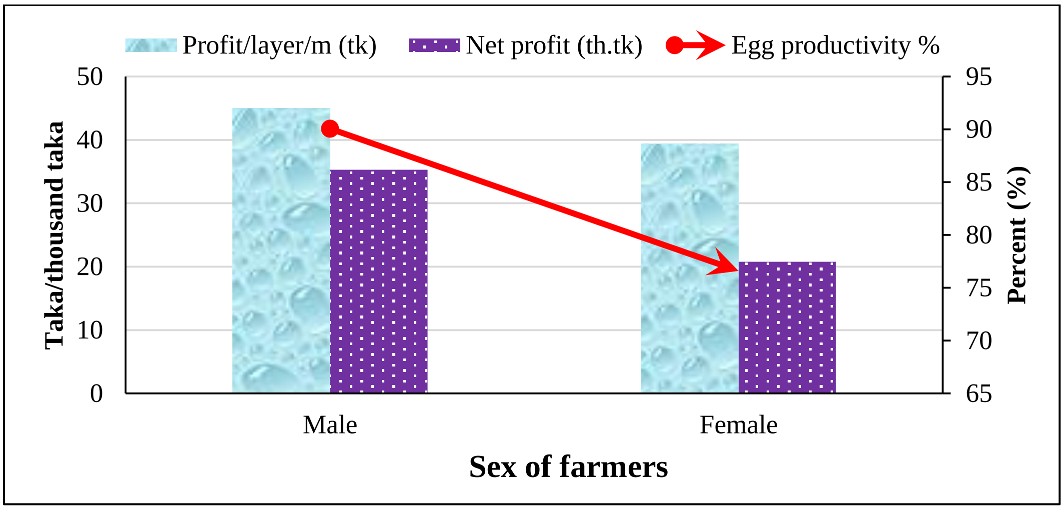

Fig. 162: Land owning effect on gain /layer/month tk, net profit/m th.tk and egg productivity/m (%)

7.4 DISCUSSION

Most of the influencing factors viz. layer breed, chick quality, farm size, age of farms, housing pattern, floor type of layer house, overall housing system, overall ventilation system, feed quality, social status of farmers, economic status of farmers, education, occupation, land owned by farmers and sex of farmers were considered as factors on productive parameters viz. feed intake per layer per month, egg mass per layer per month, FCR, production cost per layer, total production cost/m, selling price of egg per layer per month, total selling price/m, gain/profit per layer per month and net profit/m /net profit/m in farm. In total of 22 layer farms under OHOFP in 6 Upazilas of Rajshahi district were studied and followed up from July 2013 to June 2015. The study and findings are discussed below.

7.4.1 Effects of layer breed (strain) on productive performances in layer farms

Effects of layer breed (strain) on productive performances in layer farms and ANOVA are showed in Table-92-93 and Fig.118-120. From Table-92 the highest mean value of feed intake per layer per month was in Navogen Brown (3.60±0.00 kg) and was lowest in Deshi or Local breed (1.50±0.50 kg). Egg mass per layer per month was highest in Navogen Brown (1.81±0.03 kg) and was lowest in Deshi or Local breed (0.84±0.17 kg). Egg productivity (%) was highest in Navogen Brown (95.00±2.00) and was lowest in Deshi or Local breed (50.00±10.00). Production cost per layer per month was highest in Navogen Brown (148.20±1.80) and was lowest in Deshi or Local breed (55.00±18.00). Total production cost/m was highest in Hisex Brown (150.44±29.52) and was lowest in Deshi or Local breed (2.75±0.90). Selling price of egg per layer was highest in both Hyline Brown and Bovans White (196.00±0.00) and was lowest in Deshi or Local breed (93.75±18.75). Gain per broiler was highest in Hyline Brown (60.18±4.29) and was very low in Hisex Brown (24.30±6.78). The average value of FCR was lowest in deshi or local (1.74±0.25) and highest in Hisex Brown (2.28±0.13). Total selling price/m of egg per layer was highest in Navogen Brown (182.28±11.76) and was lowest in Deshi or Local breed (4.69±0.94). Net profit was highest in Hyline Brown (41.13±4.35) and was lowest in Deshi or Local breed (1.94±0.04).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month and profit per layer per month were significantly influenced by the breed ($P<0.001$, $P<0.01$, $P<0.05$), but FCR, total selling price/m and net profit/m were not significantly influenced by breed ($P>0.05$). It was partially similar to Jahan *et al.* (2011), while he observed that Local/Deshi breed showed the worst performances in egg production. However in an earlier studies in Pakistan, Farooq *et al*. (2002) found better egg production for Hisex strain of layer than Hyline, which is accordance with the present study. In addition, Sekeroglu *et al*. (2008) recorded egg weight was affected by strains of hens in Europe.

It may be concluded that the Navogen Brown showed the best, Hyline Brown showed the 2nd highest and Local/Deshi breed showed the lowest performances in considering average mean values of maximum productive parameters. It may be due to these types of breeds contain high genetic characteristics as well as they may be survived and adjusted to the environment of Rajshahi district, Bangladesh.

7.4.2 Effects of chick quality of layer farms

Effects of chick quality on productive performances in layer farms and ANOVA are summarized in Table-94-95 and Fig.121-123. From Table-94 the highest value of feed intake per layer was in good quality chick (3.57±0.03 kg) and was lowest in poor quality chick (1.50±0.50 kg). Egg mass per layer was highest in good quality chick (1.68±0.04 kg) and was lowest in poor quality chick (0.84±0.17 kg). The average value of FCR was lowest in poor quality chick (1.74±0.25) and highest in good quality chick (2.14±0.06). Egg productivity (%) was highest in excellent quality chick (91.29±0.89) and was lowest in poor quality (50.00±10.00). Production cost per layer was high in good quality chick (146.84±1.60) and was low in poor quality chick (50.00±10.00). Total production cost/m was high in good quality chick (137.87±12.29) and was low in poor quality chick (2.75±0.90). Selling price of egg per layer was highest in excellent quality chick (190.46±2.87 taka) and was lowest in poor quality chick (93.75±18.75 taka). Total selling price/m was highest in good quality (172.72±16.00) and was low in poor quality chick (4.69±0.94). Profit per layer per month was highest in excellent quality chick (58.06±4.85 taka) and was very low in poor quality chick (38.75±0.75 taka). Net profit/m was highest in excellent quality (35.26±3.21 th.tk) and was lowest in poor quality chick of layer (1.94±0.04 th.tk).

Feed intake per layer per month, egg mass per layer per month, FCR, egg productivity /m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m, profit per layer per month and net profit/m were significantly influenced by chick quality of layers ($P<0.001$, $P<0.05$).

In our study we observed excellent quality of chick showed best performances than others. It may be due to the day old chick (DOC) of this group shows best movement, no problem in whole body and look most bright in nature. Furthermore it may be due to highly taking care of DOC at the time of hatching and carrying by producing company.

7.4.3 Effects of farm size on productive performances in layer farms

Effects of farm size on productive performances in layer farms and ANOVA are represented in Table-96-97 and Fig.124-126. In Table-96 the highest value of feed intake per layer per month was in = or >1000 layers group of farm size (3.53±0.04 kg) and was lowest in = or <500 layers group of farm size (2.67±0.52 kg). Egg mass per layer per month was highest in = or >1000 layers group of farm size (1.69±0.05 kg) and was lowest in = or <500 layers group of farm size (1.32±0.20 kg). Egg productivity (%) was highest in >500 to <1000 layers group of farm size (91.38±1.63) and was lowest in = or <500 layers group of farm size (73.40±10.08). Production cost per layer per month was highest in = or >1000 layers group of farm size (145.21±1.15 taka) and was lowest in = or < 500 layers group of farm size (105.82±22.74 taka). Total production cost/m was high in = or > 1000 layers group of farm size (162.29±11.45) and was low in = or < 500 layers group of farm size (42.07±16.46). Selling price of egg per layer per month was highest in >500 to <1000 layers group of farm size (191.00±5.00 taka) and was lowest in = or <500 layers group of farm size (147.34±22.73 taka). Total selling price/m was highest in = or >1000 layers group of farm size (203.93±10.05) and was low in = or <500 layers group of farm size (55.59±20.81). Net profit/m was highest in = or >1000 layers (41.65±5.96) and was low in = or < 500 layers (13.52±5.53). The average value of FCR was lowest in = or < 500 layers (1.96±0.14) and highest in = or >1000 layers (2.11±0.08). Profit per layer was highest in > 500 to < 1000 layers (52.29±6.84) and was very low in = or > 1000 layers (37.40±5.06).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m and net profit/m were significantly influenced by farm size of layers (P<0.05, P<0.001) but FCR and profit per layer per month were not significantly influenced by farm size of layers (P>0.05). Farooq *et al*. (2002) observed feed conversion for egg production was better in larger than in small flocks, which is accordance with the present research.

In our study we observed that the farm size of > 500 to < 1000 layers group showed best performance than = or < 500 layers group and= or > 1000 layers group in layers farm. It may be due to the farmers can easily manage and taking care of > 500 to < 1000 layers in a farm and also it may be due to benefit cost ratio is higher in rearing greater than 500 to less than 1000 layers bird in a farm of Rajshahi district.

7.4.4 Effects of age of layers

Effects of age of layers on productive performances in layer farms and ANOVA are furnished in Table-98-99 and Fig.127-129. From Table-98 the highest value of feed intake per layer was in = or < 6 month age group (3.55±0.05 kg) and was lowest in >18 month age group (2.30±1.30 kg). Egg mass per layer was highest in >6 to 12 month age group (1.70±0.02 kg) and was lowest in >18 month age group (1.00±0.33 kg). Egg productivity (%) was highest in >6 to 12 month age group (92.27±1.00) and was lowest in >18 month age group (55.00±15.0). Production cost per layer was high in = or < 6 month age group (143.63±1.35) and was low in >18 month age group (88.80±51.8). Selling price of egg per layer was highest in = or < 6 month age group (189.4.04±5.00) and was lowest in >18 month age group (111.00±36.00). Net profit/m was highest in >6 to 12 month (38.47±3.71) and was low in >18 month (4.45±2.55). The average value of FCR was lowest in >6 to 12 month age group (2.02±0.04) and highest in = or <6 month age group (2.13±0.08). Total production cost/m was high in >6 to 12 month (121.54±13.21) and was low in >12 to 18 month (41.92±38.27). Total selling price/m was highest in >6 to 12 month (160.00±15.62) and was low in >12 to 18 month (49.60±43.97). Profit per layer was highest in >6 to 12 month (47.70±4.40) and was very low in >18 month (22.20±15.80).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer, selling price of egg per layer and net profit/m were significantly influenced by age of layers (P<0.05, P<0.001 & P<0.05) but FCR, total production cost/m, total selling price/m and profit per layer per month were not significantly influenced by age of layers (P>0.05). In earlier studies in Pakistan, Farooq *et al*. (2002) found egg production was negatively associated with age, which is accordance with the present research.

In our study we found that the age of layers with >6 to 12 month age group showed the best performance than = or < 6 month age group, >12 to 18 month age group and >18 month age group. It may be due to the layer birds of >6 to 12 month age group can convert feed to egg mass efficiently than others and also it may be due to this age group of layers are so young and energetic than others group. In our study we also found that average feed intake per month was higher in = or < 6 month age group than others group. It may be due to small sample size, unavailable record keeping, improper use of feed and management shortcoming.

7.4.5 Effects of housing pattern of layer farms

Effects of housing pattern on productive performances in layer farms and ANOVA are observed in Table-100-101 and Fig.130-132. In Table-100 the highest value of feed intake per layer per month was in tin shade house (3.53±0.03 kg) and was lowest in straw made house (1.50±0.50 kg). Egg mass per layer per month was highest in semi-paca house (1.69±0.02 kg) and was lowest in straw made house (0.84±0.17 kg). Egg productivity (%) was highest in semi-paca house (91.13±0.79) and was lowest in straw made house (55.00±18.00). Production cost per layer per month was high in tin shade house (142.39±2.04) and was lowest in straw made house (55.00±18.00). Total production cost/m was high in tin shade house (121.81±10.07) and was so lowest in straw made house (2.75±0.90). Selling price of egg per layer was highest in semi-paca house (188.59±3.11) and was lowest in straw made house (93.75±18.75). Total selling price/m was highest in tin shade house (155.84±12.18) and was low in straw made house (4.69±0.94). Net profit was highest in semi-paca house (36.43±5.33) and was low in straw made house (1.94±0.04). The average value of FCR was lowest in straw made house (1.74±0.25) and highest in tin shade house (2.13±0.06). Profit per layer per month was highest in semi-paca house (47.71±5.30 taka) and was low in straw made house (38.75±0.75 taka).

Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m and net profit/m were significantly influenced by housing pattern of layer ($P<0.001$, $P<0.01$ & $P<0.05$) but FCR and profit per layer per month were not significantly influenced by housing pattern of layers farm ($P>0.05$).In a European study, Sekeroglu *et al.* (2008) recorded that the egg yolk color was affected by housing systems, but not for egg weight, which is in accordance with current study.

In our study we observed that average mean values of maximum productive parameters were highest in semi-paca house which showed best performance than tin shade and straw made house. It may be because of semi-pacca house is very comfortable for layers bird.

7.4.6 Effects of floor type of layer farms

Effects of floor type on productive performances in layer farms and ANOVA are presented in Table-102-103 and Fig.133-135. In Table-102 the highest value of feed intake per layer was highest (3.60±0.00 kg) in macha with bamboo floor type of laying house and was lowest (2.55±0.64 kg) in floor with litter type of laying house. Egg mass per layer was highest in bamboo or iron made case (1.72±0.01) and was lowest in floor with litter (1.24±0.24). The average value of FCR was lowest in floor with litter (1.97±0.17) and highest in macha with bamboo (2.56±0.17). Egg productivity (%) was highest in bamboo or iron made case (92.75±0.53) and was lowest in floor with litter (70.00±12.31). Production cost per layer was high in macha with bamboo (142.50±1.90) and was low in floor with litter (98.35±26.08). Selling price of egg per layer was highest in bamboo or iron made case (189.98±2.26) and was lowest in floor with litter (141.38±28.68). Profit per layer was highest in bamboo or iron made case (48.28±3.64) and was very low in macha with bamboo (9.00±2.60). Net profit/m was highest in bamboo or iron made case (38.55±3.29) and was lowest in macha with bamboo (7.77±0.77). Total production cost/m was high in macha with bamboo floor type of laying house (130.05±23.77) and was low in floor with litter (49.78±29.71). Total selling price/m was highest in bamboo or iron made case (159.11±15.28) and was low in floor with litter (67.62±40.55).

Feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, selling price of egg per layer, profit per layer and net profit/m were significantly influenced by floor type of laying house ($P<0.01$) but total production cost/m and total selling price/m were not significantly influenced by floor type of laying house ($P>0.05$).Farooq *et al.* (2002) found feed conversion for egg production was better in cage than in floor housing, which was similar to our findings.

We found that bamboo or iron made case of layers house showed the best performance than others like macha with bamboo floor type of laying house and floor with litter type of laying house. It may be due bamboo or iron made case of layers house is more comfortable for laying hen and here free air flow is available.

7.4.7 Effects of overall housing system of layer farms

Effects of overall housing system on productive performances in layer farms and ANOVA are showed in Table-104-105 and Fig.136-138. In Table-104 the highest value of feed intake per layer was in medium group of overall housing system (3.60±0.15 kg) and was lowest in poor housing system (1.50±0.50 kg). Egg mass per layer was highest in medium housing system (1.72±0.03 kg) and was lowest in poor housing system (0.84±0.17 kg). Egg productivity (%) was highest in medium housing system (91.50±1.50) and was lowest in poor housing system (50.00±10.00). Production cost per layer was high in medium housing system (152.55±9.45) and was low in poor housing system (55.00±18.00). Total production cost/m was high in good housing system (122.41±11.72) and was low in poor housing system (2.75±0.90). Selling price of egg per layer was highest in medium housing system (192.50±3.50) and was lowest in poor housing system (93.75±18.75). Total selling price/m was highest in good housing system (158.51±13.85) and was low in poor housing system (4.69±0.94). Net profit/m was highest in good housing system (36.10±3.71) and was low in poor housing system (1.94±0.04). The average value of FCR was lowest in poor housing system (1.74±0.25) and highest in medium housing system (2.11±0.12).

