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Production and reproduction performance of local chicken breeds and their marketing practices in Wolaita Zone, Southern Ethiopia

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A study was conducted in Wolaita Zone, Southern Ethiopia to assess production and reproduction performances of local chickens and their marketing practices. Three districts vize Damot-Gale, Boloso-Sore and Humbo representing, highland, midland and lowland agro-ecologies, respectively, were selected purposively. The data were collected from a total of 135 respondents, 45 from each agro-ecology, using pre-tested structured questionnaires and analyzed using statistical package for social sciences (SPSS) version 20.0. There was a significant (P<0.05) difference in local flock size per household among the three agro-ecologies. The average chicken flock size per household was 6.0 heads. Clutch length, clutch number per year per hen, total number of eggs laid per hen per year, number of eggs hatched, hatchability and chick survival were significantly (P<0.05) different among the agro-ecologies. The overall average age at sexual maturity was 5.6 months (male) and 5.5 months (female) chickens, age at first egg laying was 6.5 months, number of eggs laid per clutch per hen was 14.8, clutch length was 26.0 days, clutch number per year per hen was 4.2 and mean number of eggs laid per year per hen were 59.1. The overall number of eggs placed per brooding hen was 12.8 of which 10.0 were hatched and out of which only 7.1 chickens survived. The overall hatchability was 79.1%. Marketing of live chicken and eggs were common; 69.6% of respondents sold both chicken and egg, 20% sold only eggs, 10.4% sold only chicken, 71.9% used formal market while only 8.9% used informal market to sell their products. Local chicken productivity and re-productivity are low and so, different improvement strategies should be introduced.

Key words: Agro-ecology, chicken product, improvement strategies, marketing practices.

INTRODUCTION

Smallholder societies throughout the world in general and developing countries in particular use poultry for multipurpose uses including: as source of income and means to ensure food security; cultural and social values such as ritual, sacrifice and symbolism; gifts to strength social bonds; and source of economic empowerment for

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women (FAO, 2010). Attributed to their source of income, high quality animal protein, ability to be kept under limited inputs and management and adaptability to different agro-climates, chickens are the most important and widely produced avian species in developing countries by resource limited families (Kondombo, 2005).

In Ethiopia, chickens play crucial roles in the livelihood of resource challenged families. According to Mamo et al. (2013) chicken production has socio-cultural and economic benefits especially in the rural communities. The chicken population of the country was at estimated 56.87 million of which 95.86% are local breeds, 2.79% hybrid breeds and 1.35% exotic breeds (Central Statistical Agency of Ethiopia (CSA), 2013). Traditional/village chicken production system is the dominant system practiced by almost every rural household (Alemayehu et al., 2015) and covers more than 90% of the total chicken meat and egg produced in Ethiopia (Dana et al., 2010).

Research reports from different parts of Ethiopia indicated that, the local chicken breeds have low production and reproduction performances (slow growth rate, late maturity, few egg yields, small sized eggs, high mortality rate, extended reproductive cycle and extended inter-clutch) (Aberra, 2000; Halima, 2007; Dana et al., 2010; Desalew, 2012; Habte et al., 2013; Mamo et al., 2013). On the other hand, local chicken breeds have many desirable traits, including thermo tolerance, disease resistance, good egg and meat flavor, productivity at no or minimal feed supplementation, hard egg shells, high fertility, hatchability and dressing percentage (Aberra, 2000).

Local chicken and eggs are preferred by most consumers because they are tasty and suitable to make traditional sauce (called “Doro wote” in Amharic) and eggs due to their deep yellow coloured yolks (Moges et al., 2010). This shows that there is a market potential for local chicken producers and in fact marketing of chickens and eggs is common by smallholder chicken producers. Despite the importance of local chicken in the farming system of Ethiopia, the marketing structure and overall value chin have not well been studied (Mokennen, 2007), and the marketing channels are informal and poorly developed (Moges et al., 2010). Besides, chicken price is affected by different factors including; chicken’s plumage colour, comb type, size, age, sex, holy days, fasting and non fasting periods, market site and health status of the chicken (Halima, 2007). Therefore, assessing the existing marketing practice in a given locality is necessary.

