Archives of Animal and Poultry Sciences
ISSN: 2690-5884
Research Article
Volume 1 Issue 3- February 2020
DOI: 10.19080/AAPS.2020.01.555565
Arch Anim Poult Sci
Copyright © All rights are reserved by Amanuel Bekuma

Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia

Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse

Department of Animal Science, Mettu University, Ethiopia

Submission: December 10, 2019; **Published:** February 20, 2020

***Corresponding author:** Amanuel Bekuma, Department of Animal Science, Mettu University, Ethiopia

Abstract

The study was undertaken to examine production and reproduction performance of village chicken, egg quality traits and marketing in Dedo district, Jimma zone. Highland, midland and lowlands agro-ecologies of the district were purposively selected on the basis of poultry population and accessibility. Two peasant associations (PA) from each agro-ecology and 30 households from each of the six PAs were selected using stratified probability random sampling; hence a total of 180 (6x30) respondents were interviewed to collect the required data. And a total of 240 fresh eggs (80 from each agro-ecology) were purchased from sampled farmers on contractual bases for analyzing egg quality traits.

Results of the study revealed that the growth performance and survival rate of chicks hatched from eggs collected were found to be poor. This study also pointed out that eggs collected were poor in most of the egg quality parameters; this might be due to poor storage period and condition of eggs. In the study area, chicken and egg were marketed informally and women and children (95%) were responsible for managing and marketing of chicken. There must be improvement in health care, control of predators and provision of better extension service, credit schemes and training opportunities for increasing the productivity of village chicken in the study area.

Keywords: Dedo district; Egg quality; Ethiopia; Marketing; Productivity; Village chicken

Introduction

Ethiopian agricultural sector employs 80-85% of the population and contributes 40% of the total growth domestic product. Of this, chicken production covers 40% of the agricultural output in the rational economy and contributes 13-16% of the total GDP Hunduma et al. cited by [1]. The total poultry population of the country is estimated to be about 56.53million. The large segment of country's poultry comprises of chicks (41.35%) followed by laying hens (32.18%). Pullets, cocks and cockerels are estimated to comprise about 5.85, 5.32 and 3.11 million, respectively. Regarding breed, 94.31 percent, 3.21 percent and 2.49 percent of the total poultry were reported to be indigenous, hybrid and exotic, respectively [2].

Poultry production systems are carrying out in Ethiopia in traditional (low input systems) and in modern production systems (using relatively advanced technology) [3]. Indigenous chicken kept under traditional system are characterized by lack of purposeful feeding, separate poultry house, small flock sizes, low input and output and periodic devastation of the flock by disease [4]. The productive performances of indigenous chicken ecotypes were relatively poor. The low egg production performance of indigenous chicken was expressed as slow growth rate, late maturity, produce small sized eggs, small clutch size, broodiness and high mortality of chicks [5]. This is mainly due to disease outbreak, poor management (poor feeding and housing) and predation [4].

Even though in the past and currently, the Ethiopian government development initiatives of village poultry placed special emphasis on genetic improvement through the introduction of exotic chicken and enlarging poultry extension package; scant information was available on the production and reproduction performances and egg quality parameters of village chicken in the study area. It is cynical to plan and design chicken improvement strategy without considering village chicken production and reproduction performance, egg quality traits and marketing system. Therefore, this research was initiated with the following objectives:

i. To analysis village chicken production and reproduction performance, and

ii. To evaluate egg quality traits and marketing system in the study area.

