

**PHENOTYPIC CHARACTERIZATION AND EVALUATION  
OF PRODUCTIVE POTENTIALITIES OF INDIGENOUS  
CHICKEN IN SANDAKAN SABAH**

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## ABSTRACT

This study was carried out at the Faculty of Sustainable Agriculture (FSA), Universiti Malaysia Sabah, Sandakan Campus from August 2016 until October 2016 with the aim to generate information on indigenous chicken, characterize and describe the phenotypic variation of indigenous chicken around Sandakan area. This study was also aimed to investigate the productive potentialities of indigenous chicken. This research was based on the collected indigenous chicken from area around Sandakan and they will be reared in the FSA chicken house. Data collection was made from 20 indigenous chicken of various type and age concerning their body parameters from comb to leg. The data were collected on their phenotypic characteristics such as plumage colour, comb colour, comb type, eyes colour, earlobe colour and others, morphometric measurement which all part of their body were measured using measuring tape and also in term of production potentialities and carcass trait measurement of indigenous chicken body weight, carcass weight, meat weight, liver weight, heart weight, gizzard, dressing percentage and others. The common types of indigenous chicken in Malaysia are black and black-red varieties. The demand of indigenous chicken is increasing to commercial farmers in Sabah as well as whole Malaysia. But, the price and availability of superior quality indigenous chicken in Sabah region are still far away from farmer's reach and indigenous chickens are generally small and are poor performers in terms of growth and egg production. Therefore by conducting this project, it is believed that the phenotypic characterization and productive potentialities of indigenous can be determined. Furthermore, this research will open the new avenues of research in indigenous chicken in Malaysia.



***Kajian terhadap Pencirian Fenotip dan Penilaian Potensi Produktif Ayam Asli di Sandakan, Sabah***

**ABSTRAK**

*Kajian ini telah dijalankan di Fakulti Pertanian Lestari yang bertempat di Universiti Malaysia Sabah, Kampus Sandakan dari Ogos 2016 hingga Oktober 2016 dengan tujuan untuk menjana maklumat tentang ayam kampung atau dikenali sebagai ayam asli, mencirikan dan menggambarkan variasi fenotip ayam asli sekitar kawasan Sandakan. Kajian ini juga bertujuan untuk mengkaji tentang potensi produktif ayam asli. Kajian ini adalah berdasarkan pada ayam asli yang dikumpulkan di sekitar Sandakan dan dipelihara di rumah ayam di Fakulti Pertanian Lestari. Pengumpulan data telah dibuat seperti yang dijangka iaitu untuk 20 ekor ayam asli dengan pelbagai jenis variasi, umur dan parameter seluruh badan ayam dari balung ayam sehingga ke kaki. Data telah dikumpulkan berdasarkan ciri-ciri fenotip seperti warna bulu, warna taji, jenis taju, warna mata, warna cuping telinga dan lain-lain. Data morfometrik juga telah diambil menggunakan pita pengukur untuk mengukur seluruh badan ayam tersebut. Selain itu, data untuk potensi productive ayam asli turut diambil seperti berat ayam, berat setiap bahagian daging dan organ ayam. Jenis variasi paling biasa ayam asli Malaysia adalah hitam dan hitam-merah variati. . Permintaan ayam asli semakin meningkat kepada peladang komersial di Sabah dan juga seluruh Negara. Namun begitu, harga dan ketersediaan ayam kampung yang berkualiti secara umumnya terhad di kawasan Sabah yang mana masih jauh dari jangkauan peladang dan ayam kampung dan ciri pembiakan dan prestasi pembesaran ayam kampung ini didapati lebih mundur daripada aspek tumbesaran dan penghasilan telur. Oleh yang demikian, dengan menjalankan kajian ini, dipercayai dapat mengenalpasti ciri-ciri fenotip dan potensi produktif ayam asli. Kajian seperti ini masih belum pernah dijalankan lagi di Malaysia setakat ini. Lebih- lebih lagi, kajian ini juga akan memuka jalan baru untuk kajian mengenai bioteknologi haiwan di Malaysia.*

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## **LIST OF SYMBOLS, UNITS AND ABBREVIATIONS**

%	Percent
SE	Standard Error
SD	Standard Deviation
g	Gram
kg	Kilogram
cm	Centimeter



## CHAPTER 1

### INTRODUCTION

#### 1.1 General introduction

The Asian countries contribution towards the world's chicken meat and egg production is about 33% and 50%, respectively. The production is dominated by China which is 47% for meat and 63% for eggs. The production of poultry meat and eggs in this region is dominated by development in relatively few countries. The total production from China, Japan, the Republic of Korea, Thailand, the Philippines, Malaysia and Indonesia made up of 75% of the region's chicken meat output and nearly 83% of the eggs output according to Anonymous (1998). The production of the poultry meat and eggs are dominated by the commercial lines of broilers and layers managed under the intensive systems. Although, the commercial production of poultry utilising the efficient commercial lines of broilers and layers has become very successful and highly competitive in these Southeast Asian countries, the backyard chicken production in rural areas would still continue to contribute towards the domestic chicken meat consumption. In Malaysia, the contribution cannot be ignored but a large contribution of village based production occurs in Indonesia, Thailand and the Philippines (Abenes, 1996).

