

## Performance of the local chickens on traditional management in Manokwari District, West Papua Province

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**Abstract.** This study aims to determine the performance of local chickens in traditional management in the Manokwari district. Two hundred and forty local chickens were taken by purposive sampling in three sub-districts (Prafi, Masni, and East Manokwari) in Manokwari district. Measurements were made on body weight (BW) and body size, i.e. femur length (FL), tibia length (TL), shank length (SL), shank circumference (SC), chest length (CL), and chest circumference (CC). The results of the descriptive analysis showed that the average BW in males and females was  $2368.5 \pm 626.3$  g and  $1876.1 \pm 413$  g; FL in males and females is  $11,892 \pm 1,659$  cm and  $10,450 \pm 1,522$  cm; TL in males and females is  $15,825 \pm 1,382$  cm and  $13,283 \pm 1,132$  cm; SL in males and females is  $9.575 \pm 1.418$  cm and  $7.7750 \pm 1.008$  cm; SC in males and females is  $4.9750 \pm 0.739$  cm and  $4.1417 \pm 0.490$  cm; CL in males and females at  $12,500 \pm 1,932$  cm and  $10,758 \pm 1,264$  cm; and CC in males and females was  $34,350 \pm 3,180$  cm and  $31,842 \pm 2,494$  cm. Statistically it was known that BW and body size of local chickens in males and females differed significantly ( $P < 0.05$ ). Based on the Pearson correlation analysis showed that BW and body size observed in both males and females correlated significantly ( $P < 0.05$ ). The stepwise regression analysis results found that BW of male local chickens can be estimated through the equation:  $BW_{\text{male}} = -3400 + 430 SL + 95 TL + 47 CC + 54 CL$ , with  $R^2 = 76.94\%$ . While BW of female can be estimated through the equation:  $BW_{\text{female}} = -2271 + 71 CC + 90 CL + 149 SC + 44 TL$ , with  $R^2 = 47.63\%$ . It was concluded that local chickens in traditional management in Manokwari district produced better performance than the same management in other regions, especially in central and western Indonesia. This is because the availability of natural feed is still abundant and inbreeding practices can be avoided.

### 1. Introduction

Local chickens in the Manokwari district area are phenotypically no different from native chickens in other regions in Indonesia. However, the local chicken population in Manokwari is genetically thought to have been inserted by genes derived from superior chickens that were once cultivated by a research institution in Manokwari during the Dutch colonial period. At that time, the research institute deliberately released superior males (Australorp and Barred Plymouth Rock) to the local community, then the superior males mated female chickens belonging to the local community [1]. On the other hand, the availability of natural food in the Manokwari district area is still very abundant, so local chickens that are generally kept by farmers with extensive systems (traditional management) are very possible to get adequate nutritional intake. Based on the above, it is suspected that the local chickens

in Manokwari district have different performance (body weight and body size) compared to native chickens outside the Manokwari regency.

This study aims to determine the performance of local chickens in traditional management in Manokwari district, and study the relationship between body weight and body size to find a formula for estimating the body weight of local chickens in Manokwari in the framework of its future development.

## 2. Materials and Methods

This research was conducted in Manokwari District, West Papua Province for four months (September to December 2018). The location of the study was on farmer farms in the Manokwari district area which is densely populated with local chickens, namely the sub-districts of Prafi, Masni and East Manokwari [2]. The material used was 240 adult local chickens obtained by purposive sampling, where each sub-district from the three sub-districts above was taken 80 individuals (40 males and 40 females).

The performance of local chickens in traditional management in the study area was studied by collecting data on body weight (BW), femur length (FL), tibia length (TL), shank length (SL), shank circumference (SC), chest length (CL), and chest circumference (CC). Body weight (g) was measured by weighing the chicken, femur length (cm) measured along the femur bone, tibia length (cm) measured along the tibia bone, shank length (cm) measured along the metatarsus bone, shank circumference (cm) measured in the center of the bone metatarsus, chest length (cm) measured along the sternum bone, chest circumference (cm) was measured from the sternum circumference to the top spine.

Data on body weight and body size of chicken samples obtained were analyzed descriptively in separate sex to obtain an overview of the average, standard deviation, and coefficient of variance of these variables in each sex. The difference in the average value of body weight and body size between male and female chickens was carried out using a two-sample t test. The best model for estimating body weight (kg) of local chickens in each sex was obtained through analysis of Stepwise Regression. Data analysis was carried out with the help of the MINITAB Release 18 for Windows.

## 3. Result and Discussion

### 3.1 Description of Manokwari local chicken

The average and standard deviation of BW, FL, TL, SL, SC, CL, and local chicken CC studied by sex are presented in Table 1. There were significant differences ( $P < 0.05$ ) between male and female chickens in the seven variables observed. Male local chickens have higher BW, FL, TL, SL, SC, CL and CC sizes than females. This is because male chickens have the hormone testosterone as an androgen steroid which is a growth regulating hormone. The high secretion of testosterone in males causes high secretion of androgen, so that the growth of male cattle is faster than that of females, especially after secondary sex traits appear [3].

The results of this study indicate that body weights and some body sizes of adult chickens (> 6 months) in Manokwari are generally higher than in some regions in Indonesia. [4] conducted a study in four research locations in Central Java (Brebes, Pemalang, Kendal, and Sukoharjo) found that the body weight and body size of native chickens studied were lower than the results of this study. [4] found the body weight of adult male native chickens (ages 4 to 6 months) ranged from 1.47 to 1.78 kg, and females ranged from 0.99 to 1.22 kg; the length of male tibia ranges from 12.44 to 14.12 cm, and females range from 11.90 to 12.87 cm; male shank length ranges from 6.99 to 8.34 and females range from 6.69 to 7.43 cm; male shank circumference ranged from 3.54 to 4.24 cm, and females ranged from 3.31 to 3.79 cm.

