

Assessment of Indigenous and Exotic Chicken Production Performance and Production Constraint at Aneded District of East Gojam, Amhara Region, Ethiopia

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Abstract: A structured survey was conducted in Aneded district, North West Ethiopia to assess the production performance of existing village chicken and exotic breeds. A formal structured survey was used to collect all the relevant data, using a multi-stage sampling technique. Six farmer administrative district (three peri urban and three from rural area a total of 60 village chicken owner households were considered for the study. The result revealed that the dominant (60.9%) chicken production system was an extensive/traditional type of production, using scavenging with supplementation of homemade grains and household food leftovers. And average age of cockerels at first mating and pullets at first egg laying were 6.4 and 6.05 month respectively for local chickens 4.74 month and 5.5 month for exotic breed respectively. The average number of total clutch periods/hen/year was 2.88 (ranged 2 - 6) for locals chickens and annual egg production performance of local hen was 64.2 eggs/hen and 137 egg/hen/year for exotic chickens under farmer's management condition. The result revealed that majority of interviewed chicken owners experienced chicken disease problems, mainly Newcastle disease (93.3%). The major constraint of production system were disease, feed shortage, and breed distribution, predator and market access. The present study ensured that there is a strong desire to increase existing village chicken production and productivity by using indigenous chicken and exotic breeds in a highly organized and intensive manner. Generally ensuring sustainable exotic chicken distribution, veterinary service and giving training in the district is important to make small holder farmers capable in better poultry production.

Keywords: Ethiopia, Exotic Chickens, Indigenous Chickens, Production Performance

1. Introduction

Agriculture is Ethiopia's most important economic sector, accounting for nearly half of GDP and employing 85 percent of the population [1]. Animal production in general, and chicken production in particular, play important socioeconomic roles in developing countries [2]. Poultry industry is one of the most profitable agricultural businesses, producing meat and eggs for human consumption and creating job for nations in Ethiopian and it is one such enterprise practiced by a number of farmers in the study area and elsewhere [3]. The total chicken population is estimated to be 57 million, with native chicken accounting for 78.85%, hybrid chicken accounting for 12.03%, and exotic breeds

accounting for 9.11% [4]. In Ethiopia, chickens are the most common, and almost every rural family owns them, providing a valuable source of protein and income [2] and the value of native birds to the rural economy in Ethiopia and other countries is enormous [5].

The vast majority of these birds (99%) are kept in a traditional system with little or no inputs for housing, feeding, or health care. Local ecotypes are the most dominant chicken types reared in this system, with a wide range of body position, plumage color, comb type, and productivity [6]. Scavenging provides the majority of the feed for those village birds, which includes household cooking waste, cereal and cereal by-products, roots and tubers, oilseeds, trees, shrubs, fruits, and animal proteins [2].

1.1. Statement of the Problem and Research Gaps

Ethiopian indigenous chicken productivity is low. As a result, several attempts have been made to introduce various exotic breeds of chicken for use alone or for crossbreeding with indigenous chickens. Small-scale production systems are mostly found in rural, peri-urban, and urban areas, with medium feed, water, and veterinary service inputs and minimal to low bio-security [7]. But the contribution of exotic chicken breeds to the Ethiopian economy is significantly low compared to that of other African countries [8].

Backyard farming has contributed significantly to the agrarian economy of rural parts of the countries over the years and plays an important role in the rapidly growing economy. However, the sector's economic contribution is still not proportional to the large number of chickens, which can be attributed to the presence of sustainable production and reproduction in the country [5, 6].

Family poultry scavenging provides much-needed protein and income, as well as contributes to food security for many families living in poor rural areas of developing countries [9]. However, the majority of research is focused on improved poultry production and the use of modern housing and feeding systems, which may not be applicable to small-holder farmers' production capacity. There has been no detailed study in Aneded district on the identification of existing village chicken production systems at the level of small holder farmers, distribution of exotic chicken breeds, production constraints, and technological interventions that are affordable to them. This study was conducted to address the following general and specific objectives:

1.2. Objectives

1.2.1. General Objective

To assess the overall chicken production system and egg production performance, production constraint at Aneded district.