In Malaysia, the standing population of indigenous chicken in 1994 is estimated to be around 10 million birds which comprised of 3% of the total standing population, and the commercial broilers about 300 million birds or 97% of the total standing population. The 1994 annual production of village chicken was around 15,000 tonnes of meat and 250

million eggs compared to the commercial broilers of 450,000 tonnes poultry meat (Seri Masran, 1996). In peninsular Malaysia, it is estimated that over three quarters of a million rural families still keep village fowl under the backyard production in flocks of 1520 birds of various ages. This practice of keeping the indigenous chicken is still widespread in Southeast Asia (Aini, 1990).

In Indonesia, figures for 1994 showed that village or native fowl population is about 26% (230 million) to the total poultry population (877 million chickens) while about 68% (592 million) are the commercial broilers and 6% (55 million) are culled layers which was described by Soejoedano (1996). In the Philippines, backyard poultry production is the predominant production system. The 1995 estimated total poultry population is 95.5 billion birds, and about 70% are under the backyard rearing system while the remaining 30% are reared under commercial farming. The scenario in Thailand would be similar to Malaysia where commercial broiler production is predominant, but there are about 4.6 million backyard chicken farming units in Thailand consisting of about 550 chickens per unit for home consumption and petty sales (Morathop and Mahantachaisakul, 1996).

### **1.1.1 Importance of Indigenous Breeds for Rural Economy**

Chickens are the most popular poultry worldwide irrespective of culture and region according to Dessie *et al.* (2012) and Al-Nasser *et al.* (2007). Dessie *et al.* (2012) reviewed the current state of knowledge on indigenous chicken genetic resources of the topics: domestication, distribution, and documentation of information on the genetic resources

Chickens in developing countries have more diverse use and benefits to household. The use of indigenous chicken in tropics varies from region to region and from community to community within a region. In the tropics small land holders keep chickens for their socio religious functions. This is because the commitment of an individual or community to a particular spiritual being, deity or season, and traditional and religious festivals is evaluated by the quality of the offering that satisfies special morphological features of the chicken demanded by the receiver (Dessie *et al.*, 2012).

Regardless of low output from indigenous in the tropics they can thrive and produce even in harsh weather and irregular supply of feed and water. They also can survive with minimum healthcare. They are part of balanced farming system and have crucial roles in the rural household as sources of high quality animal protein and also emergency cash income and play a significant role in sociocultural life of rural community. According to Tadelle (2003) local chicken are slow grower and poor layers of small size eggs but the hen are ideal mother and good sitters, excellent foragers and hardy (Darwish *et al.*, 1990). They also possess natural immunity against common disease. Their small sizes actually give advantages as it is desirable character in tropical and subtropical environment. In addition, one of most important characters of indigenous chicken according to Dessie (2012) is their hardiness, which is ability to tolerate the harsh environmental condition and poor husbandry practices constrain like climate and handling without much loss in production.

In one of case study, Yang and Jiang (2005) reported that consumers usually prefer for coloured feather and slow growing meat-type quality chickens in certain regions of the world. Quality chickens are generally produced by direct use of indigenous chicken breed which are normally slow growth with poor feed conversion. The sustained use of native chickens in the traditional or family poultry production system showed the need to consider the value of indigenous chicken. Das *et al.* (2008) reported that rural poultry production particularly chicken then followed by duck production play significant role in the socioeconomic development of Bangladesh. Almost 90% of rural family keep small flock size of indigenous chicken and duck under traditional free range semi scavenging system. They reported that poultry are generally maintained by the rural women and children that generate cash revenue and that supply adequate eggs and meat to their personal family's diet.

### **1.1.2 Common Characteristic of Indigenous Chicken**

Indigenous chicken have several valuable morphologies and characteristics that are not found in other chicken such as body, feather, plumage, comb, shank and earlobes colour and chicken with naked neck. The indigenous chicken is a small dual-purpose

chicken. They are slow growing breed that contributed to its low productivity. Both its physical characteristics and its colouring are highly variable and three principal colour types are recognized.

