Chicken Production Systems, Performance and Associated Constraints in North Gondar Zone, Ethiopia

Addis Getu and Malede Birhan*
University of Gondar, Department of Animal Production and Extension, Faculty of Veterinary Medicine, Gondar, Ethiopia

Abstract
Survey was conducted in three districts (Quara, Alefa and Tach Armachiho) of Amhara region northwestern Ethiopia. Semi structured questionnaire, participatory rural appraisal and ranking trials were used. Extensive production systems is the dominant management practices of chicken with small feed supplementation. Three peasant associations from each district and a total of 180 households were selected using multistage simple random sampling technique based on chicken potential. Farmers were interviewed using semi-structured questionnaire and additional data was obtained from key-informants through group discussion. This investigation revealed that average flock size/household was 16.11 for Quara, 16.33 for Alefa and 16.73 chickens for Tach Armachiho district. About 90% both in Quara, and Tach Armachiho and about 2.4% in Alefa districts of chicken owners are constructed separate shelter for chickens. The average eggs laid clutch/hen is 16.88, 14.23 and 11.9 eggs for Quara, Alefa and Tach Armachiho districts, respectively. Annual egg production of local hens is 60.20, 55.87 and 36.94 eggs/hen for Quara, Alefa and Tach Armachiho districts, respectively. Seasonal outbreaks of diseases and predation were the two major causes for loss of chickens. Women are responsible in managing chickens in all the study sites. Therefore, emphasis should be given in availing production technologies including breeding systems, organizing input supply system for chicks, feed, vaccines and veterinary drugs for chicken and eggs. The influential bodies should consider the importance of indigenous genetic resources and struggle to develop appropriate technologies at conserving the unique genetic resources and improving village flock production and productivity.

Keywords: Chicken production; Constraints; Performances

Introduction
In Ethiopia, the agricultural sector is a corner stone system known to possess desirable characteristics such of the economic and social life of the people [1]. At national level in Ethiopia, 99% of the total, 56.5 million, estimated chickens are contributed by village management of poultry production in ruff valley of poultry production while only 1% is from intensive exotic breed maintained under intensive management system [1]. Poultry is the largest livestock species worldwide [2], accounting for more than 30% of all animal protein consumption [3]. Chickens largely dominate flock composition and make up about 98% of the total poultry about 98% of the total poultry (chickens, ducks and turkeys) population kept in Africa.

The sector as thermo tolerant, resistant to some disease, good egg employs 80-85 percent of the population and contributes and meat flavor, hard eggshells and high dressing 40 percent to the total GDP [4]. Therefore, almost all rural and many peri-urban families keep small flock scavenging local chickens [2]. Imagining about 80% of the chicken populations in Africa are reared in free scavenging production systems [5,6]. In African countries, the rural chicken population accounts more than 60% of the total national chicken population [4]. However, in Ethiopia chicken populations were estimated about 49.3 millions of which 97.3%, 2.32 % and 0.38% were indigenous, exotics and hybrid breeds, respectively [7].

Still these large population indigenous chickens are found in traditional production systems. But, they are well adapted to the tropics, resistant to poor management, feed shortages, tolerant to diseases and provide better test of meat and eggs than exotic chickens [8]. Furthermore, short generation interval, high rate of productivity, easy to transport in different areas and easily consumed by the rural poor are the major opportunities of chickens comparing with other farm animals [4].

So comprehensive assessment of production system in the remote districts of northern Gondar zone in general, identification of production systems and associated constraints in these particular areas was unquestionable; therefore, the objective of this study were:

- To evaluate the performance of chickens and production system in the study area and
- To identify the most important problems and constraints associated with chicken production system in north Gondar zone.

