Chapter- I: Introduction

Poultry, both broiler and layer are playing a vital role for meeting the demand of animal protein for Bangladeshi people. Nowadays it is the promising sector that can offer various opportunities to increase or improve the gross domestic product growth rate ensuring self-employment and to develop economy of the country by reducing poverty (Islam *et al.,* 2014). The present status of commercial poultry industry is evaluated by the quantity of commercial poultry farm which is about 75000 (Chowdhury, 2013).

Presently, different feed mills or different commercial feed companies supplied different types of feed according to the health status of the chicken, age, its productive status (Zakeri *et al.,* 2013*).* There are about 50 commercial feed companies in Bangladesh which are directly involve with the supplementation of commercial feed for broiler and layer (website-*bangladeshbusinessdir.com,2015*). Feed of poultry is found in different forms and according to the age group it can be divided into three forms namely starter feed, grower feed and finisher/layer feed. According to physical form, feed of poultry is found as mash feed, crumble feed and pellet feed which are very important for proper growth performance of chicken specially broiler (Zakeri *et al.,* 2013). The commercial feed companies also add some feed additives with the main ingredients likely antioxidant, flavoring agent, grit, toxin binders, probiotics and sometimes antibiotics**.**

Broiler is an integral part of commercial poultry industry which is very popular for its fast growing good quality meat (Sarkar *et al.,* 2008). Eleven different commercial broiler strains found all over the Bangladesh they are: Arbor Acres, Hub chicks, Ross, Starbro, Hubbard classic, Cobb- 500, MPK, Lohman, Hybro G and Hybro N (Hossain *et al.,* 2011; Saleque, 2007). On the other hand egg is a important economic traits in layers, which greatly influenced by the feed intake, feed quality and types of feed available to layer (Altahat *et al.,* 2012) and it is also noted that most of the farmers in Bangladesh prefer to feed their layer birds mixed feed which they made in their own farm by purchasing the feed ingredients from market. In previous study, there is found that those studies was on effect of types of feed

(Zakeri *et al.,* 2013) or effect of one ingredient like protein (Gunawardana *et al.,* 2007) or amino acid (Lemme, 2009) on growth performance of broiler or egg production of layer. The effect of this mixed feed for both broiler and layer is remaining unknown in some farms. Therefore, it is important how the feeds affect on productivity.

For evaluating the performance of layers recording is very important. However, for keeping daily egg production per layer is sometimes difficult and becoming costly. Furthermore, most of the farmers do not complete their record or keep partially records, by which they cannot take any culling or selecting decision and do not know the actual record about their chickens.

Simulation modeling by mathematical equations can support farming system by estimating the productivity which assists farmer in making decision to improve farm profitability. There are various types of models for the egg production prediction in layer likely (i) 3 parametric polynomial model (Khan and Ahmed, 2010) (ii) Compartmental model (iii) Adams and Bell model (iv) Stochastic simulation model (Alvarez and Hocking, 2007).

However, such study under Bangladesh broiler and layer farming system is limited. Therefore the present study was design with the objectives

i) To know the management system of broiler and layer farm.
ii) To find out the effect of two different types of commercial feed on growth performance of commercial cobb 500 broiler and
iii) To predict the egg production in commercial layer strains using mathematical models

Chapter-II: Materials and Method

2.1 Study area: The Study was carried out in Maa Poutry farm; Patiya poultry farm; and Bidhan poultry farm of Patiya Upazilla, Chiitagong. Different feed samples were collected from the owners of the studied farm.

Figure: The map of study area Patiya upazilla, Chittangong

2.2 Management of broiler and layer farm: Poultry management usually refers to the husbandry practices or production techniques that help to maximize the efficiency of production. Sound management practices are very essential to optimize production both in broiler in layer. Though the management system of broiler and layer is different, there are some similarities. The management practices such as feeding, watering, brooding, litter systems, bio-security, lighting etc were observed during farm visit and were recorded.

