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Full Length Research Paper

An assessment of socio-economic features of village chicken farmers in Ethiopia

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The aims of the study were to characterize the socio-economic features of village chicken producers, types of chicken production systems, flock management practices, family task sharing and production constraints in lowland, midland and highland of Ethiopia. Data were collected at 360 rural households of which 120 were from lowland, 160 midland and 80 highlands. A standardized questionnaire was used to collect the data using person to person interview method. The extensive chicken management system was predominant in all of the three agro-climatic zones. Most of the studied parameters were different (P<0.01) across agro-climatic zones. Based on the whole data set, 77.9% of the households practiced an extensive form of chicken management system. However, the proportion was much higher (90%) in lowlands. From the visited 360 poultry farms, 96% of them had native chicken breeds, 3% had exotic chicken breeds and the remaining 1% had crossbreds. Chicken ownership was pre dominated by rural women than men in all of the three agro-ecological zones. Regarding family task sharing in rural poultry production systems, women were responsible for 47.9 to 77.6% of farm activities. The major production constraints and/or problems were the lack of high performing chicken breeds and disease occurrence during the period in which this study was carried out. Newcastle disease was the most prevalent health problem at 61% of the visited farms and it was highly important in all of the three agro-ecological zones. Our findings will support agro-ecology based interventions for improving village chicken management systems and enhance their economic contributions to the farmers.

Key words: Agro-climatic zone, flock management, production constraint, production system, task sharing, village chicken.

INTRODUCTION

Ethiopia is one of the sub-Saharan African countries where most of the national economy depends on agriculture (CSA, 2004; Deressa et al., 2008). Poultry production plays a vital role for food security and contributes to the country economy (Gerima et al., 2016).

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Poultry production is a promising farming activity, particularly in the regions where there is a consistent decrease of grazing areas (Kyule et al., 2014). Low technology poultry production demands small investment compared to other livestock species (Lawal et al., 2016). As a result, poultry production is very well practiced by Ethiopian smallholder farmers (Fisseha et al., 2010).
Ethiopia has about 65 million heads of chicken (FAO, 2000; Tadelle, 2003). Village chicken production account for more than 95% of poultry production in this country

(Tadelle, 1996, 2003; Mekonnen et al., 2010), whereas the average in sub-Saharan African countries is 78% (Tadelle, 1996, 2003). Village chicken production in Ethiopia contributes with 90 and 92% of the national egg and poultry meat production, respectively (Tadelle, 1996, 2003).

People in Ethiopia consume on average 57 eggs and 2.5 chicken per capita per annum (Alemu, 1985; Mekonnen et al., 2010). Besides its advantage as a source of food and income, village chicken production ensures employment opportunities for rural smallholder farmers and offers socio-cultural advantages (Moges et al., 2010). Despite all these contributions of rural poultry to the smallholder farmers, little attention has been paid to improve the system. The farmers' indigenous knowledge and management practice on village chicken production has not been exploited yet.

Characterization of village chicken production systems in different agro-climatic zones might help to identify important problems hindering the success of the poultry sector in specific agro-ecological areas. A previously conducted study in Zimbabwe has shown a high influence of agro-ecology on various parameters of village chicken production systems (Muchadeyi et al., 2007). Moreover, such agro-ecological based studies have not been studied at a wider scale in Ethiopia (Tadesse and Tesfay, 2013).

Therefore, the major objectives of this study were to characterize the socio-economic features of village chicken producing farmers, chicken management systems, task sharing and production constraints at the national level across major agro-ecological zones of the country. Outputs from this study may support agro-ecology based policies, research strategies, and development programs aiming to improve the production and productivity of village chicken at grassroots level in Ethiopia.

MATERIALS AND METHODS

Study sites

In this study, nine districts were selected from four regions in Ethiopia (Oromia, Amhara, Southern Nations, Nationalities and People region [SNNP], Tigray) where village chicken production predominate and have an easy access for transportation. Among the nine districts, the Dodota, Haremaya and Ada districts were selected from Oromia region (3°N to 10.5°N latitude; 34°E to 43°E longitude), the Gonder Zuria and Basonaworna districts were
selected from Amhara region (9°21' to 14°0' N latitude; 36°20' to 40°20' E longitude), the Arbaminch Zuria, Abeshge and Malga districts were selected from the SNNP (6°3'31.03" latitude ; 36°43'38.28" longitude) and the North Mekele district was selected from Tigray region (13°14' 06" N latitude; 38°58' 50" E longitude).

The selected districts were categorized into three groups as lowland, midland and highlands based on their traditional form of classification which depends on altitude, temperature and rainfall. Based on this classification, lowlands were represented by the Arbaminch Zuria, Abeshge, and Dodota districts. Midlands were represented by the Ada, Gonder Zuria, Haremay and North Mekele districts, whereas, highlands were represented by the Basonaworna and Malga districts. The lowland areas were characterized by an altitude in the range of 500 to 1,500 m.a.s.l. with an annual rainfall of 200 to 800 mm and a temperature of 20 to 27.5°C, whereas, the midland areas were representing an altitude in the range of 1,500 to 2,300 m.a.s.l. with an annual rainfall of 800 to 1,200 mm and temperature of 17.5 to 20.0°C, which was mainly characterized by mixed crop-livestock farming. On the other hand, highlands were featured by an altitude in the range of 2,300 to 3,200 m.a.s.l. with an annual rainfall of 900 to 1,200 mm and a temperature of 11.5 to 16.0°C. Highland districts were mainly characterized by crop production, but mixed crop-livestock farming system was also common in this area.