Materials and Methods

Description of the study area
The study was conducted in randomly selected three districts of north Gondar zone (Quara, Alefa and Tach Armachiho) of Ethiopia. The altitude of the zone is ranged from 528-4620 meter above sea label (masl) and rainfall of 880-1772 mm with the temperature of 44.5°C to -10°C. Quara district is located western part of north Gondar Zone between 11°47’ and 12°21’ and latitude and 35°16’ and 35°47’E longitude. It is 1123 km far from Addis Ababa and 324 km from Gondar town and elevation ranging 528-654 meter above sea label. The annual temperature ranges 25-44°C with mean annual rainfall of 600-1000 mm [8]. The same source indicated that Alefa district is located at 162 km in southwest of Gondar town and 909 km from Addis Ababa with the temperature of 25 - 30°C and annual rainfall of 900-1400 mm. Armachiho district is also found 814 km northwest of Addis Ababa and 65 km North West of Gonder town with the altitude of 600-2000 masl with the temperature of 25-42°C and with annual rainfall of 800-1800 mm [5].

*Corresponding author: Malede Birhan, Department of Animal Production and Extension, Faculty of Veterinary Medicine, University of Gondar, P.O.Box: 196, Gondar, Ethiopia, E-mail: birhan1975@gmail.com

Received July 25, 2014; Accepted August 20, 2014; Published August 25, 2014


Copyright: © 2014 Getu A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Data collection methods

In addition to semi-structured questionnaires participatory rural appraisal (PRA), focus group discussion and field observation were employed to dig up the required information. All 180 household chickens owner respondents, 60 per district were considered for semi-structured questionnaires.

From the present investigation both qualitative and quantitative data were considered. Qualitative data included household socio-economic characteristics, husbandry practices, and flock structure and production constraints of the chickens. Whereas, quantitative data included flock size, family size, performance of chickens and land size.

Questionnaires

Performance data like productive and reproductive ability of chickens’ husbandry practices, flock size, flock structure, family size, household socio-economic characteristics and land size of respondents were documented through semi-structured questionnaires adopted from Hunduma [8].

PRA tools

- **Group discussion**: One focus group discussion members (12) per ecotype were inhaled to generate information other than the individual interviews. Members of the focused groups were communally known to have a good understanding in animal production, people believed to be knowledgeable about past and present social and economic status of the area, community leaders and story tellers.

- **Ranking trial**: Ranking trial was used to study major constraints of farmers. Participants were asked to rank their first, second, third fourth and fifth major constraints. The respondents were mentioned so much reasons. But, only five mentioned reason were taken based on their current production mode and future improvements.

- **Data management and statistical technique**: Data was managed both in hard and softcopies. All collected data were entered and managed using Microsoft Excel computer programme. More over data were analyzed by SAS, 2002 version 9. Indexes were used to calculate for data collected from rankings with the formula: Index=sum of (5 for rank 1+4 for rank 2+3 for rank 3+2 for rank 4+1 for rank 5) given for an individual reason divided by the sum of (5 for rank 1+4 for rank 2+3 for rank 3+2 for rank 4+1 for rank 5) [8].

Results

**Socio-Economic characteristics of the area**

The majority of the respondents in this study area were females accounted about 57.8%. These larger female respondents might be absent of traditional restrictions observed women approaching to outsiders. However, smaller result was reported by Mekonnen [9] who showed that only 66.7% of the respondents were married. From interviewed respondents most information was generated from females which indicated that mainly women are culturally responsible for rearing of chicken. According to Gueye [3] in sub Saharan Africa from the total family size about 80% of the chicken flocks were owned and largely controlled by women. Similar result was also reported by many researchers such as Mekonnen, Halima [9,10]. Moreover, about 73.3% of the average interviewed farmers were illiterate while 16.7% can read and write. About 6.7% and 3.3% were literate respondents who had gone through primary first cycle (1-4) and primary second cycle (5-8), respectively. Finally illiterate those who read and write educational status of the interviewed farmers in the recent study were slightly similar to southern Ethiopia (67.8% and 18.9%) as reported by Mekonnen [9]. Thus, lower educational background obtained in the study area might be lack of security, access and location to the main town.