1.2.2. Specific Objectives

- 1) To assess the overall production potential of local and exotic chickens, as well as their distribution and marketing.
- 2) Identifying constraints and suggesting possible interventions that can help smallholder farmers to improve their productivity.

2. Materials and Methods

2.1. Description of the Study Area

The Study was conducted at Aneded district of east Gojam zone Amhara region located 285 km north east of Addis Ababa and which is 18 km from the zonal capital, Debre Markos. The average annual rainfall and average minimum and maximum temperatures for the area are 1336 mm, and 22°C and 36°C, respectively. Based on the national census conducted by the Central Statistical Agency of Ethiopia CSA, 2021 this district has a total population of 110,429 of whom 54,607 are men and 55,822 women [10]. There are 19 kebeles (sub-districts) in Aneded district and the district has a total land area of 679.4 km² and the average altitude was estimated to be 1689 masl (ranged 728 - 2832 masl).

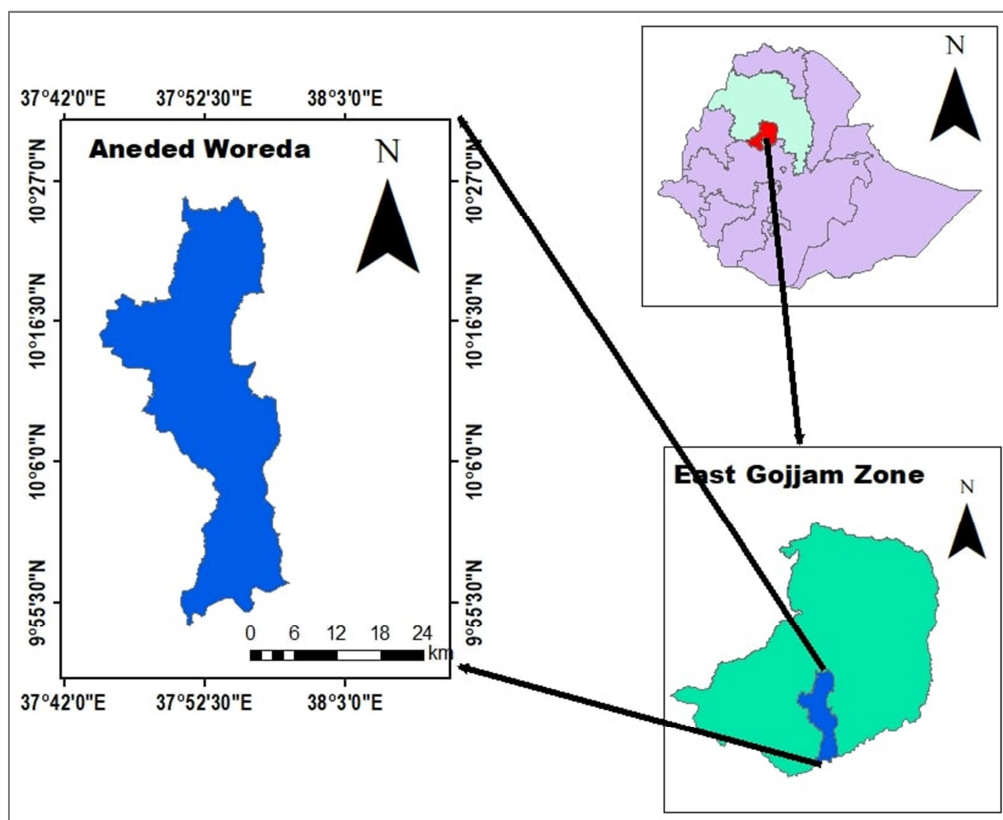


Figure 1. Location of the study district.

2.2. Selection of the Study Area and Sampling Techniques

The study used a multi-stage sampling procedure (purposive and random), hence the district was purposively divided into peri urban and Rural. This classification was useful for investigating variation in the village chicken production system and suggesting appropriate technological interventions for each sub-division.

Based on the chicken production system and transportation access, six representative kebeles (peasant associations) from the peri-urban area and three kebeles from the rural area were chosen. In the selected kebeles, all village chicken owners and some small scale farm households were registered. A simple random sampling technique was used to select 10 chicken owner respondents from each of the sub-districts. A total of 60 chicken owner households were interviewed using a pre-tested structured questionnaire.

