Characterization of village chicken production performance under scavenging system in Halaba district of southern Ethiopia

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Abstract

Village chicken production was characterized using retrospective and cross-sectional methods, where 280 households rearing local chickens in Halaba district of southern Ethiopia were used for data collection. The study revealed that the average flock size was 8.5 chickens (95% CI=7.98 – 9.08). The average number of chickens added to a flock annually was 28.3 birds (95% CI=27.76 – 28.86) while 22.9 birds (95% CI=22.36 – 23.53) were leaving the flock. The majority of the households (77.7%) constructed a wooden perch for night resting of their chickens inside the main house. Scavenging was the major avenue of feeding chickens. Most of the respondents (83.6%) practiced selection in their chicken flocks for females (68.4%) and both sexes (31.6%). The average number of eggs laid by local hen was 13.3 eggs/hen/clutch (95% CI=12.81 – 13.85) and the mean annual egg production was 50.8 eggs per year with an average clutching frequency of 3.8 clutches (95% CI = 3.69 – 3.92). The average clutch length was 26 days (95% CI = 24.92 – 27.08). While the age at first lay of village chickens was 6.53 months (95% CI = 6.45 – 6.61), the average weight at first lay was 0.91 kg (95% CI = 0.87 – 0.96). The mean egg weight for the village chickens was 39.4 g (95% CI = 38.79 – 39.91). The average hatchability of eggs in this study was 83.7 % (95% CI = 81.73 – 85.72). The survival rate of chicks to 6 months of age was 52.3% (95% CI = 51.09 - 53.45). It was concluded that village chicken production was characterized by low input and output system, and scavenging was the dominant form of feeding of village chicken.

Key words: Village chicken – Scavenging – Productivity – Clutch
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Introduction

The village chicken sector constitutes significantly to human livelihood and food security of poor households. The indigenous chickens are known to possess desirable characters such as thermo- tolerance, resistance to some diseases, good egg and meat flavor, hard eggshell, high fertility and hatchability as well as high dressing percentage (Abdelqader *et al*., 2007). With a total population size of about 65 million, chicken make up the largest share in terms of number compared to other farm animal genetic resources in Ethiopia and plays a significant role in human nutrition and sources of income (Mammo Mengesha *et al*., 2008). Moreover, 99% of the population consisted of native chicken and are managed under scavenging systems while the remaining birds are kept mainly in private farms under modern management system.

Even though village chickens provide a valuable function in the livelihood of rural smallholders, little research and development work has been carried out to characterize, understand and improve the village chicken production systems in Ethiopia (Mammo Mengesha *et al.,* 2008). Therefore, it is necessary to obtain baseline data on the characteristics of production systems and production performance of local chickens under scavenging system in Halaba district, southern Ethiopia. Having this in mind, the objectives of this study were to characterize the village chicken production systems in the area and to assess the egg production performance of village chickens in the area.

Materials and Methods

Study area

This study was conducted in Halaba district of the Southern Nations, Nationalities and People Regional State, located 310 km South of Addis Ababa, about 85 km southwest of the Southern Nations Nationalities and Peoples Region's (SNNPR) capital, Hawassa. The district is geographically located 7^0 17' N latitude and $38^0$06' E longitude (IPMS, 2005).

Study population and design

Village chickens raised under scavenging production systems in the selected study sites constitute the study population. Retrospective and cross-sectional types of studies were conducted to collect data from September 2008 to February 2009 using questionnaire survey, observation, direct measurements and participatory approaches. The sampling units were households keeping local chicken.

Sampling procedure and data collection

Peasant associations (PAs) and households in the study area were selected using simple random sampling procedure. Out of the total PAs of the district, 7 PAs (about 10% of the total PAs) were randomly selected. From each PA, 40 households were randomly selected, making a total sample size of 280 households. The sample size was determined following the formula developed by Ashram (2007) for survey works, considering a 4% probability in the variability between households. Clutch size was assessed using a total of 70 chickens, whereas hatchability was measured by incubating eggs laid by 70 chickens during a period of 10 days. Average egg weight was determined by taking individual weights of a total of 80 eggs using sensitive balance. The body weight of 35 birds at first egg was taken using a hanging balance to determine body weight at first lay. The samples sizes varied for different parameters due to the fact that all households did not have chickens in similar physiological stages. A pair-wise ranking method was used to identify major constraints of poultry production.

Statistical analysis

Data were entered into Microsoft Excel 2003 and descriptive statistics such as mean, standard error, frequency; percentage and confidence interval (CI) were calculated using SPSS (2006).

