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The dynamics of population and production of Native Chicken under extensive- and semi-intensive maintenance

Ismoyowati* and N A Setianto

Faculty of Animal Science, Universitas Jenderal Soedirman, Purwokerto, Indonesia

Corresponding author: ismoyowati@unsoed.ac.id

Abstract. This study evaluated kampung chickens' growth rate and production performance in extensive and semi-intensive rearing in Central Java, Indonesia. The survey method was employed for this study. The targets used in the study were kampung chicken farmers in the Banyumas and Kebumen areas. The survey method is carried out by collecting data, observing and measuring population, production performance, including meat and egg production. The data obtained, processed, and presented in the tables and graphs, calculated the population and production of chicken to evaluate its growth. The performance of chicken production, including egg production, egg weight, number of eggs hatched, and hatchability, was analyzed using general linear model (GLM) analysis. The result showed a 1.9% growth rate of the native chicken population, in which the hens outnumbered the roosters. The meat and egg production growth rates were 8.2% and 6.8%, respectively, between 2016 and 2020 in Central Java. Native chickens kept under semi-intensive maintenance produced more eggs than those in an extensive system. Conclusively, native chicken of Central Java experienced growth in population and production of meat and egg. The semi-intensive system, compared to the extensive system, had a higher rate of eggs production.

1. Introduction

Native chicken is an indigenous breed that exhibits high adaptability and provides meat and egg as food sources [1]. The meat of native chicken is popular because it is delicious, low-fat, and has low cholesterol [2]. Meanwhile, native eggs are superior to laying eggs for their savory taste and less rancid smell, thus safe for consumption either raw or cooked [3].

Native chickens are generally kept in traditional or extensive systems, but nowadays, a semi-intensive system has gained popularity [4]. Extensive maintenance is a traditional system where farmers play a minimum role and let the chickens forage to feed themselves. In a semi-intensive system, the farmers provide reserved space for the chickens, complete with the cage and its equipment, regular feeding, and an enclosed area with fences or partitions for the chickens to forage nearby. The intensive maintenance allows farmers to perform a fast-handling system, proper animal health management, disease control and evaluation, business added-value, and improved aesthetic aspects and sanitary quality [5]. Improving the maintenance system of native chicken has been known to increase chicken productivity up to 50% [6]. Accordingly, this study evaluated the discrepancy in population and production performance of native chickens between the extensive and intensive maintenance systems.



2. Materials and methods

Study Area and Source of Data. We surveyed the farmers who kept their native chickens under extensive and semi-intensive systems in Banyumas (36 vs. 44 farmers) and Kebumen (42 vs. 40 farmers). In the survey, we observed and measured egg production performance, conducted a structured interview using a questionnaire as an instrument, and analyzed the secondary data obtained from the reports of related agencies. The samples were collected using purposive sampling to select native chicken farming that implemented traditionally (extensive) or semi-intensive maintenance systems. The collected data included the population of native chickens based on chickens' sex and age and chicken productivity (egg production, egg weight, hatching eggs, and hatchability).

The data were processed and presented in tables and graphs to evaluate the population growth. The production performance, including egg production, egg weight, hatching eggs, and hatchability, was analyzed with the General Linear Model (GLM).

3. Results and discussion

3.1. Population and production of native chicken

Native chickens keep developing and are now the highest poultry population in Banyumas and Kebumen districts. The contrasting geographic and climatic conditions of both districts, i.e., the high-land Banyumas and low-land/coastal Kebumen, and the different maintenance systems for native chickens are assumed to have produced discrepancies in the productivity of native chickens.

Table 1. Production and population of native chicken.

Population of native chicken (bird)						
Districts	2016	2017	2018	2019	2020	Growth
Banyumas	1,320,970	1,334,568	1,053,940	1,071,350	1,189,200	-0.100
Kebumen	3,926,990	3,927,265	3,927,540	3,927,820	3,182,250	-0.190
Central Java	41,976,727	41,960,085	40,633,383	41,554,574	42,754,276	0.019
Indonesia	294,333,000	299,701,000	300,978,000	301,761,000	308,477,000	0.048
Meat production of native chicken (kg)						
Districts	2016	2017	2018	2019	2020	
Banyumas	694,243	619,861	811,534	811,530	700,789	0.009
Kebumen	33,860	69,590	5,085,400	5,085,400	584,090	16.250
Central Java	31,603,000	32,103,000	31,405,000	38,202,000	34,201,000	0.082
Indonesia	285,000,000	300,100,000	287,200,000	292,300,000	293,100,000	0.028
Egg production of native chicken (kg)						
Districts	2016	2017	2018	2019	2020	
Banyumas	777,245	667,568	566,914	566,910	685,220	-0.118
Kebumen	1,869,393	1,894,552	1,894,557	1,894,560	1,899,992	0.016
Central Java	32,855,000	29,283,000	32,189,000	30,668,000	35,077,000	0.068
Indonesia	196,700,000	221,000,000	212,300,000	246,700,000	251,000,000	0.276

Source: BPS [7]

The growing population of native chicken as a meat producer in Indonesia is second only to broilers and the third biggest egg producer [8]. The ever-increasing population is widespread across Indonesia. From 2016 to 2020, both the population and production of native chickens increased (Table 1). By 2020, the population of native chickens in Banyumas and Kebumen was 1,189,202 and 1,182,250, respectively. Banyumas produced 700.7 tons of meat and 685.22 tons of eggs, while Kebumen produced 3,584.09 tons of meat and 3,004.47 tons of eggs [7].