2.3 Data Collection for Broiler and Layer:

Broiler:

Data was collected on 4000 broiler chickens of two different batches from two different farms in which 2000 from Maa poultry farm and 2000 from Patiya poultry farm. Day-old chicks were weighted by the over loading balance and recorded. Then subsequently weekly live weight up to 28 days of broilers was taken and recorded.

Layer:

The egg production study was conducted on 7000 layer chicken from two different commercial farms (Maa poultry farm (5000 birds) and Patiya poultry farm (2000 birds) on two commercial strains (Shevar 579 and Hiline Brown strain). The egg production was recorded from 22 to 34 weeks and this was converted weekly egg production per layer. The actual egg production value was calculated by summing the weekly egg production from 22 to 34 weeks.

2.4 Fitting mathematical model:

In the case of layer, to analysis the data of egg production and prediction of egg production was used by following three equations:

(a) Linear regression equation $Y = a + bx$,

(b) Logarithm type of regression $Y = a + b\log(x)$,

(c) Mixed type function $Y = a / x + bx + c$

Where, Y is value of the traits, x is the ages of layer birds which is expressed in weeks and a, b, c are the parameters that define the shape of the curve**.** In linear and logarithm equation, Microsoft excel 2010 was used to find out the parameters (a and b) and the goodness-of-fit coefficient of determination (R^2). In mixed type function which is known as second degree inverse polynomial regression, the value of the parameters (a, b, c) was expressed by PROG MIXED procedure of SAS. The predicted egg production value was estimated by fitting the model parameters in the

equations. Then the predicted and to actual values and model performance were compared by the fit statistics coefficient of determination (R^2).

2.5 Statistical Analysis of the data:

The statistical analysis of the collected data on feed intake and live weight of commercial broiler and feed intake and egg production of commercial layer strains, and the model parameters was done by Completely Randomized design (CRD). The least square means was estimated using PROC GLM of SAS (SAS, 2012). The model for this analysis is:

$Y_{ij} = \mu + A_i + e_{ij}$

Where, Y_{ij} is the measurement of particular trait;

μ is the population mean;

A_i is the vector of i^{th} Age (i = 1 and 2) effects;

e_{ij} is the random error associated with each record, distributed as N (0, σ^2).

The mean value was compared by using the least significant difference (LSD) test at $P>0.05$ level (Steel et al. 1997).

Chapter-III: Result and Discussion

3.1 Management of Broiler and layer: The farmers of the study farm maintain their Day old Chicks in Brooder from 1st day to 6-7th day and total 1000 DOCs was maintained under two brooders within 250 sqft areas. In single brooder 400 watt of bulb is given and full time lighting is maintained for first 3-4 days and at 16 days of age they maintain the light for only 13 hours. As a litter material they use wood shavings or saw dust (broiler) and cage (layer). For 1000 bird, 20 waterer were given in the farm. But in Bidhan poultry farm, Patiya, Chittagong, for 1000 bird 25 waterer were maintained.

Broiler: The poultry farm owners always buy chicks with few characteristics and these chicks are called quality chicks containing criteria within no deformity, lively and the weight above 45g (A grade). They mainly give the Vaccine of Newcastle Disease and Infectious Bursal disease at the age of 4 days and 12 days respectively.. In commercial broiler farm, most of the mortality is mainly in early stage due to unhealed navels. Most of broiler owner use ready-made feed for their broilers management. Recently Nourish and New hope are more popular in Chittagong region. So, the current study was carried out on these two types of feed. By feeding these feed the growth performance was found better.