Results

Flock size and dynamics

The average flock size was 8.53 (95% CI = 7.98 - 9.08), with a cock to hen ratio of 1:1.8. The flocks were dominated by chicks (37.1%), which were followed by hens (26.8%), cocks (14.8%), pullets (13.4%) and cockerels (7.9%), respectively (Table 1). Hatching, purchasing of birds and gift from relatives accounted for 95.3%, 3.8% and 0.9% of the flock build up, respectively (Table 2). Mortality (disease and predation), sales, household consumptions and gift to relatives accounted for 67.5%, 26.2%, 5.8% and 0.5% of the disposals from the flock, respectively. On average, 28.3 (95% CI = 27.76 – 28.86) birds were added to a flock annually while 22.9 (95% CI = 22.36 – 23.53) birds left the flock.

Table 1. Flock size and structure

Class	Minimum	Maximum	%	Mean	SEM	95% Confidence interval (CI)	
						Lower	Upper
Cocks	0	2	14.8	1.3	0.04	1.19	1.34
Hens	1	4	26.8	2.3	0.05	2.18	2.38
Pullets	0	6	13.4	1.2	0.09	0.97	1.32
Cockerels	0	5	7.9	0.7	0.08	0.52	0.82
Chicks	0	15	37.1	3.2	0.23	2.72	3.62
Flock size	1	21	20.0	8.5	0.28	7.98	9.08

SEM = Standard error of the mean

Table 2. Flock dynamics of the study area

Variable	%	Mean	SEM	95% Confidence interval (CI)	
				Lower	Upper
Migration in to flock	55.2	28.3	0.28	27.76	28.86
Hatching	95.3	27.0	0.28	26.43	27.53
Purchase	3.8	1.1	0.05	0.99	1.18
Gift from relatives	0.9	0.2	0.03	0.18	0.3
Migration out of flock	44.9	22.9	0.29	22.36	23.53
Mortality	67.5	15.5	0.22	15.06	15.92
Selling	26.2	6.0	0.12	5.78	6.25
Consumption	5.8	1.3	0.06	1.22	1.44
Gift to relatives	0.5	0.1	0.02	0.06	0.15

SEM = Standard error of the mean

Village chickens housing, feeding and breeding

The study revealed that most (77.5%) of the respondents constructed a wooden perch for their birds inside the main house for night shelter, 12.1% of the respondent kept their birds in a separate room which was enclosed in the main house and 10.4% of the households provided a hand woven basket for their birds especially for newly hatched chicks and the broody hen (Table 3). Scavenging was the major source of feeding chickens.

About 81.8% of the farmers provided supplemental feeds for different age groups together and 18.2% of the farmers provided for the different age classes separately (Table 3). The source of water for the chickens was river (65%), well (14.3%) and tap water (20.7%). Most respondents (83.6%) practiced selection in their chicken flocks for females (68.4%) and for both sexes (31.6%). The majority of the respondents (84.3%) had no interest to keep exotic breeds and only very few respondents (15.7%) had interest to rear exotic breeds (Table 3).

Table 3. Poultry housing, feeding and breeding

Variable	Number of household	Percentage
Nesting at night		
Perch inside the house	217	77.5
Separate Room inside the house	34	12.1
Hand woven basket	29	10.4
Feeding		
Whole flock	229	81.8
Separated in groups	51	18.2
Water source		
River	182	65
Tap water	58	20.7
Well	40	14.3
Breeding practice		
Yes	234	83.6
No	46	16.4

Farmers indicated that the major causes of losses in the study area were predation by hawks, fox and wild cats (51.1%), disease (45%) and thieves (3.9%) (Table 4). Among the classes of chickens, chicks and growers were severely attacked by predators during both dry and rainy seasons. Diseases accounted for 45% of the death of chickens in which Newcastle disease played the major cause of death. The severity of the disease was higher during rainy season (75.4%) than during dry season (24.6%). The most common type of traditional medicines used for treating sick birds was tobacco leaf, lemon juice and table oil, which were administrated with drinking water. The measures taken by farmers when sick birds were observed in the flock was medication (90%), selling (6.8%) and isolation of birds (3.2%). Dead birds were disposed through pet animals (86.8%) and burying (13.2%).