Material and Methods

Description of the study area

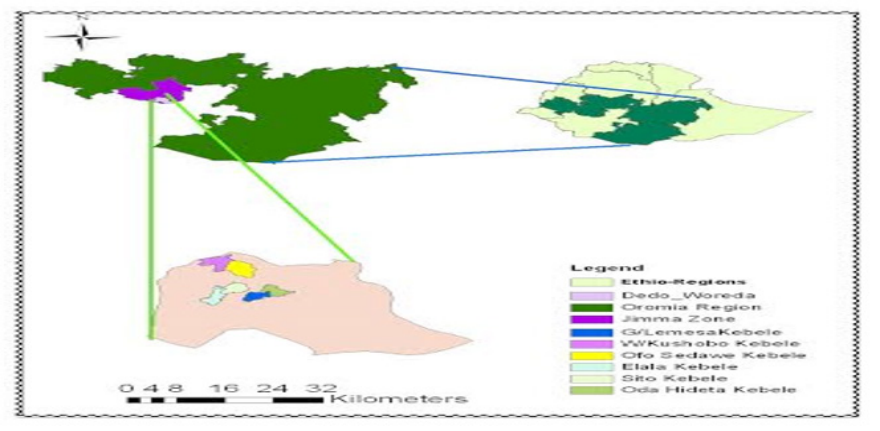

Figure 1: Map of Dedo district with selected PA.

The study was conducted at Dedo district of Jimma Zone, Oromia Region. It comprises a total land area of 1459.1 Km^2. Topographically, the district is mountainous with an altitude ranging 880- 2400 m.a.s.l. Agro-ecologically, it consists of 18% highlands, 48% midlands and 34% lowlands. The poultry and human population of the district is estimated to be about 0.056 and 0.29 million, respectively [6]. The farming practice is characterized by crop-livestock mixed system (Figure 1).

Study population and sample size

Table 1: Household sampling framework.

Poultry Population	PA	Number of HH	Agro Ecology
4652	Sito	30	Midland
	Ofole	30	
1053	WaroKolobo	30	Highland
	OdoHideta	30	
609	Elala	30	Lowland
	GaremaLamesa	30	
Total		180	

Highland, midland and lowland agro-ecologies of the district were purposively selected on the basis of poultry population and accessibility as shown in Table 1. Stratified probability random sampling method was followed to select two peasant associations (PA) from each agro-ecology and a total of 30 households were randomly selected from each of the Peasant Associations. Thus, a total of 180 (6x30) households were interviewed to collect the required data for the study.

Data collection

The required data according to the objectives of the study were collected by using primary and secondary data sources. Pre-tested structured questionnaire and field observation were used to collect the primary data. Then, secondary data were collected from zonal and districts agricultural offices, published journal articles, reports and other relevant documents.

Determination of internal and external egg quality

240 fresh eggs (80 from each agro-ecology) were purchased on contractual bases from selected farmers at household level and analyzed at Jimma University College of Agriculture and Veterinary Medicine (JUCAVM) animal nutrition laboratory for quality detection. Each egg was individually weighed using a two-digit sensitive balance and average eggshell thickness, yolk color, using roche color fan scale (1-15), albumen height, yolk height, and Haugh unit egg quality traits were recorded. For the albumen

How to cite this article: Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse. Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia. Arch Anim Poult Sci. 2020; 1(3): 555565. DOI: 10.19080/AAPS.2020.01.555565

and yolk height measurements, the eggs were broken out on a flat glass and then the maximum albumen and yolk heights were measured with a tripod micrometer. Individual Haugh unit was calculated using formula cited by Tulin and Ahmet.

$$HU = 100 \log (AH + 7.57 - 1.7EW0.37)$$

Where, AH = observed albumen height in mm and

EW = egg weight in grams.

Fertility and hatchability measurement

Fresh eggs (stored for 3-7 days) were purchased (334 eggs from each agro-ecology) on contractual basis for comparative external and internal egg quality evaluation. These were (total of 1000 eggs) selected against undesirable size, shapes and abnormal shell structures. The selected eggs (200 from each agro-ecology and total of 600) were incubated using JUCAVM hatcheries.

The empty incubator and all the fixtures were fumigated in advance using 70ml of formalin plus 35g potassium permanganate Altman et al. The incubation temperature, humidity and turning devices were adjusted in advanced incubator according to the recommendations of the manufacturer. The experimental eggs incubated were candled on the 7th and 14th day of incubation to remove infertile eggs and early and late dead embryo. The hatched chicks were transferred to the electric brooder house of JUCAVM as soon as they dried. Finally, fertility and hatchability were calculated as.

$$\% \text{ Fertility} = \frac{\text{Number of fertile eggs} \times 100}{\text{Number of total eggs set}}$$

$$\% \text{ Hatchability} = \frac{\text{Number of chicks hatched} \times 100}{\text{Number of fertile eggs}}$$