Table 1: Proximate components of two different types of feed (Source: Animal Nutrition Laboratory, CVASU, 2015)

Feed	Moisture	DM	CP	CF	EE	NFE	ME
Nourish	11	89	22.2	4	3	54	2704.75
Newhope	9	91	21.9	4	3.2	55.5	2759.13

Fig 2: At the time of brooding

Fig 3: Fifteen days growing broiler

Fig 4: Dry matter estimation

Fig 5: Ether Extract Estimation

(a) (b)

Fig 6 (a) and (b): Protein estimation of commercial feed

Layer: The study was conducted on the farms where they rear their poultry in cage system. Lighting is properly maintained in layer farm, because any differences in lighting will cause production loss. So, they maintained 24 hours lighting for day old chicks to 30 days of age. Then they decrease the lighting at slowly day by day. At the 60 days they maintain the lighting for 13 hours. They maintained this lighting level up to a definite production level. If they found any change in production, then they increase the lighting time up to 16 hours. Incase-of layer farming, most farmers want to feed the commercial layer mixed feed which they made in their own farms.

Table2: Layer ration with available feed ingredients:

Ingredients	**Weight**	**ME**	**CP**	**Methionine**	**Lysine**	**Ca**	**P**
Maize	58	1919.22	5.34	0.08	0.145	0.0406	0.232
Rice polish	8	224	0.96	0.03	0.03	0.028	0.096
Soybean meal	18	448	9	0.13	0.58	0.064	0.134
Concentrate	6	174	3.6	0.12	0.42	0.39	0.15
Limestone	8	0	0	-	-	2.864	0.002
DCP	0.5	0	0	-	-	0.1215	0.091
Layer premix	0.25	0	0	-	-	0	0
Methionine	0.2	0	0	0.2	-	0	0
Lysine	0.1	0	0	-	0.1	0	0
Choline	0.1	0	0	-	-	0	0
Sal-complex dry	0.2	0	0	-	-	0	0
Toxin Binder	0.2	0	0	-	-	0	0
Enzyme	0.05	0	0	-	-	0	0
Eggs max	0.05	0	0	-	-	0	0
Bio-calcivit	0.2	0	0	-	-	0	0
Salt	0.3	0	0	-	-	0	0
TOTAL	**100**	**2765.22**	**18.9**	**0.56**	**1.28**	**3.51**	**0.705**

Fig 7: Watering and feeding of Commercial layer farm

Fig 8: Collected egg in farm

3.2 Feed intake and growth performance of broiler:

The effect of feeding on broilers live weight (g) under two farming conditions is presented in Table 3. From table 3, it can be found the values of live-weight and feed intake in different stages of growth of commercial broiler and positive that is with the increases of live weight the feed intake was increased.

The values of feed intake and live weight are found different from farm to farm. But the live-weight of farm 1 is comparatively higher than the live-weight of farm 2.But there is no such difference between the batches of the two farms.

On the Other hand, the value of feed intake of farm 2 is lower than the feed intake of farm 1. So, the commercial broilers of farm 1 intake more feed and grow more than the farm 2. So, it can be stated that increase feed intake will influence live- weight.

This different may be due to level of nutrients content in feed, types of feed and quality of feed or environmental stress on bird (Rokon Zaman *et al*., 2015). Different managemental factors also responsible for different types of live- weight likely litter materials which is responsible for few diseases- ascites, pneumonia etc; different sanitation and hygiene management and also vaccination failure (Sarkar *et al.*, 2008).

Table 3: Effect of feeding on growth performance of commercial broiler (Cobb 500)

Traits	Farm1											Farm2										
	Batch1					Batch2					Farm mean	Batch1					Batch2					Farm Mean
	1	7	18	28	Batch mean	1	7	18	28	Batch mean		1	7	18	28	Batch mean	1	7	18	28	Batch mean	
Weight	50	180	700	1600	598	50	150	650	1450	548	604	50	150	650	1400	598	45	140	600	1300	548	541
Feed Intake	30	200	750	2200	767	32	180	700	2100	730	774	32	175	750	2000	767	32	150	650	2000	730	723

From table 4, there is found the correlations between market age, feed intake and live weight of commercial broiler. It can be noticed that high correlation between feed intake and live weight than other two traits and it means that feed intake is good determinant of body weight. If any bird is properly maintained under good environmental condition, then it will show high feed intake and high live weight with the progress of the age which is expressed as days here (Scott, 2005). Otherwise, there will be found reverse result.

