**Chapter 1:**

**Introduction**

Chickens are considered as one of the most important and widely distributed avian species among poultry birds. It is a very good source of animal protein for human consumption. Of the four wild chicken species available on the Indian sub-continent *viz.,* red jungle fowl (*Gallus gallus*), gray jungle fowl (*Gallus sonnerati*), Ceylon fowl (*Gallus lafayettii*) and green jungle fowl (*Gallus rarius*), indigenous chickens locally known as Deshi(*Gallus domesticus*) are reported to be derived from *Gallus gallus* (Dutta *et al.,* 2013) whereas *Gallus bankiva* is believed to be the major contributor to the development of modern commercial breeds. Among the native fowls there are some distinct categories such as hilly, naked neck, aseel, yasine, native dwarf and non-descriptive deshi. Collection, evaluation and conservation of different genotypes are required due to future changes in the environment, management and food habits (Crawford, 1984).

Poultry, especially chicken, is the cheapest source of animal protein in the form of eggs and meat throughout the world including Bangladesh (Simon, 2009). Poultry is the most commonly kept as an integral part of the mixed agriculture since long time in Bangladesh. Farmers ranked chicken the highest followed by goat and cattle in contribution of livestock for total farm income (Muchenje and Sibanda, 1997). The chicken population is steadily increasing, from about 143 million in 2001 to 195 million birds in 2006 (DLS, 2007). It is increasing at an annual growth rate of 5.9% (Haque *et al*., 2004) and contributes 28% of the total protein supply, taking second place to milk products which contribute 38% and are mostly imported (Ramm *et al.,* 1984). The contribution of poultry is about 21% of the total livestock to the national GDP (Khan and Roy, 2003). Per capita meat consumption is only 5.12kg per year (BBS, 2006). Protein intake recommended for human ranged from 0.8 to 1.6 g/d per kg body weight, which requires minimum 20.4kg animal protein per year for a person of 70kg body weight (Anonymous, 1998). There is a crying need to increase meat production of the country to meet the increasing demand of animal protein.

Meat consumption in 2004 was 4.6kg per capita, while in 2006 increased to 5.9kg per capita with 3.9kg (66%) coming from the commercial broilers (Saleque, 2007). According to (DLS, 2007), beef was the largest single source of meat in 1992 as well as in 2007. In 1992, the supply of goat meat was more than poultry meat. Between 1992 and 2007 the goat meat production was stagnated, while beef production has increased by a factor of 2.5. Poultry meat production has had the largest expansion by a from 105 000 tons in 1992 to 420 000 tons in 2007.

In Bangladesh, chicken meat is the most popular. Regardless of religion and age almost all people like chicken meat. The chicken roast is the top menu in Bangladeshi food culture. People always try to find the Indigenous chicken for its tenderness and special taste. Meat of indigenous chicken remains compact after cooking, but some portions of broiler meat are separated from the bone, that’s not suitable for roast and special dishes. The hardness of the indigenouschicken meat can be explained partly by increased activity (Gueye *et al*., 1998). Their meat is also leaner (Paul *et al*., 1990).

Among the native fowls there are some distinct categories such as hilly, naked neck, Aseel, Yasine, native dwarf and non-descriptive Deshi. Collection, evaluation and conservation of different genotypes are required due to future changes in the environment, management and food habits (Crawford, 1984). The major production system for the indigenous chickens is scavenging in nature and among the indigenous chickens non-descriptive Aseel and naked neck are noteworthy for genetic resources while Deshiis more acceptable to rural people as an important source of meat and eggs (Barua and Howlider, 1990) due to low nutritional demand and high disease resistance. This free range scavenging breed is being reared in Bangladesh for a long time and it has contributed about 19.75% and 25.06% of total meat and egg production (Haque, 1991). In small-scale farming, production per bird is low, but it supports the landless as it costs less, requires little skills, highly productive and is able to be incorporated into the household works.

The Aseel is a local breed reared in backyard and is a vital source of meat and income for small-holder. The Aseel has an importance in tribal culture for cock fighting and well known for its pugnacity, high stamina, majestic gait and dogged fighting qualities. The name Aseel appears to have been given to this indigenous breed because of its inherent qualities of fighting. The standard weight varies from 3 to 4kg for cocks and 2 to 3kg for hens (Hawkins, 2004).