Average family size of Quara, Alefa and Tach Armachihio districts were 5.77 ± 0.57, 6.10 ± 0.44 and 6.73 ± 0.48 persons, respectively with overall mean family size of 6.20 ± 0.28 (Table 1). These results were almost smaller than southern Ethiopia (6.95 persons) reported by Mekonnen [9] and higher than the national average of 5.2 persons [11]. Moreover, land holding characteristics of the respondents are presented in Table 1. Total land holding size/household was showed as a significant difference among the three districts. Such as recorded average land holding/household was highest 5.20 ± 0.90 ha from Quara and lowest 1.7± 0.25 ha from Alefa district. The result was also significantly higher than 1.01, 0.75 and 1.2 ha land holding/hh at national, Amhara regional state and north Gondar zone. Further recent result showed the average size 1.28 and 1.23 ha/hh was reported from northwest Amhara by Halima and Fisseha [10,12] respectively.

**Flock Sizes and Structures**

The dominant flock structures of chicken in the study area were chicks followed by hens. Overall average flock size and structure of chickens kept per household were 9.07 ± 0.59, 2.79 ± 0.26, 2.47 ± 0.26, 1.02 ± 0.15 and 1.11 ± 0.11 for chicks, hens, pullets, cockerels and cocks, respectively with a total flock size of 16.43 ± 0.92. This result was in lined with Gueye [3] who reported that the flock sizes generally ranged from 5 to 15 during the laying season. The distribution of chickens according to ages and sexes were represented in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Study area</th>
<th>Quara</th>
<th>Alefa</th>
<th>Tach Armachihio</th>
<th>P-value.</th>
<th>Overall-mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family size/hh</td>
<td>5.77 ± 0.57</td>
<td>6.10 ± 0.44</td>
<td>6.73 ± 0.48</td>
<td>0.3816</td>
<td>6.20 ± 0.28</td>
<td></td>
</tr>
<tr>
<td>Land size/hh</td>
<td>5.20 ± 0.90a</td>
<td>1.7 ± 0.25b</td>
<td>3.76 ± 0.71ab</td>
<td>0.0019</td>
<td>3.55 ± 0.42</td>
<td></td>
</tr>
</tbody>
</table>

The same row with different superscripts are significantly different (P<0.01)

**Table 1**: Average land and family size/hh (Mean ± SE) in the study area (n=90).

<table>
<thead>
<tr>
<th>Chicken Category</th>
<th>Quara</th>
<th>Alefa</th>
<th>Tach Armachihio</th>
<th>P – value</th>
<th>Overall means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicks</td>
<td>8.40 ± 1.20</td>
<td>8.83 ± 1.00</td>
<td>9.97 ± 0.86</td>
<td>0.5627</td>
<td>9.07 ± 0.59</td>
</tr>
<tr>
<td>Pullets</td>
<td>2.93 ± 0.42</td>
<td>2.83 ± 0.48</td>
<td>1.67 ± 0.40</td>
<td>0.0912</td>
<td>2.47 ± 0.26</td>
</tr>
<tr>
<td>Cockerels</td>
<td>1.03 ± 0.26</td>
<td>1.13 ± 0.27</td>
<td>0.90 ± 0.25</td>
<td>0.8208</td>
<td>1.02 ± 0.15</td>
</tr>
<tr>
<td>Hens</td>
<td>2.63 ± 0.31</td>
<td>2.60 ± 0.27</td>
<td>3.13 ± 0.41</td>
<td>0.4417</td>
<td>2.79 ± 0.19</td>
</tr>
<tr>
<td>Cocks</td>
<td>1.33 ± 0.20</td>
<td>0.93 ± 0.14</td>
<td>1.07 ± 0.20</td>
<td>0.1825</td>
<td>1.11 ± 0.11</td>
</tr>
<tr>
<td>Over all</td>
<td>16.11 ± 1.11</td>
<td>16.33 ± 1.44</td>
<td>16.73 ± 1.49</td>
<td>0.9495</td>
<td>16.43 ± 0.92</td>
</tr>
</tbody>
</table>

**Table 2**: Flock size and structure of indigenous chickens in North Gondar zone.
to 20 fowls per African village households. However, lower results were also conducted by Mekonnen and Assefa [9, 12] from Awassa Zuria and Dale district with mean flock size of 8.8 and 9.2 chickens/ household, respectively. Furthermore, similar report was carried out on the average flock size per household of 16 in the central parts of Ethiopia and in the Kwaile district of the south coast of Kenya [13]. Furthermore, two fold lower reports from current findings were carried out on the average flock size per household of 7.1 [14]. But, from the current investigation the flock size per household was not significant different among ecotypes (Table 2). The same number of flock sizes observed in different districts might be adaptation ability of the dominant ecotypes from their own production environment. Finally, the respondents noted that flock size is not always the same mainly due to chicken used as source of immediate farmers’ expense, occurrence of diseases and presence of predators. The lower proportion of the cockerels and cock within the indigenous chicken population were observed. Since cockerels and cocks are used for immediate expense and sharing of breeding males for that small number of hens in the village.