Sampling procedure

A multi-stage sampling procedure was employed to select sampling locations and target households. In each district, four villages were selected and 10 households that had a minimum of five chicken were randomly selected in each village. In total, 360 households: 80 from highlands, 160 midlands, and 120 lowlands were considered. Person to person interview was made to collect qualitative and quantitative data on the studied parameters using a standardized questionnaire. Data collection was supported by the technical staffs of the agricultural and rural development offices in Ethiopia. Agro-climatic data of the selected districts were obtained from the respective agricultural and developmental main offices in Ethiopia.

Statistical analysis

The data were coded and stored on a database. Cross-tabulation procedure of descriptive statistics such as percentages and frequencies were performed for socio-demographic characteristics of households, livestock composition, chicken breeds composition, and chicken disease data (Table 1, Figures 1 to 3) and chicken management systems and task sharing data (Tables 3 and 4) using the *Statistical Package for Social Sciences* (*SPSS*) (2006). Chi-square test was performed to determine differences in the frequency distribution of the studied variables among the three agro-ecological zones. Rank means were compared using a non-parametric Kruskal Wallis test (NPAR1WAY) of SAS version 9.2 (SAS Institute Inc., 1999) for non-measurement variables (Tables 2, 5 and 6). Alpha level of 0.05 was used to reject the null-hypothesis of no difference among agro-climatic zones on the studied parameters.

RESULTS AND DISCUSSION

Socio-economic features of the respondents

From the 360 respondents, 56.3% were males and 43.8% were females (Table 1). The respondents had an

Table 1. Socio-demographic characteristics of the households by agro-climatic zone.

Parameter (%)	Agro-climatic zones			Overall mean	Sig[a]
	Lowlands	Midlands	Highlands		
Sample size (N)	120	160	80		
Sex of the respondent (%)					***
Male	75	46.3	47.5	56.3	-
Female	25	53.8	52.5	43.8	-
Age of the respondent (years)	40.2	36.9	37.3	38.1	NS
Marital status (%)					NS
Married	86.7	80.6	87.5	84.9	-
Unmarried	4.2	11.3	6.3	7.2	-
Widowed	8.3	6.9	6.3	7.2	-
Divorced	0.8	0.6	0	0.5	-
Respondent's religion (%)					***
Orthodox	28.3	46.9	62.5	45.9	-
Protestant	31.7	0	21.3	17.6	-
Muslim	40	27.5	0	22.5	-
Other	0	25.6	16.3	14	-
Education level (%)					NS
Illiterate	30.8	41.9	32.5	35.1	-
Read & write	69.2	58.1	67.5	64.9	-
Mean land size (ha)	1.9	1.4	1.7	1.7	NS
Family size (n)	6.2	5.8	6.1	6	NS
Household Head (%)					***
Father	77.5	58.1	78.8	71.4	-
Mother	13.3	17.5	15	15.3	-
First Son	9.2	24.4	6.3	13.3	-
Engaged activity (%)					***
Farming activity	91.7	70	87.5	83.1	-
Off-farming activity	8.3	30	12.5	16.9	-
Family background (%)					***
Farmer	98.3	69.3	96.3	88	-
Other	1.7	30.7	3.8	12.1	-

Sig[a] refers to significance across agro-climatic zones (rows). Chi-Square significant at P <0.05 (*), P<0.01 (**), and P<0.001 (***). [NS] refer to non-significant. ha hectare, N number of households, n number of individual per household.

average age of 38 years, and 84.9% were married. Regarding their religion, 45.9% of the respondents were Orthodox, 22.5% were Muslim, and 17.6% were Protestant. 64.9% of the respondents were literate and 35.1% were illiterate. The average family size was composed of 6 members. The households had on average 1.7 ha of land. In lowlands, farmers had on average 0.46 and 0.20 ha more land than those living in midlands and highlands, respectively. 84.7% of the 360 households were male headed and 15.3% were female headed. In all three agro-climatic zones, most households were led by males. 83.1% of the total households were engaged in farming activities. Only 16.9% were engaged in off-farming activities. Most of the households came from families who had farming background.The socio-economic and demographic features of households can affect the size of production, management and marketing of village chicken (Aklilu et al., 2007; Tadelle and Ogle, 2001; Muchadeyi et al., 2007). The study findings showed that most households of village chicken farmerswere male headed (84.7%), had diverse religious believes which was dominated by Orthodox, mainly engaged in farming activities, and their economy was more dependent on crop production than on livestock. Our finding on the higher percentage of male headed households was in agreement with the value previously reported for Ethiopia (Mekonnen et al., 2010) and other African countries (Mwale and Masika, 2009).