The Nacked neck chickens are available in rural areas of Bangladesh and are well adapted to tropical climate (Islam and Nishibori, 2009). The higher adaptability of Nacked neck chicken to tropical climate results in increased growth, egg production and feed conversion compared to other chickens (Ajayi, 2010). They produce higher total meat and breast meat than their nana counterparts (Barua *et al.,* 1998; Islam *et al.,* 2002), but requiring less dietary protein and produce leaner meat than that of broilers (Paul *et al.,* 1990).

A random mated and unselected indigenous chicken is a huge treasure of variable genotypes (Yeasmin and Howlider, 1998) and the birds can survive under harsh nutritional and environmental conditions. Its productivity under scavenging is low but intensive rearing yields the highest production potentialities. The up gradation of the gene of aseel chicken also increase the growth rate in the subsequent generation (Padhi, 2016).

*Objectives:*

1. To determine the difference of growth rate in scavenging system, semi scavenging and intensive farming system.

2. To assess performance of upgraded nacked neck chicken with aseel gene on growth rate.

3. To determine effect of additional feed supplement on the growth rate of chicken.

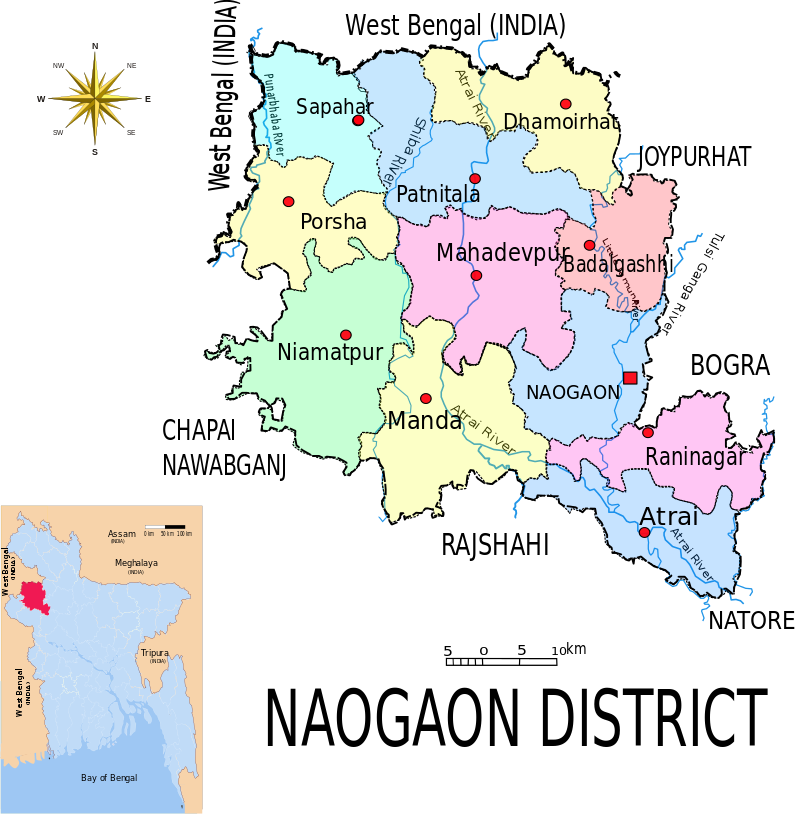
**Chapter 2:**

**Materials and Method**

The experiment was designed to assort for improvement of meat quality and growth performance of indigenous chicken by cross breeding between aseel and necked neck chicken in F1 generation and upgrading the gene percentage of aseel in the F2 and F3 generation. The factors of environment which influence by the rearing system and feed supplement on the growth rate also investigated in the study. For conducting the experiment following activities were done during experimental period.

**2.1. Study area:**

The study was conducted in the Panitala upazilla of Naogaon district.