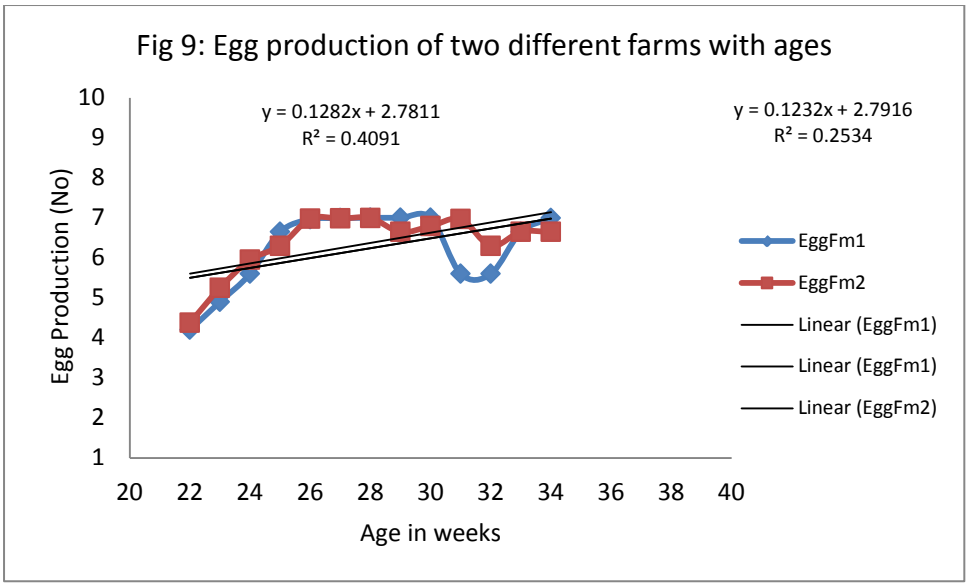
Table 4: Correlations between market age,feed intake and live weight of commercial Broiler (Cobb 500)

Traits	Age	Feed Intake	Live weight
Age	1	0.948 (0.001)	0.969 (0.0001)
Feed Intake		1	0.993 (0.0001)
Live weight			1

3.3 Parameters of different traits and egg production curve:

The values of linear regression, logarithm regression and mixed type model function of weekly egg production of Shever 579 and Hiline brown are shown in table 5 and in Fig. 1 and 2. Figure 1 and 2 present the curve of weekly egg production from 22 weeks to 34 weeks of age of commercial layer birds after fitting with linear regression and logarithm equation.

The shape of curve in linear and logarithm regression is somewhat differed within same trait. Actually, the shape of curve differed due to the parameters (a, b, c) of the model, numbers of record and also the mathematical model (Alam *et al*., 2009; Khan and Ahmed, 2010).