Crop-livestock production

Village chicken farmers in Ethiopia produce different

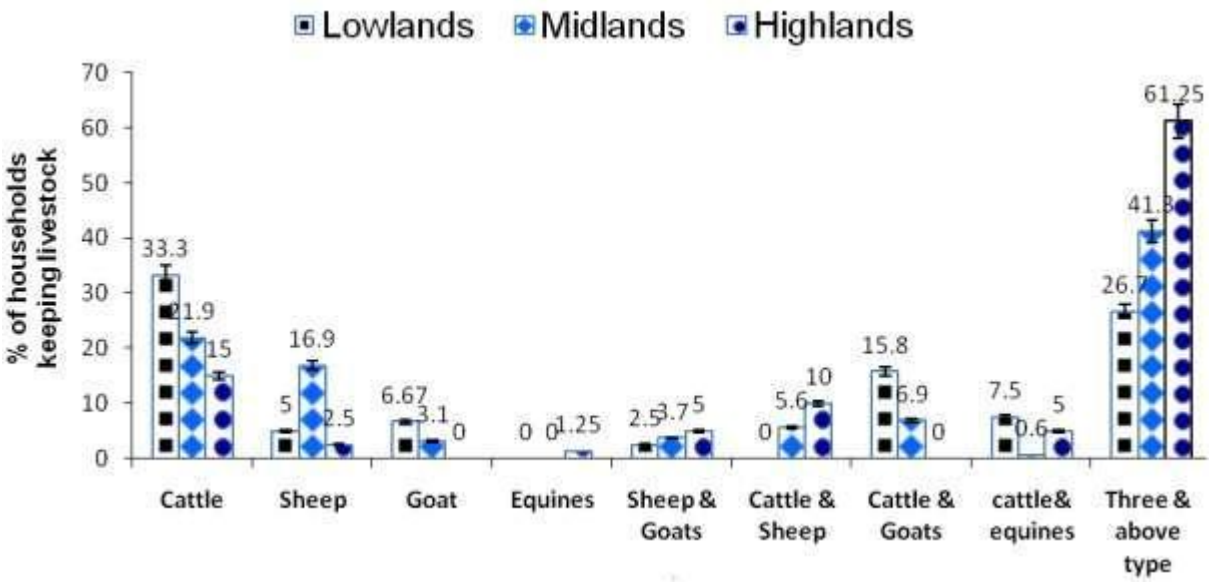

Figure 1. Livestock species kept at chicken farmers' level in lowlands, midlands and highlands of Ethiopia

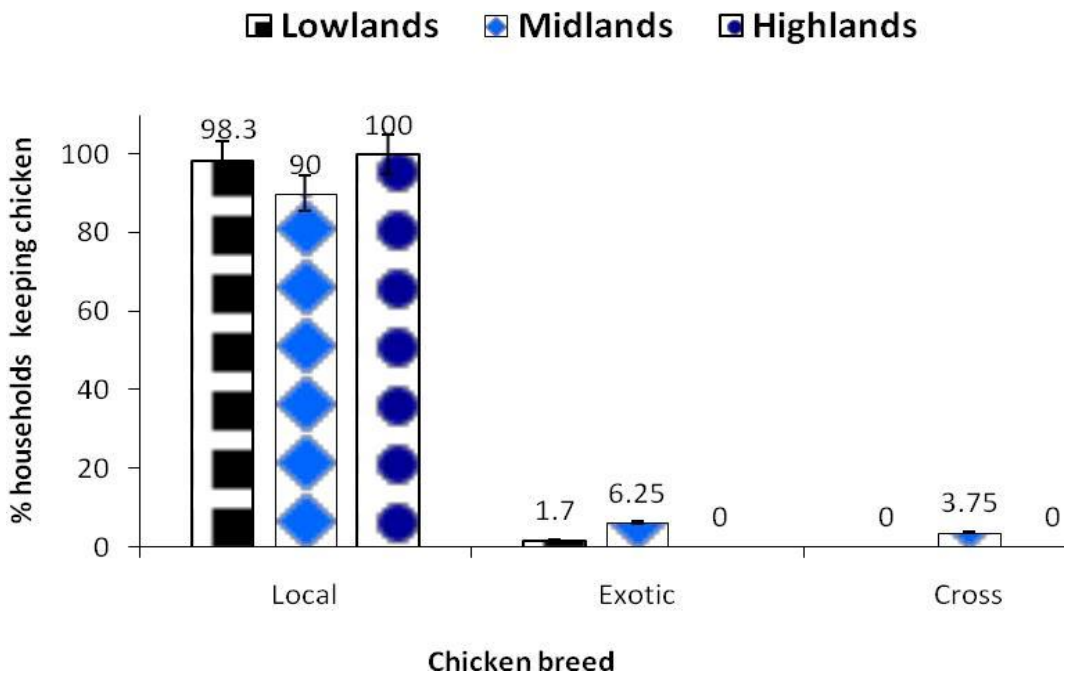

Figure 2. Chicken breeds kept in lowlands, midlands and highlands of Ethiopia.

types of crops. They were asked to rank their crops based on size of production from most important (1) to least important (4). In lowlands, the top three important crops were barley, teff and wheat (Table 2). In midlands, crop production was dominated by teff, wheat and barley. The top three predominant crops in highlands were barley, wheat and maize. There was a significant ($P<0.05$) difference in the relative importance of each crop across the studied agro-climatic zones. Only maize production did not differ ($P>0.05$) across the agro-climatic zones. The types of predominant crops were different also within an agro-ecological zone ($P<0.001$).