Profit per layer was highest in good housing system (44.73±4.31) and was lowest in poor housing system (38.75±0.75).

Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were significantly influenced by overall housing of layers farm (P<0.001) but FCR and profit per layer were not significantly influenced by overall housing pattern of layers farm (P>0.05).

We found that overall good housing system of broilers showed the best performances than others in our study. It may be due to layers get more comfort and free air flow in this type of good housing system.

7.4.8 Effects of overall ventilation system of layer farms

Effects of overall ventilation system on productive performances in layer farms and ANOVA are furnished in Table-106-107 and Fig.139-141. In Table-106 the highest value of feed intake per layer was in proper ventilation system (3.49±0.05 kg) and was lowest in poor ventilation system (2.20±0.76). Egg mass per layer was highest in Proper ventilation system (1.72±0.01 kg) and was lowest in poor ventilation system (1.00±0.19). Egg productivity (%) was highest in proper ventilation system (92.94±0.50) and was lowest in poor ventilation system (56.67±8.82). Production cost per layer was high in Proper ventilation system (143.35±2.42) and was low in Poor ventilation system (83.53±30.37). Selling price of egg per layer was highest in proper ventilation system (191.09±2.14) and was lowest in poor ventilation system (111.50±20.79). Total selling price/m was highest in proper ventilation system (164.49±14.56) and was low in poor ventilation system (56.73±52.05). Net profit/m was highest in proper ventilation system (39.62±3.30) and was low in poor ventilation system (3.63±1.69). The average value of FCR was lowest in proper ventilation system (2.03±0.03) and highest in medium ventilation system (2.16±0.17). Total production cost/m was high in proper ventilation system (124.87±12.21) and was low in poor ventilation system (53.11±50.36). Profit per layer was highest in proper ventilation system (47.75±3.54) and was very low in poor ventilation system (27.97±10.79).

Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, selling price of egg per layer, total selling price/m and net profit/m were significantly influenced by overall ventilation system ($P<0.001$ & $P<0.05$) but FCR, total production cost/m and profit per layer were not significantly influenced by overall ventilation system ($P>0.05$).

We found proper excellent ventilation system of layers farm showed best performances than medium and poor ventilation system in our study. It may be due to layers feel more comfort and get free air flow in this type of proper ventilation system.

7.4.9 Effects of feed quality of layers

Effects of feed quality of layers on productive performances in layer farms and ANOVA are summarized in Table-108-109 and Fig.142-144. In Table-108 the highest value of feed intake per layer was in medium quality feed (3.57±0.03 kg) and was lowest in poor quality feed (1.50±0.50 kg). Egg mass per layer was highest in excellent quality feed (1.69±0.01 kg) and was lowest in poor quality feed (0.84±0.17). The average value of FCR was lowest in poor quality feed (1.74±0.25) and highest in medium quality feed (2.15±0.06). Egg productivity (%) was highest in excellent quality feed (92.00±0.63) and was lowest in poor quality feed (50.00±10.00). Production cost per layer was high in medium quality feed (146.46±1.53) and was low in poor quality feed (55.00±18.00). Total production cost/m was high in medium quality feed (132.83±12.45) and was low in poor quality feed (2.75±0.90). Selling price of egg per layer was highest in excellent quality feed (191.87±2.96) and was lowest in poor quality feed (93.75±18.75). Total selling price/m was highest in medium quality feed (166.56±16.05) and was low in poor quality feed (4.69±0.94). Profit per layer was highest in excellent quality feed (61.01±4.56) and was lowest in medium quality feed (37.077±4.08). Net profit/m was highest in excellent quality feed (37.94±2.09) and was lowest in poor quality feed (1.94±0.04).

Feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, profit per layer and net profit/m were significantly influenced by feed quality of layers ($P<0.001$, $P<0.01$ & $P<0.05$).

We found excellent quality feed of layers showed best performances than medium and poor feed quality in our study. It may be due to layers get sufficient balance feed and essential feed ingredients from excellent quality feed in layers farm.

7.4.10 Effects of social status of layer farmers

Effects of social status of farmers on productive performances in layer farms and t-test are observed in Table-110-111 and Fig.145-147. In Table-110 the highest value of feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, net profit/m and profit per layer was in marginal group of social status of farmers as 3.48±0.05, 1.68±0.02, 2.09±0.05, 90.70±1.35, 141.78±2.37, 119.13±10.78, 186.04±3.25, 154.13±12.88, 34.99±3.52 and 44.25±3.99 respectively and was lowest in ultra-poor group of social status of farmers as 1.50±0.50, 0.84±0.17, 1.74±0.25, 50.00±10.00, 55.00±18.00, 2.75±0.90, 93.75±18.75, 4.69±0.94, 1.94±0.04 and 38.75±0.75 respectively.

Feed intake per layer, egg mass per layer, FCR, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, and net profit/m were significantly (P<0.001, P<0.05 & P<0.01) influenced by social status of farmers in layers farm but profit per layer were not significantly influenced by social status of farmers in layers farm (P >0.05).

In our study we observed that average mean values of all productive parameters were highest in marginal group of social status of farmers which showed best performance than ultra-poor group of social status of farmers. It may be due to marginal group of farmers are very much conscious in layers farming and they spend more time and more money for taking care of laying birds and their overall management activities.

7.4.11 Effects of economic status of farmers

Effects of economic status of farmers on productive performances in layer farms and ANOVA are furnished in Table-112-113 and Fig.148-150. In Table-112 the highest value of feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m, net profit/m and profit per layer was highest in > 10000 taka monthly income group as (3.49±0.05), (1.69±0.02), (91.79±1.13), (142.68±2.72), (119.18±13.85), (187.04±3.40), (154.40±16.70), (35.22±4.18), (44.36±4.76) respectively and was lowest in <5000 taka monthly income group as (1.50±0.50), (0.84±0.17), (50.00±10.00), (55.00±18.00), (2.75±0.90), (93.75±18.75), (4.69±0.94), (1.94±0.04) and (38.75±0.75) respectively. On the other hand the highest and lowest value of FCR was as (2.12±0.13) and (1.74±0.25) in the farmers whose income 5000 to 10000 taka and < 5000 taka accordingly.

Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m andnet profit/m were significantly ($P<0.001$, $P<0.01$ & $P<0.05$) influenced by economic status of layer farmers but FCR and profit per layer were not significantly influenced by economic status of layer farmers ($P >0.05$).

In maximum productive parameters we found in our study that the farmers who are in the group of >10000 taka income per month showed best performance than others monthly income group like <5000 taka and 5000 to 10000 taka. It may be due to the farmers of this group are very much conscious and sincere in layers farming and it also may due to they spend more money for proper feeding and management of laying birds than others group.

7.4.12 Effects of educational status of farmers

Effects of educational status of farmers on productive performances in layer farms and ANOVA are showed in Table-114-115 and Fig.151-153. In Table-114 the highest value of feed intake per layer per month was highest (3.41±0.10 kg) in HSC & above education level and was lowest in primary level (3.12±0.43 kg). Egg mass per layer per month was highest in secondary level (1.65±0.09 kg) and was lowest in primary level (1.49±0.17 kg). The average value of FCR was lowest in secondary level (2.02±0.02) and highest in HSC & above (2.11±0.11). Egg productivity (%) was highest in secondary level (89.88±4.32) and was lowest in primary level (81.50±8.55). Production cost per layer was high in HSC & above (139.66±5.15) and was low in HSC & above (125.91±18.10). Selling price of egg per layer was highest in HSC & above (182.46±5.85) and was lowest in primary level (168.00±19.65). Total selling price/m was highest in HSC & above (157.10±28.34) and was low in primary level

(110.64±26.19). Profit per layer per month was highest in secondary level (45.94±4.83) and was very low in primary level (42.09±7.43).

Average mean values of all the parameters as feed intake per layer per month, egg mass per layer per month, FCR, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m, profit per layer per month and net profit/m were not significantly influenced by educational status of farmers (P >0.05).

In our study we observed that average mean values of maximum productive parameters were highest in HSC & above education level of farmers which showed best performance than others educational group of farmers. It may be due to HSC & above education level group of farmers are very much conscious and sincere in layers farming and also they may spend more time & utilize their knowledge for taking care & management of laying birds.

7.4.13 Effects of occupational status of farmers

Effects of occupational status of farmers on productive performances in layer farms and ANOVA are summarized in Table-116-117 and Fig.154-156. In Table-116 the highest mean values of gain/profit per layer per month was highest in farmers who are involved in other activities (60.84±5.08 taka) and was lowest who are involved in business (37.09±5.04 taka). Feed intake per layer per month was highest who are involved in business (3.55±0.04 kg) and was lowest who are involved in agriculture (2.88±0.45 kg). Egg mass per layer per month was highest who are involved in business (1.71±0.03 kg) and was lowest who are involved in agriculture (1.41±0.19 kg). The average value of FCR was lowest who are involved in agriculture (1.98±0.10) and highest who are involved in service (2.26±0.27). Egg productivity (%) was highest who are involved in other activities (92.25±0.75) and was lowest who are involved in agriculture (78.17±9.29). Production cost per layer was high who are involved in business (146.52±2.13) and was low who are involved in agriculture (116.49±20.02). Total production cost/m was high who are involved in business (139.51±16.50) and was low who are involved in agriculture (83.06±28.29). Selling price of egg per layer was highest who are involved in other activities (191.55±4.45) and was lowest who are involved in agriculture (160.75±21.76). Total selling price/m was highest who are involved in business (175.57±21.29) and was low who are involved in agriculture (110.25±37.48). Net profit/m was highest who are involved in other activities (37.49±2.98) and was low who are involved in service (1.94±0.04).

Only average mean values of gain/profit per layer per month were significantly influenced by occupational status of farmers ($P<0.05$) but feed intake per layer per month, egg mass per layer per month, FCR, egg productivity/m (%), production cost per layer per month, total production cost/m, selling price of egg per layer per month, total selling price/m and net profit/m were not significantly ($P>0.05$) influenced by occupational status of farmers in layer farms.

We found that in only one dependent productive parameter like profit per layer per month was significantly influenced by occupational status of farmers. Here, others occupational status of farmers showed the best performances. In other all productive parameters non-significant variation were found. In maximum average mean values, others group of occupational status of farmers showed best performances than agriculture, business and service group of occupational status of farmers. It may be due to others group of occupational status of farmers are conscious and sincere in layers farming and also they may spend more time & money in rearing birds as main business than agriculture, business and service group of occupational status of farmers.

7.4.14 Effects of land owned by farmers

Effects of land owned by farmers on productive performances in layer farms and ANOVA are furnished in Table-118-119 and Fig.157-159. In Table-118 the highest value of feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were highest in >33 decimals land owner as (3.48±0.05), (1.69±0.03), (91.40±1.62), (142.28±2.49), (131.57±12.60), (187.50±3.65), (170.66±14.75) and (39.09±4.01) respectively and was lowest in <5 decimals land owner as (2.55±0.64), (1.23±0.24), (68.25±11.61), (101.10±27.64), (50.22±27.63), (134.88±26.25), (60.16±32.03) and (9.94±6.00) respectively. But the highest and lowest value of FCR and profit per layer per month were (2.08±0.13) &49.70±6.70 and (1.98±0.19) &33.78±7.59 for the farmers who are the owners of 5-33 decimals and <5 decimals land respectively. Feed intake per layer, egg mass per layer, egg productivity/m (%), production cost per layer, total production cost/m, selling price of egg per layer, total selling price/m and net profit/m were significantly influenced by land owned of layer farmers (P<0.001) but FCR and profit per layer were not significantly influenced by land owned of by farmers (P >0.05).

We found that maximum average mean values of productive parameters, >33 decimal land owning group of farmers showed best performance than others. It may be due to this group of land owners are conscious and sincere in layers farming and it also may be due to >33 decimals land owners are near to lower middle class of the society and they spend more money for proper caring and management of the laying birds.

7.4.15 Effects of sex of farmers

Effects of sex of farmers on productive performances in layer farms and t-test are showed in Table-120-121 and Fig. 160-162. In Table-120 the highest value of feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month, selling price of egg per layer per month, FCR, total production cost/m, total selling price/m, profit per layer and net profit/m were for male farmers as (3.46±0.05), (1.67±0.03), (90.06±1.53), (140.54±2.68), (185.57±3.67), (2.09±0.096), (117.74±12.39), (153.03±14.82), (45.03±4.60) and (35.29±4.06) respectively and were lowest for female (2.76±0.54), (1.38±0.23), (76.60±11.33), (111.28±23.68), (150.70±24.33), (1.94±0.11), (77.31±32.17), (98.07±40.15), (39.42±3.38), (20.76±8.38) respectively. Feed intake per layer per month, egg mass per layer per month, egg productivity/m (%), production cost per layer per month and selling price of egg per layer per month were significantly influenced by sex of farmers (P<0.05) but FCR, total production cost/m, total selling price/m, profit per layer per month and net profit/m were not significantly (P >0.05) influenced by sex of farmers.

We found in our study that male farmers showed the best performance than female farmers on productive performances in layer farms. It may be due to male farmers are more conscious and sincere in layers farming and also they may spend more time and utilize their knowledge in rearing of laying hens than female farmers.

CHAPTER 8

STUDY-V

ASSESSMENT THE QUALITY OF DAIRY, BROILER AND LAYER FEED USED UNDER OHOFP OF RAJSHAHI DISTRICT BY PROXIMATE ANALYSIS

CHAPTER 8

Study-V

Assessment the quality of dairy, broiler and layer feed used under OHOFP of Rajshahi district by Proximate Analysis

8.1 INTRODUCTION

The proximate analysis is a scheme for routine description of animal feed stuffs devised in 1865 by Henneberg and Stohmann at Weende's Experiment Station in Germany. It is often referred to as the Weende's System of Analysis and is principally devised to separate carbohydrates into two broad classifications; crude fiber and nitrogen free extract (NFE). The system consists of determinations of water, ash, Crude Fat (Ether Extract), crude protein and crude fiber. As indicated, NFE is a component of the system, but it is measured by difference rather than by analysis.

The important role of nutrition in the success of the breeding and improvement of products, services responsible for livestock development should implement programs to support farmers in proper animal nutrition (Nishimwe *et al.,* 2014). The productivity of indigenous cattle is low as a result of poor genetic potential, poor management practices, harsh environmental conditions, nutritional inadequacies, and diseases (Obese *et al.,* 2013).

The other major obstacle to the development and intensification of animal production in developing countries is an inadequate feed supply (Westhuizen *et al*., 2004), aggravated by the partial and imperfect knowledge of certain physiological norms of animals (Habtamu *et al*., 2010).

Diet is a major factor of success or failure in reproduction because it provides the cow all the energy, protein and minerals needed to meet its maintenance needs during gestation and production (Obese *et al*., 2013). The principal source of feeds is pasture with feed supplementation often limiting in quality and quantity (Ocen, 1999) that result into poor body condition, weight loss, low milk yield and perturbation of resumption of ovarian cycle (Damptey *et al*., 2014).

Improved feeding has a positive effect on reproductive performance including milk production of cattle (Jalil *et al*., 1995). Besides, imbalanced feeding was considered as a factor of high incidence to reproductive disorders in the crossbred cows (Shamsuddin *et al.*, 1998). Moreover, postpartum live weight loss has a direct negative effect on the resumption of ovarian cyclicity in the cows and this could be alleviated by supplying improved and balanced diet (Tomar *et al*., 1985). Several studies on nutritional effect on the productivity of dairy cattle suggest that, feed supplied in particular to cows postpartum should be enough to maintain body condition, to support milk production, as well as to initiate the ovarian cyclicity (Montgomery *et al*., 1985; Butler and Smith, 1989 and Ghosh *et al*., 1993). In perspective of Bangladesh Alam *et al.* (2001) reported that adequate nutrition before and during post-partum period is essential if acceptable oestrus and rebreeding performance are to be achieved in cattle.