2.3. Data Collection, Management and Statistical Analysis

Secondary data was collected from Aneded district livestock resources development office and office of agriculture of East Gojam zone and Primary data will be collected through individual interviews. The qualitative and quantitative data-sets were analyzed using SPSS software, version 20 [11]. Descriptive statistics and General Linear Model (GLM) were also used to locate treatment means that are significantly different or not. The significant mean values (at $P < 0.05$) were separated by Duncan's Multiple Range Test. The following linear models were used during analysis of quantitative data.

$$Y_{ij} = \mu + M_i + \epsilon_{ij}$$

Where

Y_{ij} = chicken production performance parameter estimate for bird j in that study area,

μ = the overall mean,

M_i = the fixed effect of characteristics of constituting a

city (peri-urban and rural) and
 ϵ_{ij} = the residual error.

3. Result and Discussion

3.1. Household Characteristics

The household characteristics of present study on village chicken owner households were presented in Table 1. From the total house hold interviewed 45.5% were males and 54.6% female. The average age of respondents was 38.1 years (ranged 21 -57). The analysis for educational status disclosed that 40.4% illiterate, 29.6% had basic education (Reading and writing), 12% had elementary education, and 11.3% high school, and 1.5% university and 5.2% had religious education. The number of illiterates observed in this study was much better than the reported 82.1% for North West Ethiopia [6]. In contrary the Education status observed under the present study was lower than to those report by Alemayehu and Negasi, [12] and Tadesse *et al.* [13] in other parts of Ethiopia.

The average family size per household was 5.7 (ranged 3 - 10). The family size in the study area showed significance difference between peri-urban and rural area. Numerically more family size were observed in rural households than peri-urban. The present study score higher family size than the national average of 4.53 CSA, 2020 [3] Amhara region and 5.4 in Eastern Amhara [6]. The average livestock holding was 6.4 cattle, 2.2 sheep 9.7 poultry and 1.5 equine. This study result shows greater cattle number compared with the finding of Moges *et al.* [14] who reported 4.16 and 2.24 for cattle and sheep respectively. There was significant difference in cattle and sheep numbers between peri-urban and rural areas, as usual, with more cattle and sheep (7.74 and 3.54) in rural areas and 5.27 cattle and 0.92 sheep in peri-urban areas.

Table 1. Socio-economic status of respondent chicken owners of Aneded district, Ethiopia.

Variables	Location of the area		Mean	Significance
	Peri urban	Rural		
1. Sex of respondent households (%)				
Male	24.2	66.7	45.5	
Female	75.8	33.3	54.6	
Average age of respondents (years)	39.3 ±9.1	36.3 ±6.8	38.1±8.2	
2. Education status of respondents (%)				
Illiterate	36.4	44.4	40.4	
Read and write	33.3	25.9	29.6	
Elementary	9.1	14.8	12	
high school- preparatory	15.2	7.4	11.3	
University	3.0	NA	1.5	
Religious education	3.0	7.4	5.2	
Average family size (Mean± SD)	5.3 ±1.8	6.2 ±1.4	5.7 ±1.7	*
land holding/household (hectare) (Mean SD)	1.9±1.0	2.3±1.2	2.1±1.1	
3. Livestock Holding (No. of animals)				
Cattle	5.27 ±3.00	7.74 ±2.78	6.4 ±3.13	**
Sheep	0.92 ±1.02	3.54 ±4.45	2.2 ±3.31	**
Poultry	9.95±7.25	9.38±5.17	9.7±6.38	
Equine	1.54 ±2.95	1.44 ±1.18	1.5 ±2.28	
Bee colony	0.25 ±0.81	0.88 ±1.92	0.54±1.45	

Significance level * p value between 0.01 and 0.05, ** p value <0.01, NA Not Applicable.