Based on the whole data set, the top three predominant crops were teff, wheat and barley. Our findings indicated

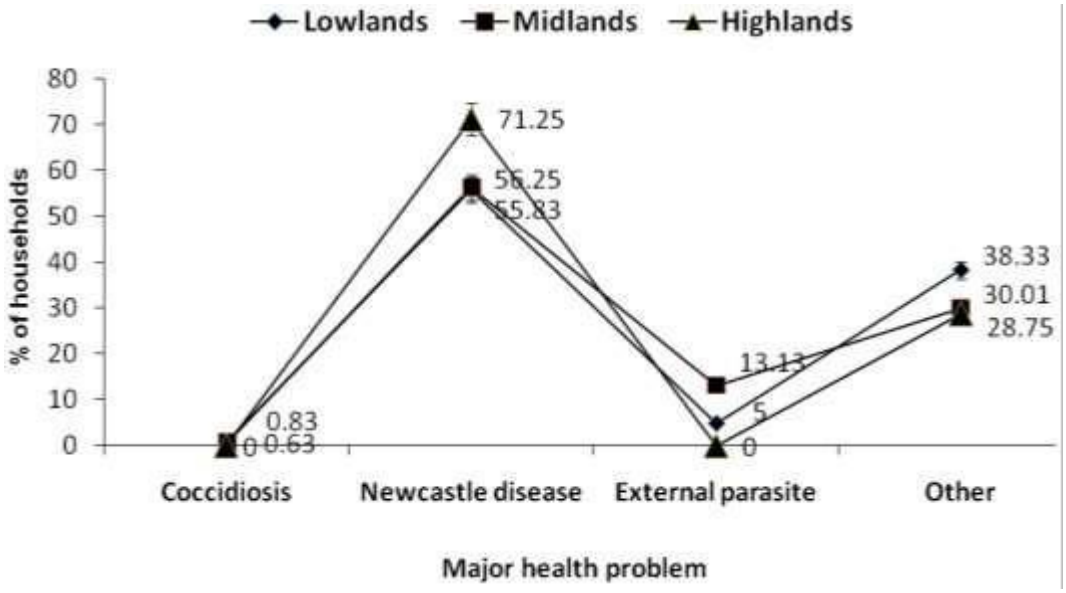

Figure 3. Major poultry health problems in lowlands, midlands and highlands of Ethiopia

Table 2. Rankmeans and standard deviations attached to the relative importance of different crops (1=most important-up to 4=least important).

Parameters	Agro-climatic zones			Sig[b]
	Lowlands	Midlands	Highlands	
Number of households	120	160	80	
Crops produced				
Teff	2.8 (1.27)	3.0 (1.31)	4.0 (0.00)	***
Wheat	3.3 (1.16)	3.2 (1.08)	3.3 (0.90)	NS
Barely	3.6 (0.77)	3.3 (1.01)	1.7 (1.25)	***
Sorghum	3.8 (0.53)	3.3 (1.26)	4.0 (0.00)	***
Maize	2.2 (1.31)	3.4 (0.88)	3.3 (1.06)	***
Coffee	3.9 (0.23)	4.0 (0.00)	4.0 (0.00)	*
Chat	3.9 (0.30)	3.9 (0.32)	3.6 (0.93)	***
Enset	3.7 (0.69)	4.0 (0.00)	3.5 (0.76)	***
Fruit	3.4 (0.92)	3.9 (0.35)	4.0 (0.00)	***
Beans and peas	4.0 (0.00)	3.6 (0.75)	3.6 (0.66)	***
Haricot bean	3.9 (0.23)	3.9 (0.07)	4.0 (0.00)	*
Potato	3.9 (0.18)	4.0 (0.00)	3.8 (0.43)	***
Sig[a]	***	***	***	-

Sig[a] significance of rankmeans within agro-ecology (columns) and Sig[b] significance across agro-climatic zones (rows). Significant at P<0.05 (*) and P<0.001 (***). Rankmeans were compared using Kruskal Wallis test.

that the economy of village chicken farmers in Ethiopia highly (> 90%) depend on crop production. This finding was in agreement with previously reported findings in Zimbabwe (Muchadeyi et al., 2007). The type and quantity of crops produced by village chicken farmers may affect the size and productivity of chicken flocks as cereals especially grains are the main supplementary feeds available for village chicken (Tsadik et al., 2015; Worku et al., 2012). Many types of crops were grown in each agro-climatic zone, however, the type of dominating crops were different among agro-climatic zones. Based on the current findings, in lowlands, the three dominant

crops were barely, teff, and wheat. In midlands, crop production was dominated by teff, wheat, and barley. The three dominate crops in highlands were barley, wheat and maize. There was a significant ($P<0.05$) difference in the relative importance of each crops across agro-climatic zones.