Chicks growth measurement

After hatching, the chicks were collected, counted, weighed and grouped according to their origin of agro ecology and level of dryness and transferred to electric brooder house which were cleaned, disinfected and well prepared in advance. All chicks were placed on commercial starters ration purchased from Addis Ababa and drinking water was provided all the times. Feed consumption was measured daily whereas body weight was taken weekly for 0-8 weeks. Growth rate was calculated as,

$$\text{Percent growth rate} = \frac{(V \text{ present} - V \text{ past})}{V \text{ past}}$$

Where,

V present = present value (weight)

V past = past value (weight)

Statistical analysis

All the data collected form the respondents were analyzed using statistical package for social science (SPSS) software version 20; and the data collected from laboratory analysis were analyzed using the General Linear Models (GLM) procedure of SAS (1999) based on the following model:

$$Y_{ijk} = \mu + I_{th} + J_{th} + \epsilon_{ijk}.$$

Where, Y_{ijk}= the value of the respective variable mentioned above

μ = overall mean of the respective variable

I_{th}= the effect of its agro ecology (i= 1-3, Highland, Midland and Lowland)

J_{th} = the jth production and reproduction performance

ϵ_{ijk}= random error term.

5% significance was used

Results and Discussion

Production and reproduction performance

About 78% of the respondents reported that chicken laid 4-5 clutches of eggs per year and each clutch was estimated to contain 10–16 eggs: showing annual egg production/hen ranging from 35-62 eggs. This might be due to lack of proper health care, poor nutrition and poor housing. Slightly, the same result was reported from Goma Woreda of Jimma Zone by Meseret M [5].

The average number of eggs incubated at a time was reported to be 12. In the study area, even though there was no practice of record keeping, only 22% of the respondents have no idea about how many eggs were laid by hen. During the study period, eggs were not stored over a long period because both live birds and eggs were an immediate source of income at household level. The flock size and structure of chicken in the study area was dominated by indigenous chicken. From field observation, the number of exotic chicken and their crosses were lower in all agro ecologies compared to the number of indigenous chickens, mainly attributed to the low adaptability of improved breeds of chicken to the local conditions. So that almost all the respondents (98%) have no interest in keeping exotic breeds of chicken.

Fertility and hatchability of eggs incubated

Fertility and hatchability are the major economically important parameters of reproduction performance in poultry production. The mean value of eggs hatchability calculated l was found to be 20.8% (Table 2), which was slightly lower than (22%) [7] and [5]. About 88% of the respondents reported that as there was low hatchability of eggs during the rainy seasons. All the respondents also reported to have had about 20-30% hatchability during the rainy seasons and > 73.3 % hatchability during the early dry period ranging from September to December (Table 2).

The overall mean shell weight without membrane and thickness of eggs collected from local hens in the study area was

How to cite this article: Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse. Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia. Arch Anim Poult Sci. 2020; 1(3): 555565. DOI: 10.19080/AAPS.2020.01.555565

5.16g and 4.60mm, respectively. The current result was higher than that of 0.71 mm and 0.69 mm reported by Halima H [8]. This might be attributed due to the high calcium and phosphorous contents of the supplementary and scavenging feed resources available in the study area. The average yolk and albumen height and weight of the eggs collected from selected agro-ecologies of the study area were reported to be 10.99 and 2.01mm and 14.77g and 22gm, respectively.

Table 2: Fertility and hatchability of eggs incubated from the experimental sites.

	Highland (N=200)		Midland (N=200)		Lowland (N=200)		Total (N=600)	
Parameters	N	%	N	%	N	%	N	%
Infertile eggs removed on the 7th day of incubation	83	42	82	41	77	39	242	40.3
Early dead embryo removed on the 7th day of incubation	17	8.5	9	4.5	18	46	44	7.3
Late dead embryo removed on 14th day of incubation	11	7.5	21	10.5	21	10.5	13	6.5
Percent fertility of the eggs	58	29	58.5	29.25	61	30.5	118	19.6
Percent hatchability of the fertile eggs incubated	39	33.62	40	34.18	46	37.7	125	35.21
Percent hatchability of the total eggs incubated	39	19.5	40	20	46	23	125	20.83

The other most important internal egg quality trait considered in this study was yolk color; estimated using roach color fun (range 1–15). According to the present finding, the average yolk color of eggs from local hens was 9.64. This was higher than the finding reported by Fisseha M, et al. [9] for local eggs (8.6 and 9.06) collected from Bure and Fogera Woredas, respectively. Hence, the higher yolk color score obtained from the current study might be because of scavenging feed resource base of the study area is rich in xanthophylls, which is responsible for deep yellow color eggs collected from scavenging indigenous chickens.