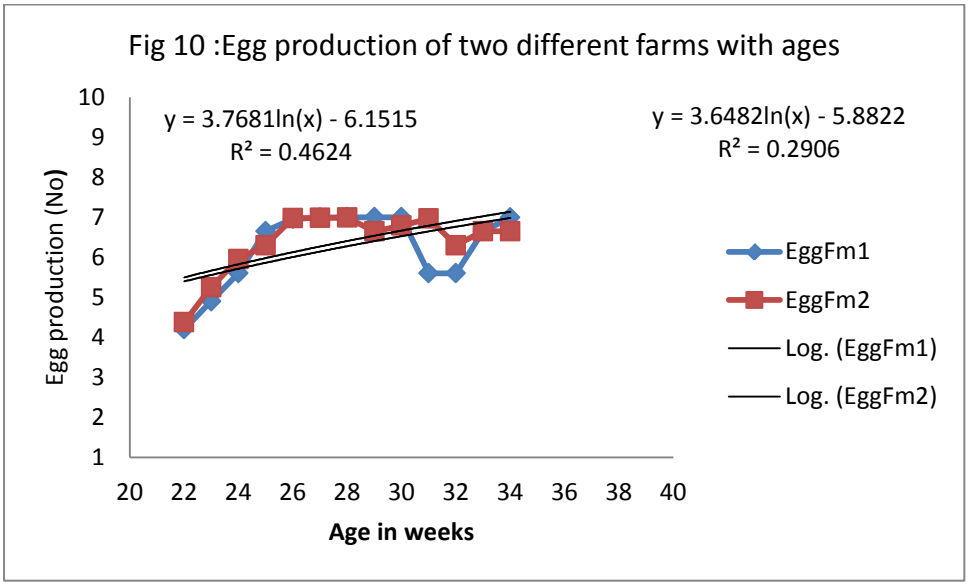


Figure 9 and 10: Egg Production Curve with Linear and Logarithm regression equation

3.4 Predicted and actual Egg production:

Table 6 mainly presented the values of parameter of the equations and predicted and actual egg production that were found after fitting of model.

Table 6: Model parameters with predicted and actual egg production and fit statistic

Parameter	Farm 1			Farm 2		
	Regression	Logarithm	Mixed	Regression	Logarithm	Mixed
a	2.79	-5.88	16	2.781	-6.15	20
b	0.123	3.648	0.20	0.128	3.768	0.20
c	-	-	-0.005	-	-	-0.005
R^2	0.25	0.29	0.36	0.41	0.46	0.18
Predicted Egg production (no)	81.04	81.16	80.30	80.91	82.83	82.49
Actual Egg production (No)	81.13	81.13	81.13	82.81	82.81	82.81

In this table 6 there is found the values of different parameter a, b, c and also the fit statistics R^2. From linear regression and logarithm model, it can be found that the value of R^2 is lower in farm 1 (0.25, 0.29, 0.36) and farm 2 (0.41 and 0.46, 0.18) and there are also found the predicted egg production values.

The calculated egg production values of the two farm owners are somewhat higher than the predicted egg production value. Similar result was also reported by Khan and Ahmed, (2010). The lower R^2 value indicates the differences between the farms and parameters and differences in actual and predicted egg production. The higher R^2 value which is about 0.93-90.98 will indicate the similar egg production with actual and predicted values (Alvarez and Hocking, 2007). But here, lower R^2 value expresses the higher differences in predicted egg production value and actual egg

production value. The primary reasons of this type of result in this current study are there was no adjustment to length of production (Alam et al., 2009) and also the data of this study which was only for thirteen weeks.

Conclusion

The commercial Cobb 500 broiler strain has appeared to be a good performer under Bangladesh condition. On the basis of results of productivity, it can be concluded that commercial broiler can be reared for market purpose up to 28 days to gain maximum weight 1450g with the commercial feed. Besides, Shever579 and Hiline brown is also good performer in the field of poultry industry. In current study, the predicted egg production value was somewhat lower than the actual egg production which was done by different mathematical equations. The fit statistic (R^2) was also found as lower which indicates the differences between actual and predicted values. Different managemental factor like brooding, feeding, lighting and also proper record keeping might be the reasons of this difference. Small number of data was the main limitation in the current study and if large number of data could be used, then more accurate result might be found using equations. However, this study might be helpful in reducing the cost for record keeping through an estimate on the total number of egg produced. But for prediction of actual egg production, all factors should be considered and the study data should be large in number.

References

Ahmad, H. A. 2012. Egg production forecasting: Determining efficient modeling approaches. Journal of Poultry Research. December; 20(4): 463–473. doi:10.3382/japr.2010-00266.

Akter,M., Chowdhury,S. D.,Akter , Y., and Khatun,M.A. 2011. Effect of duckweed (Lemna minor) meal in the diet of laying hen and their performance.Bangladesh Research Publications, (Bangladesh, 5:252-261).

