

Adaptation and performance evaluation of “Potchefstroom Koekoek” chicken breeds under farmer’s management practice in Debub Ari and Bena-Tsemay districts of South Omo Zone, Ethiopia

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Abstract

The performance evaluation and adaptation of Koekoek breeds of chicken was conducted at Debub Ari and Bena-Tsemay districts of southern Ethiopia. Eighteen households were selected purposely from both districts and training was given. Each selected households were provided with 30-days old chicks and 18 hay-box brooders. The chickens were vaccinated for New Castle Disease, Gumboro, and Mareks. The chickens were supplied with commercial starter ration for the first 45 days and then made to feed on locally available feeds. Mortality during the first two weeks was 21.67% and 5.22% after the first two weeks up to 45 days with the overall survival of 73.11%. The highest percentage of mortality occurred during the first two weeks. The mortality due to disease was low. The average body weights of both male and female Koekoek chickens at the age of 20 weeks was 1.404 and 1.213 kg, respectively. Koekoek chickens had an average of 186.28 days age at first laying. The average egg production potential of the breed was 154.17 eggs per year per hen with a relative egg weight of 47.078 g. Thus, the breeds were highly preferred due to survival, adaptation, scavenging, disease resistance, egg production and adaptation similarity with local breeds under the existing farmers' management conditions. Therefore, the Koekoek breeds of chicken should be made accessible to households, with increased awareness of the farmers via training for better management and scaling up of breeds to enhance the productivity and maximize the household's income.

Key words: Breed, Chicken, Dual-purpose, Koekoek, Potchefstroom and Production

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INTRODUCTION

Chicken production as one part of livestock sector that plays a vital role in poverty alleviation, creating job opportunities for the job-less youth with a decent livelihood (Gororo and Mabel, 2016). The egg production potential of local breeds was 30-60 eggs per year per hen with an average egg weight of 38 g under on-farm management, but exotic breeds produce around 250 eggs per year per hen with the relative egg weight of 60 g as reported by Haftu (2016). To increase the production potential transforming from traditional scavenging to semi-scavenging system and increasing the numbers of commercial breeds are best options to insure the domestic red meat and egg consumption practices for better nutrition and economy (Shapiro, 2015).

Lack of commercial layers and early maturing chicken breeds are major constraints of Ethiopian chicken producers (Zemelak et al., 2016). Shumuye et al., (2018) reported for Tigray region, that Koekoek chickens were best breeds for a scavenging and have broody behavior which makes the breeds similar in

characteristics with the local counterparts. The Agro-ecology based performance evaluation improved the living standards of farmers by increasing chickens' productivity (Zemelak et al., 2016).

The productive performance of Koekoek chickens and complementarity of the breeds to livelihoods of farmers in the South-Omo zone in general and Debub Ari and Bena-Tsemay districts in particular were not formerly evaluated. Inputs such as provision of improved breeds, improvement of existing management practices and advancing the awareness as well as attitudes of the farmers through training might bring considerable improvements in chicken production and productivity. The gaps in chicken productivity and opportunities better livelihoods for the farming community are given attention via adaptation and performance evaluation of improved breeds. Therefore, in order to solve chicken productivity problems, adapting and evaluating the Koekoek's performance in South Omo Zonal administration in general and Debub Ari as well as

Bena-Tsemay districts in particular were believed to lead to sustainable improvement in chicken production, income generation, animal protein consumption and finally contribute to the regional and national development goals of the country. This study was therefore targeting adaptation, compatibility with environment and productive performance evaluation of Potchefstroom Koekoek chicken breeds over formerly distributed breeds (local or other exotic

types) in Debub Ari and Bena-Tsemay districts of South Omo zone.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in Debub-Ari and Bena-Tsemay districts of South Omo Zone, South Nation Nationalities and Peoples Regional State (SNNPRS) of Ethiopia. Details of the study area is illustrated in the map (Figure 1) below.