Wolaita zone is one of the highly populated areas in Ethiopia and mixed crop-livestock farming system, involving the production of cereals, root crops, enset and coffee and different livestock species including chicken are commonly practiced. Traditional chicken production based on local chicken breeds is the most dominant in the zone as elsewhere in different parts of Ethiopia. So far, a study to characterize scavenging chicken production system has been done by Desta and Wakeyo (2010) in Wolaita zone. Desta and Wakeyo (2010) have documented the uses and flock management practices, chicken production constraints and their combating mechanisms practiced by producers and draw backs of scavenging chicken production in the zone. However, information with regard to production and reproduction performances of the local chicken as well as marketing practices of live chicken and egg in Wolaita zone is scanty. Therefore, the objective of the present study was to generate information on some production and reproduction traits of local chicken and their marketing practices in Wolaita zone.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Wolaita zone, located in Southern Ethiopia. Sodo town is the administrative center of the zone and is located at a distance of 383 km far from Addis Ababa. Wolaita zone has an altitude ranging from 1,200 to 2,950 m above sea level (masl); annual rainfall vary between 800 and 1400 mm with two distinct rainy seasons, the main (‘kremt’) occurring in summer (roughly June, July and August) and the small rainy season (‘belg’) occurring in spring (roughly the mid-February to mid-May); and minimum and maximum temperatures of 15 and 20°C, respectively. The study zone has twelve districts distributed in three agro-ecological zones namely; highland (9%; > 2400 masl), midland (56%, 1500 to 2400 masl) and lowland (35%, <1500 masl) (WZFEDD, 2005).

Sampling techniques

Three districts viz. Damot-Galle, Boloso-Sore and Humbo were purposively selected to represent higher, medium and lower altitudes of the zone, respectively. From each selected district, three peasant associations (‘kebeles’) were randomly selected making a total of 9 peasant associations. From each of the randomly selected peasant associations 15 households that had at least one chicken were randomly selected. Thus, a total of 135 households, 45 from each district, were considered for the study.

Data collection

Both primary and secondary sources of data were used for the survey study. Primary data like information about characteristics of the households, local chicken flock size holding, productive and reproductive traits, marketing practices of chicken and eggs, etc. were collected from the respondents via interviewing using pretested structured questionnaire. Secondary data were also collected from the study area Finance and Economic Development Department, journals and books.

Statistical analysis

The data were analyzed by using SPSS version 20.0 (2011) for descriptive statistic and one way analysis of variane (ANOVA). Duncan’s new multiple range tests was used to determine the

Table 1. Sex, marital status and education status of the of the sampled households.

Parameter	Agro-ecology					
	Highland (n=45)		Midland (n=45)		Lowland (n=45)	
	Frequency	%	Frequency	%	Frequency	%
Sex						
Male	42	91.1	37	82.2	38	84.4
Female	4	8.9	8	17.8	7	15.6
Marital status						
Single	3	6.7	2	4.4	15	33.3
Married	41	91.1	40	88.9	29	64.4
Divorced	-	-	3	6.7	1	2.2
Widowed	1	2.2	-	-	4	8.9
Educational status						
Illiterate	11	24.4	15	33.3	6	13.3
Grade 1-4	10	22.2	2	4.4	6	13.3
Grade 5-8	11	24.4	14	31.1	16	35.6
Grade 9-12	7	15.6	10	22.2	14	31.1
Diploma and above	6	13.3	4	8.9	-	-

Table 2. Mean age and family size of the respondents in the study area.