Alvarez, R. and Hocking, P. M. 2007.Stochastic model of egg production in broiler breeders.Poultry Science., 86: 1445-1452.

Chehraghi ,M., Zakeri, A. and Taghinejad-Roudbaneh, M. 2013.Effects of different feed forms on performance in broiler chickens. European Journal of Experimental Biology, 2013, 3(4):66-70.

Hossain, M.A., Suvo, K.B.and. Islam, M.M. 2011. Performance and economic suitability of three fast- growing broiler strains raised under farming condition in Bangladesh. ISSN: 2224-0616 International Journal of Agriculture Research Innovation & Technology. 1 (1&2): 37-43.

Hossain, M. E., Chowdhury, S. D., Ahammed, M., Pramanik, M. A. H. and Rahman, M. R. 2005. Growth performance of kasila broiler parent stock reared on quantitative feed restriction, under Bangladesh condition. International Journal of Poultry Science. 4: 153-158.

Huque, K.S. and Sarker, N.R. 2014. Feeds and feeding of livestock in Bangladesh: performance, constraints and options forward Bangladesh Journal of Animal Science. 43 (1):1-10.

Islam, F., Hossain, M. H., Akhtar, A. and Hossain, M. S. 2014. Prospect and Challenges in Broiler Farming of Barguna District in Bangladesh. Journal of Bioscience and Agriculture Research. Published Online: Vol. 02(01): 44-51, Online ISSN 2312-7945.

Islam, M. H., Uddin, M.F., Alam, M. M. 2014 Challenges and Prospects of Poultry Industry in Bangladesh. European Journal of Business and Management. ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online) Vol.6, No.7.

Islam, S.S. , Paul, C., Sarker, B.C. 2013. A comparative study on the performances of layer hybrids in some selected areas of Khulna region. Bangladesh Journal of Animal Science. 42 (2): 114-122.

Islam, M. S., Alam, M. R., Rashid, M. A. and Hossen, M. J. 2006. Effect of balanced supplementary feed and cafeteria feeding on the performance of cross-bred chicken in semi-scavenging system. Bangladesh Journal of Animal Science. 35(1-2): 36-41.

Khan, M. K. I. and Ahmed, S. 2010. Performance of hubbard classic broiler parents and fit the regression models for their prediction. ISSN 0003-3588. Bangladesh Journal of Animal Science. 39(1&2) : 156 – 162.

Roy, S.C. Alam, M.S. , Ali ,M.A. ,Chowdhury, S. D . and Goswami, C. 2010. Different levels of protein on the performance of synthetic broiler. Bangladesh Journal Veterinary Medicine. 8(2): 117 – 122 .

Raha, S.K. 2007. poultry industry in bangladesh: is it growing?Bangladesh Journal Agriculture ans Economics. XXX 2 93-101.

Sarkar, P. K. ,Chowdhury, S. D., Kabir, M. H.2008. Comparative study on the productivity and profitability of commercial broiler, cockerel of a layer strain and cross-bred (rir♂ × fayoumi ♀) chicks. Bangladesh Journal of Animal Science. 37(2): 89-98.

SAS®, 2012. User's Guide. Statistics. 8th edition. Cary (NC): SAS Institute Inc.,

Zaman, R., Jahan, S. S., Islam, A., Ahmed, S. 2015. Production performance of three broiler strains in summer seasons in Bangladesh. Global Journal of Animal Science, Livestock Production and Animal Breeding.ISSN: 2408-5510 Vol. 3 (2), pp. 138.

ACKNOWLEDGEMENT

*The author wishes to acknowledge the immeasurable grace and profound kindness of Almighty "**GOD**" the supreme authority and supreme ruler of universe, who empowers the author to handle the case and to complete the case report successfully.*

*The author wishes to express his deep sense of gratitude and thanks to **Professor Dr. Md. Kabirul Islam Khan**, Department of Genetics and Animal Breeding, Faculty of Veterinary Medicine of Chittagong Veterinary and Animal Sciences University for his skillful supervision and guidance to make this report.*

*The author is also grateful to **the owners of the study farms** for their cordial information and cooperation.*

Finally the author expresses thanks and warmest sense of gratitude to his parents and all well-wishers.