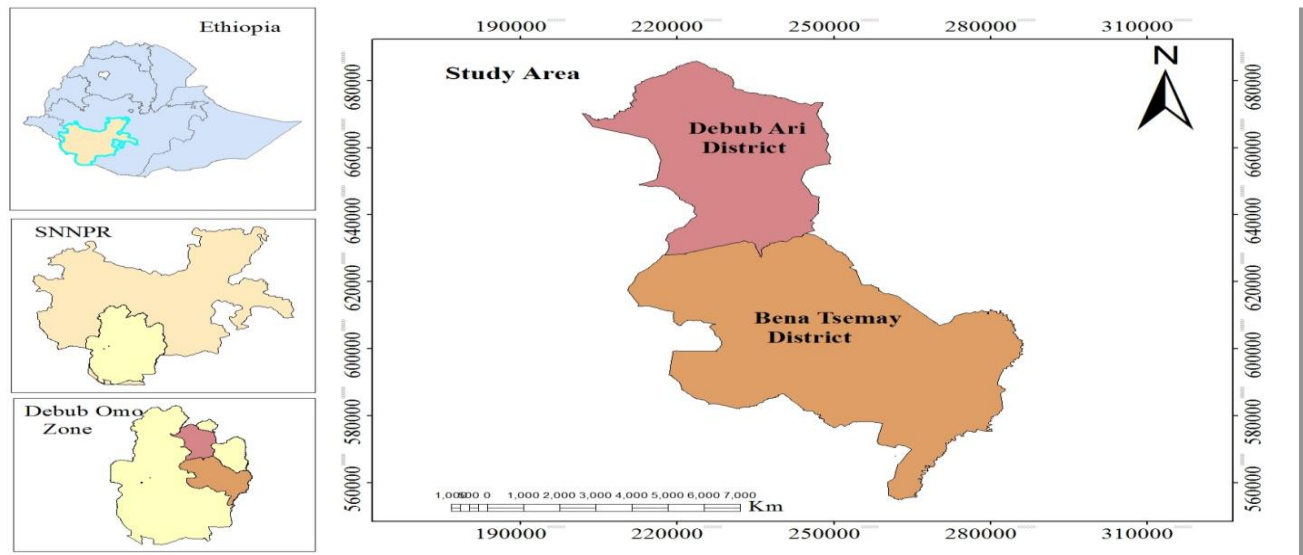


Figure 1: Map of the study area

Debub-Ari District

Debub-Ari district is found in the Southwestern part of SNNPRS, Ethiopia. It is located at 774 km southwest of Addis Ababa (capital of Ethiopia) and 529 km southwest of Hawassa (capital of SNNPRS). Debub-Ari covers an area of 1,520 km² with the population of 219,708. The district lies on 50.67'-60.19' N latitude and 360.30'-360.73'E longitude, with the respective elevation of 500-3,500 m. a. s. l. The average annual rainfall ranges from 400 to 1,600 mm with an average annual temperature of 10.1-27.50C. The dominant livestock types of the district are cattle, goat, sheep, donkey, horse, and chickens (South Omo Zone statistical abstract, 2010).

Bena-Tsemay District

Bena-Tsemay district is found in the Southwest part of SNNPRS, located at 713 km southwest of Addis Ababa and 468 km southwest of Hawassa. Bena-Tsemay covers an area of 2,922.8 km² with a population of 61,061. The district lies between 5⁰.01'-5⁰.73N latitude and 36⁰.38'-37⁰.07'E longitude, with the respective elevation of 500-2,500 m.a.s.l. and

average annual rainfall ranging between 400 and 1,600 mm. The average temperature ranges from 10.1-27.5⁰C and the dominant livestock types are cattle, goat, sheep, and chickens (South Omo Zone statistical abstract, 2010).

Household selection procedures

From each of the two districts, two kebeles were selected purposely. A total of 18 households were purposefully selected from each kebele, who were willing to take the chickens and participate in the study. Out of the total (18) households, 12 were females headed.

Distribution and management of chickens

Training on housing, health management, feeding, water provision and data recording was provided to the study participants before distributing the chicken. Chicks of 30-days old koekoek breeds and 18 hay-box brooders were provided to each selected household.

Disease prevention and feeding

The health follow up was undertaken by animal health researchers of the respective centers. Chicks were

vaccinated for New Castle Disease, Gumboro and Mareks as directed by national veterinary case team. Chicks were supplied with commercial starter ration for the first 45 days and then made to feed on locally available feeds like sorghum, maize, kitchen left overs, sunflower grain, miller ground waste and while they were also scavenging around the homestead.

Data collection

The mortality of chickens, survival, causes of mortality, growth performance, sexual maturity, age at first laying, number of eggs produced per hen per year, Egg weight, Partial budget analysis and the final net income were obtained during the data collection period. The data was collected for one year in order to know the annual egg production.

Data analysis

Descriptive statistics such as mean, standard error and percentage of the collected data were analyzed using Statistical Package for Social Sciences (SPSS) version 16, Inc., Chicago, Illinois, USA, 2007).

Model: - $Y_{ik} = \mu + A_i + C_{ik}$, where:

Y_{ik} = the value of the respective variable

μ = the overall mean of the breed

A_i = the effect of i^{th} district ($i = 1-x$ districts,

(Where, 'x' = Dehub Ari and Bena-Tsemay).

