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Characterization of chicken production system in two selected districts in Central Tigray, Ethiopia

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The study was conducted in Tahtay Michew and Mereb Leke districts with the objective of characterizing the chicken production system in the two study districts. Data collection was carried out through a structured questionnaire and data gathered from different sources. A total of 80 households (40 from each district) were randomly selected for interviews in the baseline survey. Finally, all the collected data were subjected to analysis using the Statistical Package for Social Science (SPSS version 20, 2011). The results showed that the average chicken flock size per household in the study area was 6.21, ranging from 1 to 29 in Tahtay Michew and 2 to 20 in Mereb Leke, respectively. There was a significant difference ($p < 0.001$) between the genders of respondents. There was also a highly significant difference ($p < 0.001$) in the selection of breed preferences in the study area. According to this study, the chicken production system was highly affected by a lack of proper management and a low availability of foundation stock. Therefore, governmental and non-governmental actors should emphasize training and awareness creation for chicken producers.

Key words: Breed preference, chicken characterization, household income, production system.

INTRODUCTION

Poultry production plays a vital role in ensuring food security and contributes significantly to the country's economy (Gerima et al., 2016). It is a promising farming activity, particularly in regions facing a consistent decrease in grazing areas (Kyule et al., 2014). Low-technology poultry production demands a smaller investment compared to other livestock species (Lawal et al., 2016). As a result, poultry production is widely practiced by Ethiopian smallholder farmers (Fisseha et

al., 2010). Ethiopia boasts a poultry population of 60.5 million heads (CSA, 2016), with village chicken production accounting for more than 95% of total poultry production (Mekonnen et al., 2010).

In the developing world, poultry production is primarily based on scavenging production systems, making substantial contributions to household food security (Muchadeyi et al., 2007). Livestock production covers 40% of agricultural output in Ethiopia, playing a crucial

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role in the national economy and contributing 18% to the total in the national economy and contributing 18% to the total GDP (FAO, 2010). Chickens are widespread in Ethiopia, with almost every rural family owning them, providing valuable sources of family protein and income (Tadelle et al., 2003). On average, people in Ethiopia consume 57 eggs and 2.5 chickens per capita per annum (Mekonnen et al., 2010). In addition to its advantages as a source of food and income, village chicken production ensures employment opportunities for rural smallholder farmers and offers socio-cultural benefits (Moges et al., 2010). Despite these contributions to smallholder farmers, little attention has been given to improving the production system. The indigenous knowledge and management practices of farmers in village chicken production have not been studied yet.

Characterizing village chicken production systems in different agro-climatic areas might help identify important problems hindering the success of the poultry sector. Therefore, this study was conducted with the primary objective of characterizing the village chicken production system under farmer management conditions.

MATERIALS AND METHODS

Study sites

In this study, two districts were selected from the eight administrative districts of the central zone of Tigray, based on the availability of chickens and easy transportation access. Among the two districts, Mereb Leke is located between 38° 47' 32" - 39° 25' 15" E longitudes and 14° 22' 25" - 14° 55' 30" N latitudes, while Tahtay Michew is located between 38° 10' 05" and 38° 35' 19" E longitudes and 13° 55' 18" and 14° 15' 09" N latitudes. The selected districts were categorized into two groups as lowland and midland agro-ecologies based on their altitude, temperature, and rainfall. Mereb Leke district represented the lowland, and Tahtay Michew district represented the midland, both mainly characterized by a mixed crop-livestock production system.

Mereb Leke is approximately 258 and 1041 km from Mekelle and Addis Ababa, respectively, in northern Ethiopia. It has a total population of 107,218 people, with 53,425 men and 53,793 women. The district is characterized by a wide altitude range from 1390-1950 masl, sandy to clay loam soil type, with monomodal rainfall of 400-600 mm per annum, and a temperature of 18.7– 33.9°C (NMA, 2017). The district possesses 53,039 cattle, 21,739 sheep, 52,981 goats, 9,921 asses, 171 mules, 1,087 camels, 203,529 poultry, and 2,849 beehives. The dominant crops grown in the district include groundnut (*Arachis hypogaea*), finger millet (*Eleusine coracana*), sorghum (*Sorghum bicolor*), and maize (*Zea mays*).

Tahtay Michew is one of the districts in the central zone of Tigray. It is approximately 262 km and 1040 km from Mekelle and Addis Ababa, respectively, in northern Ethiopia. It has a total population of 99,122 people, with 48,623 men and 50,499 women. The district is characterized by altitude ranges from 1500-2260 masl, with monomodal rainfall of 600 mm per annum, and an average temperature of 20°C (NMA, 2017). The district possesses 39,269 cattle, 8,686 sheep, 34,459 goats, 6,892 asses, 166 mules, 469 camels, 321,987 poultry, and 3,211 beehives. The dominant crops grown in the district includes ground Tef (*Eragrostis tef*), finger millet chickpea (*Cicer arietinum*), bean (*Phaseolus vulgaris*), wheat (*Triticum*), barley (*Hordeum vulgare*), maize (*Zea mays*) and Sorghum (*Sorghum bicolor*).