Table 4. Poultry health and predation

Variable	Number of household	Percentage	Rank
Causes of loss			
Predation	143	51.1	1
Disease	126	45	2
Thieves	11	3.9	3
Season of disease severity			
Rainy season	211	75.4	1
Dry season	69	24.6	2
Dead birds disposal			
Given to pet animals	243	86.8	1
Burying	37	13.2	2
Measures against diseases			
Medication	252	90	1
Selling	19	6.8	2
Isolation	9	3.2	3

Performance of village chicken

The average number of eggs laid by local hen was 13.3 eggs/hen/clutch (95% CI = 12.81 – 13.85) and the mean annual egg production was 50.8 eggs per year (Table 5). It was also observed that the number of eggs, which was laid by local hen at one clutch period, ranged from 7 to16 eggs. The average clutch length in the present study was 26.0 days (95% CI = 24.92 – 27.08), which ranged from 12 to 34 days. It was observed that all of the hens laid the eggs with more than one-day interval. The average number of clutches per hen per year in the present study was 3.8 (95% CI = 3.69 – 3.92), which ranged from 2 to 6 clutches. The way of breaking broodiness so as to increase the numbers of clutches practiced by farmers in the study area was taking the bird to other place for more than a week, piercing the nostrils with feathers, hanging the bird upside down for 3 days consecutively for 2 to 3 h per day.

Age at first lay, egg weight and hatchability

The age at first lay of local chicken in the study area ranged from 5 to 8 months with an average age at first lay of 6.5 months (95% CI = 6.45 – 6.61) (Table 5). The average weight at first lay in the present study was 0.914 kg (95% CI = 0.869 – 0.959), which ranged from 0.8 to 1.2 kg (Table 4). The age of the hens, which were weighed, ranged from 5 to 7 months.

Table 5. Productive and reproductive performance of local chicken

					95% confidence interval	
Variable	Minimum	Maximum	Mean	SEM	lower	upper
Clutch size, n = 70	7	16	13.3	0.26	12.81	13.85
Clutch length, n = 70	12	34	26	0.55	24.92	27.08
Age at first lay (month)	5	8	6.5	0.04	6.45	6.61
Weight at first lay (kg), n = 35	0.8	1.2	0.9	0.02	0.87	0.96
Egg weight (g), n = 80	34.1	44.6	39.4	0.28	38.80	39.91
Clutching frequency	2	6	3.8	0.06	3.69	3.92
No of times the hen hatches per year	1	3	2.3	0.04	2.22	2.35
Clutch period for hatching	2	3	2	0.01	2.01	2.05
No of eggs incubated	6	16	12	0.27	11.51	12.57
No of eggs hatched	6	14	10.1	0.24	9.58	10.53
Hatchability (%), n = 70	66.7	100	83.7	1.00	81.73	85.72
Survivability (%)	30	83.33	52.3	0.58	51.09	53.45

SEM = Standard error of the mean

The mean egg weight for the local chicken in the study area was 39.4 g (95% CI = 38.799 – 39.912) which ranged from 34.1 to 44.6 g (Table 5). Most of the eggs were small in size and had a white and pale white color. The hatchability percentage observed in this study was 83.7 %(95% CI = 81.729 – 85.717), which ranged from 66.7% to 100%. During the observation, the minimum and the maximum number of eggs incubated per hen were 6 and 16 eggs, respectively. From the incubated eggs the minimum and maximum number of eggs hatched per hen was 6 and 14 eggs, respectively. The mean number of eggs, which were incubated and hatched per hen, was 12 (95% CI = 11.51- 12.57) and 10.1(95% CI = 9.58 – 10.53) eggs, respectively. Farmers in the study area did not select eggs for incubation. They did prepare a brooding nest made of hand woven basket prior to incubation. The minimum and maximum number of times a hen hatched per year was 1 and 3 times, respectively and most farmers let the hen to brood eggs at the second clutch period (Table 5). According to the respondents 52.3% (95% CI = 51.098 – 53.45) of chicks survived until 6 months of age and the survival rate of the chicks ranged from 30 to 83.3%.

Discussion

The average flock size (8.5 chickens) in this study was 36.4 % higher than the average flock size of 6.23 chickens per household reported by Meseret Molla (2010). The cock to hen ratio of 1:1.8 in this study was higher than 1:3.7 reported by Fisseha Moges *et al.*, (2009). The reason for having more cocks than required for breeding might be meant for selling purposes for the forthcoming religious festivals particularly during Christian festivals to fetch a higher premium market price. Hatching of chicks accounted for the largest share (95.3%) of the flock build up, which was in corroboration with a previous report which indicated that over 90% of migrants into in the flock were from hatched chicks (Muchadeyi *et al.*, 2005).