The average mean value of Haugh unit of the eggs collected from the study area was 45.46, the value of which was lower than that (66.5) reported by Fisseha M, et al.[9] for Bure and Fogera Woredas and then that (61 and 81) reported by Halima H [8] for eggs collected from local and RIR chicken kept under intensive management condition of Northwest Amhara regional state. The lower mean Haugh unit obtained from (≤ 72) in the current study might be attributed to the poor handling and storage of the eggs, since egg Haugh unit is highly correlated with storage period and condition of eggs.

Performance and survival of the experimental chicks hatched

Performance of the experimental chicks as shown in Table 3, there was not statistically significant (P<0.05) difference between all the groups of the experimental chicks in mean hatching (initial) and mean body weight at an age of 8 weeks. The mean hatching weight (39.86 g/chick) of the groups of chicks hatched from eggs collected from the lowland area tended to be slightly higher than the others. On the contrary, the mean body weight (394.42 g/chick) attained at an age of 8 weeks by the groups of chicks hatched from eggs collected from midland areas tended to be higher than the others (Table 3). Growth is influenced by genotype, nutrition, type of tissue, specific regulatory factors and aspects of the feed. Low protein reduces growth because of depressed appetite and thus reduces intake. The depression in feed intake resulted in retarded growth in chickens [10]. The results of this study showed that, there was no significant difference (P<0.05) between all the groups of chicken in growth rate as measured by mean daily body weight gain (Table 3).

Table 3: Performance and survival rate of the experimental chicks.

Items	High land	Mid land	Low land	Average
Total chicks hatched %	40	54	31	125
Initial body weight gain(g)	36.69	37.37	39.86	37.97
Body weight at an age of 8 weeks (g)	366.06	394.42	374.34	378.27
Daily Weight gain(g)/bird	6.1	6.57	6.23	6.3
Total Feed intake /bird/day (g)	3311.02	3367.09	3172.39	3283.5
Mean daily feed intake/bird (g)	55.18	56.12	52.9	54.7
Feed conversion ratio (FCR)	9.05	8.53	8.47	8.68
Mortality to an age of 8 weeks	53	56	57	55.3

How to cite this article: Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse. Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia. Arch Anim Poult Sci. 2020; 1(3): 555565. DOI: 10.19080/AAPS.2020.01.555565

a) **Daily feed intake:** The current results showed that there was no statistically significant difference (P<0.05) between all the groups both in mean daily feed consumption and total feed consumed over the 8 weeks of the feeding trial. The mean total feed consumed from hatching to an age of 8 weeks (3172.39g/chick) and the mean daily feed consumption (52g/chick) of the groups hatched from eggs collected from the lowland tended to be lower than the others.

Feed conversion ratio

There was no statistically significant difference (P>0.05) between all the groups of chicks in feed conversion ratio as measured by the amount of feed consumed per unit of body weight gain. Feed conversion ratio of 9.05, 8.5 and 8.4 was calculated for the groups hatched from eggs collected from the highland, midland and lowland area, respectively (Table 3). The result indicated that the groups hatched from eggs collected from highlands seemed to have consumed more feed (9.05g) per g of body weight gain compared to those hatched from eggs collected from midlands (8.5g) and lowland (8.4g).

The feed conversion ratio calculated from the current study were higher than that (4.9 -5.2g of feed per g of gain) reported by Tadelle D [11] from Tepi, Horro, and Tilili indigenous chicks. Feed conversion ratio is a complex process and a highly aggregated traits which is the result of the interaction of behavior, level of production, appetite and other factors [8]. Moreover, frequent disease outbreaks were encountered during the conduct of the feeding trial which might have confounded the performance of the experimental chicks.