The maximum exploitation of production potentiality of an animal depends on their nutritional status which indicates the state whether the nutrient intake is in deficit or excess. It is a fact that not only the deficit of nutrients affect productivity and reproductive performance of animals, but also the excess of certain nutrients supplied to the animals have adverse effects on animal physiology. In addition, supplying excess of nutrients to animals makes the dairying costly. Various factors influence nutritional status of dairy cows such as quantity and quality of feeds supplied to animals, their price and feeding systems. So, it is essential to consider the existing nutritional status when attempts are to be taken for improving the productivity of dairy cattle utilizing available feed resources following various dietary manipulation strategies.

Feeding practices of livestock in Bangladesh are very poor. Dairy farming is expanding with crossbred high yielding cows in urban and peri-urban areas. There is no recognized standard feeding system. The farmers neither have scientific knowledge nor are following any feeding standard to satisfy the nutrient requirements of the cows. They offer daily feed to animals based on the assumption that more is the feed supply higher is the milk yield. Due to lack of available grazing lands, stall-feeding is practiced and sometimes cattle are tethered on the road sides and fallow land. Seasonal and fluctuating supply of rice straw and green grass also creates a great problem in feeding dairy cattle (Rahman *et al.*, 1998).

The poultry farming has now turned into one of the most important division of agriculture throughout the world. It is expanding rapidly as a dynamic industry in South Asian countries like Bangladesh, India and Pakistan. The tremendous role of commercial layers and broilers is to meet the increasing demand of the population for protein by the meats and eggs. Poultry is basically a source of economical, palatable and healthy food protein (Mahesar *et al.* 2010). In Bangladesh, poultry industry is playing a vital role in the economy of the country and providing employment for about 1.5 million people. Presently, there are more than 140 feed mills operating with the capacity of around four million tons of compound feed per annum to meets the high demand of poultry farms.

Poultry feed industry is closely connected to the primary agricultural production and forms an essential component of the food chain. Poultry feeds are known as a complete feeds, since it is prepared in such a way to contain all the vitamins, minerals, energy, protein, and other nutrients essential for proper health of the birds, egg production and growth. It is frequently recognized that feed correspond to the major expenditure of the poultry production. According to Kleyn (1992) feed costs represents 60-80% of the economic inputs in the commercial poultry industry.

In our project areas pellet system of feeding is used in broilers rearing. It is really a modification of the mash system. It consists of mechanically pressing the mash into hard dry pellets or "artificial grains". Pellet is a form of complete feed that is compacted and extruded to about 1/8 inch in diameter and 1/4 inch in long (Banerjee, 1988). The greatest advantage in using pellets is that there is little waste in feeding. The disadvantage is that pellets are expensive-about 1 0 percent more expensive than that of feeds not pelleted. Asha Rajini *et al.* (1998) reported that pellets had better-feed efficiency up to six-week age of birds. On the other had Moran (1990) observed that pelleting of feed improves the body weight of poultry. Bolton and Blair (1977) reported that feed intake of broilers could be up to 10 percent greater with crumble or pellets compared with mash.

Nazri (2003) reported that in poultry production the most important component is the ratio amongst the feed and egg/meat. Different feeds give different results in terms of growth and egg production. To attain the exact quantities of nutrients, it is important to balance the ratio of diets. In Bangladesh the situation of feed is not good enough from the quality point of view because of the seasonal accessibility of local feed ingredients variations. In addition to lack of governmental control and analytical services has further provoked the situation.

Proximate analysis allows us to make legitimate comparisons of feeds on the basis of specific nutrients. This makes it possible to know how much better one feed is than another in terms of specific nutrients.

As far as know, no proximate analysis has been performed to assess the quality of dairy and poultry (broilers and layers) feed used by the farmers within OHOFP areas in Rajshahi district Bangladesh. After considering above all things the following objectives had been undertaken for this study-V.

Objectives:

- To assess and compare the observed values to the standard values of dairy feed used by the farmers in project areas.
- To assess the quality of broiler grower and Layer-1 feeds used by farmers of OHOFP.

8.2 MATERIALS AND METHODS

This experiment (Study-V) was conducted at DLS laboratory, Dhaka from January 2015 to June 2015. 16 (sixteen) feed samples were collected from OHOFP areas of Rajshahi district for the assessment of the quality of dairy, broilers and layers feed used by the farmers by proximate analysis of feed components. Each sample weight was 50-100g. Two samples were roughages and 8 (eight) samples were concentrates feed ingredients of dairy cows which had a standard amount of feed ingredients for each specified by DLS, Dhaka. 3 samples were 3 types of broiler grower feed and another 3 samples were 3 types of Layer-1 feed which were supplied by the specific feed company containing standard amount of feed ingredients of that company.

8.2.1 Sample collection

Dairy and poultry (broilers and layers) feeds randomly used by the farmers in project areas of Rajshahi district were collected and analyzed by Proximate Analysis in the DLS Laboratory, Dhaka for quality assessment.

8.2.2 Analytical methods

For the proximate analysis of poultry feeds Association of Official Analytical Chemists recommended methods (AOAC, 1990) were used to measure the levels of crude protein (CP), total ash (TA), moisture, crude fat (EE) and crude fiber (CF) by DLS laboratory, Dhaka. At the time of proximate analysis of feed components, each feed sample had been replicated three times.

Moisture

An accurately weighed poultry feed sample (10 g) was placed in a petri dish and dried in a previously heated oven at 105 ^{0}C to a constant weight.

Crude Protein (CP)

The micro Kjeldahl method was used for the nitrogen (N) determination and crude protein determined by multiplied with a protein factor (N × 6.25).

Total Ash (TA)

Accurately weighed sample 2gm each was placed in a ceramic crucible and subjected to ashing in a muffle furnace maintained at 550°C until a constant final weight for ash was achieved.

Crude Fat (EE) Content

For the fat extraction approximately 20gm finely ground feeds, was placed in a cellulose thimble paper and fat extraction was carried out using hexane in a 250 mL Soxhlet extractor for 6 hours.

Crude Fiber (CF)

Dietary fiber content of the defatted poultry feed samples was determined by decomposing starch and protein with dilute acid, while fatty material with dilute base, and then filtering and igniting in the muffle furnace at 550°C.

8.2.3 Statistical Analyses

Data was subjected to one way analysis of variance (ANOVA) with the Statistical Package for Social Sciences (SPSS) version 20. The data were expressed as Means ± S.E (Std. Error Mean) and significant differences were made at $p<0.05$. Descriptive statistics for all parameters were calculated in triplicate and reported as Means ± S.E.

Chi-square (χ^2) test and General Linear Model (GLM) test i.e Univariate (Post Hoc) for multiple comprises for observed mean were performed.

8.3 RESULTS

In total of 219 cows, 60 broilers and 22 layers farms were studied under OHOFP in 9 Upazilas of Rajshahi district, Bangladesh. The farmers were randomly used different types of roughages and concentrates feeds for their dairy cows, different types of broiler grower and Layer-1 feeds for their broilers and layers farms. Sixteen (16) feed samples had been analyzed with each three replication. Analysis results, mean tests and one way ANOVA tests are presented in Table 123-132 and Figure- 163-164.

8.3.1 Results of analysis of cow feed

Ingredients of eight concentrates feeds (wheat bran, rice polish, oil cake-mohsina, broken rice, lentil bran, pea bran, maize crust and anchor bran) and two types of roughages feeds (straw and durba grass) were analyzed and the results were presented in Table 133. Among the concentrate feeds wheat bran contained maximum moisture (12.61%) and the lowest was in rice polish (9.62%). In the other nutrient ingredients of concentrate feeds, the ranges of DM, CP, TA, AIA, CF and CF were 87.39-90.38%, 7.18-31.44%, 0.67-16.43%, 0-1.68%, 0.82-38.20% and 0-11.48%, respectively. Furthermore, out of two roughage feeds maximum values of DM (90.64%), TA (15%), AIA (0.56%) and EE (1.3%) were found in straw; and moisture (10.59%), CP (14.33%) and CF (45.71%) were higher in durba grass than straw. Chi-square (χ^2) test showed that the observed values of various feed ingredients were significantly ($P<0.05$) differed at different levels by the standard values of moisture in durba grass; CP in wheat bran, rice polish, broken rice, maize crust and durba grass; TA in rice polish; CF in rice polish, lentil bran and durba grass; and EE in oil cake, maize crust and durba grass (Table 122-127). However in other cases the differences were non-significant ($P>0.05$).

Table-122: Ingredients of eight concentrates and two roughages feed of dairy cows (%)

Feed name	Moisture	Dry Mater (DM)	Crude Protein (CP)	Total Ash (TA)	Acid Insoluble Ash (AIA)	Crude Fiber (CF)	Crude Fat (EE)
Concentrates							
Wheat bran	12.61	87.39	18.81	5.25	0.38	10.37	4.19
Rice polish	9.62	90.38	8.21	16.03	1.68	23.13	11.48
Oil cake (Mohsina)	11.1	88.9	31.44	11.2	0.52	13.34	0
Broken rice	11.18	88.82	8.68	0.67	0	0.82	2.74
Lentil bran	10.34	89.66	14.79	16.43	0.6	28.28	0
Pea bran	12.28	87.72	7.18	1.99	0.2	38.2	0
Maize crust	10.73	89.27	9.47	1.31	0	2.21	0.15
Anchor bran	12.56	87.44	12.7	2.99	0	32.65	0.39
Roughages							
Straw	9.36	90.64	3.6	15	0.56	35	1.3
Durba grass	10.59	89.41	14.33	12.04	0.26	45.71	0.11

Table-123: Ingredients of wheat bran and rice polish of dairy cows feed

Ingredients	Wheat bran				Rice polish			
	Analyzed value	Standard value	Chi-Square value	Sig. level	Analyzed value	Standard value	Chi-Square value	Sig. level
Moisture	12.61±0.58	10-14	0.26	NS	9.62±0.58	07-12	0.41	NS
Dry Mater (DM)	87.39±2.89	86-90	0.58	NS	90.38±2.31	88-93	0.35	NS
Crude Protein (CP)	18.81±0.81	12-15	9.87	**	8.21±0.58	11-14	3.92	*
Total Ash (TA)	5.25±0.51	04-06	0.34	NS	16.03±1.15	07-12	11.71	***
Acid Insoluble Ash (AIA)	0.38±0.06	<01.00	0.29	NS	1.68±0.06	<01.00	2.93	NS
Crude Fiber (CF)	10.37±0.59	10-13	0.51	NS	23.13±1.73	08-14	19.15	***
Crude Fat (EE)	4.19±0.50	03-05	0.40	NS	11.48±1.73	12-18	2.61	NS

Table-124: Ingredients of oil cake (Mohsina) and broken rice of dairy cows feed

Ingredient/Component	Oil cake (Mohsina)				Broken rice			
	Analyzed value	Standard value	Chi-Square value	Sig. level	Analyzed value	Standard value	Chi-Square value	Sig. level
Moisture	11.10±0.58	10-14	0.37	NS	11.18±0.58	11-13	0.92	NS
Dry Mater (DM)	88.90±2.56	86-90	0.47	NS	88.82±2.89	87-89	0.59	NS
Crude Protein (CP)	31.44±1.15	28-30	0.57	NS	08.68±0.58	6-7	6.35	*
Total Ash (TA)	11.20±0.58	12-14	0.90	NS	0.67±	0.5-0.6	0.21	NS
Acid Insoluble Ash (AIA)	0.52±0.06	<1.00	0.07	NS	0±0.0	<0.2	0.30	NS
Crude Fiber (CF)	13.34±1.15	7-10	3.07	NS	0.8±0.06	1.0-1.5	0.12	NS
Crude Fat (EE)	0±2.19	7-10	8.63	*	2.74±0.12	3.0-3.5	0.22	NS

Table-125: Ingredients of lentil bran and pea bran of dairy cows feed

Ingredients	Lentil bran				Pea bran			
	Analyzed value	Standard value	Chi-Square value	Sig. level	Analyzed value	Standard value	Chi-Square value	Sig. level
Moisture	10.34±0.72	10-13	0.40	NS	12.28±0.58	11.00	0.63	NS
Dry Mater (DM)	89.66±2.31	87-90	0.37	NS	87.72±1.73	89.00	0.26	NS
Crude Protein (CP)	14.79±0.58	11-14	0.89	NS	7.18±0.58	10.00	2.59	NS
Total Ash (TA)	16.43±1.15	12	5.57	NS	1.99±0.12	03.00	1.05	NS
Acid Insoluble Ash (AIA)	0.60±0.06	<1.0	0.07	NS	0.20±0.06	<01.00	0.17	NS
Crude Fiber (CF)	28.28±1.15	25-28	18.06	***	38.20±2.31	41.00	1.35	NS
Crude Fat (EE)	0±0.29	1.0	1.25	NS	0±0.21	01.00	1.34	NS

Table-126: Ingredients of maize crust and anchor bran of dairy cows feed

Ingredient/Component	Maize crust				Anchor bran			
	Analyzed value	Standard value	Chi-Square value	Sig. level	Analyzed value	Standard value	Chi-Square value	Sig. level
Moisture	10.73±0.58	10-14	0.57	NS	12.56±1.15	11-15	0.66	NS
Dry Mater (DM)	89.27±1.73	86-90	0.26	NS	87.44±1.73	85-89	0.21	NS
Crude Protein (CP)	9.47±2.52	08-09	6.36	*	12.70±0.58	12-15	0.51	NS
Total Ash (TA)	1.31±0.06	01-02	0.09	NS	2.99±0.49	2.0-5.0	0.48	NS
Acid Insoluble Ash (AIA)	0±0.19	<01.00	0.96	NS	0±0.19	<1.0	0.96	NS
Crude Fiber (CF)	2.2±0.12	2.0-4.0	0.65	NS	32.6±1.73	30-35	0.56	NS
Crude Fat (EE)	0.15±0.03	3.0-5.0	8.12	*	0.39±0.04	1.0-2.0	0.48	NS

Table-127: Ingredients of straw and durba grass of dairy cows feed.

Ingredients	Straw				Durba grass			
	Analyzed value	Standard value	Chi-Square value	Sig. level	Analyzed value	Standard value	Chi-Square value	Sig. level
Moisture	9.36±0.58	10.50	0.56	NS	10.59±0.56	77.00	7.41	*
Dry Mater (DM)	90.64±2.37	89.50	0.41	NS	89.41±2.31	23.00	1.87	NS
Crude Protein (CP)	3.60±0.12	3.90	0.09	NS	14.33±1.15	8.90	10.84	**
Total Ash (TA)	15.00±0.58	14.90	0.14	NS	12.04±0.58	12.80	0.29	NS
Acid Insoluble Ash (AIA)	0.56±0.06	<1.00	0.24	NS	0.26±0.06	<0.50	0.07	NS
Crude Fiber (CF)	35.00±1.15	35.90	0.29	NS	45.71±1.15	23.80	60.85	***
Crude Fat (EE)	1.30±0.07	1.40	0.02	NS	0.11±0.03	2.30	6.26	*

8.3.2 Results of analysis of broiler feed

The major ingredients of a broiler feeds are moisture, dry mater (DM), crude protein (CP), total ash (TA including Ca & P), crude fiber (CF), crude fat (EE) and energy. The results of proximate composition of analyzed broiler feed samples are shown in Table 128 and ANOVA Table 129. Moisture content in broiler feeds for grower was determined in the range of 10.99-15.97%. Among three types of broiler feeds the broiler grower (Nourish) carried highest amount of crude protein (CP) (23.94%) and crude fat (EE) (5.07%). On respect of nutrients ingredients of broiler grower feeds, significant differences ($p < 0.05$) were observed except acid insoluble ash (AIA) (Table-128).

