Characteristics and growth of Merawang Chicken in Bangka Belitung under traditional farming system

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Abstract. Merawang Chicken is a local chicken originated from Bangka Belitung based on the Decree of the Minister of Agriculture No.2846/kpts/L8.410/8/2012. In addition to its historical value, Merawang chicken also has high economic value; therefore, it needs to be conserved. Most of the Merawang chicken management system in Bangka Belitung is still traditional. The original characteristics of the Merawang chicken are thought to have been mixed with other native chickens. This study aims to identify Merawang chickens' characteristics in the Bangka Belitung Islands traditionally raised by farmers. This research was conducted on six farmers in three districts on Bangka Island (Pangkalpinang, Bangka, and Central Bangka). Qualitative and quantitative traits were observed. There was non-uniformity in the qualitative characteristic of Merawang chickens at the farmer level, especially in the color of the feathers. As for the quantitative traits, some of the body sizes of Merawang chickens at the farmer level are still below the size stated in the Minister of Agriculture Decree, such as breast length, head length, and comb length. The Average Daily Gain (ADG) for each location also varies depending on the type of feed given.

1. Introduction
Merawang chicken is one of 41 local chicken families that live in Indonesia [1]. Merawang Chicken is a local chicken originated from Bangka Belitung based on the Decree of the Minister of Agriculture No.2846/kpts/L8.410/8/2012. The bodyweight of Merawang chickens reaches 2.41 kg for males and 1.81 kg for females [2]. Merawang chickens that are raised intensively also have faster growth than those raised under traditional management. So, this chicken has the potential to be developed as a commercial broiler. However, due to the mixed data with other native chickens, the Merawang chicken population in Bangka Belitung remains unclear.

Identification of the characteristics of Merawang chickens is important for the basic data of Merawang chicken characteristics. According to [3], it is important to identify the characteristics of local chickens. The basic data obtained from the identification can be used for conservation and breeding.
programs. Identification can be made on phenotypic characteristics, including qualitative (coat color, skin, shank, comb shape) and quantitative traits. Meanwhile, according to Pamungkas [4], the exploration of native chickens' genetic potential needs to be done by intensive research on the genetic marker and purification of the existing population of native chickens. These efforts need to be supported by good research on heritability value, phenotype, and genotype correlation between certain traits. The general characteristics of Merawang chickens have been defined in the Decree of the Minister of Agriculture of the Republic of Indonesia Number 2846/Kpts/LB.430/8/2012, which established the Merawang chickens as local chicken from Bangka Belitung.

The rearing system for Merawang chickens in the most traditional farms in Bangka Belitung is still conventional that animal freely to mixed with other native chicken. This causes the genetic purity or original characteristics of the Merawang chicken have been combined with other native chickens. This study aims to evaluate the characteristics of Merawang chickens in the Bangka Belitung traditionally raised by farmers.

2. Methods
This study was conducted on June-October 2018 in 7 (seven) locations of smallholder farms in Pangkalpinang City (PKP), Bangka Regency (BR), and Central Bangka Regency (CBR). The number of Merawang chicken observed was 56 that aged two weeks. The observed variables include; qualitative characteristics, body morphometric measurements, two weeks body weight, ten weeks body weight, and average daily gain (ADG).

Observation of qualitative traits was carried out by observing each sample, including feather color, feather pattern, comb shape, shank color, and coat color patterns. Body morphometric measurements are obtained by measuring head length, neck length, comb length, chest circumference, chest-length, beak length, femur length. Bodyweight was observed by weighing each sample. While the data of ADG was obtained by the formula:

\[
\text{Average Daily Gain (ADG)} = \frac{10 \text{ weeks weight} - 2 \text{ weeks weight}}{56 \text{ days}}
\]

The feed given by each farmer varies in each location according to availability, accessibility, and the price of raw materials. The feed composition given can be seen in Table 1 below.

| Feed material      | Pangkalpinang A | Pangkalpinang B | Pangkalpinang C | Central Bangka Regency D | Central Bangka Regency E | Bangka Regency F | Bangka Regency G |
|--------------------|-----------------|-----------------|-----------------|--------------------------|--------------------------|-----------------|-----------------|
| Corn (%)           | 20              | 20              | 30              | 20                       | 35                       | 35              | 40              |
| Commercial feed (%)| 20              | 20              | -               | 30                       | -                        | 25              | -               |
| Rice bran (%)      | 60              | -               | -               | 50                       | -                        | -               | 60              |
| Pollard (%)        | -               | 30              | -               | -                        | 60                       | -               | -               |
| Palm kernel meal (%)| -              | 30              | 40              | -                        | -                        | -               | -               |
| Tofu dregs (%)     | -               | -               | 30              | -                        | -                        | -               | -               |
| Grass (%)          | -               | -               | -               | -                        | -                        | 5               | -               |