3.2. Production System and Status

The chicken flock structure, type of poultry production system, housing system and purpose of rearing was illustrated in Table 2 and Table 3. The average chicken flock size per household in peri urban and rural of the study area was 9.95 and 9.38 respectively. Despite the fact that intensive poultry production is more common in peri-urban areas than in rural areas, there was no statistically significant difference between these two locations. The average chicken flock size was 9.7, which was lower than the findings of Dejene [15]

and Alemayehu and Negasi [12]. For all chicken age groups, indigenous chickens are more common in rural areas than in urban areas, while cross chicken and exotic chicken are more common in peri-urban areas in all age group (young chickens, pullet, hen and cokes). In the current study Indigenous chickens are mostly k-ept than exotic and cross chicken type. These findings are consistent with report that reported in Malawi, the majority (96.8%) of extensive chicken production system used indigenous chicken ecotypes, accounting for the majority of chickens kept [16].

Table 2. Chicken flock structure by mean flock size per household in Aneded district, Ethiopia.

Chicken type		Location		
		P. urban (Mean± SD)	Rural (Mean± SD)	Mean (Mean± SD)
Pullet	Local	1.1±1.9	1.1±2.8	1.1±2.0
	Cross	0.3±0.2	0.1±0.6	0.1±0.4
	Exotic	0.2±1.0	0.1±0.5	0.2±0.8
Hen	Local	2.4±2.8	3.4±2.3	2.8±2.4
	Cross	2.2±5.0	1.0±1.5	1.7±4.0
	Exotic	1.6±2.4	1.2±2.8	1.4±2.6
Cock	Local	0.4±0.5	0.4±1.0	0.4±0.9
	Cross	0.3±0.8	0.03±0.2	0.2±0.6
	Exotic	0.3±1.0	0.000	0.2±0.8
Total flock size		10.0±7.3	9.4±5.6	9.7±6.4

Table 3. Production system of chicken in Aneded district, Ethiopia.

Variables	Location		Grand mean
	Peri urban	Rural	
1. Type of poultry production system%			
Extensive	51.5	70.4	60.9
Semi intensive	27.2	22.2	24.7
Intensive	18.2	7.4	12.8
Intensive only for exotic	3.1	NA	1.6
2. housing system%			
With human	12.1	29.6	20.9
Separate house	81.8	63.0	72.4
With other animals	6.1	7.4	6.7
3. purpose rearing birds%			
For Egg	27.3	25.9	26.6
For Meat	6.0	18.5	12.2
For income source	66.7	55.6	61.2

The present study revealed that the type of poultry production was characterized by 60.9% extensive, 24.7% semi intensive, 12.8% intensive and 1.6% use intensive production system only for exotic breeds. The majority (72.4%) of respondent rear the chickens with separate house for cash income source (61.2%), for egg production (12.2%) and for meat production (26.6%). The result of the current study was in line with the findings of Sonaiya *et al.* [17], stated that sale of live birds for income generation was the primary goal of keeping family chicken in developing countries.

3.3. Production Performance of Indigenous and Exotic Chickens

Average age at first egg laying for local chicken was 6.1 month in lined with finding of different scholars [12, 18, 19].

This report was better than finding of various authors indicated that age of female village birds at first laying were, 6.88 month Moges *et al.* [14], 6.5 month Gebreegzabher and Tsegaya [20] and 7.9 month Assefa *et al.* [21]. In addition this result also different from report of various scholars

indicated that sexual maturity age of female village birds was 7 month in Tanzania [22] and 7 - 9 month in Benin [23].

Average annual egg production capacity of indigenous hen was 64.2 which is greater than the previous finding that reported 60 egg/year/hen annual egg production potential for indigenous birds in Bure district Ethiopia [14]. Annual egg production performance revealed that 63.7 for peri urban and 65.1 for rural in contrary, Matiwos *et al.* [24] mentioned that Egg laying period and number of eggs laid per period are to some extent higher in urban than in rural areas. Number of clutch/hen/year was 2.88 which is lower than report of Moges *et al.* [14] who reported 3.83 number of clutch/hen/year. Similarly, Yousif and Eltayeb [18] reported that Sudanese native Dwarf Chicken was 5 clutch and Bare Neck Chicken 4 clutch raised under improved traditional production system. Average age of male indigenous chicken reach to matting or for consumption was 6.4 month which is in agreement with the result that reported average age of male chicken reach to first mating was 6 month at bure district [14].