The trend of population growth and increased production of meat and eggs are not always positive because they may decrease in any years (Table 1). However, indigenous chickens exhibit a relatively fast recovery rate despite the decrease [9], attributed to the chicken's biological factors and farmers' interest in breeding indigenous chickens.

3.2. The different productivity of native chickens in extensive and semi-intensive systems

Based on its geographic and climatological conditions, together with a vast range of area and feeds, Banyumas and Kebumen districts are potential areas for developing native chickens. Situated at an elevation of 17-420 meters above sea level, Banyumas has an average temperature of 21.4°C-30.9°C, with 57-86.62% humidity and 623.50 mm precipitation [7]. When undertaking the study, we found that Banyumas had an average temperature of 29.82°C with 78.05% humidity, while Kebumen was averagely 29.99°C with 68.82% humidity. Banyumas district is dominated by highland areas, while Kebumen is mostly low-land or coastal areas. Hence different management and maintenance systems for native chickens farming affect animal productivity.

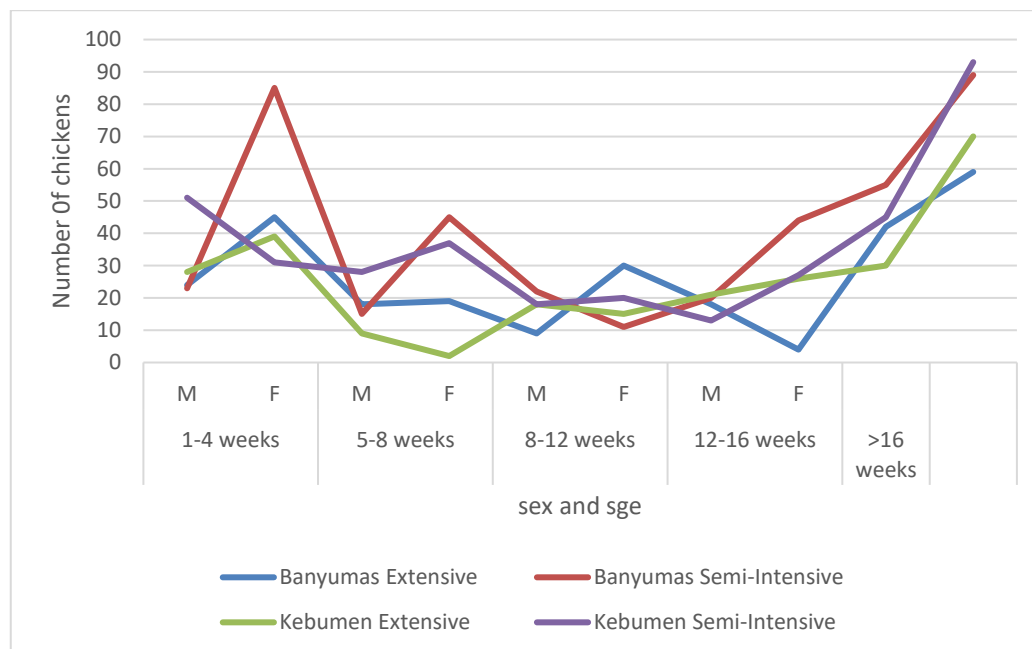


Figure 1. The population of native chickens based on sex and age.

A parameter in native chicken productivity is the growing population affected by the farming system that includes the male-to-female ratio. A suitable mating system and a proper male-to-female ratio are the success factors of producing fertile eggs. The number of native chickens in the area of study based on age and sex is presented in Figure 1.

Table 2. Average egg production in Banyumas and Kebumen Districts.

Variables	Banyumas		Kebumen	
	Extensive	Semi-intensive	Extensive	Semi-intensive
Production/chicken/period	11.44±2.06 ^b	13.28±1.76 ^a	12.3±2.00 ^b	12.50±2.12 ^b
Egg weight (g)	41.78±1.77 ^a	41.61±3.70 ^a	41.62±1.36 ^a	39.46±2.42 ^b
Total hatched eggs	10.31±2.44	11.24±3.18	10.05±1.82	11.00±2.18
Hatchability (%)	77.14±15.07	83.89±7.87	72.87±23.07	78.29±14.71

Note: Different superscripts within row show a significant difference ($P < 0.05$)

The result showed that the average population (in percent) of female native chicken was higher than males across ages, but the male-to-female ratio was relatively low (Figure 1). A previous study reported

a mating system with a male-to-female ratio of 1:7, 1:5, and 1:9 showed a better fertility percentage than the 1:11. In addition, the 1:7 and 1:9 ratio produced a higher percentage of hatchability than the 1:5 and 1:11. Salamony et al. [10] recommended a 1:7 male-to-female ratio to produce higher egg fertility.

Egg production refers to the number of eggs produced by a native chicken parent in a hatching period. The average egg production in Banyumas and Kebumen districts in this study is presented in Table 2.

The result of variance analysis shows a significant difference (>0.05) in the production and egg weight variables according to each maintenance system. However, the geographic area and maintenance system did not produce a significant difference ($P<0.05$) on total hatched eggs and hatchability (Tabel 2). In Banyumas, native chickens in the semi-intensive maintenance produced more eggs than those in extensive systems. Meanwhile, the egg production in Banyumas and Kebumen in the present study was lower than in another study [11], which reported an 85% fertility, an average production of 20 eggs/chicken/period, and an average weight of 38.8g/egg. The contributing factors to egg production and egg weight are the parent's age and body weight, genetic factors, medicine, feed nutrient, disease, and environmental factors [12-14].

4. Conclusions

The population growth and the increased egg production of native chickens in Central Java were relatively lower than the national rates in the past five years, but their meat production was higher. The egg production in a semi-intensive system is higher than that in an extensive system.

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