Parameter	Agro-ecology			SEM	P-value
	Highland (n=45)	Midland (n=45)	Lowland (n=45)		
Age	40.8	42.7	40.1	0.90	0.467
Family size					
Male	3.3^{b}	3.2^{b}	4.0^{a}	0.12	0.017
Female	3.4	4.0	3.9	0.16	0.285
Total	6.8^{b}	7.0^{b}	7.9^{a}	0.21	0.064

[a,b]Means in the same row with different superscript letters differ significantly (P<0.05). SEM: Standard error of means

differences between agro-ecologies mean values for the quantitative parameters at 5% level of significance. The statistical model used to analyze the data was: Yij = μ+Ai+eij; where, Yij = response variable, μ = overall mean, Ai = effect of agro-ecology and eij = random error.

RESULTS AND DISCUSSION

Demographic characteristics of respondents

Sex, marital and educational status of the respondents is presented in Table 1. Majority (85.9%) of the respondents were males, while the rest (14.1%) were females and this result is in agreement with Desta and Wakeyo (2010). The percentage of male respondents was higher than that of females in all the three agro-ecologies. Majority (81.5%) of the respondents were also married. With regard to educational status of the respondents, higher proportion (76.3%) was literate, while the rest (23.7%) was illiterate. The presence of high proportion of literate individuals in a farming community could be an opportunity for easily adoption of improved technologies (Asaminew and Eyassu, 2009). The percentage of illiterates in the present study was lower than the values (33.6%) reported by Desta and Wakeyo (2010), but higher than the value (6.9%) reported by Mokennen (2007) in Dale Wosho and Loka Abaya Woredas, southern Ethiopia.

There were no differences in mean age and female family size among the three agro-ecologies (Table 2). However, higher male and total family size was found in the lowland than the highland and midland agro- ecologies.

Table 3. Mean flock size per household, productive and reproductive traits of local chickens in three agro-ecologies.

Parameter	Agro-ecology			SEM	P-value
	Highland (n=45)	Midland (n=45)	Lowland (n=45)		
Local flock size/household	4.4[b]	6.3[ab]	7.2[a]	0.46	0.036
Male age at sexual maturity (months)	5.9	5.5	5.5	0.14	0.360
Female age at sexual maturity (months)	5.9	5.2	5.4	0.14	0.129
Male age at slaughter (months)	8.6	9.4	8.9	0.19	0.236
Age at first egg (months)	7.0	6.2	6.3	0.16	0.060
Number of eggs /clutch/hen	14.4	15.2	14.7	0.26	0.401
Clutch length (days)	24.6[b]	27.2[a]	26.0[ab]	0.46	0.057
Clutch number/year/hen	4.8[a]	4.1[b]	3.6[b]	0.11	<0.001
Total number of eggs/year/hen	66.2[a]	60.0[a]	51.1[b]	1.67	0.001
Number of eggs set/brooding hen	12.9	13.3	12.1	0.22	0.079
Number of eggs hatched	10.7[a]	9.8[b]	9.5[b]	0.19	0.019
Hatchability (%)	83.6[a]	74.1[b]	79.5[ab]	1.29	0.010
Number of chicks survived	7.8[a]	7.1[ab]	6.3[b]	0.19	0.007

[a,b]Means in the same row with different superscript letters differ significantly (P<0.05). SEM: Standard error of means.

The mean age of the respondents in the present study was similar to the 41.9 years reported by Desta and Wakeyo (2010) but higher than the 35.2 years reported by Alemayehu et al. (2015) in Benishangul-Gumuz region, Western Ethiopia. The average total family size per household in the present study was similar to the 7.0 persons per household reported by Desta and Wakeyo (2010); comparable to the 6.95 persons per household reported by Mokennen (2007) in Dale Wosho and Loka Abaya, but higher than the 5.2 (national average) and 6.4 (in Benishangul-Gumuz region, Western Ethiopia) persons per household reported by Central Agricultural Census Commission of Ethiopia (CACC) (2009) and Alemayehu et al. (2015), respectively.

Production and reproduction traits of local chicken

Local chicken flock sizes per household were in the order of lowland ≥ midland ≥ highland agro-ecologies (Table 3). The overall mean local chicken flock size in the present study was 6.0 heads per household. This result was lower than the 9.2, 7.9, 7.7 and 9 to 13.0 heads per household reported by Mokennen (2007), Melesse et al. (2012), Alemayehu et al. (2015) and Moges et al. (2010) in different parts of Ethiopia.