The commonest is the black-red variety, in which cocks are mainly green-black with glossy red-brown back, neck hackles and saddle feathers. Other varieties are the red type and the naked-neck type. The other types of indigenous chicken that can be found in Malaysia are dwarf chicken, Serama. Indigenous chickens are generally small and are poor performers in terms of growth and egg production according to Engku Azahan *et al.* (1980), Engku Azahan *et al.* (1983), Engku Azahan and Wan Zahari (1983), Jalaludin *et al.* (1985); Oh *et al.* (1987), Ramlah and Shukor (1987) and Engku Azahan *et al.* (1990).

The body weight of indigenous chicken generally is between 1.1 and 1.5 kg over 4 months have been regularly quoted and they produce about 100 eggs per year. Their poor egg producing capacity is mainly due to the prevalent characteristic of broodiness among the females. Thus, despite of their slow growth and small size, they are more costly and expensive than other chicken. Malaysian indigenous chickens have been a part of traditional rural living of local farmer. There are the common backyard fowls and they are a mixture of different breeds, sex and ages, which are managed by small scale farmers in rural areas of Malaysia. The productivity of Malaysia indigenous chicken is very low compared to commercial or exotic breeds. According to Islam *et al.* (1981) although indigenous chicken have lower in productivity compared to commercial chicken but they are adapted to tropical climatic condition. Furthermore, meat of indigenous chickens has some unique features and seems superior, because fat and cholesterol content were low and the fatty acid profile is favorable.

Indigenous chickens, which account for 99 % of the total poultry population in Ethiopia, according to available statistics (AACMC, 1984 and ILCA, 1993) provide major opportunities for increased protein supply and income for smallholders because they require low capital investment, have a short generation interval and a high rate of productivity. They also play a complementary role in relation to other crop-livestock activities. Characterization, utilization and conservation of these poultry genetic resources

are highly important for developing countries like Ethiopia, Bangladesh and some Asian countries whose economy depend heavily on the agricultural sector and cannot ignore the contribution of indigenous chicken in Malaysia.

Local farmer classified indigenous chicken by the appearances, especially their plumage color and characteristics. However, in order to improve the standard of chicken management and to develop a suitable conservation strategy for indigenous chicken, improvement in management of the village chicken production should be accompanied. Generally, characterization of animal genetic resources involved three types of information which are phenotypic, genetic and historical. Thus, the aim of this study is to phenotypically characterize the indigenous chicken in Sandakan area, Sabah. In addition, this study aims to study the productive potentialities of indigenous chicken in Sandakan, Sabah.

## **1.2 Justification**

Indigenous chicken in Malaysia especially in Sabah might not be paid attention like other chicken. It is might be because of slow growing rate as the demand for chicken meat is increasing from time to time. However, by investigating and studying on all the morphologies and even the genetics of indigenous chicken, we might be end up by knowing the certain way to improve the indigenous chicken in Sabah and Malaysia as well.

## **1.3 Objective**

- i. To study the phenotypic characterization of indigenous chicken in Sandakan, Sabah.
- ii. To study the productive parameters of indigenous chicken in Sandakan, Sabah.



#### **1.4 Hypothesis**

$H_0$ : There are no significant differences among the phenotypic characteristics of indigenous chicken in Sandakan, Sabah.

$H_a$ : There are significant differences among the phenotypic characteristics of indigenous chicken in Sandakan, Sabah.

## CHAPTER 2

### LITERATURE REVIEW

Several research studies have been conducted and reported in the literature on phenotypic characterization and evaluation of productive potentialities of indigenous chicken. Few researches so far had also been reported on the morphometric of indigenous chicken. The related findings of research work carried out in different countries of the world are reviewed in this chapter.

#### 2.1 Scientific Classification of Chicken

- Kingdom : Animalia
- Phylum : Chordata
- Class : Aves
- Sub-Class : Neornithes
- Order : Galliformes
- Family : Phasianidae
- Subfamily : Phasianinae
- Genus : Gallus
- Species : G. gallus
- Subspecies : G. g. domesticus
- Scientific Name : Gallus gallus domesticus

Source: ([www.roysfarm.com/classification-of-poultry/](http://www.roysfarm.com/classification-of-poultry/))

## 2.2 Background of Chicken

Chicken is the cheapest and important source of animal protein in the form of eggs and meat throughout the world including Malaysia (Simon, 2009). The chicken was thought to be domesticated more than 10,000 years ago where the Indians and later the Vietnamese bred chickens for meat, feathers and eggs. The domestication of chickens was thought to have then spread rapidly across Asia and into Europe and Africa resulting in the chicken being the most widely farmed animal today.