Table-128: Comparison of 3 (three) types of broiler grower feeds used in broiler farms under OHOFP

Ingredient/Component	Br. grower (Nourish)	Br. grower (Quality)	Br. grower (Aftab)	F-value	P-value
Moisture	15.97 ± 0.68^{b}	11.89 ± 0.58^{a}	10.99 ± 0.57^{a}	14.56	**
Dry Mater (DM)	84.03 ± 2.38^{a}	88.11 ± 0.58^{b}	89.01 ± 1.73^{b}	21.05	**
Crude Protein (CP)	23.94 ± 0.54^{b}	22.13 ± 2.89^{ab}	20.74 ± 0.60^{a}	5.73	*
Total Ash (TA)	6.80 ± 0.46^{c}	5.58 ± 0.58^{a}	6.13 ± 0.56^{b}	98.11	***
Acid Insoluble Ash (AIA)	0.43±0.09	0.43±0.58	0.43±0.08	0.00	NS
Crude Fiber (CF)	2.81 ± 0.55^{b}	2.23 ± 0.06^{a}	2.34 ± 0.50^{a}	61.15	***
Crude Fat (EE)	5.07 ± 0.54^{b}	4.60 ± 0.58^{a}	5.03 ± 0.69^{b}	10.87	**

Values are mean ±S.E, S.E= Std Error of Mean**,** in a row different ^{abc} superscript letters indicate significant difference according to Duncan's Multiple Range Test (DMRT), **=Significant at 1% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-129: Analysis of variance of comparison of 3 (three) types of broiler grower feeds used in broiler farms under OHOFP

Feed ingredients	Source of variables	Sum of Squares	df	Mean Square	F-value	P-value
Moisture	Between Groups	42.257	2	21.128	14.56	0.015
	Within Groups	6.738	6	1.123		
Dry Mater (DM)	Between Groups	42.257	2	21.128	21.05	0.008
	Within Groups	100.000	6	16.667		
Crude Protein (CP)	Between Groups	15.448	2	7.724	5.73	0.047
	Within Groups	6.000	6	1.000		
Total Ash (TA)	Between Groups	2.240	2	1.120	98.11	0.000
	Within Groups	6.000	6	1.000		
Acid Insoluble Ash (AIA)	Between Groups	0.000	2	0.000	0.00	1.000
	Within Groups	.060	6	.010		
Crude Fiber (CF)	Between Groups	.569	2	.285	. 61.15	. 0.001
	Within Groups	6.000	6	1.000		
Crude Fat (EE)	Between Groups	.407	2	.204	. 10.87	0.024
	Within Groups	6.000	6	1.000		

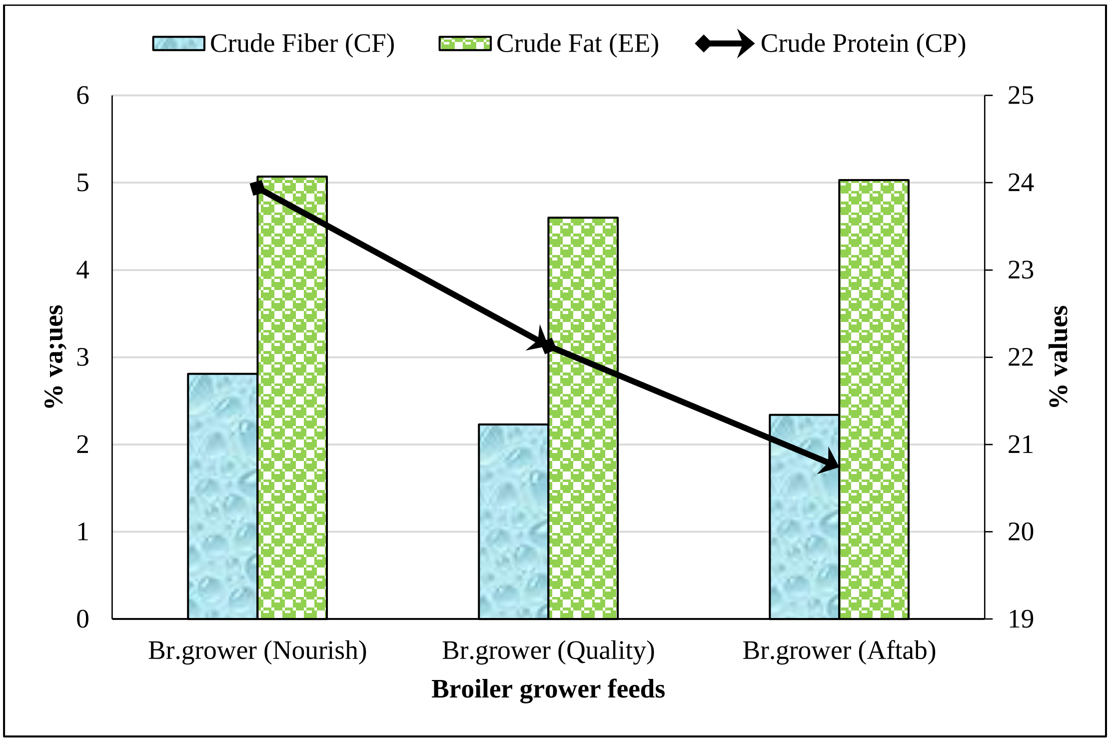

Fig. 163: Graphical representation of mean values of CF, EE and CP in percent values in considering 3 types of broiler grower feeds.

8.3.3 Results of analysis of layer feed

The major ingredients of layer feeds are moisture, dry mater (DM), crude protein (CP), total ash (TA including Ca & P), crude fiber (CF), crude fat (EE) and energy. The results of proximate composition of analyzed layer feed samples are shown in Table 130 ANOVA Table 131. Moisture content in layer feeds in the range of 10.20-10.87%. Among three types of layer feeds the feed of Layer-1 (Nourish) carried highest amount of crude protein (CP) (21.01%) and middle amount of crude fat (EE) (2.49%). The lowest average mean value of CF (2.79%) was found in Layer-1 (Nourish) feed. On respect of nutrients ingredients of layer feeds, the significant differences ($p < 0.05$) were observed in maximum ingredients.

Table-130: Comparison of 3 (three) types of layer-1 feeds used in layer farms under OHOFP

Ingredients	Layer-1(Nourish)	Layer-1(Quality)	Layer-1(Aftab)	F-value	Sig. level
Moisture	10.87±0.79	11.20±0.58	10.74±0.93	0.091	NS
Dry Mater (DM)	89.13±1.73	88.80±2.27	89.26±2.22	0.009	NS
Crude Protein (CP)	21.01 ± 0.64^{b}	18.16 ± 0.92^{a}	18.10 ± 0.58^{a}	5.229	*
Total Ash (TA)	12.63±0.58	11.04±0.87	12.82±0.53	2.083	NS
Acid Insoluble Ash (AIA)	0.55±0.06	0.50±0.09	0.54±0.05	0.160	NS
Crude Fiber (CF)	2.79 ± 0.06^{a}	3.83 ± 0.22^{b}	3.15 ± 0.23^{a}	7.985	*
Crude Fat (EE)	2.49 ± 0.12^{a}	04.36 ± 0.06^{b}	4.85 ± 0.41^{b}	24.772	***

Values are mean ±S.E, S.E= Std Error of Mean**,** in a row different ^{ab} superscript letters indicate significant difference according to Duncan's Multiple Range Test (DMRT), *=Significant at 5% levels, ***=Significant at 0.1% levels and NS=Non-significant.

Table-131: Analysis of variance of comparison of 3 (three) types of layer-1 feeds used in layer farms under OHOFP

Feed ingredients	Source of variables	Sum of Squares	df	Mean Square	F-value	P-value
Moisture	Between Groups	.332	2	.166	.091	.914
	Within Groups	10.933	6	1.822		
Dry Mater (DM)	Between Groups	.224	2	.112	.009	.991
	Within Groups	78.391	6	13.065		
Crude Protein (CP)	Between Groups	16.633	2	8.316	5.229	.048
	Within Groups	9.543	6	1.590		
Total Ash (TA)	Between Groups	5.723	2	2.862	2.083	.206
	Within Groups	8.241	6	1.374		
Acid Insoluble Ash (AIA)	Between Groups	.004	2	.002	.160	.856
	Within Groups	.083	6	.014		
Crude Fiber (CF)	Between Groups	1.674	2	.837	7.985	.020
	Within Groups	.629	6	.105		
Crude Fat (EE)	Between Groups	9.269	2	4.634	24.772	.001
	Within Groups	1.122	6	.187		

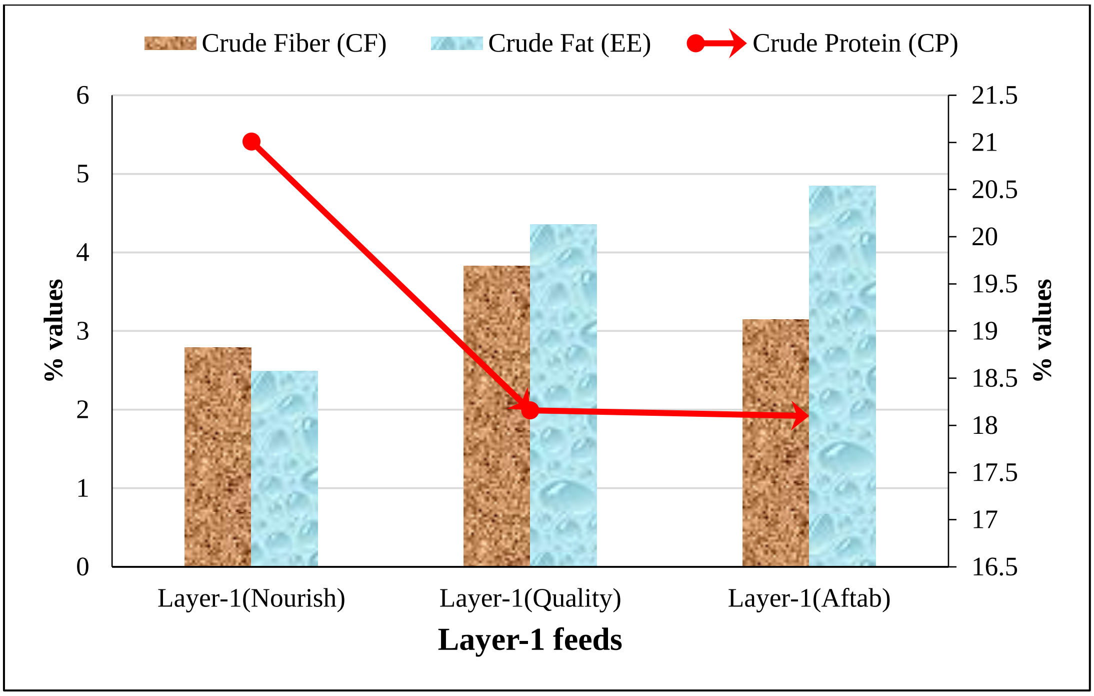

Fig. 164: Graphical representation of mean values of CF, EE and CP in percent in considering 3 types of Layer-1 feeds.

8.4 DISCUSSION

8.4.1 Proximate Analysis of cow feeds

Ingredients of eight concentrates feeds (wheat bran, rice polish, oil cake-mohsina, broken rice, lentil bran, pea bran, maize crust and anchor bran) and two types of roughages feeds (straw and durba grass) were analyzed and the results were computerized in Table-123 and Table-1224-128. Among the concentrate feeds wheat bran contained maximum moisture (12.61%) and the lowest was in rice polish (9.62%). In the other nutrient ingredients of concentrate feeds, the ranges of CP, CF and EE were 7.18-31.44%, 0.82-38.20% and 0-11.48% respectively. The CP content of oil cake (Mohsina) was found to be highest (31.44%) and the lowest CP content was observed in pea bran (7.18%). The highest crude fiber (CF) was reported in anchor bran (32.65%) and lowest was in broken rice (0.82%). The highest EE was found in rice polish (11.48%). Chi-square (χ^2) test showed that the observed values of various feed ingredients were significantly ($P<0.05$) differed at different levels by the standard values of moisture in durba grass; CP in wheat bran, rice polish, broken rice, maize crust and durba grass; TA in rice polish; CF in rice polish, lentil bran and durba grass; and EE in oil cake, maize crust and durba grass (Table-124-128). However in other cases the differences were non-significant ($P>0.05$).

In concentrates feeds our findings were more or less similar to Wahida *et al.*(2014) except oil cake (mohsina) because it is the concentrate feed only for dairy cows. They found the crude protein (CP) content of feed ingredients varied from 8.00 to 14.01%. The CP content of wheat bran was found to be highest (14.01%) and the lowest CP content was observed in rice polish (8.00%). The crude fiber (CF) content of feed ingredients varied from 1.92 to 10.80%. The highest crude fiber (CF) was reported in rice polish (10.80%) and lowest was in broken rice (1.92%). The ether extract (EE) contents of maize, wheat, rice polish, broken rice and wheat bran were 4.70, 1.65, 10.93, 1.76 and 3.97%, respectively. The highest EE was found in rice polish (10.93%) and the lowest EE was found in wheat (1.65%)

For proper growth of dairy cows CP and CF affect positively as they are the essential and very important nutrient gradients in ruminant feeds. The CP influences milk production alone with the body growth of dairy cows; and CF supply energy continuously. Therefore, oil cake (Mohsina) was might be suggested as the best feed ingredient which contained 31.44% of CP. Considering the value of CF (38.2%), Pea bran was the most effective feed for supplying energy (Table-128).

8.4.2 Proximate Analysis of broiler feeds

Among three types of broiler feeds the broiler grower (Nourish) carried highest amount of crude protein (CP) (23.94%) and crude fat (EE) (5.07%). On respect of nutrients ingredients of broiler grower feeds, significant differences ($p < 0.05$) were observed. Heavier broilers were produced by high protein level diets compared to broilers fed low protein diets (Neto *et al.,* 2000).

Crude protein is one of the most important nutrient to quantify in a prospective feeds due to the fact that is one of the most costly to supply and a deficiency of protein has a drastic effect on growth and production. Roy *et al.* (2004) stated that the crude protein content of commercial feeds would appear to be the best criterion of their value for supporting growth and feed conversion in intensively managed broilers. Furthermore, crude fat (EE) is the 2nd most important nutrient in case of broiler feed. Fat makes up about 40% of the dry egg and about 17% of the dry weight of a broiler (Okafor *et al*., 2014).

Hence, Broiler grower (Nourish) feed could be considered as the best feed for broiler grower due to it contained highest CP and EE than broiler grower (Quality) and broiler grower (Aftab) feed (Table-129) .

8.4.3 Proximate Analysis of layer feeds

In case of Layer-1, three types of feeds were tested and the feed Layer-1 (Nourish) carried highest amount of CP (21.01%) out of the rests Layer-1 feeds like Layer-1 (Quality) and Layer-1 (Aftab). On the other hand, lowest CF (2.79%) ingredient was measured in Layer-1 (Nourish). On the basis of CP and CF ingredient the feeds showed significant difference at $p \leq 0.05$ (Table-130). Similar results were found by Okafor *et al*. (2014). He found that crude fiber content of the experimental diets was 2.8 % and 4.2% respectively. These values were below the levels found in the control (Commercial feeds). This is desirable since mono gastric animals do not require a high level of crude fiber in their diets.

However, larger amount of CP and lower CF makes a feed more suitable for layer growth and egg production. Therefore, it might be suggested that among the three feeds tested Layer-1 (Nourish) was the best one other feeds like Layer-1 (Quality) and Layer-1 (Aftab).

CHAPTER 9

SUMMARY AND CONCLUSIONS

CHAPTER 9

SUMMARY AND CONCLUSIONS

To find out the socio-economic impacts of ‘One House One Farm Project’ on dairy and poultry production in Rajshahi district, Bangladesh 5 studies (experiments) were conducted in 9 Upazila of Rajshahi district from January 2013 to December 2015. The summery and conclusions are briefly described separately under 5 studies. These are given below:

STUDY-I

9.1 Present scenario of ‘One House One Farm Project’ of Rajshahi district

This study was conducted to evaluate the effectiveness of ‘One House One Farm Project’ (OHOFP) involving the farmers and money in 6 Agricultural trades such as Fisheries, Poultry, Livestock (Dairy), Nursery, Vegetables and Others using primary and secondary data obtained from 9 Upazila administrative offices of Rajshahi district within the period of January to April 2015. The study investigated that Agricultural trade wise involvement of the farmers in 9 Upazilas were significantly different ($P \leq 0.05$). In OHOFP, a total of 35288 farmers were involved and most of them involved in Livestock (Dairy) trade (22103) and among 9 Upazilas, the highest involvement of 6974 farmers was found in Bagmara. Total mobilization of fund Tk. 3867.05 lac was disbursed among the members of OHOFP. The maximum involvement of loan Tk. 2474.71 lac (63.99%) was recorded in Livestock while the same trade showed near to lowest (33.98%) loan recovery. The members of the societies of OHOFP who took loan on Nursery trade were able enough to recover their loan (76.76%).