There were no differences in male and female age at sexual maturity and age at slaughter of male chicken among agro-ecologies (Table 3). The overall mean ages at sexual maturity for male and female chickens were 5.6 and 5.5 months, respectively. The findings of the present study were slightly lower than the range values 5.8 to 6.1 and 5.8 to 6.3 months for male and female chickens, respectively (Alemayehu et al., 2015). Meseret (2010) also reported higher age at sexual maturity of 6.47 months for male and 6.33 months for female chicken from Jima zone, Ethiopia. The overall mean age at slaughter of male chicken in the present study (9.0 months) was comparable to the 8.62 months reported by Meseret (2010). Sexual maturity is an important reproductive trait from evolutionary and economic viewpoints (Wright et al., 2012). According to El-Dlebshany (2008), early age at sexual maturity results into high number and mass of eggs. Moges et al. (2010) also reported that late sexual maturity results in low productivity of local chickens.

There were no differences in age at first egg of local chickens among the agro-ecologies (Table 3). This is in agreement with Mokennen (2007) who reported there were no differences in age at first egg of local chickens in highland, midland and lowland agro-ecologies of Dale woreda, Southern Ethiopia. The overall mean age at first egg (6.5 months) in present study was in agreement with the 5.9 to 7.1 months (Moges et al., 2010), 6.6 months (Melesse et al., 2012), but lower than the 7.01 months (Mokennen, 2007) and 7.0 to 7.4 months (Alemayehu et al., 2015) reported from different parts of Ethiopia. Guni et al. (2013) reported higher age at first age (7.48 months) in Tanzania.

Differences were observed in clutch length and clutch number per year per hen among the agro-ecologies; clutch length was higher in the midland and lower in the lowland, but the observed difference was not significant between the lowland and the other two agro-ecologies and clutch length was higher in the highland than the midland and lowland agro-ecologies (Table 3). The

overall mean number of eggs per clutch per hen, clutch length (days) and clutch number per year per hen in the present study were 14.8, 26.0 and 4.2, respectively. The number of eggs per clutch in the present study was comparable to that reported by Mokennen (2007) and Moges et al. (2010), but higher than the reported by Meseret (2010), Addisu et al. (2013), Habte et al. (2013), Yitbarek and Atalel (2013) and Alemayehu et al. (2015). The clutch length found in this study was also higher than that of reported by Mokennen (2007) and Meseret (2010). The variation could be attributed to genetic makeup of the local chickens, environmental factors and management practices provided by the chicken producers (Melesse et al., 2012; Guni et al., 2013).

Total numbers of eggs per year per hen were higher in the highland and midland agro-ecologies as compared to the lowland agro-ecology (Table 3). The lower number of eggs per year per hen in the lowland may be attributed to the lower number of clutches per year recoded compared to the other agro-ecologies. This was in line with the report of Guni et al., (2013). The overall mean eggs per hen per year (59.1) in the current study was higher than the 55.2, 43.8, 55 and 49.5 reported by Mokennen (2007); Meseret (2010); Moges et al. (2010) and Addisu et al. (2013), respectively but lower than the 65 reported by Yitbarek and Zewudu (2013). Eggs per year per hen in the present study were also higher than the 45.2 reported by Guni et al. (2013) in Tanzania. The relatively higher number eggs per hen per year found in current study could indicate that there is potential the local chickens for increased egg production.

There were differences ($P<0.05$) in the number of eggs hatched, percent of hatchability and numbers of chicken survived (Table 3). But the number of eggs set per brooding hen was similar among the agro-ecologies. The numbers of eggs hatched in the highland were higher than the midland and lowland. Percent hatchability was higher in the highland than the lowland. The chicken survival rate was also higher in the highland than the lowland agro-ecology, but the value in the midland was similar with that of the highland and lowland agro-ecologies.