There are thought to be at least 25 billion chickens worldwide, which is the highest population of any bird in the world. The chicken usually gets to about 40 cm tall and surprisingly, the chicken is one of the species of bird that is not very successful as far as flying is concerned.

The male chicken is typically referred to as a cockerel but is known as a rooster in some countries such as Australia. A female chicken is called a hen and the little; fluffy yellow babies are called chicks. Chickens can live for up to 4 or 5 years in the wild but many commercially farmed chickens usually do not exceed the age of one. Many chickens have been known to live for longer and the oldest recorded chicken was said to live until it was 16 years old.

Chickens are omnivorous animals meaning that they eat a mixture of plant and animal matter. Although chickens are commonly seen scratching on the ground in search of seeds, berries and insects, chickens have also been known to eat larger animals such as lizards and even small mice. Chickens are considered as easy prey to some predator like snake and larger birds like eagle.

Chickens are kept by humans for their meat and eggs. Breeders tend to keep different types of chicken for these different purposes and meat chickens will often only reach 3 months old before they are killed, which is why it is crucial that chicken eaters ensure that the chicken they are eating has had the best existence possible in its few

months of life. The same principle applies to the egg laying chickens with the typical commercial hen laying around 300 eggs in one year. After that, the hens tend to start laying fewer eggs and are generally killed by their breeder.

Chickens are very sociable birds and are at their happiest when surrounded by other chickens. In one chicken flock there can be any number of hens but generally only one cockerel who is the dominant male. The dominant cockerel pushes other cockerels out of their flock when they start becoming big enough to be a threat to him. The dominant male is usually the mating partner for all of the hens that he watches over.

Chicken is one of the most widespread meats in the world with numerous cultures having their own special ways to prepare and eat chickens. The UK's most common dish is roast chicken, the USA's most common dish is fried chicken and in China they use every part of the chicken including their feet which are commonly found in soup.

There has been a great deal of media attention focused on chickens in the last few years, mainly concerning the welfare of commercially farmed chickens. Intensive farming occurs around the world where meat chickens are force fed and packed in a shed with hundreds of thousands of other chickens often with no free space for the chickens to walk around. Egg laying chickens are shut in tiny cages and are slaughtered when they no longer produce as many eggs as they used to. The conditions that intensively farmed chickens live in are utterly disgusting, which is why chicken lovers should fork out a few extra pennies for organic or free range meat and eggs, to ensure that the chicken has had a good quality of life.

### **2.2.1 Origin and Background of Indigenous Chicken**

The terminology used to describe chickens is confusing, as they are referred to as "indigenous", "native", or "local". According to the Oxford Dictionary (1990) these terms are defined as;

- Indigenous: living naturally in an area; not introduced
- Native: belonging by birth to a specific area, country

- Local: native inhabitant.

Hence, for the purpose of this study it was decided to use the word “indigenous” for the characterization of chickens. Indigenous chicken or called as kampung chicken is the chicken breed that was originated from Malaysia and Indonesia. The indigenous chickens, although sought as a delicacy, are known for their inferior growth performance when compared with other imported coloured and free ranging strains and their crosses (Azahan and Houte, 1992; Azahan *et al.*, 1993; Noraziah and Azahan, 1995; Rahman *et al.*, 2000). According to Petersen *et al.* (1991), he reported that the indigenous chicken produced an average of 100 eggs per year which is higher than the egg production of the Ethiopian (Tadelle *et al.*, 2003) and Indonesian (Rasyaf, 1998) indigenous chicken at 75 and 66 eggs per year respectively.

The present stocks of indigenous chickens of Malaysia or the popularly known ‘kampung’ (village) chickens (*Gallus domesticus*) are the descendants of the red jungle fowl (*Gallus gallus*). They evolved from random and indiscriminate crossbreeding between the original Malay fowl, the jungle fowl and the exotic commercial breeds. As they are no longer purebreds, their physical attributes are so variable that no single description can fit the entire flock.

The indigenous chicken is a small dual-purpose chicken. They are slow-growing breed that contributed to its low productivity. Both its physical characteristics and its colorings are highly variable. Three principal colour types are recognized according to (Rasyaf, 1998). The commonest is the black-red variety, in which cocks are mainly green-black with glossy red-brown back, neck hackles and saddle feathers. Other varieties are the red type, serama chicken and the naked-neck type.