Mortality

There was no statistically significant difference between all the groups of the experimental chicks in mortality. Reasonably low and comparable rate of mortality was recorded from all the groups during the early phase of brooding. There was increased rate of mortality of the experimental chicks gradually with time. The overall mean mortality to an age of 8 weeks of all the experimental chicks was calculated to be 53%, the value of which was high by any standard for chicks kept in confinement. About 55% of the total mortality to an age of 8 weeks occurred during the 7-8 weeks of the feeding trial which was attributed to the occurrence of serious disease outbreaks.

Marketing system

Table 4: Market Price of live birds and eggs in Dedo district.

Item	High Land	Mid-Altitude	Lowlands	P Value
Price of adult cock during rainy season (birr/h)	121±17.5^{ab}	124.50±17.63^{a}	119±19.70^{ab}	0.18
Price of adult cock during dry seasons (birr/h)	131.00±25.23^{a}	132.83±27.027^{a}	127.66±19.72^{ab}	0.01
Price of adult hen during rainy season (birr/h)	68.12±13.20^{a}	65.5±14.25^{ab}	67.7±13.20^{a}	0.39
Price of adult hen during dry season (birr/h)	72±15.17^{a}	68.55±16.50^{ab}	71.8±13.30^{a}	0.1
Price of pullets and cockerels in rainy season (birr)	54.21±15.23^{a}	50.31±15.20^{ab}	50.31±15.20^{ab}	0.26
Price of pullets & cockerels in dry seasons (birr)	56.23±17.30^{a}	52.4±18.50^{ab}	51.65±13^{ab}	0.26
Price of eggs during rainy seasons (birr)	1.75.0±0.2^{c}	185.0±0.12^{ab}	1.92±0.1^{a}	0.01
Price of eggs during dry seasons (birr)	1.88±0.13^{a}	1.80±0.12^{ab}	1.88±0.14^{a}	0

In the study area, marketing of chicken and eggs were common and undertaken informally. This finding was in line within Ethiopia; village chicken and egg marketing channels are informal and poorly developed [12]. Chicken and eggs were sold to consumers within the villages, on roadsides and in local and urban markets. The annual income from the sale of poultry and poultry products in the study area was calculated to be Birr 335.44. The result of this study was agreed with the mean annual income of Birr 300/hh reported by Assefa T [13] from the study conducted in the SNNP regional state (Table 4).

The major reasons of selling live birds and eggs in the Dedo district were reported to be the occurrence of disease outbreak, the beginning of the big rainy season, need of cash for buying children cloth and purchase of feed and other household inputs. The same result was reported by Assefa T [13] and Halima H [8] in different areas of the country. Both women and men were involved in chicken marketing in the study area. The cause of variation in chicken and egg market price in Dedo district were reported to be diseases outbreak (3.9%), holiday (11.1%), egg size (15%) and combinations of disease and holiday (70%) (Figure 2). Market price of chicken and eggs is highly related to holy days, non-fasting season for the Orthodox Christians, plumage color, comb type, body size, age, sex, market site and health status of chicken [8] (Figure 2).

There was seasonal variation in market price of live birds and eggs and market price showed decrease with the onset of the big rainy season (June to August) as shown in Table 4. The results of this study also showed that white, red and mixture of white and red plumage colors were more preferred for consumption in the study area. Black, mixture of black and white, mixture of red, white and black and mixture of red and black plumage colors were less favored.

How to cite this article: Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse. Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia. Arch Anim Poult Sci. 2020; 1(3): 555565. DOI: 10.19080/AAPS.2020.01.555565

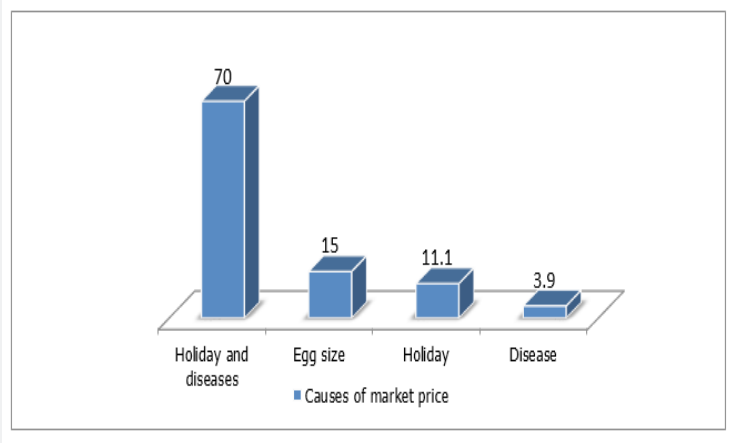

Figure 2: Determinant of market price in Dedo distrcit.