Only maize production did not differ ($P>0.05$) across agro-climatic zones. The types of dominate crops differed also within agro-ecological areas ($P<0.001$). Overall, the three dominant crops were teff, wheat and barley from high to low, respectively. From the 360 interviewed farmers, 88% kept one or more livestock species other than chicken. In the midlands, only 12% of the households had chicken alone. Percentages of village chicken farmers who kept cattle, sheep, goats or equines were 23.4, 8.1, 3.3, and 0.4, respectively. Those chicken farmers who kept cattle in lowlands and midlands were 33.3 and 22%, respectively. However, in highlands, 48.7% of the farmers had combinations of cattle, sheep, and equines (Figure 1). The experience of farmers to keep one or more livestock species besides chicken were previously reported for different African countries (Muchadeyi et al., 2007, Mwale and Masika, 2009; Aboe et al., 2006). In our study, the percentages of village chicken farmers who kept chicken with either of cattle, sheep, goats or equines were 23.4, 8.1, 3.3, and 0.4, respectively. Most of the village chicken farmers in lowlands (33.3%) and midlands (21.9%) kept cattle together with chicken. However, most farmers (48.8%) kept combinations of cattle, sheep, and equines with chicken in highlands. The most frequent livestock compositions at village chicken farmers in Ethiopia were cattle and chicken (23.4%) or cattle, sheep, equines and chicken (20.5%).

Chicken production systems

In this study, 77.9% of the households practiced an extensive form of chicken management system (Table 3). The remaining 22.1% of the households practiced a semi-extensive form of chicken management system. The extensive management system was predominant in all the three agro-climatic zones, especially, in lowlands and highlands. The low input requirements can be considered as an advantage for extensive chicken management systems. However, this system exposes the birds to predators, harsh climatic conditions, disease challenges, uncontrolled breeding, and inadequate and poor quality feeds (Olwande et al., 2009).

Culling and replacement

Farmers used different systems to cull unproductive and/or sick chicken. 63.8% of all the visited households sold their unproductive chicken. Selling as a culling strategy was practiced at 47.5% of the households in lowlands, 76.3% in midlands and 67.5% in highlands (Table 3). Many factors can force farmers to cull their chicken. Diseases, low production and lack of feed are some of the major causes of culling (Halima et al., 2007; Muchadeyi et al., 2009). When culling is necessary, farmers cull their chicken in different ways. In this study, selling and home consumption were the dominant methods of culling in all agro-climatic zones. These results are in agreement with previous findings in Ethiopia (Tadelle and Ogle, 2001; Halima et al., 2007).

However, such culling methods can be a risk for human health if sick chicken are used for consumption. Zoonotic diseases can be easily transmitted from chicken to humans (Dale and Corrie, 2013; Mondal, 2015). Flock replacement was made by hatching in 47.6% of the cases. On average, 39.2, 61.3 and 42.5% of the households in lowlands, midlands and highlands used hatching as a method of flock replacement. Buying chicken from local markets was the second method of flock replacement in all agro-climatic zones. Tadelle (2003) reported that 70% of breeding females in Ethiopia originated from hatching at home. Studies in other African countries also reported hatching as the main source of flock replacement under extensive chicken production systems (Kondombo, 2005). Flock replacement by hatching can prevent the introduction of chicken from other places to already existing flocks, reducing the risks of dissemination of diseases; however, it avoids the cleaning up of disease already entered into the flock because it lacks all–in–all–out practice. Such flock replacement method can also prevent gene flow between flocks with different genetic origin.

Feed, feeding and housing management

Village chickens mainly depend on scavenging for their feeds in many African countries like Ethiopia. Cereals like wheat, barley, maize, and sorghum are the common grains available for supplementation. In the present study, it was noted that village chicken were mainly depended on scavenging for their feeds. Some households provided supplementary feeds to their chicken. Grains were the main (78.7%) supplementary feeds provided for chicken. Additionally, chicken had access for family food leftovers (Table 3). The amount and type of supplementation was dependant on the type and size of crop production in the different agro-climatic zones (Tsadik et al., 2015; Worku et al., 2012).

Due to frequent movement in the field, chicken using considerable energy for physical activity and they are exposed to harsh climatic conditions, disease and predator attack. A previous study conducted by Dana et al. (2010) in Ethiopia showed that 83% of the 225 chicken farmers were practicing scavenging and supplementary feeding management system. According to this author,

Table 3. Chicken management systems across agro-climatic zones.

