# Chapter I

## Introduction

Domestic fowl was found to have originated from the wild ancestor of jungle fowl (*Gallus domesticus*) from the southeastern Asia around year (2000-3000 BC). They are important in the available market in the country given their organic way of being raised (Angel, 2010). Poultry is by far the largest group of livestock (FAO, 2000a) species contributing about 30% (Permin and Pedersen, 2000) of all animal protein consumed in the world. The indigenous chickens represent valuable resources for livestock development especially in the rural poor, this is because of their extensive genetic diversity which allows for rearing of poultry under varied environmental conditions (Ajayi, 2010). Chickens play very significant socio-cultural and economic roles in most societies. Chickens in developing countries provide nutrition for the family, a small cash flow reserve for times of celebrations or need and in some areas contribute to religious ceremonies and recreation (Roberts, 1995). There are no cultural or religions taboos of any kind relating to the consumption eggs and poultry meat. To the world’s poor, chickens are probably the most nutritionally important domestic animal species. Scavenger chickens are usually self-reliant and hardy, capable of withstanding the abuses of harsh climate, minimal management, and inadequate nutrition. They live largely on weed seeds, insects, and feeds that would otherwise be a waste (Vietmeyer *et a*l., 1991). Indigenous chickens are widely distributed in the rural areas of the tropics and sub-tropical countries where they are kept by the majority of the rural poor. Despite the introduction of exotic and crossbred types of chickens deep into rural areas, their productivity, even existence is under question. Poultry production in most tropical countries is based mainly on scavenging production systems. Since indigenous chickens in Bangladesh are hardy, they can adapt to rural environments and survive on little or no inputs. They can adjust themselves to the fluctuations in feed availability; thus, such ecotypes remain predominant in villages (Kitalyi, 1998). Thus, they are a potential source of hardiness genes or traits that should be conserved for future use. Such importance of indigenous poultry breeds for subsistence farmers in many developing countries combined with many consumers’ preference for their eggs and meat suggests that these genetic resources are not under immediate threats. However, gradual erosion of the genetic integrity of the stock, through cross-breeding and upgrading program is a cause for concern. The indigenous chickens have special importance to the local community of a country and are a good gene pool for the genetic improvements of a chicken species. Moreover, Mc Ainsh *et al*., (2004) reported that indigenous chickens are not classified into specific breeds; rather they are heterogeneous in phenotype and probably also in genotype. The domestic local chicken (*Gallus gallus domesticus*) is the populous genetic resources among poultry. These local breeds of domestic chicken are kept mainly by smallholder farmers under traditional management practices, and have adapted to a wide range of ecological settings. They are characterized by nondescript and hyper-variable phenotypic landscape (Dana *et al*., 2010; Egahi *et al*., 2010; Melesse and Negesse, 2011). Local chicken show striking morphological variations in plumage color and pattern, comb shape, ear lobe color, shank color, etc. Other characteristics such as naked neck, frizzled feathers, single, pea, rose and cushion combs are common within the flock of local chicken (Hassabellah *et al*., 2014; Negesa *et al*., 2014 and Liyanage *et al.*, 2015). It has been verified that single comb (the wild type) is recessive to all comb types, except the comb-less variant whiles the causative genetic variants for some morphological traits were mapped to their respective genomic region (Wragg *et al.*, 2012). Smallholder farmers usually have broad breeding objectives to fulfill their versatile needs (Moges *et al.,* 2010), hence they keep flock of diverse phenotypes. However, there is some sort of selection on visual traits by smallholder farmers who keep chickens not only for eggs and meat production but also to satisfy their visual appeal and to meet their cultural and religious needs (Dana et al., 2010; Melesse and Negesse, 2011).The future improvement and sustainability of local chicken production systems is dependent on the availability of genetic variation (Benitez, 2002), which can be ascertained through characterization studies. Since morphological traits constitute major components of phenotypes in animal genetic resources, knowing the variations of morphological traits is fundamental to characterization of local genetic resources. Morphometric measurements have been found useful in contrasting size and shape of animals (Latshaw and Bishop, 2001; Ajayi *et al*., 2008). Phenotypic characteristics are very important in describing the uniqueness of animal genetic resources, and providing data for conservation of poultry genetic resources. This study was therefore intended to characterize indigenous chickens for specialized production of lines for selection purposes .

# Chapter II

## Metarial And Methods

### 2.1 Study area and Study period

My study area was Balashpur, Sadar Upazila under the district of Mymensingh. It is located at South-Eastern area in Bangladesh. The study areas were selected considering the agro-ecology, socioeconomic significance of chicken production and population of indigenous chickens based on the atlas published jointly by the International Food Policy Research Institute and the Central Statistics Authority. This study was conducted from February, 2016 to October, 2016.

### 2.2 Study design and chicken selection

Within the period of February to October 2016, simple random sampling was used to select the birds within the village area. A total number of chicken were recorded through preset questionnaire survey by taking information from the owners.