This result agreed with that of [12], who reported the same tendency in consumer and market color preference from a survey conducted on indigenous chicken productions and marketing systems of Bure and Fogera of the Amhara regional state and Dale Woreda of the SNNP regional state.

Conclusion and Recommendations

It could be concluded that, productive and reproductive performances of village chicken and most of egg quality parameters were found to be poor due to poor management systems, poor storage period and condition of eggs. Besides, in the study area, marketing of live chicken and eggs was undertaken informally. These overall low production and productivity of the sector call introduction of different improvement programs.

References

1. Melkamu BY, Solomon TG (2013) Production and Marketing of Chicken at Kimbibit Woreda in North Shoa Zone, Oromia Region, Ethiopia. International Journal of Scientific and Research Publications 3(9): 1-9.
2. CSA (2017) Central Statistics Agency of Ethiopia, Ethiopia.
3. Alem T (2014) Production and Reproduction Performance of Rural Poultry in Lowland and Midland Agro-Ecological Zones of Central Tigray, Northern Ethiopia. British Journal of Poultry Sciences 3(1): 06-14.
4. Amanuel BH (2018) Assessment of Chicken Production under Farmers Management Condition in Gimbi District, West Wollega Zone, Ethiopia. Innovative Techniques in Agriculture 3(1): 550-557.
5. Meseret M (2010) Characterization of village chicken production and marketing system in Gomma Wereda, Jimma Zone, Ethiopia. Animal Production, pp. 110
6. National Census (2007) Population and Housing Census of Ethiopia: Results for Oromia Region. 1: 1-116.
7. Mekonnen G, Gebre Egziabher (2007) Characterization of small holder poultry production and marketing system of Dale, Wonsho and Loka Abaya Woredas of Southern Ethiopia. MSc. Thesis, School of Graduate Studies of Hawassa University, Ethiopia.
8. Halima H (2007) Phenotypic and Genetic Characterization of Indigenous Chicken Populations in Northwest Ethiopia. PhD Thesis, University of the Free State, South Africa p. 186.
9. Fisseha M, AzageT, Tadelle D (2007) Indigenous chicken production and marketing systems in Ethiopia: Characteristics and opportunities for market oriented development. International livestock institute, Ethiopia
10. King ori AM (2011) Review of the factors that influence egg fertility and hatchability in poultry. International Journal of Poultry Science 10(6): 483-492.
11. Tadelle D (2003) Phenotypic and genetic characterization of chicken ecotypes in Ethiopia. PhD Thesis. Humboldt University, Germany, pp. 208.
12. Moges F, Azage T, Tadelle D (2010b) Indigenous chicken production and marketing systems in Ethiopia: Characteristics and opportunities for market-oriented development. International livestock institute, Ethiopia.
13. Assefa T (2007) Poultry management practices and on farm performance evaluation of Rhode Island Red, Fayomy and Local chicken in Umbulo Wachu water shade in Sidama zone. MSc thesis. Hawassa University, Ethiopia pp. 126.

How to cite this article: Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse. Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia. Arch Anim Poult Sci. 2020; 1(3): 555565. DOI: 10.19080/AAPS.2020.01.555565

This work is licensed under Creative Commons Attribution 4.0 License
DOI: 10.19080/AAPS.2020.01.555565

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
  (Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission
https://juniperpublishers.com/online-submission.php

How to cite this article: Amanuel Bekuma*, Meskerem Asefa and Tekalign Tadesse. Analysis of Village Chicken Productivity, Egg Quality Traits and Marketing System in Dedo District, Jimma Zone, South West Ethiopia. Arch Anim Poult Sci. 2020; 1(3): 555565. DOI: 10.19080/AAPS.2020.01.555565