Parameter (%)	Agro-climatic zones			Overall	
	Lowlands	Midlands	Highlands	mean	Sig[a]
Sample size (N)	120	160	80		
Chicken Management (%)					**
Extensive	90	65	78.7	77.9	-
Semi-extensive	10	35	21.3	22.1	-
Since when do you keep chicken? (%)					***
< 1 year	3.3	4.3	17.5	8.4	-
1-10 years	33.3	51.2	28.8	37.8	-
> 10 years	29.1	29.5	5	21.2	-
Since childhood	26.8	1.3	43.8	23.8	-
I don't know	7.5	13.8	5	8.8	-
Chicken ownership (%)					**
Boys	15.8	10.6	11.3	12.6	-
Girls	2.5	5	2.5	3.3	-
Father	27.5	10	32.5	23.3	-
Mother	44.2	65	45	51.4	-
Other	10	9.4	8.7	9.4	-
Culling (%)					***
Slaughter for home consumption	16.7	19.4	18.8	18.3	-
Sale	47.5	76.3	67.5	63.8	-
Other	35.8	4.4	13.8	18	-
Replacement (%)					**
Purchase	26.7	25.6	36.3	29.5	-
By Hatching	39.2	61.3	42.5	47.6	-
Purchase & by Hatching	30	10	20	20	-
Other	4.2	3.1	1.3	2.8	-
Breed selection (%)					***
Yes	20	60	37.5	39.2	-
No	80	40	62.5	60.8	-
Type of supplementary feed (%)					***
Grain	94.2	69.4	72.5	78.7	
Grain plus concentrate	0	7.5	23.8	10.4	
Other	5.8	23.1	3.8	10.9	
Where spent chicken in the night? (%)					***
In the Family house	31.7	16.9	53.8	34.1	-
In the kitchen	30	9.4	30	23.1	-
On the tree	0.8	0	1.3	0.7	-
In a basket	7.5	8.1	2.5	6	-
In sheds	29.2	65	12.5	35.6	-
Other	0	0.6	0	0.2	-
How you treat chicken? (%)					***
Local medicament	87.4	60.6	68.8	72.2	-
Advise health technician	6.7	35.6	13.8	18.7	-

Sig[a] refers to significance across agro-climatic zones (rows). Chi-Square significant at P <0.05 (*), P<0.01 (**), and P<0.001 (***). [NS] refer to non-significant. [%] percent.

no farmer was practicing a confined or complete ration system. Regarding housing conditions, this study revealed that almost 35.6% of the households had sheds for their chicken (Table 3). The sheds were small in size and made from locally available materials. 34.1% of the cases showed that chicken spent their nights in the same house with humans (Table 3). So, family housing and sheds were the major housing systems used by farmers to shelter chicken during the night. Similar housing conditions were previously reported in Ethiopia (Tadelle and Ogle, 2001; Halima et al., 2007; Mekonnen et al., 2010) and in other African countries (Gondwe and Wollny, 2007; Olwande et al., 2009). As the system allows close contact of humans with chicken, the risk of exposure to transmittable diseases is very high. For instance, Avian Influenza Virus like H5N1 can be transmitted from chicken to farmers through direct contact (Proenca-Modena et al., 2007; Tiensin et al., 2007).

Health management

Diseases were one of the major bottlenecks for village chicken productions in the studied areas. Newcastle disease was most widely distributed among the village chicken in Ethiopia. This was reported in several previous studies which employed different diagnostic methods such as virus isolation, sero-epidemiological investigations and molecular methods to confirm the presence of the disease in Ethiopian village chicken productions (Tadesse et al., 2005; Zeleke et al., 2005; Chaka et al., 2012; Mulisa et al., 2014; Terefe et al., 2015).

In this study survey, almost 56 to 71% of the visited farms were affected by this disease at least once (Figure 3). The disease occurred in all agro-climatic zones during the period studied, particularly affecting chicken in highlands (71.3%). Farmers did not know how to differentiate the disease affecting their chicken in 17.9% of the cases. They knew only symptoms shown by affected chicken. The symptoms most commonly observed in affected village chicken were bloody diarrhea, nasal discharge, sneezing, torticollis, and deaths within few days. Only 18.7% of the visited households contacted veterinarians when their chicken were sick.

Farmers used their own traditional practices to resolve health issues of affected chicken (Table 3). 72.2% of households used local treatments such as lemon, pepper, alcoholic drink, salt and onion for trying to cure affected birds. Unhealthy chicken normally receive a mixture of one or more of the aforementioned traditional treatments with water or feed. Also, some farmers let bleeding from the wings of sick chicken as a means of treatment. Normally the farmers believe that bleeding can give sick chicken relief from their pain and support recovery from the disease (Mengesha et al., 2011).

Farmers smoke leaves of *Eucalyptus* tree in chicken sheds in order to protect the chicken from external parasites. Such indigenous knowledge of farmers is very helpful especially in conditions where there is no access to contact veterinarians and where there is no money to buy medicaments from animal health centers. The rate of village chicken mortality (33.6%) observed in this study was lower than the 60% reported previously (Tadelle, 1996). Reasons for mortality can be poor management practices, bad quality and low quantity of feeds, predations, and diseases. Different types of disease cases were previously reported in Ethiopia (Tadelle and Ogle, 2001; Halima et al., 2007; Mekonnen et al., 2010).