**Chicken production systems**

The major feed resources, feeding practices and frequency of giving to eat in the study area indicated by the respondents showed (Table 3). All respondents kept only pure indigenous chickens and managed extensively under traditional production systems. Almost all respondents practiced supplementary feeding of local chickens’ spring on the ground. Whereas, confined management of chickens with commercial feeding is not known at all districts. Similarly, many researchers such as Mekonnen, Halima, Moreda, Fisseha [9-12] about 95%, 98.1%, 99.28% and 96.3% of the poultry producers in Awassa Zuria, Dale Woreda, Northwest and central Ethiopia were offered supplementary feed to their chickens, respectively. Additionally, related result showed that there was no purposeful feeding of rural chickens in Ethiopia and the scavenging feed resources were almost the only source of feed [6]. Farmers believe that chickens provided with supplementary feed hens lay more eggs and chicks grow faster. Nevertheless, farmers had no cleared idea in terms of the quality and quantity of supplementary feeds. The major source of chicken feed was obtained from their house and cereal grains of maize (*Jula*) and sorghum (*Rifa*) were the most important supplementary feeds. Similar research result was found from Gomma woreda of cereal grains were important supplementary feeds [15].

### Water resources and watering of chickens

Water plays an important role for feed digestion and metabolic activity of chickens. Almost all of the respondents in the study district provide water ad libitum for their chickens. In Alefa 19.8% of the respondents provide water to their chickens only during the dry season and the remaining (79.2%) offered throughout the year. The major sources of provided water in Alefa district is obtained from river (56.67%), spring (26.67%), locally constructed underground water (3.33%) and hand operated pipe water (13.33%). However, all respondents together with equal proportion from Quara and Tach Armachihio district provided water for their chicken both in dry and wet season. In Quara the water sources are river (26.67%), spring (16.67%), locally constructed underground water (10%) and hand operated pipe (46.67%). Whereas, in Tach Armachihio district river (33.33%), springs (20%) and hand operated pipe water (46.67%) were the major sources of households, supplied water for their chickens. About 98%, 96 and 58% of the respondents haven’t standard watering troughs in Quara, Tach Armachihio and Alefa district, respectively. In Alefa, clay material (47.3%), wooden trough (32.7%) and troughs made of plastic (18.2%) were the most widely used watering troughs, whereas in Quara clay material (77.3%) and wooden trough (22.7%) and in Tach Armachihio district clay materials (92.5%) and wooden trough (7.5%) were used. Concerning to the frequency of cleaning watering trough in Alefa district was about 23.33% and (76.67%) of chicken owners were cleaned every day and never cleaned, respectively. In Quara and Tach Armachihio districts the respondents washed the containers randomly during changing of hot water twice per day.

### Chicken housing practices

As usual poultry house protects chickens from predators, theft, rough weather (rain, sun and wind and temperatures) and provide shelter for egg layers and broody hens. In Alefa district about 97.6% of the respondents kept their chicken at night sheltering places within the family house and placed on the floor covered by ventilated bamboo made materials. The main reasons for not constructing separate chicken houses in Alefa district was small flock size, lack of awareness and risk of predators. However, almost all equal proportion of respondents in Quara and Tach Armachihio districts more than 90% of the respondents were constructed separate perches. The reasons for constructing of chicken houses in Quara and Tach Armachihio districts were presence of predators specially sticks and suffocations. While, only 3% and 2% of the respondents were allowed their chickens to roost enclosed baskets hanging in the trees and in the family house whereas 5% and 2% of chickens were roost on the trees and enclosed baskets hanging in the trees from Quara districts, respectively. Smaller research result was reported from north western part of Ethiopia [9] and from Fogera [16] who revealed that 50.77% and 59.7% of farmers kept their chicken outside the house, respectively whereas Mekonnen [9] reported that there is no specific separate poultry house in Dale Wereda.