The OHOFP was effective to the entrepreneurs showing the abilities to recover loan of the farmers of different trades along with the skill of Upazila administrative offices where Bagha Upazila performed the best (48.25%) and Bagmara Upazila showed the lowest performance to recover loan (23.60%).

In this study-1 it may be concluded that a total number of 35288 farmers and total amount of Tk. 3867.05 lac involved in OHOFP that generated and enhanced IGA (Income Generated Activities) as well as employment and socio-economic opportunities in the rural areas of Rajshahi district, Bangladesh.

STUDY-II

9.2 Factors influencing the productive and reproductive parameters of dairy cows under OHOFP at Rajshahi district, Bangladesh.

A total of 219 dairy cows of five breeds (Local × Local, Local × Friesian, Local × Sahiwal, Local × Jersey and Local × Sindhi) were found in 9 Upazilas of Rajshahi district considering for this study from July 2013 to June 2015.

In all dairy cows, average mean values (mean ± S.E) of age of puberty 25.6±0.3 month, age of first calving 36.9±0.3 month, post-partum heat period 92.4±2.3 day. services per conception 1.3±0.0, gestation length 280.8±0.2day, calving interval 13.6±0.2 month, birth weight of calf 21.7±0.3 kg, milk yield per day per cow 3.7±0.2 liter, lactation length 191.0±4.8 day, total lactation yield 708.3±42.2 liter and total milk selling 31.7±2.0 thousand taka were observed.

There were significant ($P<0.001$) effects of breed (genotype), age, parity, body weight and body condition on the productive and reproductive performances of dairy cows. There were also significant ($P<0.05$) effects of overall housing system, feeding practices, concentrates feed quality, veterinary caring, breeding method and socio-economic status of farmers. Local × Friesian cows produced highest (5.9±0.4 liter) amount of milk per day and Local × Local cows produced lowest (2.0±0.1 liter) milk per day. Milk productions of other breeds (genotypes) Local × Sahiwal, Local × Jersey and Local × Sindhi were not significantly different ($P>0.05$) among them.

Considering productive and reproductive parameters, age of puberty, age of 1st calving, birth weight of calf, daily milk yield per cow, total lactation yield and total milk selling were significantly ($P<0.001$) highly influenced by the breeds (genotypes). Here, Local × Friesian breed showed the highest performances, Local × Local breed showed the lowest performances and Local × Jersey, Local × Sahiwal & Local × Sindhi breed showed the medium performances. The cows of >5 to <7 yr age group, 3rd Parity, >200 kg body weight and healthy body condition were showed the best performances. The cows of concrete housing pattern group, concrete-concrete floor type of house, overall good housing system, proper ventilation system, stall feeding practices, good quality concentrate feed, treated by veterinarian group and artificial insemination group of breeding method showed the best performances. In case of socio-economic status of farmers the cows reared by marginal and >10000 taka monthly income group of farmers showed better performances.

Considering all factors, productive and reproductive parameters, it may be concluded that-

- Local × Friesian genotypes had excellent performances in 9 Upazila of Rajshahi district.
- >5 to <7 years age group of cows showed the best performances.
- Parity-3 showed excellent productive and reproductive performances of cows.
- Body weight of >200 kg showed the best performances.
- Healthy body condition showed the best the performances.
- The cows of concrete housing pattern group, concrete-concrete floor type of house, good condition of overall housing system, proper ventilation system, stall feeding practices, good quality concentrate feed, treated by veterinarian group and artificial insemination group of breeding method showed the best productive performances of dairy cows.
- Artificial Insemination (AI) method showed better performances.
- The cows reared by marginal and >10000 taka monthly income group of farmers showed better performances.

STUDY-III

9.3 Productive performances of broiler farms in OHOFP areas of Rajshahi district, Bangladesh.

A total of 60 broiler farms of three breeds (Cob 500, Hubbard Classic and Ross 308) were considered for this study. Aim of this study was to find out productive performances of broiler farms in project areas under 9 Upazilas of Rajshahi district during July 2013 to June 2015.

In all broiler farms average mean values (mean ± S.E) of feed intake per broiler per month 3.01±0.02 kg, body weight gain per broiler per month 1.73±0.02 kg, FCR 1.75±0.02, production cost per broiler 192.79±1.23 taka/m, total production cost 97.61±6.09 thousand taka/batch, selling price per broiler 216.85±2.31 taka/m, total selling price 109.00±6.64 thousand taka/batch, profit per broiler 25.12±2.10 taka and tnet profit 12.21±1.14 thousand taka/batch were observed. Body weight gain was highest in both Cob 500 and Hubbard Classic as (1.75±0.02 kg) and lowest was in Ross 308 (1.45±0.02 kg) which was significantly ($P<.001$) difference. The mean values of FCR was better in Cob 500 (1.73±0.02) and not good in Ross 308 (2.16±0.02) which was also significantly ($P<.001$) difference.

There were significant ($P<0.001$) effects of broiler strain, chick quality and farm size of broiler farms on productive performances. In managemental factors there were also significant ($P<0.05$) effects of housing pattern, overall housing system, overall ventilation system and feed quality of broilers. In case of socio-economic status of farmers there were slightly significant ($P<0.05$) effects of social status, economic status, education, land owning and sex of broiler farmers.

Considering productive performances, body weight gain per broiler per month, FCR, selling price per broiler and profit per broiler were significantly ($P<0.05$) influenced by the broiler strains. Hence, Cob 500 broiler strain showed the best, Hubbard Classic better and Ross 308 good performances. Excellent quality chick and >600 broilers in a farm showed best performance. In management factors semi-paca house, overall good housing system, overall excellent ventilation system and excellent quality feed of broilers showed best performances. In considering socio-economic status of farmers ultra-poor and <10000 taka income per month group of farmers showed best performances. It is also observed that none education group of farmers, >10 to ≤50 decimal group of farmers and the female farmers showed better performances.

Considering all factors and all productive parameters it may be concluded that-

- Cob 500 broiler strain show the best performance than Hubbard Classic and Ross 308 broilers in our study. So, Cob 500 broiler strain may be recommended as economic and more suitable for rearing under OHOFP areas of Rajshahi district, Bangladesh..
- Excellent quality chick, >600 broilers in a farm, semi-paca house, overall good housing system, overall excellent ventilation system and excellent quality feed of broilers showed best performances on production of broiler farms in project areas.
- Ultra-poor, <10000 taka income per month group of farmers, none education group of farmers and the female farmers showed better performances on production of broiler farms in project areas.

STUDY-IV

9.4 Productive performances of layer farms in OHOFP areas of Rajshahi district, Bangladesh

A total of 22 layer farms of six breeds (Hyline Brown, Hisex Brown, Hyline White, Bovans White, Navogen Brown and Deshi or Local) were considered for this study. Aim of this study was to find out productive performances of layer farms under project areas in 6 Upazilas of Rajshahi district during July 2013 to June 2015.

In all layer farms, average mean values (mean ± S.E) of feed intake per layer per month 3.30±0.14 kg, egg mass per layer per month 1.60±0.06 kg, FCR 2.05±0.05, egg productivity/m 87.00±2.91%, production cost per layer per month 133.89±5.97 taka, total production cost 108.55±12.20 thousand taka/m, selling price per layer per month 177.65±6.61 taka, total selling price 140.54±14.98 thousand taka/m, profit per layer per month 43.75±3.64 taka and net profit 31.99±3.81 thousand taka were observed. The highest mean value of feed intake per layer per month was in Navogen Brown (3.60±0.00 kg) and was lowest in Deshi or Local breed (1.50±0.50 kg). Egg mass per layer per month was highest in Navogen Brown (1.81±0.03 kg) and was lowest in Deshi or Local breed (0.84±0.17 kg). Egg productivity (%) was highest in Navogen Brown (95.00±2.00) and was lowest in Deshi or Local breed (50.00±10.00).

There were significant (P<0.001) effects of breeds, chick quality, farm size and age of layer farms on productive performances. In managemental factors, there were also significant (P<0.001) effects of housing pattern, floor type of laying house, overall housing system, overall ventilation system and feed quality of layers. In case of socio-economic status of farmers there were again significant (P<0.001) effects of social status, economic status (income per month), land owning and sex of layer farmers.

Considering productive performances, feed intake per layer per month, egg mass per layer per month, egg productivity percent, production cost per layer per month, total production cost, selling price per layer per month and gain per layer per month were significantly (P<0.001) influenced by the breeds of layers. Here, Navogen Brown layer breed showed the best performances. Hyline Brown, Hisex Brown, Hyline White and Bovans White showed better performances and Deshi or Local showed the worst performances. The excellent quality chick, farm size of > 500 to < 1000 layers and >6 to 12 month age of layers showed best performance. In management factors semi-paca house, bamboo or iron made case, overall good housing system, overall excellent ventilation system and excellent quality feed of layers showed the best performances. In considering socio-economic status of farmers marginal and >10000 taka income per month group of farmers showed the best production performances. It was also observed that >33 decimal land owners and the male farmers showed better performances.

Considering all factors and all productive parameters it may be concluded that-

- Navogen Brown layer breed show the best performances than other 5 layer breeds like Hyline Brown, Hisex Brown, Hyline White, Bovans White and Deshi or Local in our study. So, Navogen Brown layer breed may be recommended as more economic, profitable and suitable for rearing under OHOFP areas of Rajshahi district, Bangladesh.

- Excellent quality chick, > 500 to < 1000 layers in a farm, semi-paca house, bamboo or iron made case, overall good housing system, overall excellent ventilation system and excellent quality feed of layers showed the best performances on layer production in project areas.
- Marginal, >10000 taka income per month group of farmers, >33 decimal land owners and the male farmers showed the best performances on layer production in project areas.

STUDY-V

9.5 Assessment the quality of dairy, broiler and layer feed used under OHOFP of Rajshahi district by Proximate Analysis

Various feeds were the source of essential energy for proper growth of dairy cows, broilers and layers. Eight types of concentrate and two types of roughage feeds were commonly used in the research areas of Rajshahi district which were analyzed by DLS laboratory, Dhaka within January to June 2015. Concentrates and roughages feed ingredients of cows feeds, feed ingredients of broiler grower and Layer-1 feeds were differed significantly ($P<0.05$). Among the concentrate feeds oil cake (Mohsina) supplies highest CP a very effective feed ingredients for dairy cows. For the sound growth of broiler, CP was also effective nutrient that supplied from broiler grower (Nourish) feed. Among three types of broiler grower feeds i.e. broiler grower (Nourish), broiler grower (Quality) and broiler grower (Aftab), the highest CP 23.94% was found in broiler grower (Nourish) feed and the highest CP (21.01%) was found in Layer-1 (Nourish) feed.

Here, it may be concluded that-

- Broiler grower (Nourish) feed might be suggested to suitable for broiler grower feed than broiler grower (Quality) and broiler grower (Aftab) feeds.
- Layer-1 (Nourish) feed was the best for layer than other feeds like Layer-1 (Quality) and Layer-1 (Aftab).
- In dairy cows among the concentrate feeds oil cake (Mohsina) might be suggested for supplying highest CP than others concentrates feeds for dairy cows at Rajshahi district.

RECOMMENDATIONS

After observing near about three and half years under OHOFP areas of Rajshahi district, some recommendations have been viewed as follows:

- OHOFP is the effective and a very vital program for running Government to reduce poverty in the rural level of Bangladesh. The Marginal and Ultra-poor peoples under OHOFP areas could follow every income generating activities and loan functions of this project for poverty alleviation and socio-economic development.
- Maximum women can be involved in OHOFP activities for empowerment and gender equation.
- Regular and follow up training should be needed for the dairy and poultry (broilers and layers) farmers of OHOFP about scientific farm management.
- Selection of farmers should be done carefully and neutrally without any political interference.
- The amount of loan per farmer should be increased up to 25000 taka and recovery of loan should be ensured in case of livestock as well as other agricultural trades.
- Scientific feeding and management should be needed for dairy cows, broilers and layers.
- Green succulent grass including durba grass and good quality concentrate feeds should be supplied to the dairy cows according to their body weight.
- Hygienic environment and fresh water must be ensured.
- Regular deworming, vaccination should be ensured at study areas of OHOFP
- Strengthening the monitoring by OHOFP authority should be needed.
- Involvement of DLS to the OHOFP should be increased.
- The rural farmers of Rajshahi region of Bangladesh could be reared Local × Friesian breed for cow, Cob 500 strain for broiler and Novogen Brown breed for Layer due to their best performances.
- The farmers could be used broiler grower (Nourish), Layer-1 (Nourish) and oil cake (Mohsina) feeds for broiler, layer and dairy cows, respectively.
- It may also be recommended that further researches can be done under OHOFP areas of Rajshahi district, Bangladesh with other livestock like cattle fattening, heifer, goat, sheep, duck and pigeon rearing etc.

CHAPTER 10

REFERENCES

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REFERENCES

Abdullah Y, Abdullah Nafez A, Al-Beitawi, Murad MS, Rjoup, Rasha I, Qudsieh and Majdi AA 2010. Growth Performance, Carcass and Meat Quality Characteristics of Different Commercial Crosses of Broiler Strains of Chicken. *Journal of Poultry Science,* 47: 13-21.

Abdullah Y, Abdullah Nafez A, Al-Beitawi, Murad MS, Rjoup, Rasha I, Qudsieh and Majdi AA 2010. Growth Performance, Carcass and Meat Quality Characteristics of Different Commercial Crosses of Broiler Strains of Chicken. *Journal of Poultry Science*, 47: 13-21.

Agarwal SB, Bhupal S, Raina VS, Singh RV and Singh K 1997. A study on performance of artificial insemination in Himachal Pradesh. *Indian Journal of Dairy Science*, 50 (3): 213-217.

Ahmed S and Haque QME 1990. Avalable Feed Resources for Small Scale Poultry and Duck Production. *Proceedings of the International Workshop on Crop and Animal Farming System Research, Asian Farming System Nrt-work,* Dhaka, Bangladesh.

Ahmed Z and Islam TS 1987. Cattle breeding programme through artificial insemination in Bangladesh. AI Extension Project Report, Central Cattle Breeding and Dairy Farm (CCBDF), Dkaha.

Aho P 2001. The world's commercial chicken meat and egg industries. In: *Commercial Chicken Meat and Egg Production.* 5th edn. (eds. Bell, D. D. and Weaver W. D.). Pp: 3-17. Kluwer Academic Publishers, the Netherlands.

Alam J 1991. Livestock development strategies in Bangladesh. The Socioeconomic Perspective. Proceeding of workshop on Livestock Development in Bangladesh. BLRI, Savar, Dhaka.

Alam J 1995. Livestock resources in Bangladesh: Present status and future potential. The University Press Ltd., Dhaka.

Alam J, Akteruzzaman M, Rahman A and Ahmed Z 1994. Comparative performance of local and crossbred cows in Bangladesh. Bangladesh Livestock Research Institute. Savar, Dkaha. *Indian Journal of Dairy Science,* 47: 112-117.

Alam MGS and Ghosh A 1988. Reproductive performance of cows; its relation of parity and season. *Bangladesh Veterinary Journal*, 22:51-61.

Alam MGS and Gosh A 1993. Reproductive patterns of rural buffaloes (Bubalus bubalis) in *Bangladesh. Buffalo Bulletin*, 12: 66-69.

Alam MGS and Gosh A 1994. Reproductive performance in cows: it's relationship to parity and season. *Bangladesh Veterinary Journal*, 22:51-61.

Alam MGS, Ghosh A, Mondal AK and Akbar MA 2001. Supplementation and puberty of Zebu calves of Bangladesh. *The Bangladesh Veterinarian,* 18:1-8.

Alam MM 2010. Studies on factors affecting productive and reproductive performance of dairy cows. A Ph.D thesis of Department of Animal Husbandry and Veterinary Science, University of Rajshahi, Bangladesh.

Alam MM, Sarder MJU, Ferdosi Z and Rahman M 2008. Productive and reproductive performance of dairy cattle in Char areas of Bangladesh. *The Bangladesh Veterinary Journal*, 25:68-74.