The present study found that Newcastle disease was the major causes of mortality among village chicken in all of the three agro-climatic zones of Ethiopia which is in agreement with previous findings in Ethiopia (Tadelle and Ogle, 2001; Halima et al., 2007; Mekonnen et al., 2010) and in other African countries (Horning et al., 2003; Hassan et al., 2004; Aboe et al., 2006; Henning et al., 2006; Otim et al., 2007; Olwande et al., 2009).

Farmers used some strategies to protect flocks from predators. For instance, they select against white plumage color of chicken, avoiding white plumage which easily expose birds to predators.

Chicken ownership and task sharing

Chicken were the wealth of women in 51.4% of the studied cases. The higher chicken ownership of women was observed in all of the three agro-climatic zones (Table 3). Feeding, watering, cleaning, house construction, treating sick chicken, and buying and selling live chicken are common activities in poultry farms. This study described that such activities were accomplished by family members including the mother, father and children (Table 4). Rural women accomplished 47.9 to 77.6% of farm activities, except chicken house construction which was mainly (63%) done by rural men. There was a clear difference in task sharing among the different family members. According to the current findings, chicken ownership and management were dominated by rural women indicating that village chickenare the property of rural women which is in accordance with previously reported findings in Ethiopia (Tadelle and Ogle, 2001; Aklilu et al., 2007; Halima et al., 2007; Mekonnen et al., 2010) and other African countries (Aboe et al., 2006; Olwande et al., 2009).

Relative advantages of keeping native chicken

Chicken farmers were asked whether they prefer to keep native chicken breeds than exotic chicken breeds. They were also asked to rank the reasons (1 very important to 5 not important) for preferring native breeds than exotic breeds. Data analysis confirmed that farmers prefer to

Table 4. Family task sharing across agro-climatic zones.

Parameter (%)	Agro-climatic zones			Overall	
	Lowlands	Midlands	Highlands	Mean	Sig[a]
Sample size (N)	120	160	80		
Feeding the chicken (%)					NS
Mother	78.3	76.9	77.5	77.6	-
Father	13.3	7.5	8.8	9.9	-
Other	8.3	15.6	13.8	12.6	-
Chicken house construction (%)					**
Mother	12.5	22.1	2.5	12.4	-
Father	55.8	63.1	70	63	-
Other	31.7	14.7	27.5	24.6	-
Preparing basket for hens (%)					NS
Mother	70	62.5	68.8	67.1	-
Father	20	26.3	12.5	19.6	-
Other	10	11.2	18.8	13.3	-
Cleaning the chicken House (%)					***
Mother	75.8	61.3	90	75.7	-
Father	5.8	4.4	1.3	3.8	-
Other	18.3	34.4	8.8	20.5	-
Buying chicken (%)					NS
Mother	44.2	54.4	44.8	47.9	-
Father	38.3	33.1	43	38.2	-
Other	17.5	12.5	12.3	14.1	-
Selling chicken (%)					***
Mother	53.5	59.4	56.3	56.4	-
Father	24.8	16.9	11.3	17.7	
Other	2.7	23.7	32.5	19.6	-
Treating sick chicken (%)					**
Mother	55.7	68.8	46.8	57.1	-
Father	31	17.5	43.3	30.6	-
Other	13.3	13.7	10	12.4	-

Sig[a] refers to significance across agro-climatic zones (rows). Chi-Square significant at P <0.05 (*), P<0.01 (**), and P<0.001 (***). NS refer to non-significant.

keep high performing exotic chicken breeds instead of native chicken breeds. This finding was noted in all of the three agro-climatic zones. However, native chicken breeds were preferred mainly because they were cheaper for buying a replacement flock and they had lower feed consumption (Table 5).

Indeed the ability of village chicken to survive and produce under an extensive management system makes the choice of birds for smallholder farmer's lever. Due to the lack of improved and locally adapted exotic chicken breeds, 98, 90 and 100% of the total interviewed poultry farmers were keeping native chicken breeds in lowlands, midlands and highlands, respectively. However, exotic chicken breeds were kept only at 0.0% to 6.2% of the households in the studied areas (Figure 2).

Ethiopian farmers tend to prefer exotic chicken breeds than those for native chicken breeds in case they have the opportunity to keep locally adapted exotic chicken breeds. This result could be associated with the high performance of exotic chicken breeds for egg and meat yield. Based on our findings, the farmers mainly preferred exotic chicken breeds or their genetic crosses for their

Table 5. Rankmeans and standard deviations attached to relative advantage of keeping native chicken than exotic breeds, farmers' view (1=most important up to 5=least important).