Sampling techniques

The two districts were selected purposely based on the potential of the poultry population, agro climatic zone and accessibility of transportation. From each district 40 households were selected by using purposely sampling technique, in which the households must have a potential in rearing village chickens for a least two years. The data were collected from the entire survey using a set of semi structured questionnaire for characterization of the chicken production system in the study districts.

Statistical analysis

The survey data were entered and managed using Microsoft excel computer program. Descriptive statistics data, such as frequency and percentage were calculated using statistical package for social sciences (SPSS Version 20, 2011). For qualitative data like selection practice, income sources, and farmer trait preferences ranking and index were used by the following formula:

$$\text{Index} = \frac{\sum (n \times \text{number of HHs ranked 1st}) + (n-1) \times \text{number of HHs ranked 2nd} + \dots + 1 \times \text{number of HHs ranked last}}{\sum (n \times \text{number of HHs ranked 1st} + (n-1) \times \text{number of HHs ranked 2nd} + \dots + 1 \times \text{number of HHs ranked last})}$$

where n = number of traits under consideration.

The variable with the highest index value was the highest economically important trait (Musa, 2006).

RESULTS AND DISCUSSION

Household characteristics and respondent's profile

In the overall mean, out of the total 80 respondents, 76.3% were males, and 23.7% were females (Table 1) in the surveyed districts. The respondents had an average age of 37.71 years. Regarding educational status, 35, 25, 22.5, and 17.5% of the respondents were illiterate, could read and write, had primary education, and had secondary education, respectively. The average family size was composed of 7 members, in line with Mearg (2016), who reported that the average family size in the central zone of Tigray was 6.29±2.29. The households, on average, possessed 0.78 ha of land. In the lowlands, farmers had, on average, 0.28 hectares more land than those living in the midlands. This result was smaller than the reported 1.28 hectares of landholding per household in Northwest Amhara (Halima, 2007) and 1.23 hectares of landholding per household in the Bure district of Northwest Amhara (Fisseha et al., 2010).

Sources of household income

The sources of household income are presented in Table 2. The dominant income-generating categories for households were primarily crop farming, livestock keeping, and other activities, with respective index values of 0.333, 0.263, 0.129 in Tahtay Michew and 0.317, 0.179, 0.142 in Mereb Leke. The household income was mainly derived from the crop-livestock production system,

Table 1. Respondents profile in the study districts.

Variable	Study districts (N, %)		Average	X2	P_value
	Tahtay Michew (N=40)	Mereb Leke (N=40)			
Gender of respondents of the hh (%)					
Male	32(80.0%)	29(72.5%)	61(76.25%)	22.05	0.001
Female	8(20.0%)	11(27.5%)	19(23.75%)		
Average age respondents in years	38.80	36.63	37.71		
Educational status of respondents (%)					
Illiterate	15(37.5%)	13(32.5%)	31(35%)	120.39	0.001
Reading and writing	9(22.5%)	11(27.5%)	20 (25%)		
5-8 grade	10 (25%)	8(20%)	18 (22.5%)		
9-12 grade	6 (15%)	8 (20%)	14 (17.5%)		
Landholding/hh(ha)	0.64	0.92	0.78		
Average family size/hh	6.15	7.02	6.58		

Table 2. Sources of income in the study districts.

List of income sources	Name of districts and sources of income by index									
	Tahtay Michew					Mereb Leke				
	1 ^o	2 ^o	3 ^o	Index value	Rank	1 ^o	2 ^o	3 ^o	Index value	rank
Crop farming	17	9	11	0.333	1 st	15	11	9	0.317	1 st
Livestock keeping	9	11	14	0.263	2 nd	6	13	9	0.179	2 nd
Others (gold mining, weaving)	4	6	7	0.129	3 rd	4	6	10	0.142	3 rd
Livestock product trading	0	5	0	0.042		0	0	0	0.000	
Self employed	0	0	0	0.000		0	2	3	0.030	
Farm laborer on other's farm	0	2	0	0.017		4	3	2	0.085	
Old /retired/	2	0	0	0.025		2	1	0	0.053	
Poultry keeping	4	3	6	0.100		5	2	4	0.095	
Unemployed /dependent/	2	3	2	0.058		3	2	2	0.072	
Remittance	2	1	0	0.033		1	0	1	0.027	

1^o= Primary sources of income; 2^o = Secondary sources of income; 3^o = Tertiary sources of income.

with less emphasis on trade, self-employment, and other income sources. Livestock product trading, including eggs, butter, skin, and hide, was rarely practiced as a source of income in Tahtay Michew and was not common in Mereb Leke, primarily due to the unsuitability (high temperature) and perishability of livestock products. Some individuals also derive income by being employed on other farms, a practice more prevalent in Mereb Leke than in Tahtay Michew, attributed to the accessibility of irrigation.