### 2.3 Data collection and questionnaire design

A list of physical descriptors was prepared to record both qualitative morphological characters and certain quantitative traits. Individual households were selected that kept only local chickens. Neighboring households were skipped to avoid the risk of sampling chickens sharing the same cock. Morphological variations were studied based on body weight, feather type, plumage color, shank color, skin color, eye color, beak color and comb type. Data were recorded for a total indigenous chickens following the FAO descriptors for chicken genetic resources (FAO, 1986). Descriptions of comb types were based on illustrations (Somes, 1990). Simple weighing balance was used body weight and quantitative traits were recorded by close inspection of individual chickens in the field.

# Chapter III

## Result & Discussion

I selected 20 birds for my study and took them from different areas of Balashpur in different times of my study period.I have taken all the information about every individual bird by cross questioning with the owners. None of the birds are less than 7 months. The birds were reared by semi-intensive system. Maximum time of the day they were fed outside. Owner fed them twice a day and they sheltered in shed only at night.

The purpose of keeping indigenous chickens at household level in the rural areas is mainly for consumption and income (Aini, 1990; Gueye, 1998; Moreki, 2000; Badubi *et al*., 2006). Variation in phenotype is exactly what characterizes local chickens (Mc Ainsh *et al*., 2004)

The phenotypic characteristics of the different populations of indigenous chickens in this study are delineatedin Tables 1, 2, 3, 4, 5, 6, 7 and 8. The specific features of eachpopulation are elaborated in the following sections. Thedata disaggregated by sex is only presented for morphological traits, showing some interesting variations betweenthe sexes.

Body weight is a function of frame or size and condition of animal (Philip, 1970). The average live weight of 1.3kg reported in this study is comparable to those ( Egbunike and Oluyemi, 1979; Mancha, 2004; Fayaye *et al*., 2006, Ezekwe et al., 2000 and Sudik, 2007). (Aganga *et al*., 2000) and Badubi et al., 2006) Low live weight in indigenous chicken to poor management, while (Mwalusanya *et al*., 2001) genetic, nutrition and parasitic problems as possible reasons. Body weights of the birds were taken by normal weighing balance. I categorized the birds in different weight for my working facility. Table 1 shows the number of birds with different category of body weight.

Table 1: Different type of body weight of selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category (kg) | No. of birds | Percentage (%) |
| Body weight | 1  1.1  1.2  1.5  1.8  2 | 4  2  5  5  2  2 | 20  10  25  25  10  10 |

The superior weight of the naked neck birds may mean that weight related genes are expressed better in these birds than the normal and frizzled feathered birds. It has been suggested that the naked neck chickens have greater weight in the hot season due to genes that cause a reduction in the number of feathers from four to seven weeks than their counterpart chickens (Abdul-Rahman, 2000). Perhaps the naked neck birds dissipate heat easier than their counterparts during hot conditions. This could result in increased performance on growth and productivity. The most probable explanation is that a number of genes interact to determine feather colors and patterns (Crawford, 1990) and probably because indigenous chickens have not been artificially selected (Oluyemi and Roberts, 1979). Feather types of the birds were examined by close inspection. There were the chicken with different types of feather which are given below. (Table 2)

Table 2: Different types of feather of selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Feather type | a. Normal  b. Frizzled  c. Necked neck | 12  3  5 | 60  15  25 |

Seven plumage colors were observed in the native chickens in the study area. The results showed that complete brown color occurred highest while complete black plumage color occurred least (Table 3). This result is in agreement with other authors (Odubote, 1994; Ozoje *et al.,* 1999; Adebambo *et al*., 1999and Duguma, 2006). Duguma (2006) reported very diverse plumage coloration in indigenous chickens of and he concluded that diversity in plumage color is a feature for camouflaging, adaptability and survival. Plumage color of birds were detected by close observation. I found many colors of the plumage. The colors are shown in the following table. (Table 3)

Table 3: Different plumage color of selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Plumage color | a. Black and mottled  b. White and mottled  c. Brown and mottled  d. Black  e. White  f. Brown  g. Dark brown | 3  2  2  1  2  7  3 | 15  10  10  5  10  35  15 |

The dark brown, light brown and dark red are the most frequent eye colors found in the study area, is similar to reports of Mbap and Zakar (2000); Saidu (2002); Sudik (2007). Eye color to a large extent depends on the pigmentation (carotenoid pigments and blood supply) of a number of structures within the eye (Crawford, 1990). All the birds were observed for eye color. The eyes were examined by close inspection. The result of examination is given below (Table 4).