The data obtained were analyzed using descriptive statistical analysis.
3. Results and discussion

3.1. Qualitative traits
There is non-uniformity in the qualitative traits of Merawang raised by smallholder farmers in Bangka Belitung, especially in the color of the feathers (table 2).

| Phenotype          | Male (%) | Female (%) |
|--------------------|----------|------------|
|                    | PKP*     | CBR**      | BR***     | PKP*     | CBR**      | BR***     |
| Feather color      |          |            |           |          |            |           |
| Light brown        | 0        | 0          | 0         | 88.89    | 0          | 10        |
| Brown              | 0        | 0          | 0         | 11.11    | 50         | 90        |
| Reddish brown      | 100.00   | 100.00     | 71.57     | 0        | 50         | 0         |
| Golden brown       | 0        | 0          | 28.57     | 0        | 0          | 0         |
| White              | 0        | 0          | 0         | 0        | 0          | 0         |
| Feather color      |          |            |           |          |            |           |
| pattern            |          |            |           |          |            |           |
| Black              | 0        | 0          | 0         | 0        | 0          | 0         |
| Wild               | 0        | 0          | 0         | 0        | 0          | 0         |
| Columbian          | 100.00   | 100.00     | 100.00    | 100.00   | 100.00     | 100.00    |
| Feather pattern    |          |            |           |          |            |           |
| Plain              | 100.00   | 100.00     | 100.00    | 100.00   | 100.00     | 100.00    |
| Striated           | 0        | 0          | 0         | 0        | 0          | 0         |
| Shank color        |          |            |           |          |            |           |
| white/yellow       | 100.00   | 100.00     | 100.00    | 100.00   | 100.00     | 100.00    |
| black/grey         | 0        | 0          | 0         | 0        | 0          | 0         |
| Comb shape         |          |            |           |          |            |           |
| rose               | 0        | 0          | 0         | 0        | 0          | 0         |
| pea                | 0        | 0          | 0         | 0        | 0          | 0         |
| single             | 100.00   | 100.00     | 100.00    | 100.00   | 100.00     | 100.00    |

* PKP = Pangkalpinang;
**CBR = Central Bangka Regency
***BR = Bangka Regency
Most of the male Merawang Chicken feather colors were uniform, with a dominant golden brown color in PKP, CBR, and BR. The color of male Merawang chicken feathers in PKP and CBR was 100% reddish-brown, while in BR, 71.5% reddish brown and 28.5% golden brown. The color of the hens' feathers tends not to be uniform in each region; for example, in PKP, it shows a dominant color of brown (88.89%) and light brown (11.1%). Whereas in CBR, the frequency of brown and reddish-brown hair color in females was 50% each. In BR, the color of female fur shows a dominant brown color (90%) and only 10% for light brown.

According to [3], the genotype and phenotype variation of native chickens is significantly high, so it needs to be selected up to the 4th generation. The feathers of male chickens are 100% reddish-brown, but these results are different from hens, where the color of the hen is reddish-brown (80%), while in this study, the feather color of hen tends to light brown and brown. In general, the phenotypic variation level is influenced by the differences of breeding environment, different rearing environments, and climatic influences [2]. The high degree of variation of the color of the Merawang Chicken feathers in 3 districts is because maintenance is still traditionally free-range or limited-range. By this maintenance system, Merawang chickens can interact with other local chickens, such as kampung chicken. This interaction allows the mating between Merawang chickens and other local chickens. This causes the environment and maintenance management to affect the qualitative traits of Merawang chickens in each district. According to Kusumo & Prijono [5], the body variation of native chickens is influenced by the breed's origin, breeding environments, and climatic influences. The variations in the color of the feathers can be generated by evolution or revolution due to uncontrolled breeding and mating in the traditional breeding system that occurs from generation to generation. The adaptation process due to environmental stress factors also greatly influences changes due to efforts to defend themselves. Diverse or new traits can be generated by a long adaptation process and can be passed on genetically from generation to generation [6].