### **2.2.2 Breeds of Indigenous Chicken**

There are various breeds of indigenous chicken all over the world. The breeds of indigenous normally differ according to every country. In this study it will be more focused and specific to Malaysia indigenous chicken breeds. The indigenous chicken breeds that

are commonly found are naked-neck chicken, serama chicken, jungle fowl, Malay chicken, the Sumatra and the Siamese fighting cock. The kampong chicken is not a breed. It is a term used to describe a mix-breed chicken commonly found in villages throughout South East Asia.

In the markets, the term kampong chicken refers to any non-broiler chicken which have characteristics like slow growing, colored feather chicken. Various improved breeds and hybrids are now also sold as kampong chicken. These include the Sasso chickens, Asil, Naked-neck, various crosses such as Kabir and Isaand others. In many rural roads, one can see these breeds roaming free and are considered as 'ayam kampung' by villagers now. For urban area they thought kampong chickens are chicken that are reared by giving organic feed in free range system.

a) Serama

The Serama or can be known ' *Ayam Serama* ' in Malay, also called the Malaysia. Serama is a bantam breed of chicken originating in Malaysia within the last 50 years. Serama originate in the Malaysian state of Kelantan, apparently through the crossing of Japanese and Malaysian bantams. Other stories of the birds derived from a gift of some small chickens by the King of Thailand to a local sultan in ancient times. Small chickens have always been popular pets in this area and are often referred to as "ayam katik" (pygmy chickens) and "ayam cantik" (pretty chickens). Figure 2.1 shows the picture of serama breed of chicken.





Figure 2.1: Photograph of Serama  
Source: (www.wikipedia.org)

b) Naked- neck chicken

Naked-neck chicken or can also be known as Transylvanian Naked Neck is a breed of chicken that is naturally devoid of feathers on its neck and vent. This breed of chicken was originally from Transylvanian and developed in Germany. The naked-neck chickens have unusual appearance compared to other breed of indigenous chicken as it devoid of feather on their neck and vent. Figure 2.2 shows the picture of naked-neck chicken in India.



**Naked neck**  
( Photo source: KVK Namakkal )

Figure 2.2: Photograph of Naked neck chicken in India  
Source: Namakkal

c) Asil chicken

The Asil or Aseel is a breed of indigenous chicken originating from South Punjab and India. These breeds of chicken also were found throughout Southeast Asia like Thailand and Malaysia. Asil were firstly used fighting cock as it is noted for its pugnacity, high stamina, and majestic gait and dogged fighting qualities. There are many varieties of Asil. Although poor in productivity, the birds of this breed are well known for their meat qualities. Broodiness is most common and the hen is a good sitter and efficient mother. They possess pea combs which are small but firmly set on head. Wattles and ear lobes are bright red, and the beak is hard. The face is long and slender, and not covered with feather. The eyes are compact, well set and present bold looks. The neck is long, uniformly thick but not fleshy. The body is round and short with broad breast straight back and close set strong tail root. The general feathering is close, scanty and almost absent on the breast. The plumage has practically no fluff and the feathers are tough. The tail is small and drooping.

d) Malay chicken

Malay chicken is a breed of chicken especially for game chicken. It is the tallest breed of chicken, and may stand over 90 cm high. The breed achieves its great height from a combination of long neck, long legs, and upright carriage of body. At the time that Europeans first encountered them, Malay chickens were widely distributed throughout the Orient, in particular from north India to Indonesia and Malaysia. The figure 2.3 below shows the photograph of Malay chicken.





Figure 2.3: Photograph of Malay chicken

Source: ([www.livestockconservancy.org](http://www.livestockconservancy.org/images/uploads/abstracts/malay.jpg))(images/uploads/abstracts/malay.jpg)

### 2.3 Phenotypic Characterization of Indigenous Chicken

The phenotypic characterization can be defined as the morphological features or physical appearances of chicken that can be observed from all parts of their bodies. The body parts of chicken that are normally observed like plumage colour, comb colour, earlobe colour, shank colour, beak colour, eye colour, comb type, shank feather and others. There was a study that was conducted by Ferdaus *et al.* (2016) which investigated about morphological and morphometric characteristics of indigenous of dwarf chicken of Bangladesh. The table 2.1 below shows result of the finding of his study.

Table 2.1: Morphological characteristics of indigenous dwarf chicken of Bangladesh

Trait	Characteristic features	No. observation	Frequency (%)
Plumage colour	Black	37	41.11
	Blackish red	11	12.22
	Reddish red	11	12.22
	Golden	10	11.11
	Blackish golden	16	17.78
	Black with white spot	4	5.56
Shank colour	Black	25	27.78



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