Ali J. 2007. Livestock Sector Development and Implications for Rural Poverty Alleviation in India. *Livestock Research for Rural Development*, 19(2).

Ali MH 1998. A comparative performance study on the crossbred and indigenous dairy cattle under small holder dairy farming condition in Gaibandha district MS Thesis. Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Ali Y, Jahan S, Islam A and Islam MA 2015. Impact of socio-economic factors on production performance of small and medium size broiler farming in Bangladesh. *Journal of new sciences*, Agriculture and Biotechnology, 15(1):479-487.

Andersson S 2012. Part-time grazing in automatic milking systems - exercise pasture compared to production pasture, Degree project 363, Department of Animal Nutrition and Management, Swedish University of Agricultural Sciences, pp 46.

Ansarey FH 2012. Prospects of poultry industry in Bangladesh. Published in Seminar and Reception of Bangladesh Animal Husbandry Association proceedings; Animal Husbandry and Profession in Bamgladesh-A journey of 50 Years, Pp. 62-63.

AOAC. 1990. Methods of Analysis of the Association of Official Analytical Chemists, 14th Ed., Association of Official Analytical Chemists, Washington, DC.

Asha Rajini R, Kumararaj R, Narahari D, Ravindran R and Sundaresan K 1998. Influence of season, form of feed, dietary energy, age and sex on carcass traits of broilers. *Indian Journal of Poultry Science*, 33: 346-348.

Asimwe L 2007. Effect of breed, season, year, and parity on the reproductive performance of dairy cattle under smallholder production system in Bukoba district, Tanzania. Livestock Research for Rural Development. www.lrrd.org/lrrd21/7/chen21100.htm.

Auldist MJ, Pyman MF, Grainger C and Macmillan KL 2007. Comparative reproductive performance and early lactation production productivity of Jersey × Holstein cows in predominantly Holstein herds in a posture based dairying system. *Journal of Dairy Science*, 90: 4856-4862.

Banerjee GC 1998. Poultry. Third edition, Oxford and IBH Publishing Co. Pvt. Ltd. Calcutta, pp: 120-121.

Barwe VK, Dhingra MM and Tomar SS 1998. Factors affecting breeding efficiency, it genetic and phenotypic relationships with age at first calving in gir cows. *Indian Journal Dairy Science*, 51: 395-398.

BBS (Bangladesh Bureau of Statistics) 1998. The Bangladesh census of agriculture and livestock-1983/84. Vol-1. Structure of Agricultural holding and livestock population Statistical Division, Ministry of Planning, Government of Bangladesh, Dhaka.

BBS (Bangladesh Bureau of Statistics) 2009. Statistical year book of Bangladesh. Ministry of Planning, Dhaka, Bangladesh.

BBS (Bangladesh Bureau of Statistics) 2010. Statistical year book of Bangladesh. Ministry of Planning, Dhaka, Bangladesh.

BBS (Bangladesh Bureau of Statistics) 2014. Statistical year book of Bangladesh. Ministry of Planning, Dhaka, Bangladesh.

Bernet T 2000. The Peruvian dairy sector: Farmer perspectives, development strategies and policy options. Ph.D. Thesis, ETH No 13830, Zurich, Switzerland.

Bhende M J 2006. Production and cost of broiler meat: A case study. Karnataka Agricultural Development and Rural Transformation Center, Research Report 9/ADRT/118. Institute for Social and Economic Change, Bangalore, India, March, 2006.

Bhuiyan AKFH 1995. Genetic lift in the birth weight of local cattle resulting from nucleus bull selection programme. *Bangladesh Journal Animal Science*, 24:1-6.

Bhuiyan AKFH and Sultana R 1994. Analysis of performance of exotic cattle breeds and their crosses in Bangladesh. Proceedings of the 5th World Congress on Genetics Applied to Livestock Production (Guelph, Canada), 20: 355-358.

Bhuiyan SA, Ali A, Bhuiyan AKFH and Bhuiyan MM 2000. Genetic and phenotypic parameters on some economic traits in dairy cows. *Bangladesh Journal Animal Science*, 29:143-152.

Bolanos JM, Meneses A and Forsberg M 1997. Resumption of ovarian activity in zebu cows in the humid tropics. Tropical Animal Health and Production, 28: 237-246.

Bolton W and Blair R 1977. Poultry Nutrition. Ministry of Agriculture, *Fisheries and Food. Bulletin* 174 (London, H.M.S.O.).

Borisutsawat K 1996. Factors affecting adoption of technology by dairy producers at Nongpho Dairy Cooperative. M.S. Thesis, Kasatsert University, Bangkok, Thailand.

Brosaster WH and Brosaster VJ 1998. Body condition score of dairy cows. *Journal of Dairy Research*, 65: 155-173.

Burow E, Thomsen PT, Sprensen JT, Rousing T 2011. The effect of grazing on cow mortality in Danish dairy herds. *Preventive Veterinary Medicine 100*, 237-241

Butler WR and Smith RD. 1989. Interrelationships between energy balance and postpartum reproductive function in the dairy cattle. *Journal of Dairy Science*, 72:767-783.

Chawatama S, Mutisi C and Mupawaenda C 2005. Socio-economic status of smallholder livestock production in Zimbabwe: a diagnostic study. *Listock Research for Rural Development*, 17(12):1-8.

Chowdhury SD, Latif MA and Debnath SC 1993. Appropriate level of education for trainers in backyard poultry raiser’s training programme as determined by their performance. *International Journal Animal Science*, 8:23-26.

Damptey J K, Obese F Y, Aboagye G S, Ayim-Akonor M and Ayizanga R A 2014 Blood metabolite concentrations and postpartum resumption of ovarian cyclicity in Sanga cows. *South African Journal of Animal Science*, Vol. 44, No 1: 10-17.

DARSA-2004. Department of agriculture, Republic of South Africa 2004. Small-scale egg production. This publication is available on the *web:www.nda.agric.za*/publications

Darwash AO, Lamming GE and Williams JA 1996. Estimate of genetic variation in the interval from calving to post partum ovulation of dairy cows. *Journal of Dairy Science*, 80: 227-1234.

Das SC Chowdhury SD Khatun MA Nishibori M Isobe N and Y. Yoshimora 2008. Poultry production profile and expected future projection in Bangladesh. *World's poultry science journal*, 64: 98-118

De Kruif A 1978. Factors influencing the fertility of a cattle population. *Journal of Reproduction and Fertility*, 54:507-518.

Dhara KC, Ray N and Singh R 2006. Factors affecting production of F1 crossbred dairy cattle in West Bengal. Livestock Research for Rural Development www.cipav.org.co/lrrd/lrrd18/4/dhar18051.htm.

DLS (Department of Livestock Services) 1991. A report of livestock. Department of Livestock Services, Dhaka.

DLS 1998. Annual report. Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh.

DLS 2000. Expansions and Activities. Department of Livestock Services. Dhaka. Bangladesh, pp. 31

DLS Department of Livestock Services 2008. A report of livestock. Department of Livestock Services, Dhaka.

Dolberg F. (2009) Poultry Sector Country Review: Bangladesh. FAO, Rome.

Eduvie LO 1985. Factors affecting post-partum ovarian activity and uterine involution in zebu cattle, indigenous to Nigeria. *Animal Reproduction Science*, 8: 123-128.

Farooq M, Miam MA, Durrani FR and Syed M 2002. Egg production Performance of commercial laying hens in Chakwal district, Pakistan. Livestock Research for Rural Development. Volume 14. Number 2. http://www.lrrd.org/lrrd14/2/faro142.htm; Accessed on: 14/12/2015)

Garcia M, Goodger WJ, Bennett T and Perera BMAO 2001. Use of a standardized protocol to identify factors affecting the efficiency of artificial insemination services for cattle through progesterone measurement in fourteen countries. Proceedings of a final research coordination meeting organized by the joint FAO/IAEA held in Uppsala, Sweden, 10-14 May, pp 173-184.

Ghosh A, Alam MGS and Akbar MA 1993. Effect of urea-molasses-mineral block supplementation in postpartum ovarian activity in zebu cows. *Animal Reproduction Science*, 31:61-67.

Gimbi A. 2006. Assessment of reproductive performance of small holder dairy cattle in Rungwe district Tanzania and possible interventions. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 270pp.

Gonzales E, Johan B, Takita TS, Sartori JR and Decuypere E 1998. Metabolic disturbances in male broilers of different strains. 1. Performance, mortality, and right ventricular hypertrophy. *Poultry Science*, 77: 1646-1653.

Grohn YT, Rajawala PJ 2000. Epidemiology of reproductive performance in dairy cows. *Animal Reproductive Science*, 60: 605-614.

Gwazdauskas FC, Wilcox CJ and Thatcher WW 1975. Environmental and managemental factors affecting conception rate in a subtropical climate. *Journal of Dairy Science*, 58: 88-92.

Habib MS 2001. Study on the red Chittagong Cattle an animal genetic resource of Bangladesh. M.S. A thesis of Dept. of Animal Breeding and Genetics, BAU Myminsingh, Bangladesh.

Habtamu L, Kelay B, and Sheferaw D 2010 Study on the reproductive performance of Jersey cows at Wolaita Sodo dairy farm, Southern Ethiopia. *Ethiopian Veterinary Journal*. 14 (3) 53-70

Halim 1992. Comparative economic analysis of local and crossbred dairy cows in a selected area of Dhaka districts, Bangladesh. MSc Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Haskell MJ, Rennie LJ, Bowell VA, Bell MJ, Lawrence AB 2006. Housing system, Milk production, and Zero-Grazing Effects on Lameness and leg injury in Dairy Cows, *Journal of Dairy Science*, 89, 4259-4266.

Herlin AH 1994. Effects of tie-stalls or cubicles on dairy cows in grazing or zero grazing situations. PhD thesis. Swedish Univ. Agr. Sci., Dep. Animal Nutrition and Management, Uppsala, pp132

Hoque MA, Amin MR and Hussen SS 1997. Breeding profiles of Sahiwal Bulls and Native cows in dairy pocket of Bangladesh. *Bangladesh Journal of Animal Science*, 26:147-153.

Hoque MM, Amin MR and Hussen M 1999. Dairy potential of Pabna cows and crossbreds with Sahiwal and Friesian and within and between breed sire effect. *Asian-Australasian Journal of Animal Science*, 12:161-164.

Hossain MK, Hossein MS, Bari FY, Shamsuddin M and Paul RK 2001. Economics of fertility management of small holding dairy farms. *The Bangladesh Veterinarian*, 18: 83-88.

Hossain MM, Alam MM, Rashid MM, Asaduzzaman M and Rahman MM 2005. Small scale dairy farming practice in a selective area of Bangladesh, *Pakistan Journal of Nutrition*, 4(4): 215-225.

Hossain MS 1992. Comparative study on egg production and feed efficiency of different breeds of poultry under intensive and rural conditions in Bangladesh. *Livestock Research for Rural Development,* 4(3) http://www.lrrd.org/lrrd4/3/bangla1.htm.

Hossain ZMA, Hossain SMJ, Sultana N, Rashid MM and MH Ali 2004. Study on the present management condition of private dairy farm at Rangpur Sadar thana in *Bangladesh. Journal of Biological Sciences*, 3:185-188.

Hunter RHF 1982. Reproduction of Farm Animals. ELBS, Longman, London, UK.

Hussain SS, Ali A, Mostafa KG and Hasnath MA 1984. Genetic Investigation on Gestation and Birth Weight of Indigenous Cows and F1 graded calves. *Bangladesh Agricultural Sciences*,11: 1-5.

Imtiaz HSM, Fuquay JW and Younas M 1992. Estrous cyclicity in nonlactating and lactating Holsteins and Jerseys during a Pakistani summer. *Journal of Dairy Science*, 75: 2968-2975.

Integrated Sample Survey 2012-13. Report on Integrated Sample survey for Estimation of Production Milk, egg and meat. Directorate of Animal Husbandry & Veterinary, Government of Meghalaya.

Islam MA 1992. A comparative economic analysis of milk cows and buffaloes in two selected village of Mymensingh district in Bangladesh. M. Sc. Thesis. Department of Agricultural Finance, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Islam MA 1995. An economic analysis of poultry farm of different sizes in some selected areas of Dhaka city. M.S. Thesis submitted to the Department of Agricultural Economics. Bangladesh Agricultural University, Mymensingh.

Islam MA and Sarder MJU 2010. Evaluation of productive and reproductive status of Indigenous and Crossbred dairy cows in Bangladesh. A thesis of Department of Animal Husbandry and Veterinary Science, University of Rajshahi, Bangladesh.

Islam MN, Khatun H, Khatun R, Rashid MA and Rahman M 2011. Biosecurity status and products quality of small scale commercial poultry farms in Bangladesh. Proceedings of Seventh International Poultry Show and seminar, 25-27 March, 2011, WPSA-BB, Dhaka, Bangladesh.

Islam MS 1998. A study on some productive and reproductive parameters of Local×Friesian upgraded dairy cows of Government Dairy Farm, Faridpur. M.S. A thesis, Department of Dairy Science, BAU, Mymensingh, Bangladesh.

Islam MS, Takashi S and Chabbi KQN 2010. Current scenario of the small scale broiler farming in Bangladesh: Potential for the future projection. *International Journal of Poultry Science*, 9: 440-445.

Islam SS and Bhuiyan AKFH 1997. Performance of crossbred Sahiwal at the Pabna milk shed area in Bangladesh. *Asian-Australian Journal of Animal Science*, 10:581-586

Islam SS, Ashraf A and Islam ABMM 2000. A study of the milking and reproduction performances of grazing indigenous cattle at a semi-urban area of Bangladesh. *Asian-Australasian Journal of Animal Science*, 13:837–841.

Jahan SS, Islam MS and Howlider MAR 2011. Performance of exotic, hybrid and indigenous chicken breeds under farm and semi scavenging condition. A thesis of Department of Zoology, University of Rajshahi, Bangladesh.

Jalil MA, Sarker N, Paul DC and Khan AA 1995. Status of existing husbandry practices of dairy cattle at Manikganj, Bangladesh. *Bangladesh Journal of Animal Science*, 24:71-80.

Japri BM, Majid AM, Fauziah HE and Adrien KR 1997. Effects of breed of sire, percentage of Bos taurus inheritance and season of birth on calving performance of crossbred dairy cattle. *Asian-Australasian Journal of Animal Science,* 10: 313-317.

Jensen HA and Dolberg F 2003 A Conceptual Tool for Using Poultry as a Tool in Poverty Alleviation. Revised version. Paper delivered at the International Conference on Staying Poor: Chronic Poverty and Development Policy, IDPM, University of Manchester.

Kanchanasinith P 1999. The Comparative study of knowledge, attitude and practices affecting productivity of dairy farming in Chiang Mai Province. M.S. Thesis, Chiang Mai University, Chiang Mai, Thailand.

Karnal 2005. Total determination of calving interval by path analysis in Sahiwal cattle. Indian Journal of Animal Research, 39: 45-48.

Karume SC, Kimambo AE and Mtenga LA 2013. Assessment of factors affecting performance of dairy cattle kept in smallholder farms in peri-urban areas of Temeke Municipality. M. Sc thesis, page-41.

Kawsar MH, Chowdhury SD, Ali MA, Raha SK and Hossain MM 2013. Management interventions on productivity and profitability of small-scale broiler farming in Bangladesh. A PhD thesis at BAU, Mymensingh.

Keck M, Zahner M, Hauser R 2004. Testing of minimal housing for dairy cows. Recommendations for planning and management. FAT Berichte, Switzerland, 620: 12.

Khan AA, Ali A., Hussain SS and Bhuiyan AKFH 1999. Reproductive performance of different genetic group of cows under farm condition. *Bangladesh Journal of Animal Science,* 28: 59-64.

Khan MAA, Amin MR, Howlider AR and Hussian SMI 1991. Successive Reproductive and Milk yield performance of dairy cows. *Bangladesh Journal of Training and Development*, 4: 31-38.

Khan MKI and Khatun MJ 1998. Performance of F1 crossbred cows at Baghabarighat milk shed area. *Bangladesh Journal of Animal Science,* 27: 183-186.