Merawang chicken is the genetic resource from Bangka Belitung that has been designated as the original local chicken from Bangka Belitung with the decree of the Minister of Agriculture No. 2846 / Kpts./LB.430/8/2012. The descriptions of qualitative traits that have been approved in this decree for feather color are mainly brown, red, and golden yellow with wings and tail colored black. Compared with this description, this study's results indicate that male chickens are consistent with the description in which it is colored reddish-brown. Still, for females, especially in PKP, there was a color difference in which 88% of the hen were colored light brown.

The feather color pattern in this study was observed as uniform (100% Columbian), both male and female. This result is not different from Nuraini's study [7] that the 3rd generation Merawang chicken has a Columbian feather color pattern. The Columbian color pattern is also by the description that has been mentioned in the Minister of Agriculture Decree.

The Merawang chicken feather pattern in this study was plain in all of the locations. This is consistent with Nuraini's result [4] for the Merawang chicken feather pattern in G3. However, these results are slightly different from the previous generations of Merawang chickens G0, G1, and G2, where only in part of the male and female Merawang chickens had plain patterns [8, 9]. The color of the shank on Merawang chickens in this study was 100% white/yellow. This accordance with the description in the Minister of Agriculture Decree. The shape of Merawang chickens' comb in 3 districts in Bangka Belitung shows a 100% single comb. Some indigenous chickens in Indonesia have other combs, such as Sentul chicken, with a pea comb shape[10].

### 3.2. Body morphometric size

The observations indicated that the morphometric size of Merawang chickens in the three districts in Bangka Belitung was varied (table 3). This is probably due to the different traditional rearing systems
in each location. Traditional animal rearing provides a high environmental influence on the physical traits that appear in the Merawang chicken.

The qualitative traits observation results show that Merawang chickens in the PKP region tend to have a larger morphometric size than Merawang chickens in CBR and BR, both for males and females. This indicates chicken rearing management affects the body size of the chickens. The quality of feed-in PKP was better than the other two areas. PKP farmers provide tofu dregs and fish waste to Merawang chicken feed. Fish waste increases the ration protein, while the high protein ratio increases the animal’s live weight [11]. The body size of Merawang chickens in the traditional rearing system is still below the size stated in the Minister of Agriculture Decree. The chest-length, head length, comb length in the Agriculture Decree Minister were 11.8 cm, 7.3 cm, and 11.5 cm, respectively. This decrease in body size is due to the low purity level of the Merawang chickens traditionally reared. The traditional breeding system allows for cross-breeding with local chickens whose body size is smaller.

### Table 3. Body morphometric measurements of Merawang Chickens at three districts in Bangka Belitung Province

| Average body morphometric size          | PKP* | CBR** | BR*** | PKP* | CBR** | BR*** |
|----------------------------------------|------|-------|-------|------|-------|-------|
| Haed length (cm)                       | 5.3±0.35 | 4.9±0.25 | 4.9±0.61 | 4.5±0.50 | 4.6±0.07 | 4.3±0.54 |
| Head width (cm)                        | 3.0±0.01 | 3.1±0.10 | 3.2±0.27 | 3.0±0.01 | 2.8±0.35 | 2.9±0.24 |
| Beak length (mm)                       | 24.2±3.74 | 19.9±1.79 | 22.7±4.39 | 20.9±3.19 | 21.5±0.86 | 20.3±3.02 |
| Comb length (mm)                       | 83.5±3.59 | 57.7±3.60 | 80.6±3.46 | 43.7±1.00 | 31.2±6.62 | 38.7±1.95 |
| Comb height (mm)                       | 42.9±2.37 | 30.0±3.09 | 40.5±1.71 | 19.1±5.78 | 12.4±2.90 | 15.9±1.08 |
| Neck length (cm)                       | 12.0±1.41 | 9.4±0.75 | 9.8±0.27 | 10.4±0.76 | 10.5±0.01 | 9.5±0.67 |
| Back length (cm)                       | 26.0±1.41 | 20.1±2.17 | 25.2±3.29 | 20.2±1.87 | 16.5±0.71 | 21.5±1.91 |
| Wing length (cm)                       | 18.0±1.41 | 17.3±1.50 | 19.1±1.51 | 16.3±1.87 | 16.8±1.77 | 17.8±1.18 |
| Chest circumference (cm)               | 34.8±1.77 | 29.3±0.96 | 34.3±5.25 | 33.1±2.36 | 28.5±1.41 | 29.9±4.10 |
| Chest length (cm)                      | 11.8±1.06 | 8.9±0.25 | 11.4±1.37 | 11.2±0.97 | 8.8±0.35 | 9.3±1.58 |
| Femur length (cm)                      | 12.5±0.71 | 10.1±0.48 | 11.4±1.69 | 11.1±0.95 | 9.0±0.71 | 9.9±0.91 |
| Tibia length (cm)                      | 13.8±1.06 | 12.8±0.50 | 12.6±1.30 | 12.8±1.56 | 11.5±0.01 | 11.3±0.82 |
| Shank length (cm)                      | 9.5±0.71 | 6.9±0.48 | 8.2±1.32 | 7.6±1.17 | 6.3±0.35 | 7.40±0.88 |
| Shank circumference (cm)               | 5.5±0.01 | 4.8±0.29 | 5.1±0.73 | 4.4±0.17 | 4.3±0.35 | 4.2±0.42 |