**Figure 1: Map of Panitala upazilla, Naogaon.**

**2.2.** **House hold selection of the local community**

The techniques, Social mapping and Baseline survey were very effective to select the portion of the village. The households were selected on the basis of previous experience on poultry rearing. Some parameters were used such as the existing number of poultry of the houses, hatching history, previous mortality rate and as well as production level in their house.

**2.3. Collection of the male and female chicken:**

In the study for the cross breeding male aseel chicken and female nacked neck chicken were used. The male aseel birds were collected from Brahmanbaria and distributed to the house holds that are selected for the study. The female nacked neck chickens were collected from the local market.

**2.4. Cross breeding:**

Cross breeding was done in between aseel male and nacked neck female chicken which results the F1 generation that contained 50% aseel and 50% nacked neck genotype.

**Male × Female**

Aseel Nacked Neck

F1 generation (50% aseel gene)

**2.5. Breed upgrading:**

Breed up gradation of aseel gene chicken was done by mating between male aseel chicken and female cross breed chicken (Aseel × Nacked neck).

**Male × Female**

Aseel F1 generation (50 % aseel).

F2 generation (75% aseel gene)

And F3 generation was produced by mating between male aseel chicken and female F2 generation chicken.

**Male × Female**

Aseel F2 generation (75% aseel gene)

F3 generation (87.5% aseel gene)

In the F2 and F3 generation the percentage of gene of aseel chickens were increased.

**2.6. Vaccination and medication:**

The chickens were vaccinated against Newcastle disease; Baby Chick Ranikhet Disease Vaccine (BCRDV) first dose was given at 7 days and a booster dose was given at 21 days. Ranikhet Disease Vaccine (RDV) first dose was given at 2 months. Medication was performed as per need during in confined rearing.

**2.7. Rearing System:**

Three types of rearing system were followed during the study period. These were scavenging, semi scavenging and confinement.

**2.7.1. Scavenging:**

Total 15 birds were kept under this rearing system. No additional feed was provided to the chicken.

**2.7.2. Semi scavenging:**

Total 30 birds were kept under this rearing system. Additional feed supplement was provided to the chicken.

**2.7.3. Confinement:**

Total 17 birds were kept in this rearing system and the birds were kept on full feeding.

**2.8. Data Collection:**

**2.8.1.** **Body weight measurement:**

The experimental birds were marked for their identification and body weight measurement; individually body weight measurement was considered two times during in just after hatched i.e. day old chicks and two month of age. They were weighed by using a top loaded scale balance of five-kg capacity. During 2 months of age the chickens were kept in paper box then placed on the top of the balance. Thus by reading the scale the measured weight was recorded for each of the chickens individually. The data was recorded separately for the genotypes and also for the rearing system.

**Chapter 3:**

**Results**

**3.1. Effects of genotype on growth:**

There were total three types of genotypes included in this study. These were F1 generation cross breed of aseel and nacked neck chicken that contained 50% aseel gene and others were F2 generation (75% aseel gene) and F3 generation (87.5% aseel gene).

In the F1 generation the growth of the birds were measured at two months of age. The weights were taken in gram. During this period total 20 chicken of F1 generation were reared and weighed at the age of 2 months. The average body weight of the F1 cross breed chicken was 370.84 gm. Where the highest body weight was 405 gm and the lowest body weight was 338 gm. Among the all data there shown that body weights of 9 birds were lower than the average and 11 birds were higher than the average value.

**Table 1:**  Body weight in F1 genotype.

|  |  |  |  |
| --- | --- | --- | --- |
| **Points** | **Average body weight** | **Individual highest body weight** | **Individual lowest body weight** |
| Bosy weight( in gm) | 370.84 | 405 | 338 |

**Figure 2:** Comparison of individual highest and lowest body weight with average body weight in F1 Generation.

In the F2 generation the percentage of aseel gene were increased (75% aseel gene) in the chicken. Growths of the birds were measured in two months of age. The weights were taken in gram. During this period total 20 chicken of F2 generation were reared and weighed at the age of 2 months. The average body weight of the F2 generation chicken was 338.38 gm. Where the highest body weight was 380 gm and the lowest body weight was 301 gm. This variation was seen in male and female bird. Among the all data there shown that 12 birds body weight were lower than the average and body weight of 8 birds were higher than the average value.