Khan MR & Roy PC 2003. Credit policy; disbursement and its impact on poultry industry in Bangladesh. Third International Poultry Show and Seminar Dhaka Bangladesh: 43-51

Kirsten JF & van Zyl J 1998. Defining small-scale farmers in the South African context. Agrekon, 37(4) : 560-563.

Kleyn R 1992. Broiler feeding for better returns. Poult. Bullet. 283-286.

Kumar AB, Jana DN, Suman CL, Sexena MM, Sriivastava BB and Pandey HS 1997. Comparative performance of crossbred cows of different levels of exotic inheritance. Livestock production Research (Cattle and buffalo), Indian Veterinary research Institute. Izathnagar 243132, India, *Indian Journal of Animal Production and Management*, 13: 104-108.

Mack SD Hoffmann and J Otte 2005 The Contribution of Poultry to Rural Development. *World's Poultry Science Journal*, 61(1): 7–14.

Magana JG and Segura JG 1997. Heritability and factors affecting growth traits and age at first calving of zebu beef herifers in South-Estern Mexico-Facultal de Medicinal Veterinaria Y. Zooteinia, Universided Autooma de Yuncatan, Apolo 4-16 Merida, Yucaton, 97100 Mexico. *Tropical Animal Health and Production*, 29:185-192.

Mahesar SA, Sherazi STH, Abdul Nia, Bhanger MI, Sirajuddin and Abdul Rauf 2010. Simultaneous assessment of zinc, cadmium, lead and copper in poultry feeds by differential pulse anodic striping voltammetry. *Food and Chemical Toxicology*, doi: 10.1016/j.fct.2010.05.071.

Majid MA, Nahar TN, Talukder AH and Rahman MA 1995. Factors affecting the reproductive efficiency of crossbred cows. *Bangladesh Journal of Livestock Research*, 2:18–22.

Majid MA, Nahar TN, Talukder AI and Rahman A 1998. Reproductive performance of purebreds, F1, F2 and F3 cows raised in Savar Dairy Farm. *Bangladesh Journal of Livestock Research,* 5: 53-62.

Mapiye C, Chimonyo M, Muchenji V, Dzama K, Marufu MC and Raats JC 2007. Potential for value-addition of Nguni cattle products in the communal areas of South Africa: a review. *African Journal of Agricultural Research*, 2(10): 488-495.

Martin RO 1982. Dairy housing environment in Northern Climate for 1980's livestock environment-ii. proc. 2nd International Congress on Livestock Environment, Symposium, 20-23 April, pp 605-613.

Martin SW, Mseek AH and P Willeberg. 1988. Veterinary Epidemiology; Principles and Methods. Iowa State University Press, USA pp 79-114.

Matin MA 1993. Qualitative analysis of milk yield records and genetic ranking of cows in Savar Dairy Farm. M Sc thesis, Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh, Bangladesh.

McDougall S, Williamson NB and Macmillan KL 1995. GnRH induces ovulation of a dominant follicle in primiparous dairy cows undergoig anovulatory follite turnover. Animal Reproduction Science, 39: 205-214.

Miazi OF, Hossain ME and Hassan MM 2007. A comparative account of the productive and reproductive performance of crossbred and indigenous dairy cows at some selected areas of Comilla district. *University Journal of Zoology*, Rajshahi University, 26: 67-70.

Ministry of Livestock and Development, 2008-2009. Pakistan Economy Survey, pp. 32- 37.

Mittal JP, Prasad S and Phillips CJC 1989. A comparison of indigenous with exotic crossbred cattle in dry zone of India. New Techniques in Cattle Production, 1: 242-244.

Monarul MI, Baree MA and Sekender MA 2014. Contribution of Palli Daridro Bimochon Foundation activities on socio-economic development of the beneficiaries in Bangladesh. A PhD thesis submitted the Department of Crop Science and Technology, University of Rajshahi, Bangladesh, Page-222.

Mondol SC, Alam MM, Rashiad MM, Ali MY and Hossain MM 2005. Comparative study on the productive and reproductive performance of different genotypes reared in Bangladesh Agriculture University dairy farm. *Pakistan Journal of nutrition*, 4:222-225.

Montgomery GW, Scott IC and Hudson N 1985. An interaction between season of calving and nutrition on the resumption of ovarian cycles in postpartum beef cattle. *Journal Reproduction and Fertility*, 73:45-50.

Moran ETJr 1990. Effect of pellet quality on the performance of meat birds. Poult. Abst., 16: 2875.

Morrow DA 1980. Analysis of record for reproductive herd heath programmes In Current Therapy in Theriogenology. Edited by DA Morrow WB Sanuders Company. Philadelphia. Toronto. London, Vol-1, 559-562.

Nagare QK and Patel AM 1997. The comparative performance of Geir cross breeds under Moharasta conditions. Department of Animal Science and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri 4137221, District Ahjmednagar, India. *Indian Journal of Animal Production and Management*, 13: 87-92.

Nahar N, Mostafa KG and Amin MR. 1989. A comparative study on the performance of F1 crossbred cows. *Bangladesh Journal of Animal Science*, 18: 55-62.

Nahar TN Islam M and Hasnath MA 1992. A comparative study on the performance of F1 crossbred cows under rural conditions in and around the BAU campus, *Asian-Australasian Journal of Animal Science*, 5: 435-438.

Nazmul H 2007. Factors affecting reproductive performance of Dairy cows in Milk pocket Areas of Northern Bangladesh. MS Thesis, Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Nazri MM 2003. Development of poultry industry. Economic review. Available online at: Nazri, M.M.. "Development of poultry industry", *Economic Review*, March 2003 Issue.

Neto M, Pesti GM and Bakali RI 2000. Influence of dietary protein level on broiler chickens response to methionine and Betaine supplements. *Poultry Science*, 79: 1478-1484.

Nishimwe K, Sserumaga P, Manishimwe R, Byukusenge M, Habimana R and Bareba F 2014. Assessment of nutritional status of cattle in Rwanda: A case of Huye District. *Journal of Livestock Research for Rural Devrlopment*, 26:12(1-8).

Obese F Y, Acheampong D A and Darfour-Oduro K A 2013 : Growth and reproductive traits of Friesian x Sanga crossbred cattle in the Accra plains of Ghana. *African Journal of Food, Agriculture, Nutrition and Development*. Volume 13

Ocen G W 1999: Feeding strategies for sustainable cattle production on Swazi nation land. *UNISWA Journal of Agriculture*, Volume 8:31-38

Okafor N and Ezebuo FC 2014. Proximate analysis and antinutrient composition of poultry feed containing two replacement levels of *mucuna pruriens* for soy bean meal. *World Applied Sciences Journal*, 32 (2): 201-206, 2014

Osawa T, Nakao T, Nakada K, Moriyoshi M and Kawata K 1996. Pituitary response to exogenous GnRH on day 7 post-partum in high producing dairy cows. Reproduction in Domestic Animals, 31: 343-347.

Otte J, Pica- Ciamarra U, Ahuja V and Gustafson D 2009. Supporting Livestock Sector Development for Poverty Reduction. Issues and Proposals. *PPLPI Research Report* 09–01, FAO, Rome.

Pakage S, Hartono B, Fanani Z and Nugroho B A 2015. Analysis of technical, allocative and economic efficiency of broiler production using closed house system in Malang District of East Java Indonesia. *Livestock Research for Rural Development*, 27 (9) 2015

Parera O 1999. Management of reproduction in small holder dairying in the tropics (Ed. by, Falvey, L. and Chantalakhana, C.), ILRI, Nairobi, Kenya, pp. 241-264.

PD OHOFP report 2013. Annual report of OHOFP head office, Dhaka approved by Rural Development and Cooperative Division, Ministry of LGRD & Cooperatives.

Pereira MN, Silva HM and Reis RB 1995. Effect management on reproductive performance in a dairy herd. *Journal of Animal Science*, 47: 181-190.

Pica Ciamarra U and Otte J 2010 Poultry, Food Security and Poverty in India: Looking beyond the Farm-gate. *World's Poultry Science Journal*, 66(2): 309–320.

Planning Commission 2011. A yearly report of Planning Commission under Ministry of Planning, Government of the People's Republic of Bangladesh.

Rabbani MS, Alam MM, Ali M YS, Rahman MR and Saha BK 2004 Participation of Rural People in Dairy Enterprise in a Selected Area of Bangladesh. *Pakistan Journal of Nutrition*, 3: 29-34.

Raha SK 2013. Poultry industry in Bangladesh: ample opportunities for improvement. In: proceedings of the seminar ,8th international Poultry Show and Seminar2013.World's *Poultry Science Association*, Bangladesh Branch,pp.13-19.

Rahaman SMA, Sayeed MA, Sarkar NR and Alam J 2006. Impact of improved poultry management technique on socio-economic condition of broiler beneficiaries. *Journal of Bangladesh Agricultural University*, 4: 401-411.

Raheed MG 2002. Production performance and improvement of the dairy cattle in relation to nutrition. PhD Thesis, Department of Zoology, Faculty of Life and Earth Sciences, Rajshahi University, Bangladesh.

Rahman MA, Alam MGS and Das SC, 1995. Assessment on reproduction status of zebu heifer and cows in Tangail milk shed Area. *Bangladesh Veterinary Journal*, 29: 17-24.

Rahman MF 1993. An economic study of dairy enterprise in two-selected area of Bangladesh Agricultural University, Mymensingh, Bangladesh. MSc Thesis. Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Rahman MF, Hossain MS and Prodhan MAM 1993. Reproductive problems of cattle in Bangladesh. *The Bangladesh Veterinarian*, 10: 71-73.

Rahman MM, Akhtar S and Hossain MM 1998. The availability of livestock feeds and feeding practices followed by the farmer of some areas of Mymensingh District. *Bangladesh Journal of Animal Science*, 27:119-126.

Rahman MM, Akhter S, Rabbani MS and Hossain MM 1999. Indigenous knowledge on livestock practiced by the farmers in Mymensingh District of Bangladesh. *Bangladesh Journal of Animal Science*, 28: 97-103.

Rahman S 2015. Management of Broiler Farms in Aizawl District of Mizoram, India. Livestock Research for Rural Development. Volume 27, Article #61. Retrieved October 24, 2015, from http://www.lrrd.org/lrrd27/4/rahm27061.html

Randel RD 1990. Nutrition and post-partum rebreeding in cattle. *Journal of Animal Science*, 68: 853-862.

Rashid MM, Roy BC, Asaduzzaman M and Alam MM 2007. Study of the Dairy Cattle Management System at Farmer's Level in Jessore District of Bangladesh. *Pakistan Journal of Nutrition*, 6: 155-158.

Ribeiro HFL, Andrade VJ, de Marques JrAP, Vale WG and De-Anbdrede VJ 1997. Effect of body condition at parturition on the interval to first post-partum oestrus in buffaloes. *Revista Brasileira de Medicina Veterinaria*, 19: 213-218.

Roenigk WP 1999. World poultry consumption. *Journal of Poulttry Sciience*, 78: 722-728

Rokonuzzaman 2006. Study on the productive and reproductive performances of cross bred and indigenous cows under small holder dairy farming condition at Sarsha thana in Jessore district, MS Thesis. Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Roy B C, Ranvig H, Chowdhury S D, Rashid M M and A Chwalibog 2004. Evaluation of compound broiler feeds manufactured in Bangladesh. "http://www.lrrd.org/lrrd16/11/roy16093.htm" \l

Roy PK and Tripathi VN 1992. Factors affecting age at first calving in Friesian × Sahiwal or Tharparkar crossbreeds. *Indian Veterinary Journal*, 69: 908-911.

Saacke RG, Dejarnett GM, Nebel RL and Nadir S 1991. Assessing bull fertility. Proc. Annual Meeting of Society for Theriogenology San Diego, California, pp 56-69.

Sainsbury DWB 1981. Health problem in intensive animal production. In: Clark JA (Editor). Environment Aspect of Housing for Animal Production.

Saleque MA 2010. Livestock and Livelihood - The role of BRAC in Livestock Development in Bangladesh, Paper for Workshop on "Review of Livestock Research Programs and Preparation of Future Research" Organized by BRAC.

Sarder MJU 2001. Reproductive and productive performance of indigenous cows. *The Bangladesh Veterinarian*, 18:123-129.

Sarder MJU 2006. Study on the influence of sire on reproductive and productive capability of dairy cows used for artificial insemination programme at greater Rajshahi district. Rajshahi University Studies, Part-b, *Journal of Sciences*, 34: 237-253.

Sarder MJU 2008. Occurrence of reproductive disorders in crossbred cows of North Bangladesh. Published in proceeding paper of 15th International Congress on Biotechnology and animal Reproduction, held in 6-7, August, 2008 at Bangladesh Agricultural University, Mymensingh, Bangladesh, p:74-75.

Sarder MJU and Islam MK 2001. Effect of genetic group and parity of cows on reproductive parameters in mini dairy farm. Progressive Agriculture, 12: 121-125.

Sarder MJU and Rashid SMH 2005. Effect of feed quality on reproductive and productive performance of cross-breed dairy cows in rural area of Bangladesh. *Journal of Biological Science*, 13:45-54.

Sarder MJU, Rahman MM, Ahmed S, Sultana MR, Alam MM and Rashid MM 2007. Consequence of Dam genotypes on Productive and Reproductive performance of Dairy Cows under the Rural Condition in Bangladesh. *Pakistan Journal of Biological Sciences*, 10: 3341-3349.

Sarder MJU, Shamsuddin M, Bhuiyan MMU and Rahman MA 1997. Individual Cow as determinant of the fertility and productivity in mini Dairy farms. *Bangladesh Veterinary Journal*, 31: 91-98.

Sarker MA 1995. Economic analysis of Dairy Cattle Enterprise and its pattern of contribution to farm income in a selected area of Bangladesh. MSc Thesis Department of Agriculture Economics, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Sekeroglu A, Sarica M, Demir E, Ulu tas Z, Tilki M and Saatci M 2008. The effects of housing system and storage length on the quality of eggs produced by two lines of laying hens. Arch. Geflugelk, 72: 106-109.

Shamsuddin M, Alam MGS and Ahmed JU 1988. Reproductive disorders in cross-bred zebu cows. *Bangladesh Veterinary Journal*, 22: 121-128.

Shamsuddin M, Bhuiyan MMU, Chanda PK, Alam MGS and Galloway D 2006. Radioimmunoassay of milk progestrone as a tool for fertility control in smallholder dairy farms. *Tropical Animal Health and Production*, 38: 85-92.

Shamsuddin M, Bhuiyan MMU, Skder TK, Chanda PK and Alam MGS 1998. Post partum intervals to the initiation of luteal activity, first service and conception of cows in AI programme in Bangladesh. Proceeding of Bangladesh Society for Veterinary Education and Research (BSVER), Symposium on Veterinary Services in Bangladesh for the next decades, Bangladesh Agricultural University, Mymensingh 14:15.

Shamsuddin M, Bhuyan MMU, Sikder TK, Sugulle AH, Chandra PK and Alam MGS 2001. Constraints limiting the efficiency of artificial insemination of cattle in Bangladesh. *International Atomic Energy Agency, IAEA*-TECDOC-1220:9-27.

Shamsuddin M, Goodger WJ, Hossein MS, Azizunnesa BT and Nardlund K 2006. A survey to identify economic opportunities for smallholder dairy farms in Bangladesh. *Tropical Animal Health and Production*, 38: 31-140.

Shamsuddin M, Rahman MA and Sarder MJU 1995. Management related variations in the health and fertility status of cows in mini dairy farms. *Bangladesh Journal of Animal Science*, 24: 7-17.

Singh A, Taylor CM and Sighth BN 1999. Factors affecting calving interval in Malvi cattle. Livestock Advisor, 8: 9-11.

Singh B 2003. Role of Backyard Poultry in improving Socio-economic status of Rural People. Compendium, Winter School on Technical advances in Livestock and Poultry Production and Management –Special Reference to Rural Development, PAU, 21st November to 11th December 2003, 185-187

Steel RGD and Torrie JH 1980. Principles and procedures of statistics : a biometrical pproach. 2nd edition. New York: McGraw-Hill, 633 p.

Sultana R 1995. Quantitative analysis of reproductive performance of pure breed and their cross in the Savar dairy farm. MSc Thesis, Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh, Mymensingh, Bangladesh.