Age at first laying for exotic chicken was 5.5 months this result in line with the report of Aderaw *et al.* [25] and Matiwas *et al.* [24] revealed that the mean age at first egg of Bovans Brown in the urban area of Bahir Dar was 5.5 month and 5.7 month mean age at first egg of exotic pullet chicken

at rural household level in Nole Kabba Woreda, Western Wollega respectively. The present study find that annual egg production of Exotic chicken's were 137.5 ± 51.5 which is lower than report of Getu and Birhan [26] reported 185 eggs in Northern Ethiopia.

Table 4. Production performance of local, cross and exotic chickens at Aneded district.

Chicken type		Parameters (Mean \pm SD)			
		Age (month) at first egg laying	No. of eggs collected annually per bird	No clutch/hen/year	Age (month) at first matting (male)
Local	P. urban	5.9 \pm 1.7	63.7 \pm 27.8	3.15 \pm 1.1	6.0 \pm 1.0
	Rural	6.2 \pm 1.7	65.1 \pm 26.0	2.8 \pm 0.7	6.2 \pm 1
	Mean	6.05 \pm 1.7	64.2 \pm 26.8	3.0 \pm 1.0	6.4 \pm 0.9
exotic	P. urban	5.6 \pm 0.9	145.0 \pm 26.6		4.7 \pm 0.7
	Rural	5.3 \pm 0.5	130.0 \pm 76.3		4.8 \pm 0.7
	Mean	5.5 \pm 0.5	137.5 \pm 51.5		4.74 \pm 0.7

3.4. Feeding and Watering

Feeding and watering practice of chicken in the study area is illustrated in Table 5. Majority of the respondent use scavenging with supplementary feeding, homemade feed as supplement and formulated (purchased feed) 47.1%, 34.9% and 13.5%, respectively. Overall 81.6% of respondent use supplementary feed for their chickens. Similarly, Dejene [15] revealed that the main feed of chicken in pawe district were scavenging with additional supplements. The present result was lower than the finding of Moges *et al.* [14] revealed that Supplementary feed was provided by majority (97.5%) of chicken owners. The Source of water showed 54.6% whole water and 40.5% Tap water. This all suggests that wandering of birds for feed and water or scavenging is low in the current study.

Table 5. Feeding and watering condition of chicken in Aneded district, Ethiopia.

Parameters	Location of the area		Overall Mean
	Peri urban	Rural	
1. Feeding system of birds%			
Scavenging with supplement	42.4	51.9	47.1
Purchased feed	12.1	14.8	13.5
Homemade feed	36.4	33.3	34.9
2. Status of supplementary feed%			
Yes	81.8	81.5	81.6
No	18.2	18.5	18.4
3. type of supplementary feed used			
Formulated feed	13.6	11.1	12.4
Homemade feed (Grains)	63.6	63.0	63.3
Furshka or wheat middling	4.5	11.1	7.8
4 source of water%			
Whole water	53.5	55.6	54.6
Pond	6.1	3.7	4.9
Tap	39.4	40.7	40.5

3.5. Meat and Egg Consumption

Meat and egg consumption of the present study was indicated in Table 6. Majority of the respondent had egg consumption at holidays (54.8%), consume egg once a week (34.9%), consume egg daily (3.7%) and the rest (6.6%) had no egg consumption at all. Chicken meat consumption also practice during holiday or for cultural/religious ceremonies 64.1%, consumption once a month 8.6% and 27.3% had no

meat consumption at all. This result was slightly lower than the previous finding reported that 78% of interviewed village chicken owners only consumed chicken during religious/cultural holidays [14]. This indicated that the study area had low poultry egg and meat consumption and this may indicate that there is cultural/religious taboos against eating chicken meat.

Table 6. Meat and egg consumption of household in Aneded district.

Parameters	Location of the area		mean
	Peri urban	Rural	
1. When you consume egg%			
Daily	NA	7.4	3.7
Once a week	36.4	33.3	34.9
At holidays	57.6	51.9	54.8
No consumption at all	6.1	7.4	6.6
2. When you consume meat%			
Once in month	6.1	11.1	8.6
At holidays	72.7	55.6	64.1
No consumption at all	21.2	33.3	27.3

3.6. Chicken Health, Market Access and Distribution

Newcastle disease (NCD) was the most prevalent and economically important (93.3%) disease problem affecting village birds and it is reported to be the first major causes of chicken death/loss in the district. Similarly, Halima [6] reported that the major causes of death for local birds in North West Amhara were seasonal outbreaks of diseases, specifically New- castle disease. The overall mean revealed that 81.5% of the respondent got veterinary access even though Peri urban got more access for veterinary service (90.9) than rural areas (72.2%).