### Marketing systems

During data collection the communities were sold live chickens.
and eggs from the ordinary day is presented in Table 4. Respondents confirmed that chickens prices are not always constant. Therefore, in the usual market chicken owners were obtained better prices from matured chickens 82.83 ± 2.14 and 67.87 ± 2.24 from Quara 77.00 ± 2.76 and 52.50 ± 1.74 from Tach Armachiho than 53.27 ± 1.74 and 40.33 ± 1.42 from Alefa districts with the average prices of 71.03 ± 2.14 (n=180) and 53.56 ± 2.24 (n=90) birr per matured cocks and hens, respectively. The prices obtained in this finding were significantly higher as compared to Hunduma [8] who reported 21.74 ± 0.54 (78) and 13.95 ± 0.43 (78) as well as Assefa [13] who reported that the price of matured cocks and hens were 21.5 (30) and 13.4 (30) birr, respectively. This finding is still higher than that of Solomon [17] who reported 27.24 and 15.51 birr for matured male and female chickens, respectively in the study made around Awassa Zuria. Market and road accessibility in particular, phenotypic nature of an animals, seasons and holidays in general play important role for the variations of chicken price in the study area. Whereas, average price per unit egg was 1.70 ± 0.05 (n=180) birr. Due to lack of marketing place and access to main road in Alefa as like as live weight of chicken the price of egg was lower than the two districts. Smaller result was also reported by Mekonnen [9] with the average price of 0.57 birr (n=156) and [13] 0.46 birr per egg (n=30) around southern Ethiopia and Debere Zuria, respectively.

Major Constraints of Chicken Production

Major constraints of chicken production are presented in Table 5. Among the reported constraints of chicken production prioritized by the respondents in the study area were disease, predators, market problem, lack of water and extension together with veterinary services. Most respondents were frequently mentioned diseases as the first ranked chicken production constraint in all districts whereas predators like snicks were the third problems in Tach Armachiho and Quara district. Market facilities including access to main road were the bottleneck of chicken production in Alefa where as like as live weight of chicken the price of egg was lower than the two districts. Smaller result was also reported by Mekonnen [9] with the average price of 0.57 birr (n=156) and [13] 0.46 birr per egg (n=30) around southern Ethiopia and Debere Zuria, respectively.

<table>
<thead>
<tr>
<th>Chicken Category</th>
<th>Quara</th>
<th>Alefa</th>
<th>Tach Armachiho</th>
<th>P-value</th>
<th>Overall means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(LSM ± SE)</td>
<td>(LSM ± SE)</td>
<td>(LSM ± SE)</td>
<td>95%</td>
<td>(LSM ± SE)</td>
</tr>
<tr>
<td>Cock</td>
<td>82.83 ± 2.14*</td>
<td>53.27 ± 0.74*</td>
<td>77.00 ± 2.76a</td>
<td>0.0012</td>
<td>71.03 ± 2.14</td>
</tr>
<tr>
<td>Hen</td>
<td>67.87 ± 2.24a</td>
<td>40.33 ± 1.42b</td>
<td>52.50 ± 1.74b</td>
<td>0.0011</td>
<td>53.56 ± 2.24</td>
</tr>
<tr>
<td>Cockerel</td>
<td>41.90 ± 2.59a</td>
<td>23.78 ± 0.93a</td>
<td>38.83 ± 2.03a</td>
<td>0.0013</td>
<td>34.90 ± 2.59</td>
</tr>
<tr>
<td>Pullet</td>
<td>33.36 ± 2.01a</td>
<td>17.36 ± 0.85b</td>
<td>25.46 ± 1.32b</td>
<td>0.0015</td>
<td>25.40 ± 2.01</td>
</tr>
<tr>
<td>Unit egg</td>
<td>1.97 ± 0.07a</td>
<td>1.12 ± 0.04a</td>
<td>2.02 ± 0.06a</td>
<td>0.0016</td>
<td>1.70 ± 0.05</td>
</tr>
</tbody>
</table>

Table 4: Mean prices birr of live chickens and eggs in ordinary market days (LSM ± SE).