Syed M, Rehman A, Farooq M and Ali M 1998. Production performance of Sahiwal and various grades of cross bred cattle. Animal Breeding, Abstract, 66: 209.

Tadelle D and Ogle B 1996. Studies on village poultry production in the central highlands of Ethiopia. Integrated Farming in Human Development Proceedings of a Workshop held in March 25-29, 1996, Tune Landboskole, Denmark.

Tadelle D, Million T, Alemu Y and Peters KJ 2003. Village chicken production systems in Ethiopia: 1. Flock characteristics and performance. *Livestock Research for Rural Development*, 15 (1):2003. www.lrrd.org/lrrd15/1/tadea151.htm

Talukder MSU, Hoque MN, Hossain MI, Aziz SA and Rahman MR 2001. Effect of different genotypes of milk yield and reproductive performance of cows. *Pakistan Journal of Biological Science*, 4: 1421-1424.

Than UHA, Aungmyatt U, Daw SUKYI and Yehtun UWIN 2001. Improvement of cattle Production in Mymensingh. Progesterone RIA to Increase Efficiency and Quality of Artificial Insemination Services. In Radioimmunoassay and related techniques to improve artificial insemination programmes for cattle reared under tropical and sub-tropical conditions. Proceedings of a final Research Co-ordination Meeting organized by the joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and held in Uppsala, Sweden, 10-14 May.

Thijae K. 1999. Sustainable environmental management of small dairy farmers in Chiang Mai Province. M.S thesis, Chiang Mai University, Chiang Mai, Thailand.

Tibbo K, Wiener G and Fielding D 1994. A review of the performance of Jersey breed of cattle and it's crosses in the tropics in relation to the Friesian or Holstein and indigenous breeds: Anim. Breed. Abstract 10: 719-729.

Tomar OS, Sarma PA, Verma GS and Nag P 1985. Effect of plane of nutrition on growth, reproductive performance and milk production in Karan-Swiss animals. World Review Animal Production, 21:45-48.

Tong AKW, Kennedy BW, Chicoine RL, Moxley GL and Moxley JE 1979. Reproductive efficiency of artificially bred Holsteins in Quebec. Animal Breeding, Abstract, 48: 584.

Wahab S, Jainudden MR and Aziuddin K 1990. Monitoring reproductive performance of crossbred dairy cattle on small holder farms in Malaysia. Department of Veterinary of Clinical Studies. Agricultural University of Malayia. Proceedings of the final research coordination meeting, 5-9 September, Vienna. Organized by the joint FAO-IAEA 12: 35-43.

Wahida P, Chowdhury SD, Raha SK, Jasimuddin MK and Ali MA 2014. Development of cost-effective feeding technology for improved productivity of indigenous (desi) ducks in coastal areas of Bangladesh. PhD thesis submitted to the Department of Poultry Science. Bangladesh Agricultural University, Mymensingh.

Westhuizen R R, Westhuizen J and Schoeman S J 2004 : Genetic relationship between feed efficiency and profitability traits in beef cattle. *South African Journal of Animal Science*, Vol. 34 (Supplement 2): 50-52.

Wildman EE, Jones GM, Wanger PE and Lesch TN 1982. A dairy cow body condition scoring system and its relationship to selected production characteristics. *Journal of Dairy Science*, 65: 495-501.

Wright IA, Rhind SM, Smith AJ and Whyte TK 1992. Effects of body condition at calving and feeding level after calving on LH profiles and the duration of post-partum anestrus period of beef cows. *Journal of Animal Reproduction*, 55: 41-46.

Yeamkong S, Koonawootrittriron S, Elzo MA and Suwanasopee T 2010. Effect of experience, education, record keeping, labor and decision making on monthly milk yield and revenue of dairy farms supported by a private organization in central Thailand. *Asian-Australian Journal of Animnal Science*, Vol. 23, No. 6: P- 814 – 824.

Zafar AH, Ahmad M and Rehman SU 2008. Study of some performance traits in Sahiwal cows during different periods. *Pakistan Veterinary Journal*, 28: 84-88.

Zu-Fengxun and Zun FX 1997. Conception rate of cows and analysis of its correlations. *China Dairy Cattle*, 4: 30-31.

APPENDICES

APPENDIX-I

Questionnaire

Title: Impact of 'One House One Farm Project' on Dairy and Poultry Production in Rajshahi district, Bangladesh

Questionnaire used for interviewing Dairy Cow owners.

General Information about Dairy Cow Owners:

1. Farmers Name, Address & Family Status:

Name, Age & Sex -
Father's Name-
Mother's Name-
Name of Spouse-
Village- P. O-
Upazila- District-
Contact Number- Family Member- Income-

2. Farmer's Education: (Put tick ✔ Mark)
(i) None or Sign (ii) Primary (iii) Secondary (iv) Above

3. Farmer's Occupation: (Put tick ✔ Mark)
(i) Agriculture (ii) Business (iii) Service iv) Others

4. Farmer's Land holding
(i) Homestead Land ☐ acre
(ii) Cultivated Land ☐ acre

5. Farmers Statues: **(**Put tick ✔ Mark)
(i) Ultra poor (ii) Marginal (iii) Rich

<u>**Information about Dairy Cow:**</u>

6. Number of Dairy Cow: Mention the number ....

7. Individual information: (i) Cow ID....................(ii) Age ....
(iii) Puberty ....

8. Breed: (i) Indigenous (Local × Local) ....
(ii) Cross bred (Local × Friesian) / (Local × Sahiwal) / (Local × Jersey) / (Local × Sindhi) ......
(iii) Breed: (F_1, F_2, F_3 ....)
(iv) Parity: parity 1/ parity 2/ parity 3/ parity 4/ parity 5/ above

9. Vaccination: (Put tick ✔ Mark**) (**i) Regular (ii) Irregular (iii) None

10. De-warming: (Put tick ✔ Mark) **(**i) Regular (ii) Irregular (iii) None

11. Treatment by: (Put tick ✔ Mark)
(i) Veterinarian (ii) Quack doctors and (iii) Others

12. Age of Cow .... months

13. Body weight of Cow .... kg

14. Body condition: (i)Healthy (high/moderate/poor) (ii)Weak

15. Roughages feed types (kg/cattle)
(i) Straw .... Tk. .... /kg
(ii) Green grass .... Tk. .... /kg

(iii) Others .... Tk ..../kg

16. Concentrate feed types (kg/cattle)

(i) Wheat bran .... Tk .... /kg
(ii) Rice polish .... Tk. ..../kg
(iii) Oil cake .... Tk. ..../kg
(iv) Broken rice .... Tk. ..../kg
(v) Broken Kheshari ....Tk. .... /kg
(vi) Pea bran .... Tk. ..../kg
(vii) Lentil bran .... Tk. ..../kg
(viii) Anchor bran .... Tk. ..../kg
(ix) Maize crust ....Tk. /kg
(x) Salt .... Tk. ..../kg
(xi) Others .... Tk. ..../kg

17. Concentrate feed service: (Put tick ✔ Mark)

(i) One time/day in Morning (ii) Two times/day in morning & evening
(iii) Three times/day in Morning, Afternoon & Night

18. Feeding practices: (Put tick ✔ Mark)

(i) Stall feeding (ii) Stall + Tethering (iii) Stall + Grazing (iv) Only grazing

19. Housing condition: **(**Put tick ✔ Mark)

(i) Separate (ii) Dwelling house (iii) Closely dwelling adjacent with house

20. Housing Type: **(**Put tick ✔ Mark)

(i) Concrete (ii) Semi concrete (iii)Straw made

21. Floor type (Put tick ✔ Mark)

(i) Concrete-concrete (ii) Muddy-concrete (iii) Muddy-muddy

22. Ventilation: **(**Put tick ✔ Ma**rk)**

(i) Proper-ventilated (ii) Moderate-ventilated (iii) Poor-ventilated

23. Cleaning schedule: **(**Put tick ✔ Mark)

(i) Regular (ii) Occasional (iii) Irregular

24. Reproductive management (Dairy Cow):

(i) Date of birth....................................
(ii) Age of puberty ....
(iii) Age of first calving ....
(iv) Heating time/Post partum heat period .... Days After calving
(v) Number of services required for conception (sc) ....
(vi) Calving interval............months
(vii) Cow weight at puberty.. kg
(viii) Gestation period ....Days

25. Yield of dairy Cow: (Put tick ✔ Mark)

(i) Average daily milk yield .... liter
(ii) Lactation length .... days
(iii) Total lactation yield .... liter
(iv) Peak milk yield .... liter
(v) Birth weight of calf ....kg
(vi) Sex of the calf: Male/Female
(vii) Milk selling .... Tk/liter
(viii) Number of milking per day: Once/Twice/Thrice/Several times
(ix) Hide value of Dairy Cattle..........Tk./piece

26. **Name of diseases out break in Dairy Cattle:** (Put tick ✔ Mark)
(i)Anthrax (ii) Foot & Mouth Disease (iii) Mastitis (iv) Brucellosis
(v) Respiratory Disease (vi) Ephemeral fever (vii) Black Quarter
(viii) Hemorrhagic Septicemia (ix) Anaplasmosis (x) Other disorders/Disease

27. **Reproductive Disease:** (Put tick ✔ Mark)
(i). Dystocia (ii) Retained placenta (iii) Abortion (iv) Still birth (v) Vagina prolapsed (vi) Uterine prolapsed (vii) Anestrus (viii) Repeat breeding (ix) Milk fever (x) Mastitis (xi) Pyometra (xii) Metrities

<u>Administrativive Information about Dairy Cow Owners:</u>

28. **Got Loan/Subsidy from:** (Put tick ✔ Mark)
(i) BRDB (ii) Upazila Livestock Office (iii) Upazila Youth Development Office
(iv) Grameen Bank/Any other Bank (v) BRAC/ PRASHIKA/ASA/Any other NGO

29. **If got loan:** How much amount .... Tk.

30. **Got any other services from :** (Put tick ✔ Mark)
(i) UNO Office/AC Land Office (ii) Upazila Co-operative Office (iii) ULO (iv) BRDB Office (v) UYDO Office (vi) BRAC Office (vii) Other GO/NGO

31. **Got any services from:** (Put tick ✔ Mark)
(**i**) Upazila Chairman (ii) Upazila Vice Chairman (iii) Local M. P (iv) Political Leaders (v) Any other Persons/Organization

32. **Got Training about Dairy Production from:** (Put tick ✔ Mark)
i) BRDB (ii) Upazila Livestock Office (iii) Upazila Youth Development Office (iv) Garmeen Bank/Any other Bank (v) BRAC/ PRASHIKA/ASA/ Any other NGO/Privet organization

33. **Got any Loan from 'One House One Farm Project'?** Yes / No

34. **Got any Service from 'One House One Farm Project'?** Yes / No

35. **If yes:** (i) Supply of Dairy Cow (ii) Supply of poultry/Broilers/Layers (iii) Supply of Free services/ Free Vaccine

36. Indigenous knowledge on Dairy cow management (feeding, breeding, health care)

Types of knowledge	Purpose
(i)	(i)
(ii)	(ii)
(iii)	(iii)

37. **Problems faced by farmers for raising Dairy Cows**
(i)
(ii)
(iii)

38. **Overall suggestions for Dairy Production:**
(i)
(ii)
(iii)

Signature/hand sign of Farmer
Name of the farmer

....
Signature of Interviewer/Investigator Date & Place
Full Name

APPENDIX-II

Questionnaire

Title: Impact of 'One House One Farm Project' on Dairy and Poultry Production in Rajshahi district, Bangladesh

Questionnaire used for interviewing Poultry (Broilers & Layers) owners.

General Information about Poultry (Broilers and Layers) Owners:

1. Farmers Name, Address & Family Status:

Name, Age & Sex -
Father's Name-
Mother's Name-
Name of Spouse-
Village- P. O-
Upazila- District-
Contact Number- Family Member- Income-

2. Farmer's Education: (Put tick ✔ Mark)
(i) None or Sign (ii) Primary (iii) Secondary (iv) Above

3. Farmer's Occupation: (Put tick ✔ Mark)
(i) Agriculture (ii) Business (iii) Service iv) Others

4. Farmer's Land holding
(i) Homestead Land ☐ acre
(ii) Cultivated Land ☐ acre

5. Farmers Statues: **(**Put tick ✔ Mark)
(i) Ultra poor (ii) Marginal (iii) Rich

<u>**Information about Poultry (Broilers and Layers)**</u>**:**

6. Number of Poultry reared by farmers: mention number- ....

7. Chicken: Breed – Sonaly/Isha-brown /Bebcob BV 300/ Leghorn/ Fahimi/ Deshi/ Novogen Brown/Hisex Brown/White/Shaver brown/black/Brown neck/Hyline Brown/White/Bablona harco
(i) Laying hen (Hyline Brown/White, Hisex Brown/White, Novogen Brown and Deshi/Local) (ii) Broilers (Cob 500, Habbard Classic and Ross 308).

8. Rearing System of Poultry: (Put tick ✔ Mark)
(i) Scavenging (ii) Semi-scavenging (iii) Close/confine-housing

9. Feeding of Poultry: (Put tick ✔ Mark)
(i) Supplied Balance Ration (ii) Supplied Traditional Ration (iii) Mixed

10. Housing System of Poultry: (Put tick ✔ Mark)
(i) Poor (ii) Medium (iii) Good

11. Return From Poultry: Batch No. 1/2/3/4
(i) Laying hen/duck: Production of egg .... nos /month/hen
(ii) Broilers/growers: Meat yield .... kg /chicken
(iii) Body Weight /chicken......... kg (1st fortnight)
(iv) Body Weight /chicken......... kg (2nd fortnight)
(v) Body Weight /chicken......... kg (3rd fortnight)
(vi) Body Weight /chicken......... kg (4th fortnight)

12. Feeding of Poultry (Broilers and Layers): Cost/hen........ Tk. ....

13. **Threat from Bird Flue:** Yes/No

14. **Name of diseases out break in Poultry Production:** (Put tick ✔ Mark)
(i) Chicken Pox (ii) Rani Khet Disease (iii) Bird Flue (iv) Others (vi) New Castle Disease (v) Gumboro Disease (vii) Coccidiosis (viii) Fowl Cholera (ix) Mycoplasmosis (x) EDS (xi) Other Disorders/Diseases
(xii) Duck: Duck viral hepatitis/Duck plague/Duck Cholera
(xiii) Parasites: Ectoparasite/Endoparasite

Administrativive Information about Poultry Owners:

15. **Got Loan/Subsidy from:** (Put tick ✔ Mark)
(i) BRDB (ii) Upazila Livestock Office (iii) Upazila Youth Development Office (iv)Grameen Bank/Any other Bank (v) BRAC/ PRASHIKA/ASA/Any other NGO

16. **If got loan:** How much amount .... Tk.

17. **Got any other services from :** (Put tick ✔ Mark)
(i) UNO Office/AC Land Office (ii) Upazila Co-operative Office (iii) ULO (iv) BRDB Office (v) UYDO Office (vi) BRAC Office (vii) Other GO/NGO

18. **Got any services from :** (Put tick ✔ Mark)
(**i**) Upazila chairman(ii) Upazila Vice Chairman (iii) Local M. P(iv) Political Leaders (v) Any other Persons/Organization

19. **Got Training about Poultry Production from:** (Put tick ✔ Mark)
i) BRDB (ii) Upazila Livestock Office (iii) Upazila Youth Development Office (iv) Garmeen Bank/Any other Bank (v) BRAC/ PRASHIKA/ASA/ Any other NGO/Privet organization

20. **Got any Loan from 'One House One Farm Project'?** Yes / No

21. **Got any Service from 'One House One Farm Project'?** Yes / No

22. **If yes:** (i) Supply of Dairy Cow (ii) Supply of poultry/Broilers/Layers (iii) Supply of Free services/ Free Vaccine

23. **Problems faced by farmers of raising Poultry (Broilers/Layers):**
(i)
(ii)
(iii)

24. **Overall suggestions by farmers for Poultry (Broilers/Layers) Production:**
(i)
(ii)
(iii)

Signature/hand sign of Farmer
Name of the farmer..

....
Signature of Interviewer/Investigator Date & Place
Full Name