C_{ik} = random error term.

RESULTS AND DISCUSSIONS

Mortality and survival of distributed chickens

The on-farm mortality and survival evaluation of Koekoek chickens were presented in (Table 1). The on-

Table 1. Survival and mortality of chickens

Parameters	Districts (percentage)		
	Dehub Ari	Bena-Tsemay	Av. total
Mortality in the first 2 week	21.11	22.22	21.67
Mortality after the 1 st 2 week - 45 days	2.65	7.78	5.22
Total		23.76	30.00
Survival	76.24	70.00	73.11
Causes of Mortality			
Mortality due to disease	11.54	11	11.27
Mortality due to predator	28.20	28	28.10
Mortality due to injury	24.36	20	22.18
Mortality due to stress	35.90	41	38.45
Total	100	100	100

Av. = average; values in the table represent percentage of the parameters.

Body weight of male and female chicken

The average body weight of Koekoek breeds for male and female at the age of 20 weeks under farmer's management was 1.404 ± 0.097 and 1.213 ± 0.061 Kg, respectively (Table 2). Similarly, Aman *et al.* (2016)

farm mortality evaluation during the first two weeks was highest (21.67%) and decreased after the first two weeks (5.22%) with the average overall survival of 73.12%. Approximately similar percentage of the survival of chickens using hay-box brooder at on-farm management was 79.8% for Areka area (Aman *et al.*, 2016).

The highest survival was reported by Hassen (2019) for Asayta district, with the average survival rate of 98.3%, which after 5.5 months declined to 93.3%. The observed variation might be due to the agro-ecologic and managerial difference between the two sites.

The highest percentage of mortality during the first two weeks was due to stress that attributed while transporting too long distance, associated injury and predator attacks (Tekalegn *et al.*, 2019). The percentage of mortality decreased to 5.22% after the first two weeks due to the stress compensation of chickens and adaptability to the area.

The mortality due to disease was lower than other causes of mortality due to the effective vaccination schedule provided according to the recommendations of the national institute of veterinary for dual purpose breeds. As observed during the intensive follow up and according to farmer's perception Koekoek breeds of chicken have less exposure to disease when compared to other exotic breeds distributed formerly, and to some extent Koekoek breeds share the same adaptation and resistance properties with that of the local chickens.

reported that, the average body weight of male and female Koekoek chickens at the age of 20 weeks was 1.5 and 1.1 kg, respectively. Kasa (2016) also reported 1.34 and 1.03 kg body weight at 20 weeks, respectively for the case of Jimma zone of Oromia

region. Similar result was also reported recently by Atsbaha *et al.* (2018), where the average body weights of Koekoek chicken breeds at the age of first twenty weeks was 1.01 and 1.40kg for female and male, respectively. Differently, higher average body weight was reported by Hassen (2019) for Asayta districts of Afar region, where the average body weight of

Koekoek chicken breeds at the age of 20 weeks under agro pastoral management condition was 2.23 and 1.91 kg for male and female chickens, respectively. The variations might be attributed to the difference of management and agro ecological sites, i.e., largely arid in the case of Asayta districts and mid land in the case of the present study.

Table 2: Productive performance of chickens

Parameters	Districts (Mean $\pm$ SE)		
	Debut Ari	Benatsemay	Average total
Body weight of male	1.25 $\pm$ 0.17Kg	1.558 $\pm$ 0.07Kg	1.404 $\pm$ 0.097Kg
Body weight of female	1.081 $\pm$ 0.08 Kg	1.344 $\pm$ 0.07 Kg	1.213 $\pm$ 0.061 Kg
Age at first egg laying	185.56 $\pm$ 4.65days	187.0 $\pm$ 4.356days	186.28 $\pm$ 3.10days
Total number of eggs/year/hhs	1787.34 $\pm$ 55.6	1195.8 $\pm$ 28.2	1491.57 $\pm$ 32.51
Number of layer hens	11.11 $\pm$ 1.996	8.11 $\pm$.992	9.61 $\pm$ 1.494
Number of eggs per year	160.88 $\pm$ 27.86	147.45 $\pm$ 28.43	154.17 $\pm$ 21.76
Egg weight	46.78 $\pm$ 1.99g	47.38 $\pm$ 2.142g	47.078 $\pm$ 1.421g

g = gram; kg = kilo gram; SE = standard error; values in the table represent mean and standard error

Age at first laying

The age at the first egg laying of Koekoek female chickens was presented in Table 2. As the result of overall total indicated the female Koekoek chickens had the average age of first egg laying as 186.28 days /6.2 months. Similar result was reported by Atsbaha *et al.* (2018) for Mehoni areas of Southern Tigray, where the average age of first laying was 6.48 months. The late age of first laying was reported by this study than Aman *et al.* (2016) for Wolaita areas of southern region, the Koekoek breeds reportedly reaching the age of sexual maturity at 4.733 months, which might be attributed to management standard of farmers especially feed types and feeding. Similarly, late age of first laying was reported by current study than Debre-Zeit Agricultural Research Center (2012); that is for 5 months under intensive management condition, which is attributed to the free-range management system and use of nutritionally deficient feed resources after 45 days in the current study.