<table>
<thead>
<tr>
<th>Major Constraints</th>
<th>Quara</th>
<th>Alefa</th>
<th>Tach Armachiho</th>
<th>Weighted value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension service</td>
<td>0.27(2)</td>
<td>0.26(2)</td>
<td>0.18(4)</td>
<td>0.22(3)</td>
</tr>
<tr>
<td>Water problem</td>
<td>0.14(4)</td>
<td>0.06(5)</td>
<td>0.23(2)</td>
<td>0.21(4)</td>
</tr>
<tr>
<td>Predators</td>
<td>0.26(3)</td>
<td>0.16(4)</td>
<td>0.22(3)</td>
<td>0.23(2)</td>
</tr>
<tr>
<td>Disease</td>
<td>0.28(1)</td>
<td>0.28(1)</td>
<td>0.27(1)</td>
<td>0.25(1)</td>
</tr>
<tr>
<td>Market</td>
<td>0.05(5)</td>
<td>0.24(3)</td>
<td>0.10(5)</td>
<td>0.09(5)</td>
</tr>
</tbody>
</table>

Table 5: Rating of major constraints of chicken production in the study area.
obtained in the form of purchased, gift and hatched eggs, respectively. According to the respondents’ point of view good performance of chicken could be attributed to non-genetic factors such as supplementary feed and care of farmers to their chickens. The present finding discovered that mean age at first female sexual maturity was 4.70 ± 0.27, 5.50 ± 0.17 and 6.08 ± 0.20 months with average mean age of 5.43 ± 0.14 months and as well as first male sexual maturity was 4.30 ± 0.27, 4.85 ± 0.14 and 5.13 ± 0.20 with average mean age of 4.76 ± 0.13 months in Necked neck, Gasgie and Gugut chickens, respectively. Average productive and reproductive performances of chicken ecotypes and their significant difference were estimated under existing farmers’ management condition (Table 5).

In this result average age at first female sexual maturity was much earlier than 6.8 months reported by Tadelle [13], and later than 5 months reported by Halima [9]. The productive performance of the ecotypes obtained from the present study was larger in 3.97 ± 0.19 clutches/hen/year in Gasgie but smaller in 55.87 ± 2.67 eggs/hen/year whereas smaller in 3.52 ± 0.13 clutches/hen/year in Necked neck but larger in 60.20 ± 4.09 eggs/hen/year. Mean annual egg production of the indigenous chickens of necked neck and Gasgie were higher than those reported (55.2 eggs/year from southern Ethiopia [8], (36-42 eggs/year from Ambo [20], 32 eggs/year from Assela [21] and 36 eggs/year from Fogera [22]. However, higher performance record was reported from Kibret and Rahman [18,23] than Gugut ecotype of 36.94 ± 2.05 eggs/hen/year. This indicated that the better performance of the two ecotypes and existence of variability in egg production could be an indication of the potential for genetic improvement through selection followed by cross breeding with selected indigenous superior chickens [24].

Conclusions

Chicken production system in the study area was mixed crop-livestock production system using through traditional management of indigenous chickens. The presences of various predators and diseases prevalence were the two major economic important of chicken production constraints. Chickens prices are not always constant which associated with whole days and the fasting situations of the people and festivity of the society. The usual market chicken owners were obtained better prices from matured chickens and from Quara and Tach Armachiho than Alefa districts. The study of performance analysis showed that Nacked neck and Gasgie ecotypes were found better in both productivity and reproductive performances than Gugut ecotypes.

Recommendations

Farmers in the study area were fully involved in traditional management of indigenous chickens. However, the feasibility of intensive managements on performances of indigenous chickens needs to be assessed. Further intensive and monitoring studies to be proceed on type and coverage of chicken diseases.

Acknowledgements

The first author would like to thank the Germen international corporation (GIZ) for granting the research budget, Bahir-Dar University allowing access to all facilities, Bahir-Dar University for granting MSc study and local extension workers in the study districts for their help during the survey work. Farmers who took part in the interview and group discussion are gratefully acknowledged.

References