Most of the chicken owners were purchased their local chickens from local market and purchase exotic and cross from agricultural office. But the rural chicken owners didn't have more chance to obtain different chicken breeds from agricultural office. Market preference showed that both indigenous and exotic chickens for meat purpose prefer 38.7 and 39.4% for its best taste and weight for indigenous and exotic respectively, while cross bred select 22% for meat purpose. The egg preference showed that 77.6% of respondent mentioned that white egg color is

more prefer in the market due to its taste. Majority of the house hold had got risk of predators 67.9% especially the rural area faced predators of wild cat, rat, and Falcon locally called (chlfir).

Table 7. *Chicken health and market.*

Parameters	Location of the area		mean
	Peri urban	Rural	
1. Meats Type more prefer at market%			
Indigenous	27.3	50	38.7
Exotic	45.5	33.3	39.3
Cross breed	27.3	16.7	22
2. Egg shell and yolk colour more prefer at market%			
White shell	77.3	77.8	77.6
Brown shell	4.5	11.1	7.8
Both	9.1	11.1	10.1
White shell	97	98.7	97.8
Yellow shell	3	1.3	2.2
3. Access to veterinary service%			
Yes	90.9	72.2	81.5
No	9.1	27.8	18.5
4. Common poultry disease in district%			
NCD	93.9	92.6	93.3
Fowl cholera	3.1	7.4	5.2
No disease occurrences	3	0	1.5
5. Risk of predator (%)			
Yes	63.6	72.2	67.9
No	36.4	27.8	32.1

3.7. Problems or Constraint Regarding Production and Management System

The major first ranked constraint in the present study were disease occurrence (45.3%), feed shortage (30.7%) especially for rearing exotic chicken and breed distribution (24%). The second ranked constraint were disease occurrence (25.8%), feed shortage (19.2%), breed distribution (29.2%), management problem 15% and predator (10.8%). Similarly, different scholars mentioned that under small holder farmer management poultry production prevailing disease, predators, market problem, lack of proper health care, poor feeding and veterinary services were reported as the major constraint [14, 27, 28]. In addition from several common challenges that hinder the poultry sector development Feed cost is the major one which accounts for 75-80% of the total livestock operational costs in Ethiopian [29, 30]. Alemneh and Getabalew [31] also mentioned that the major constraints of chicken production performance in Ethiopia were 26% Predator and 11% financial and management problems.

Table 8. *Major constraint Rank in the study area.*

Variables	First (%)	Second (%)	Third (%)	Forth (%)
Disease	45.3	25.8	9	-
Feed shortage	30.7	19.2	3.5	2.7
Breed distribution	24	29.2	30	12.4
Predator	-	10.8	25.8	16.9
Farm hygienic	-	-	11.3	35
Market access	-	-	15.4	30
Management problem	-	15	5	3

4. Conclusion and Recommendation

From The present study it could be concluded that local chicken ecotypes were dominant and more adapted for the existing scavenging chicken production system of the district. The study also revealed that the main feed of chicken in the study areas are scavenging with additional supplements. Few of the respondents use homemade and purchased chicken feed. Production performance of indigenous chicken for both peri urban and rural area is better when compared with other areas in Ethiopia. Distribution and rearing of exotic chicken is more concentrated in peri urban than rural area. So the production performance of this exotic chicken breed at rural area of the distinct is poor. The major constraint in the present study is disease, feed shortage, breed distribution, predators and market access for purchasing exotic chickens. Based on this result and conclusion the following recommendation is forwarded.

- 1) Attempts have been made to introduce different exotic poultry breeds to small holder farmers especially for rural area of the district.
- 2) Hence, appropriate intervention in chicken disease control, sustainable exotic chicken distribution for all small holder farmers, predator control activities, proper management strategies like providing frequent extension services interims of regular training to farmers focusing on disease prevention, improved housing, feeding and watering of chicken are highly recommended.

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