**Tabel 1.** Mean with standard deviations ( $\bar{x} \pm SD$ ) in local chickens with different sex (N=240).

Traits	Sex	
	Male (n=120)	Female (n=120)
BW (g)	2368.5 ± 626.3 <sup>a</sup>	1876.1 ± 413.8 <sup>b</sup>
FL (cm)	11.892 ± 1.659 <sup>a</sup>	10.450 ± 1.522 <sup>b</sup>
TL (cm)	15.825 ± 1.382 <sup>a</sup>	13.283 ± 1.132 <sup>b</sup>
SL (cm)	9.575 ± 1.418 <sup>a</sup>	7.775 ± 1.008 <sup>b</sup>
SC (cm)	4.975 ± 0.739 <sup>a</sup>	4.142 ± 0.490 <sup>b</sup>
CL (cm)	12.500 ± 1.932 <sup>a</sup>	10.758 ± 1.264 <sup>b</sup>
CC (cm)	34.350 ± 3.180 <sup>a</sup>	31.842 ± 2.494 <sup>b</sup>

- Superscripts that are not the same in the same row show significant differences ( $P < 0.05$ ).
- **Abbreviations:** BW = body weight, FL = femur length, TL = tibia length, SL = shank length, SC = shank circumference, CL = chest length, CC = chest Circumference.

Body weight and body size of native chickens in Samarinda district (East Kalimantan) reported by [5] are also smaller than local chickens in Manokwari, which have a body weight of 1,790.48 ± 481.41 g (male) and 1,847.50 ± 186, 75 g (female), shank length 6.28 ± 0.68 cm (male) and 7.06 ± 0.26 cm (female), and chest circumference 28.38 ± 3.39 cm (male) and 27.31 ± 3.70 cm (female). Similarly, native chickens in Buton (Southeast Sulawesi) also have weight and some body size lower than the local chicken in Manokwari, except chest circumference. The body weight of native chickens in the Buton region is 1753.10 ± 139.73 g (male) and 1216.71 ± 130.16 g (female), shank length 8.58 ± 0.45 cm (male) and 7.06 ± 0.44 cm (female), and chest circumference 41.51 ± 1.88 cm (male) and 37.47 ± 1.04 cm (female) [6]. [7] also reported that the average body weight of native chickens in Sungai Pagu sub-district, Solok Selatan district was lower than that of local chickens in Manokwari, namely in males 1.90 ± 0.53 kg and females 1.36 ± 0.28 kg, but the average shank length is higher than local chickens in Manokwari, namely males 10.36 cm and in females 8.10 cm. [8] reported the quantitative appearance of male and female native chicken in the Padangsidempuan sub-district of northern, Padangsidempuan city was also lower than the results of this study, namely body weight 2.16 ± 0.30 kg and 1.35 ± 0.17 kg, length femur 11.105 ± 0.910 cm and 9.055 ± 0.854 cm, tibia length 14.599 ± 1.443 cm and 12.101 ± 1.027 cm, but its shank length is higher than that of local chickens in Manokwari, namely 10.982 ± 0.990 cm and 8.308 ± 0.801 cm. In the city of Ambon (Maluku), [9] also found native chickens in this region to have femur lengths (males: 9,956 ± 0,760 cm; females: 8,918 ± 0,437 cm) and tibia lengths (male: 14,217 ± 1,071cm female: 12.736 ± 0.555 cm) smaller than the local Manokwari chicken, but shank length (male: 10.122 ± 0.789 cm; female: 8.814 ± 0.548 cm) and circumference shank (male: 5.888 ± 0.508 cm; female: 5,034 ± 0.797 cm ) native chickens in Ambon city are larger than local chickens in Manokwari found in this study.

The high body weight and some body size in local chickens in this study when compared to native chickens in several other regions in Indonesia, allegedly because of better genetic composition, and also the availability of natural feed (animal and vegetable) is still abundant in the area where chickens extensively / traditionally maintained. The adequacy of feed (quantity and quality) throughout the day will cause the appearance of body weight and body size to be better. Besides that, the application of extensive (traditional management) to local chickens in the research area (at night the chickens are grounded and throughout the morning until evening the chickens are free to roam foraging for food) will reduce the chances of mating close relatives which can reduce the appearance of body weight and some body size.

### 3.2 Estimating body weight through body size in Manokwari local chickens

Based on the Pearson correlation analysis showed that body weight and body size observed in both males and females Manokwari local chickens correlated significantly ( $P < 0.05$ ). The results of this study are supported by the results of the study of [10] who also found a positive correlation between

body weight and body size (body length, femur length, and shank circumference) in native chicken. This shows that body size in local chickens in Manokwari can be used as an estimator of body weight.

Based on the results of the stepwise regression analysis, the body weight of male local chickens (BW-Male) in Manokwari can be predicted by formula:  $BW\text{-Male} = -3400 + 430SC + 95TL + 47CC + 54SL$ , with  $R^2 = 76.94\%$ . Whereas the body weight of local female chickens (BW-Female) in Manokwari can be predicted by formula:  $BW\text{-Female} = -2271 + 71CC + 90SL + 149SC + 44TL$ , with  $R^2 = 47.63\%$ . The two formulas can be applied by farmers in the field as simple selection tools as an effort to improve the performance of local chickens in Manokwari in the traditional management in the future.

#### 4. Conclusions

Local chickens in Manokwari have relatively higher body weight and posture than similar chickens found in other regions in Indonesia. The good performance of local chickens can be improved through a simple selection method using the body weight estimation formula through its body size in the framework of its future development.

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