The author,

December, 2015.

ANNEX

A.Basic information:

1. Name of the farm: ……2.Name of the owner:……..

3.Address of the farm: …… …4.Farm size:…….

4.Owners mobile number: …….....

B.Housing pattern and management:

1. Housing system: Intensive / Semi-intensive

2. Floor type: Litter /concrete / slat / cage

3. Ventilation status of house: poor / moderate / good / nothing

4. Drainage status: poor / moderate / good / nothing

5.Frequency of cleaning the house: once a week/ twice per week / daily / other schedule

6. Biosecurity: Visitor access- restricted / not restricted

7. Foot bath: present / absent

8. Trees around the farm: present / absent

C. Feed: commercial / handmade mixed / both

D. Preventive measures:

1. Regular practice of vaccination: Yes /No

2.Types of vaccine used: ……

Table 6: Raw data collected from broiler farm owner

Batch 1													
	Days	Birds		Feed Intake		Live weight		Cost of feed		Cost of Bird		Mortality	
		Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2
	1	1000	1000			55	50			55	60	50	60-70
	7	950	935	200	175	180	150	8.26	7.26			40-50	55-60
	18	930	905	750	750	700	650	30.97	31.13			20	20-40
	28	910	875	2200	2000	1600	1400	90.86	83	140-160	140-160	20	30
Batch 2													
	1	1000	1000			50	45					35	40
	7	965	960	180	150	150	140	7.43	6.23			30	30
	18	935	930	700	600-700	650	600	28.91	26.98			4-5	4
	28	930	926	2100	2000	1450	1300	86.73	83	120-130		0	0

Data 2: Raw data collected from layer owner:

weeks	Birds		Egg production		Egg weight		Feed Intake		Mortality	
	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2
22	5000	2000	3000	1250	55-60	55-60	110-120	110-120	254	85
23	4746	1915	3022	1436	55-60	55-60	110-120	110-120	143	57
24	4603	1858	3682	1579	55-60	55-60	110-120	110-120	138	18
25	4465	1840	4241	1656	55-60	55-60	110-120	110-120	90	18
26	4375	1822	4350	1815	55-60	55-60	110-120	110-120	20	7
27	4355	1815	4350	1810	55-60	55-60	110-120	110-120	17	8
28	4338	1807	4338	1805	55-60	55-60	110-120	110-120	8	5
29	4330	1802	4330	1711	55-60	55-60	110-120	110-120	0	3
30	4330	1799	4330	1745	55-60	55-60	110-120	110-120	0	0
31	4330	1799	3464	1790	55-60	55-60	110-120	110-120	129	5
32	4201	1794	3360	1614	55-60	55-60	110-120	110-120	74	17
33	4127	1777	3920	1688	55-60	55-60	110-120	110-120	41	6
34	4086	1771	4080	1682	55-60	55-60	110-120	110-120	0	0

BIOGRAPHY

My self **Tuli dey**, the author of this Production report would like to introduce as Intern. DR of Chittagong Veterinary and Animal Sciences University (CVASU) have passed four years academic career in faculty of veterinary medicine and attended several clinical training programs on Veterinary Medicine in Bangladesh, India and USA. As a student of Veterinary science, the main mission and vision of my life is to do something better and creative job by dint of my academic knowledge and experience, for the development of livestock and poultry as well as development of the economic condition of our country. So, study on the growth and egg production of the commercial broiler and layer, is my first step to fulfill my dream.

Full Name *: Tuli Dey*
Nickname *: Shanta*
Born *: 10 June, 1992*
Birth Place: *Chittagong, Bangladesh.*
Nationality: *Bangladeshi*

Education:
DVM *: 2015(running, Intern Doctor)*
HSC *: 2009*
SSC *: 2007*