The overall mean number of eggs placed per brooding hen in the present study (12.8 eggs) was within the range (10.3 to 13.2 eggs) reported by Melesse et al. (2012); Meseret (2010); Nigatu and Bezabih (2014) and Alemayehu et al. (2015) but higher than the 11.3 eggs reported by Guni et al. (2013) in Tanzania and 10.3 eggs reported by Hagan et al. (2013) in Ghana. These differences could be attributed to season of incubation, brooding experience, size of the hen, availability of eggs, size of eggs, body size of broody hen and her maternal instinct behavior (Tadelle et al., 2003; Hagan et al., 2013). These traits are known to determine the number of eggs placed per brooding hen (Habte et al., 2013).

According to Meseret (2010) and Habte et al. (2013), hatchability of eggs and the survival rate of the hatched chicken are among the major factors that determine the productivity of chicken. Out of the overall mean number of eggs set for hatching per brooding hen in the present study, on average, 10.0 were hatched. This was similar to the 10.0 reported by Melesse et al. (2012) but higher than the 8.1reported by Meseret (2010) in Ethiopia and 8.7 by Hagan et al. (2013) in Ghana. On average, out of the hatched chicks in the present study only 7.1 chicks survived and this result was higher than the 5.5 chicks that survived as reported by Melesse et al. (2012). The overall percent hatchability (79.1%) in the current study was comparable to the 82.8% reported by Nigatu and Bezabih (2014), and higher than the 72% reported by Yitbarek and Atalel (2013), 59.6% by Yitbarek and Zewudu (2013). However, the percent hatchability was lower than 89.1% reported by Mokennen (2007) in Ethiopia and 84.5% by Hagan et al. (2013) in Ghana. Hatchability depends on instinct maternal behavior of the hen, degree of management of the hen during brooding and prevalence of predators (Habte et al., 2013; Hagan et al., 2013) while survival rate of the hatched chicks depends on prevalence of predation and disease (Hagan et al., 2013).

Chicken and egg marketing practices

Table 4 shows the type of chicken product marketed, type of market used, and customers' preference criteria during purchasing of live chicken and eggs in the study area. Selling of live chicken and eggs were common in the study area. This is in agreement with Mokennen (2007) who reported that selling of live chicken and egg was a common practice in Ethiopia. According to Moges et al. (2010) village chicken producers in Ethiopia sold their live chicken and eggs in their locality and urban markets directly to consumers or traders (collectors) and marketing channels were informal and poorly developed. Meseret (2010) also reported that there was no formal market to sell live chicken and eggs in Gomma Woreda, Ethiopia. However, the results of the present study revealed that majority (71.9%) of the respondents sold their chicken and eggs in formal market while only 8.9% used informal market to sell their products (Table 4). This indicates that chicken producers have better understanding of formal market.

About 35% of respondents reported that customers preferred live chicken based on plumage color, body weight/size, comb type and sex while 20% reported that customers preferred live chicken based on plumage color, body weight and sex (Table 4). This agrees with Halima (2007) who reported that chicken price is affected by different factors such as chicken's plumage color, comb type, size, age, sex, holy days, fasting and non fasting periods, market site and health status of the

Table 4. Type of local chicken product marketed, place of marketing, customers preference criteria during purchasing live chicken and eggs.