**Table 2:** Body weight in F2 genotype.

|  |  |  |  |
| --- | --- | --- | --- |
| **Points** | **Average body weight** | **Individual highest body weight** | **Individual lowest body weight** |
| Bosy weight( in gm) | 338.38 | 380 | 301 |

**Figure 3:** Comparison of individual highest and lowest body weight with average body weight of F2 generation.

In the F3 generation the percentage of aseel gene were increased (87.5%) in the chicken. Growths of the birds were measured in two months of age. The weights were taken in gram. During this period total 20 chicken of F3 generation were reared and weighed at the age of 2 months. The average body weight of the F3 generation chicken was 404 gm. Where the highest body weight was 445 gm and the lowest body weight was 355 gm. This variation was seen in male and female bird. Among the all data there shown that 9 birds body weight were lower than the average and 11 birds body weight were higher than the average value.

**Table 3:** Body weight in F3 genotype.

|  |  |  |  |
| --- | --- | --- | --- |
| **Points** | **Average body weight** | **Individual highest body weight** | **Individual lowest body weight** |
| Bosy weight( in gm) | 404 | 445 | 355 |

**Figure 4:** Comparison of individual highest and lowest body weight with average body weight in F3 generation.

**Table 4:** Average body weight gain at 2 month of age in different genotype

|  |  |
| --- | --- |
| **Genotype** | **Average body weight(in gm)** |
| F1 (50% aseel gene) | 370.84 |
| F2 (75% aseel gene) | 338.38 |
| F3 (87.5% aseel gene) | 404 |

**Figure 5:** Comparison of average body weight in different genotype.

Among the three types of genotype the highest average of body weight were found in the F3 generation which posses the highest percentage of aseel gene. The average body weight in the F3 generation was 404 gm and lowest average body weight were found in the F2 generation. The average body weight in F2 generation was 338.38 gm and in the F1 generation was 370.84gm.

**Figure 6:** Average body weight in different genotype.

**3.2. Effect of rearing system on growth:**

There are total three types of rearing system were included in this study. These were scavenging without feed supplement. Semi scavenging with feed supplement and confinement. Results shows that,

In the scavenging system without feed supplement the growth of the birds were measured in two months of age. The weights were taken in gram. During this period total 15 chickens were reared and weighed at the age of 2 months. The average body weight of the chicken was 347.13gm. Where the highest body weight was 395gm and the lowest body weight was 295 gm. Among the all data there shown that body weight of 8 birds were lower than the average and body weight of 6 birds were higher than the average value.

**Table 5:** Body weight in scavenging rearing system without feed supplement.

|  |  |  |  |
| --- | --- | --- | --- |
| **Points** | **Average body weight** | **Individual highest body weight** | **Individual lowest body weight** |
| Bosy weight( in gm) | 347.13 | 395 | 295 |

**Figure 7:** Comparison of individual highest and lowest body weight with average body weight in scavenging rearing system.

In the semi scavenging system with additional feed supplement the growth of the birds were measured in two months of age. The weights were taken in gram. During this period total 30 chickens were reared and weighed at the age of 2 months. The average body weight of the chicken was 408.7 gm. Where the highest body weight was 428 gm and the lowest body weight was 390 gm. Among the all data the body weight of 15 birds were lower than the average and 15 birds measured higher than the average body weight.

**Table 6:** Body weight in semi scavenging rearing system with additional feed supplement

|  |  |  |  |
| --- | --- | --- | --- |
| **Points** | **Average body weight** | **Individual highest body weight** | **Individual lowest body weight** |
| Bosy weight( in gm) | 408.7 | 428 | 390 |

**Figure 8:** Comparison of individual highest and lowest body weight with average body weight in semi scavenging rearing system

In the confinement rearing system with full feeding the growth of the birds were measured at two months of age. The weights were taken in gram. During this period total 17 chicken were reared and weighed at the age of 2 months. The average body weight of the chicken was 464gm. Where the highest body weight was 375 gm and the lowest body weight was 532 gm. Among the all data there shown that 10birds body weight were lower than the average and 6 birds measured body weight were higher than the average value.