All farmers provided supplementary feeds on a daily basis, which was in line with earlier reports, where 97.8% of the farmers provided supplementary feed to rural chickens (Meseret Molla, 2010). The results revealed that chicks followed by broody hens were given priority in case of supplemental feed provision, since chicks are not yet in a position to scavenge feed and the broody hens were mostly being kept inside the house incubating the eggs and do not have enough time to freely scavenge and get their feed.

Predator attack was higher in the rainy season because predators have a place to hide around the houses during the rainy season. All of the farmers in the study area complained that Newcastle disease, which is locally known as 'Kimbisha' was the major disease frequently causing death of chickens. The most common traditional medicine used in the study area for treating sick birds was tobacco leaf, lemon juice and table oil which were administrated with a drinking water.

Majority of the respondents (84.3%) had no interest to keep exotic breeds. This was due to exotic breeds have no the characteristics of fleeing as well as making alarm sounds when they see predators. Due to this problem, they were easily picked up by predators. On the other hand even though the local breeds have less productivity in terms of egg and body weight; they can resist the diseases and have the ability to flee when they see predators. Very few farmers (15.7%) reported that they preferred exotic cocks to local cocks due to the higher price for exotic cocks than local cocks at the market.

The main purchasing criteria for female and male chickens used by farmers in the study area were color and weight, respectively. Kei ecotype colored is the most preferred color of female chickens. This color preference is due to the belief that Kei ecotype female chickens are more productive in terms of egg and meat than the other female ecotype. The comb type has influence on farmer's preference at time of purchasing of male chickens. The pea and rose comb type were mostly preferred by farmers than that of single comb type. Age was not considered for purchasing of male chicken but in case of female it was considered.

Most farmers ranked predators (hawks, foxes and wild cats) as the main constraint of poultry production in their area. In contrast to the present results, Moreki (2010) reported that mortality due to diseases as the main constraint to village chicken production. Among diseases, Newcastle disease (locally known as "Kimbisha") was the most prevalent disease of local chicken in the area. Feed shortage, housing, marketing, financial problems and lack of veterinary services played also an important role in village chicken production. Mammo Mengesha *et al*., (2008) also reported that inadequate health care, poor production, inappropriate housing and poor

knowledge of poultry management were the major constraints to village poultry production.

The average number of eggs (13.3 eggs/hen/clutch) laid by village hen in this study was 18% lesser than 15.7 eggs/hen/clutch (Fisseha Moges *et al*., 2009) and 16.5% lesser than 15.5 eggs/hen/clutch (Moreki, 2010). The mean annual egg production was 50.8 eggs. This was 8.5% higher than the mean annual egg production of 46.8 eggs (Moreki, 2010). The clutch length of 26.04 d obtained in the present study was similar with the clutch length of 26.2 d, whereby the average clutches/hen of 3.81 in this study was a bit (2.98%) higher than 3.7 clutches/hen (Bogale Kibret, 2008). The reason for the high number of clutches in the current study might be due to the fact that most farmers practiced different means of breaking broodiness such as taking the bird to other places for few days, piercing the nostrils with feathers, hanging the bird upside down for about 2 to 3 h per day for consecutive 3 days so as to increase the number of clutches.

The average age at first lay of village chickens in the present study (6.5 months) was 2.7% higher than the average age at first lay of 6.33 months (Meseret Molla, 2010). The average body weight of 0.914 kg at first lay in the present study was 42% lower than the average body weight of 1.3 kg (Fisseha Moges *et al*., 2010). This might be associated with differences in the breed of chicken and other factors related to feeding and management of chicken. The mean egg weight of 39.4 g in the present study was 3.4% higher than the mean egg weight of 38.1 g (Njenga, 2005). On the other hand, the mean egg weight in the present study was 13.7% lower than the mean egg weight of 44.8 g (Bogale Kibret, 2008) and 8.6% lower than the mean egg weight 42.9 g (Halima Hassen, 2007).

The hatchability percentage observed in the present study (83.7%) was higher compared to 81.90% (Moreki, 2010) and 77 to 81% (Iqbal and Pampori, 2008). The high hatchability percentage observed was due to the small number of eggs set per hen and preparation of good sitting material prior to incubation. It might be also an indication of good fertility and brooding of the local chicken. Eggs were selected for incubation based on hens' previous performance, body size, egg size and color and the presence of males in the flocks. The survival rate of 52.3% in chicks in this study was 24.3% lower than the survivable rate of 65% reported by (Moreki, 2010).

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