*PKP= Pangkalpinang;  
**CBR = Central Bangka Regency  
***BR= Bangka Regency

### 3.3. Bodyweight dan growth

The observations on body weight and growth of Merawang chickens showed that body weight at two weeks, body weight at ten weeks, and ADG for Merawang chickens in PKP were higher than in CBR and BR (table 4). This is because of the larger body morphometric size of the Merawang chicken in PKP compared to the other two districts. Also, male Merawang chickens have a higher body weight of 2 weeks, bodyweight of 10 weeks, and ADG than females. The growth rate of livestock is influenced by sex [12]. This is also consistent with previous studies [2, 13, 14, 15].
Table 4. Body weight and growth of Merawang chicken

| Variables            | Males           | Females         |
|----------------------|-----------------|-----------------|
|                      | PKP* CBR** BR*** Mean | PKP* CBR** BR*** Mean |
| 2 weeks body weight (g) | 288.00 282.00 263.00 277.00 294.00 262.00 256.00 274.00 | 1239.00 1106.00 1124.00 1164.00 1146.00 940.00 1011.00 1069.00 |
| 10 weeks body weight (g) | 15.12 14.20 14.85 14.76 13.68 11.68 13.02 13.24 | 1.164 g 1.069 g |

*PKP= Pangkalpinang; **CBR = Central Bangka Regency ***BR= Bangka Regency

The bodyweight of 10 weeks old Merawang chickens in this study was 1.164 g for males and 1.069 g for females. This bodyweight is higher than the crossbreeding of Merawang chickens with Arabic chicken, where the bodyweight of 10 weeks of age in males is 818.2 g - 846.5 g, and females 733.73 g - 748.5 g [16]. The bodyweight of Merawang Chickens was also higher than that of some improved native breeds and their crosses. KUB-1 x KUB-1 (768 g), SenSi-1 x KUB-1 (830 g), Gaok x KUB-1 (732 g) [17]. KUB chickens aged 11 weeks has bodyweight 1.088 g for males, and 920.68 g for females [18], selected Sentul chickens G4 aged ten weeks have body weight for male 920 g - 996 g and females 748 g - 775 g [10]. Local indigenous chickens aged ten weeks old have bodyweight 681.4 g [19].

ADG of Merawang chickens until the age of 10 weeks in this study was 14.76 g / day for males and 13.24 g/day for females. This result was higher than that of Sidadolog and Yuwanta's study on the same chicken family but in ex-situ locations, where the ADG of Merawang chickens aged 2-12 weeks was 9.1-9.2 g/day [21]. This study's results were also higher than Hardini and Dewiki [13] that ADG Merawang chicken was 11.1 g/day for males and 9.2 g/day for females. This is due to differences in the composition of the feed used and the presence of genetic traits that affect Merawang chickens' growth in the area of origin (Bangka Belitung) better than outside their area of origin.

4. Conclusions

Identification of the characteristics of Merawang chickens traditionally raised by farmers in Bangka Islands resulted in some information that can be used as basic data for breeding programs and conservation. According to the data obtained, it can be concluded that there is non-uniformity in the qualitative traits of Merawang chickens that are managed traditionally, especially in the color of the feathers. The body size of Merawang chickens in traditional farming management is smaller than that stated in the quantitative characteristics found in the Minister of Agriculture Decree No 2846 / kpts / LB.430 / 8/2012, such as the size of the chest length, head length, and comb length. Merawang Chickens' bodyweight in this study is higher than some other local chicken and their crosses, such as Merawang Chicken crosses with Arabic chickens, KUB crosses, and sensi crosses, gaok crosses native chickens, super native chickens, and superior native chickens.

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