Table 4: Different eye color of examined birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Eye color | a. Dark red  b. Dark brown  c. Pink  d. Light brown  e. Light green  f. Dark ash | 4  7  1  5  1  2 | 20  35  5  25  5  10 |

The commonest shank colors observed in the study were pink, dark ash, ash and light yellow is supported by reports of Mancha (2004) and Sudik (2007). However, Oluyemi and Roberts (1979) had concluded that the commonest shank colors are yellow and black but other variants such as white, blue, slate and willow also exist. These differences are probably the usual differences observed between and within free ranging local chickens in different geographical locations (Msoffe *et al*., 2002).The birds were also examined for shank color. There were different types of shank color which were closely observed. The chicken with different colors is given in the table 5.

Table 5: Different color of shank of selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Shank color | a. Milky  b. Dark ash  c. Ash  d. Red  e. Light pink  f. Light yellow  g. Pink  h. Ash and yellow | 1  5  2  1  2  3  4  2 | 5  25  10  5  10  15  20  10 |

The larger combs as well as wattles of white skin birds probably suggests that, such birds have advantage over birds with other skin colors in the growth and developments of head traits. It may also mean that the underlying carotenoid pigmentation for white skin coloration is possibly associated with genes which favour the development of head, comb and wattle. The significant effects of skin color observed in this study disagreed with the findings of Tabassum *et al*., (2014) in Bangladesh where body measurements were not affected by skin color in indigenous chicken. White skin colored birds are expected to reflect light very effectively and so will experience less heat stress, thereby adapting and growing well in a tropical environment. Skin color of the birds was detected by removing the feather and exposing the skin. Skin color varies individual to individual. The observed colors of the skin of the chicken are given below. (Table 6)

Table 6: Different skin color of selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Skin color | a. Brown  b. Grey  c. Red  d. Violet  e. White  f. Yellow | 3  4  3  2  5  3 | 15  20  15  10  25  15 |

Three beak colors were obtained which are white, yellow and black (Table 7). The colors of the birds were examined by normal observation. There was no more variation of the colors. The observed colors of the birds are given in the following table. (Table 7)

Table 7: Different types of beak color of selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Beak color | a. White  b. Yellow  c. Black | 12  3  5 | 60  15  25 |

The fact that single combed chickens were predominant followed by those possessing rose and pea combs tallies with the reports of Oluyemi and Roberts (1979), Mbap and Zakar (2000), Ikeobi *et al*. (2001), Saidu (2002), Mancha (2004) and Sudik (2007) on indigenous chickens of Nigeria. Similar results were also obtained in other African countries; Badubi *et al*.(2006) reported that the indigenous chickens of Tanzania were mostly single combed as was also observed by Bhuiyan et al. (2006) in Asia among the indigenous chickens of Bangladesh. The higher values observed for the single comb type which was also the largest in size (Oluyemi and Roberts, 1979) suggests a selection advantage and greater adaptability. Combs are important avenue for heat loss in birds (Van Kampen, 1974) and since the tropical climate is characterized by high temperature (Ibe, 1993), large combs would provide an efficient means for heat dissipation. Comb of the birds was also observed by close inspection. The following types of comb of the birds were found in my study. (Table 8)

Table 8: Different comb of the selected birds

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | No. of birds | Percentage (%) |
| Comb type | a. Single  b. Rose  c. Pea  d. Cushion | 12  3  3  2 | 60  15  15  10 |

Badubi *et al*. (2006) in Botswana observed indigenous chickens to be multicoloured but predominantly black; others being brown, red, silver ormetallic green in colour. Vietmeyer *et al*. (1991), Mbap and Zakar (2000) and Mancha (2004) reported similar observations. These reports are in agreement with those obtained in this study.

Chapter IV

## Conclusion & Recommendation

Population number of indigenous otherwise native chickens in Bangladesh is declining. On the other hand, chicken is the only species that are expected to be found in every poor household that is serving an income sources. Therefore, emphasis should be given to balance the indigenous chicken population number dynamism from the research and development bodies. Communities from different parts of a county have been attaching their social believes and life-safeness with the morphological characteristics of indigenous chickens that are used at home. Such believes of the society on the morphological appearances of birds are creating influences on the market values of matured chickens. Thus, any breeding and improved production programs of local chickens should therefore incorporate the production objectives and trait preferences of the society. Moreover, different scholars indicated that the presences of diversified phenotypic appearances of local chickens showed the genetic potential for improvement. Moreover, indigenous chicken have immune-competence and these traits will also help for traditional selection. Hence, these huge gene pool should be protected from genetic erosion and apply improvement through traditional selection together with genomics technology.

# Chapter V

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**The Author**

**Chapter VI**

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# Chapter VII

## Brief Biography of the student

I am Tahamina Akter, daughter of Md. Bahauddin Chowdhury and Halema Akter. I am native to Mymensingh. I have passed Secondary School Certificate examination in 2007 followed by Higher Secondary Certificate examination in 2009. Now I am an intern veterinarian under the Faculty of Veterinary Medicine in Chittagong Veterinary and Animal Sciences University. In the future, I would like to work as a veterinary practitioner and do research on clinical animal diseases in Bangladesh.