**Table 7:** Body weight in confinement rearing system with full feeding

|  |  |  |  |
| --- | --- | --- | --- |
| **Points** | **Average body weight** | **Individual highest body weight** | **Individual lowest body weight** |
| Bosy weight( in gm) | 464 | 532 | 375 |

**Figure 9:** Comparison of individual highest and lowest body weight with average body weight in confinement rearing system.

**Table 8:** Average body weight gain at 2 month of age in different rearing system.

|  |  |
| --- | --- |
| **Rearing system** | **Average body weight(in gm)** |
| Scavenging (Without feed supplement) | 347.13 |
| Semi scavenging (With feed supplement) | 408.7 |
| Confinement | 464 |

**Figure 10:** Comparison of average body weight in different rearing system.

Among the three types of rearing system the highest average of body weight were found in the confinement rearing system with full feeding. The average body weight in this rearing system was 464 gm and lowest average body weight were found in the scavenging rearing system without feed supplement. The average body weight in scavenging rearing system was 347.13 gm and in the semi scavenging system was 408.7gm.

**Figure 11:** Average body weight in different rearing system.

**Chapter 4:**

**Discussion**

The experimental results clearly showed that a crossbreed obtained higher bodyweight than indigenous chicken which is in agreement with the result o f (Zaman *et all.,* 2004). In this study the highest average body weight were found in the F3 generation. That contains 87.5% aseel gene. This clearly made an impact on the growth performance of the chicken. The high amount of aseel gene increase the growth rate of chicken this also supported by (Padhi, 2016).

But in case of F2 generation the aseel gene was 75% which show lower body weight gain than F1 generation( 50% aseel gene) which contradicted the study (Padhi, 2016). This variation may be due to the heterosis in the F1 generation (Amin *et al.,* 2013) along with environmental factor that includes the rearing system, feed supplement. Another point that can affect the growth performance was the prevalence of disease and stress that is similar as the study of (Dutta *et al.,* 2013).

The productivity o f native chicken is generally poor because of genetic disposition, the rural environment, local feed availability, diseases and parasites this is supported by the study of (Amber *et al.,* 1999).

This study also observe the effect of rearing system on the growth performance of nacked neck and aseel crossbreed chicken. From the result it revealed that there was a clear effect of system on growth. This result match the result of previous studies (Wang *et al.,* 2004; Hameed *et al.,* 2012; Herendy *et al.,* 2004). Among the scavenging, semi scavenging and confinement rearing system the highest body weight gain were found in the confinement system with full feeding. This statement also similar in the other study (Zia *et al.,* 2017). The highest weight gain was due to availability of feed in confinement rearing system. So the birds had got the entire necessary nutrient for the growth. The adequate level of ME and CP results the highest growth. The reqirement of ME for aseel bird is 2800 kcal/kg and CP 16% for the optimum growth (Anand *et al.,* 2004).

In the scavenging system the lowest body weight gain was due to no additional feed supplement offered to the bird. The birds were fully depending on the scavenging. That was not adequate for the fulfillment of requirement for the rapid growth rate (Wang *et al.,* 2004). There might be another cause loss of energy during scavenging.

In the semi scavenging rearing system with additional feed supplement shown average body weigh higher than the scavenging system. This was due the nutrition deficit were covered by the additional feed supplement (Hameed *et al.,*  2012).

**Conclusion**

From the result of experiment it was observed that average body weight in upgraded genotype of aseel chicken was highest. The highest body weight was found in the chicken that contains 87.5% aseel gene (F3 generation). The highest average body weight of F3 generation was 404 gm. Among the rearing system the highest body weight was obtained in the confinement rearing system with full feeding. The average body weight in confinement rearing system was 464 gm. So it may be concluded that upgradation with aseel male may be potential with supplementation of feed under management of households in rural area of Bangladesh.

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**My Goal:**

Seeking a challenging position where I may utilize my qualifications, experience, skills meaningfully through disciplinary hard work. To build up myself as a competent, self-motivated, dynamic and successful person by implementing my educational and technical skills as well as to serve in the field of veterinary medicine with an emphasis on clinical practice, animal welfare, and infectious disease research for the greater development of Bangladesh.