Parameter	Agro-ecology					
	Highland (n=45)		Midland (n=45)		Lowland (n=45)	
	Freq	%	Freq	%	Freq	%
Type of chicken product marketed?						
Egg	14	31.1	9	20.0	4	8.9
Live chicken	3	6.7	3	6.7	8	17.8
Both egg and live chicken	28	62.2	33	73.3	33	73.3
Type of market for selling chicken and egg?						
Formal market	31	68.9	34	75.6	32	71.1
Informal market	3	6.7	4	8.9	5	11.1
Both formal and informal markets	11	24.4	7	15.6	8	17.8
Customers' preference during selling chicken?						
Plumage color (1)	2	4.4	2	4.4	5	11.1
Body weight/size (2)	2	4.4	6	13.3	4	8.9
Comb type (3)	9	20.0	2	4.4	2	4.4
Sex (4)	1	2.2	1	2.2	1	2.2
All the above (1-4)	15	33.3	23	51.1	9	20.0
Body weight, comb type and sex	2	4.4	6	13.3	0	0.0
Plumage color, body weight and sex	11	24.4	2	4.4	14	31.1
Comb type and sex	1	2.2	2	4.4	1	2.2
Body weight and sex	0	0.0	1	2.2	3	6.7
Plumage color and body weight	2	4.4	0	0.0	5	11.1
Plumage color and comb type	0	0.0	0	0.0	1	2.2
Customers' preference during selling egg?						
Size	9	20.0	18	40.0	22	48.9
Color	1	2.2	6	13.3	1	2.2
Both size and color	19	42.2	11	24.4	17	37.8
No preference	16	35.6	10	22.2	5	11.1

Freq.: Frequency

chicken.

Respondents (36.3 and 34.8%) reported that the customers purchased eggs based on size and both size and color, respectively. On the other hand, 23% of the respondents reported that customers had no particular preference for egg while only 5.8% reported that customers had color preference of eggs during purchasing. Such information could help chicken producers to produce products which are highly demanded by customers in their localities.

Conclusion

There were differences in productive and reproductive performances of local chickens in the highland, midland and lowland agro-ecologies of the present study zone. The productive and reproductive performances of the local chickens were low and this calls introduction of different improvements strategies. Marketing of live chicken and eggs were common and majority of the chicken producers sold their products in formal market.

Conflict of Interests

The authors have not declared any conflict of interests.

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REFERENCES

Aberra M (2000). Comparative studies on performance and physiological responses of Ethiopian local ('Angete-melata') chicken and their F1 crosses to long term heat stress. PhD thesis. Martin-Luther University, Halle-Wittenberg, Berlin, Germany. 182 pp.

Addisu H, Hailu M, Zewdu W (2013). Local Chicken Production System and Breeding Practice in North Wollo, Amhara Region, Ethiopia. Poult. Fish. Wildl. Sci. 1(2):1-9.

Alemayehu A, Yilma, T, Shibeshi Z, Workneh T (2015). Village Chicken Production Systems in Selected Areas of Benishangul-Gumuz, Western Ethiopia. Asian J. Poult. Sci. 9(3):123-132.

Asaminew T, Eyassu S (2009). Smallholder Dairy Production System and Emergence of Dairy Cooperatives in Bahir Dar Zuria and Mecha Woredas, Northwestern Ethiopia. World J. Dairy. Food Sci. 4(2):185-192.

CACC (2009). Central Agricultural Census Commission (CACC). Ethiopian Agricultural sample enumeration, 2007/08. Results for Southern Nations, Nationalities and peoples Region. Statistical report on livestock and farm implements. Part IV. Addis Ababa, Ethiopia.

CSA (2013). Central Statistical Agency (CSA). Agricultural sample survey; report on: livestock and livestock characteristics. CSA, Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia.

Dana N, Desssie T, van der Waaij L H, van Arendonk JAM (2010). Morphological features of indigenous chicken populations of Ethiopia. Anim. Genet. Resour. 46:11-23.

Desalew T (2012). Management Practices, Productive Performances and Egg Quality Traits of Exotic Chickens under Village Production System in East Shewa, Ethiopia. MSc thesis. Addis Ababa University, College of Veterinary Medicine and Agriculture, Debre Zeit, Ethiopia. 58p.

Desta TT, Wakeyo O (2010). Village chickens management in Wolaita zone of southern Ethiopia. Trop. Anim. Health Prod. 45:387-396.

El-Dlebshany AE (2008). The Relationship between Age at Sexual Maturity and Some Productive Traits in Local Chickens Strain. Egypt Poult. Sci. 28(IV):1253-1263.