Parameter (%)	Agro-climatic zones			Sig[b]
	Lowlands	Midlands	Highlands	
Sample size (N)	120	160	80	
Relative advantages				
Egg production and quality	4.2 (1.53)	3.7 (1.84)	4.3 (1.48)	*
Meat production and quality	4.8 (0.74)	4.8 (0.63)	4.9 (0.44)	NS
Mothering ability	4.7 (0.97)	5.0 (0.00)	4.8 (0.82)	***
Disease resistance	4.5 (1.23)	4.8 (0.78)	4.7 (0.88)	*
Adaptation to environment	4.8 (0.84)	4.9 (0.31)	5.0 (0.00)	*
Lower market price	3.5 (1.88)	4.2 (1.58)	3.4 (1.95)	***
Lower feed consumption	3.5 (1.68)	3.4 (1.92)	4.0 (1.52)	*
Sig[a]	***	***	***	-

Sig[a] significance of rankmeans within agro-ecology (columns) and Sig[b] significance across agro-climatic zones (rows). Significant at P<0.05 (*), P<0.01 (**), and P<0.001 (***). Rankmeans were compared using Kruskal Wallis test.

Table 6. Rankmeans and standard deviations attached to production constraints (5 levels with 1=most important and 5=least important).

Parameter	Agro-climatic zones			Sig[b]
	Lowlands	Midlands	Highlands	
Number of households	120	160	80	
Constraints / problems				
Disease	2.5 (1.65)	3.1 (1.72)	2.8 (1.65)	*
Lack of improved breed	2.6 (1.71)	2.2 (1.72)	2.1 (1.73)	**
High cost of feed	4.6 (0.95)	4.5 (1.05)	4.9 (0.33)	***
Predators	4.8 (0.80)	5.0 (0.00)	4.8 (0.67)	*
Poor management skill	4.4 (1.18)	4.1 (1.46)	4.3 (1.32)	NS
Sig[a]	***	***	***	-

Sig[a] significance of rankmeans within agro-ecology (columns) and Sig[b] significance across agro-climatic zones (rows). Significant at P<0.05 (*), P<0.01 (**), and P<0.001 (***). Rankmeans were compared using Kruskal Wallis test.

higher eggs and meat production. Therefore, the keen interest of Ethiopian farmers to have chicken breeds with better fitness and higher production can be achieved through importation and on-station adaptation and evaluation of high yielding exotic chicken breeds and also through a long term selection of the native chicken breeds.

Production constraints

The success of poultry production and productivity at farm level might be affected by several limitations. This study described the five most important constraints which were reported as the major bottleneck for village chicken productions in Ethiopia (Table 6). All production constraints, except management skills, differed by agro-climatic zones. Even within each agro-climatic zone, the rank order of importance of the different production constraints were not the same.

The most priority constraints were the diseases affecting chicken followed by the lack of locally adapted and well performing chicken breeds in lowlands; whereas, the lack of locally adapted and well performing chicken breeds was the most priority constraint in midlands and highlands. Production constraints such as diseases, unavailability and poor quality of feeds, low management skills, predators attack, lack of modern technologies, and uncontrolled breeding were common findings in extensive chicken production systems (Tadelle, 2003; Kondombo,

2005; Halima, 2007; Mwale and Masika, 2009). Up to date information on the type of the production constraints and their degree of importance is helpful to make necessary innervations at farm level. Farmers' response on lack of locally adapted and well performing chicken breeds as the main production constraint at farm level could be associated with the increasing market prices of chicken and eggs in Ethiopia.

Conclusions

This study provided a comprehensive overview about village chicken production systems' characterization across agro-climatic zones in Ethiopia. It emphasized the effect of agro-climate on the studied parameters related to village chicken production systems. The study also provided detailed information on chicken farmers' indigenous knowledge and practices across the three agro-climatic zones in the country.

According to the findings of the study, native chicken breeds predominated in the Ethiopian village chicken production systems. The ability of village chicken to survive and produce under extensive form of management system makes them the birds of choice at smallholder farmers' level. Although there are several reasons to choose native chicken breeds instead of exotic chicken breeds in an extensive management system, farmers in Ethiopia take the relative lower feed requirement and lower market price of native chicken breeds as the two top advantages. Many of the farmers' practices did vary among agro-climatic zones. This is likely due to differences in social, religious, economic and climatic factors existing in the different agro-climatic zones. The effect of agro-climate on the studied parameters may imply that there is a need for strategic agro-climate based interventions to improve village chicken production systems in Ethiopia.

Farmers' indigenous knowledge is highly important in an extensive chicken production system. However, training is necessary to upgrade their management skills. This study also showed that the Ethiopian village chicken production systems were characterized by several limitations. The system exposes the birds to predators, harsh climatic conditions, disease challenges, un-controlled breeding, and inadequate and poor quality feeds. The major input shortage in village chicken production was the lack of locally adapted and well performing chicken breeds. Newcastle disease was the major chicken health problem in all of the three agro-climatic zones during the period studied.

Therefore, the future research and development inter-ventions aiming to improve village chicken production systems in Ethiopia should address the main constraints identified at grass roots level. Outputs from this study can support future agro-climate specific interventions aiming to improve management of village chicken production systems and enhance their contribution to the livelihoods of smallholder farmers.

Conflict of Interests

The authors have not declared any conflict of interests.

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