Number of eggs per year per hen

The average yearly egg production potential of Koekoek breeds was presented in Table 2. The overall egg production potential of Koekoek chickens was 154.17 eggs per year per hen with the relative egg weight of 47.078 g. Similar result was reported by Atsbaha *et al.* (2018), with the average yearly egg production potential of koekoek having 156.29 eggs per year per hen with the relative egg weight of 40.30g. But the highest number of eggs per year per hen was reported by Hassen (2019) for Asayta districts of Afar region (182 eggs per year per hen) The difference in the egg production potential might be due to the types of feed and feeding difference in

which commercial feed for the former trial conducted at Asayta district gave higher values compared to scavenging with locally available feed supplementation after 45 days in the present study.

Farmers' perception during field day

As observed during the data collection period and farmer's perception during the field day, Koekoek chicken breeds were good scavengers like the indigenous breeds, with some of chickens showing signs of broody behavior, having higher disease resistance when compared to other exotic chicken breeds that were previously distributed.

The farmers invariably accepted the breed color, preference of egg, scavenging behavior of the breed, and adaptation to the agro-ecological conditions. Finally, the farmers participated in field day showed interest to rear the breed for the future expansion and production for better productivity and profitability.

Partial budget analysis

The partial budget analysis of Koekoek chicken breeds in terms of all the costs and total return were recorded to be 28,303 birr (Table 3). The profit was calculated by adding the cost of feed, medication and chicken purchase as total variable cost and sale of cock, egg and hens as a total return and then subtracting total variable cost from total return. Although the profit was not similar in all participant households, on average each participant households got 1572.4 Ethiopian birr after the completion of the package.

Table 3. Partial budget analysis

Code	Cost				Income				profit
	Chick purchase	Feed cost	Medication cost	TVC	Cock Sale	Egg Sale	Hen Sale	TR	
1	240	980	75	1295	1400	695	1700	3795	2500
2	240	800	75	1115	1050	1281	1600	3931	2816
3	240	780	75	1095	1400	365	720	2485	1390
4	240	1400	75	1715	1300	1423	2100	4823	3108
5	240	880	75	1195	2250	88	1200	3538	2343
6	240	680	75	995	590	120	600	1930	225
7	240	580	75	895	400	90	500	990	35
8	240	600	75	915	1100	220	450	1770	885
9	240	800	75	1115	1000	894	1100	2994	1909
Debub Ari district				10,335				26,256	15,921
10	240	850	75	1165	2100	515	1000	3615	2480
11	240	750	75	1065	1400	717	600	2717	1682
12	240	580	75	895	960	323	450	1733	868
13	240	750	75	1065	830	508	1320	2658	1623
14	240	480	75	795	600	290	700	1590	795
15	240	480	75	795	550	320	900	1770	975
16	240	680	75	995	800	386	900	2086	1091
17	240	480	75	795	1000	480	600	2080	1285
18	240	900	75	1215	750	968	1200	2918	1703
Bena-Tsema district			8785				21,167	12,382	
Average total			19,120				47,423	28,303	
Overall profit									1572.4

TVC = total variable cost; TR = total return; values in the table represent the numbers or amounts of the respective variable or codes. The breeds share nearly similar resistance behavior with that of the local chickens.

CONCLUSION AND RECOMMENDATIONS

Although stress was main cause of mortality, “Potchefstroom koekoek” breeds showed better adaptation (survival) and productive performance under existing farmers management. More over back-yard attitude was observed among the farmers regarding day old chick management, i.e., it is impossible to rear day old chicks without the broody hen.

In addition, the scavenging behavior of this breed was better and more or less similar with that of local breeds. The farmers showed no contradicting idea about the breed color, egg preference, scavenging behavior, adaptation and finally the farmers participated in the field visit showed interest for further expansion.

“Potchefstroom Koekoek” breeds were highly preferred due to the survival, scavenging ability, disease resistance, egg productivity under existing condition with similar adaptation to that of local breeds.

Therefore, accessibility to the improved breeds should be given attentions by extension programs with intensive training for the farmers to have information in selecting chicken breeds for better productivity.

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