FAO (2010). Smallholder poultry production – livelihoods, food security and sociocultural significance, by Kryger KN, Thomsen KA, Whyte MA, Dissing M. FAO Smallholder Poultry Production Paper No. 4. Rome.

Guni FS, Katule A M, Mwakilembe PAA (2013). Characterization of local chickens in selected districts of the Southern Highlands of Tanzania: II. Production and Morphometric traits. J. Livest. Res. Rural Dev. 25(11).

Habte M, Ameha N, Demeke S (2013). Production performance of local and exotic breeds of chicken at rural household level in Nole Kabba Woreda, Western Wollega, Ethiopia. Afr. J. Agric. Res. 8(11):1014-1021.

Hagan JK, Bosompem M , Adjei IA (2013). The productive performance of local chickens in three ecological zones of Ghana. Asian Research Publishing Network (ARPN). J. Agric. Biol. Sci. 8(1):51-56.

Halima H (2007). Phenotypic and genetic characterization of local chicken populations in Northwest Ethiopia. PhD thesis. University of the Free State, Bloemfontein, South Africa. 175 pp.

Kondombo SR (2005). Improvement of village chicken production in a mixed (chicken–ram) farming system in Burkina Faso. PhD Thesis, Wageningen Institute of Animal Sciences, Animal Nutrition Group, Wageningen University, The Netherlands. 208 pp.

Mamo W, Melaku M, Tamir B (2013). Characterization of Urban Poultry Production System in Northern Gondar, Amhara Regional State, Ethiopia. Agric. Biol. J. North Am. 4(3):192-198.

Melesse A, Worku Z, Teklegiorgi Y (2012). Assessment of the prevailing and quality of egg from scavenging indigenous chickens reared in different agro-ecological zones of Ethiopia. Res. J. Poult. Sci. 5(4-6):64-70.

Meseret M (2010). Characterization of village chicken production and marketing system in Gomma Wereda, Jimma zone, Ethiopia. M.Sc. Thesis, Jimma University, Jimma, Ethiopia. 110 pp.

Moges F, Tegegne A, Dessie T (2010). Local chicken production and marketing systems in Ethiopia: Characteristics and opportunities for market-oriented development. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 24 Nairobi, Kenya, ILRI. 55 pp.

Mokennen G (2007). Characterization of smallholder poultry production and marketing system of Dale, Wonsho and Loka Abaya Weredas of southern Ethiopia. M.Sc. Thesis, Hawsaas University, Ethiopia. 95 pp.

Nigatu MG, Bezabih M (2014). Assessment of Chicken Production under Farmers Management Condition in East Gojam Zone, Amhara Regional State, Ethiopia. Greener J. Anim. Breed Genet. 1(1):001-010.

SPSS (2011). Statistical Package for the Social Sciences (SPSS). Vision 20.0. IBM Corporation, SPSS Inc., Chicago IL.

Tadelle D, Million T, Alemu Y, Peters KJ (2003). Village chicken production systems in Ethiopia: 1. Flock characteristics and performance. J. Livest. Res. Rural Dev. 15(1).

Wright D, Rubin C, Schutz K, Kerje S, Kindmark A, Brandström H, Andersson L, Pizzari T, Jensen P (2012). Onset of Sexual Maturity in Female Chickens is Genetically Linked to Loci Associated with Fecundity and a Sexual Ornament. Reprod. Domest. Anim. 47:31-36.

WZFEDD (2005). Wolaita Zone Finance and Economic Development Department (WZFDD), Zonal basic socio–economic and demographic information.

Yitbarek MB, Zewudu A (2013). Performance evaluation of local chicken at Enebsie Sar Midir Woreda, Eastern Gojjam, Ethiopia. Unique Res. J. Agric. Sci. 1(2):006-010.

Yitbarek MB, Atalel W (2013). Constraints and opportunities of village chicken production in Debsan TiKara Keble at Gonder Zuria Woreda, North Gonder, Ethiopia. Int. J. Sci. Res. 3(9):1-8.