Livestock population of the study districts

Livestock population in the study districts were indicated in Table 3. According to the secondary data of both the

study districts showed that the dominant livestock species were cattle, goat and sheep in terms of total livestock unit. Comparatively higher livestock population was observed in Mereb Leke than Tahtay Michew. This is due to better landholding ownership in Mereb Leke as compared to Tahtay Michew. The population of camel was higher in Mereb Leke due to environmental suitability and commonly used by the community as pack animal for transporting agricultural products, by products and water. The number of bee hive in Tahtay Michew was higher as compared with Mereb Leke due to the reason that in Tahtay Michew there was a plenty of bee forage availability. Chicken type in the study districts were indicated in Table 4. Higher chickens were observed in Mereb Leke due to high demand of their products throughout (even in the fasting period) the year as

Table 3. Livestock population by districts.

Livestock type	Mereb Leke	Tahtay Michew	Overall
Cattle	53039	39269	92308
Sheep	21739	8686	30426
Goat	52981	34459	87440
Asses	9921	6892	16813
Mule	171	166	237
Camel	1087	469	1556
Poultry	203529	118458	321987
Beehives	2849	3211	6060

Source: Woreda office of Agricultural Bureau of the study districts.

Table 4. Breed selection in terms of preference, reason of breed preference.

Breed preference	Study districts (N, %)		Overall (%)	X2	P_value
	Tahtay Michew	Mereb Leke			
Local breed	15 (37.5%)	11 (27.5%)	26 (32.5%)	50.72	0.001
Exotic breed	24 (60.0%)	29 (72.5%)	53 (66.25%)		
Cross breed	1 (2.5%)	0 (0.0%)	1 (1.25%)		
Reason for breed preference				28.90	0.001
Produce a lot of eggs	13 (32.5%)	16 (40.0%)	29 (36.25%)		
Adaptive	2 (5%)	3 (7.5%)	5 (6.25%)		
Produce egg with harder shell	0 (0.0%)	2 (5%)	2 (2.5%)		
Better meat taste	1 (2.5%)	0 (0.0%)	1 (1.25%)		
Large body size	6 (15%)	5 (12.5%)	11 (13.75%)		
Produce high survival rate chick	3 (7.5%)	3 (3.75)	6 (8.75%)		
Efficient in feed utilization	1 (2.5%)	1 (2.5%)	2 (2.5%)		
Good physical appearance	5 (12.5%)	2 (2.5%)	7 (8.75%)		
*Others	9 (22.5%)	8 (20.0%)	17 (21.25%)		

*Other: Mothering ability (local), hatchability and brooding behavior (local), aggressive to predator (local), longevity (local), docile behavior (introduced), early mature (introduced).

compared to Tahtay Michew district. Out of the total chicken population the number of chicks was leading and followed by hens in the study districts.

Flock size and breed type

The flock size and breed composition in the study area were indicated in Table 5. The overall chicken flock composition of the study districts was dominated by local chicken (72.5%) and followed by exotic (16.25%) and cross breed chickens (11.25%) respectively. Generally, the overall chicken flock composition in the study area was higher as compared to the (CSA, 2016) which stated as 94.33% indigenous, 2.47% exotic and 3.20% crosses. The higher proportion exotic and cross relative to indigenous chicken in the study area implies that various governmental and nongovernmental organizations frequently distributed exotic and cross breed chicken.

The average flock size in the study area was 6.23 per household. This finding is the same to the report of (Meseret, 2010) who reported the average flock size per household in Gomma district was 6.23. In contrast, the mean flock size recorded in this study was lower than the mean flock size of 8.8 and 9.2 chickens/ household reported by (Asefa, 2007) for Awassa Zuria and (Mekonnen 2007) for Dale Woreda in Ethiopia, respectively. The current result also lower than 12-13 chicken/household reported from other regions of Ethiopia (Fisseha et al., 2010; Hunduma et al., 2010).

Chicken production system and management

The average duration the respondents have experience of chicken keeping was 17.65 years. In terms of breed preference, in the production system exotic breed first, followed by local breed, and cross breed. The most

Table 5. Sources of foundation stock, chicken entry and exit.

Sources of stock	Study districts (N, %)		Overall %	X ²	P_value
	Tahtay Michew	Mereb Leke			
Purchase	30 (75%)	32 (80%)	62 (77.5%)	90.70	0.000
Inherit	0 (0.0%)	1 (2.5%)	1 (1.25%)		
Custody	3 (7.5%)	4 (10%)	7 (8.75%)		
Gift	7 (17.5%)	3 (7.5%)	10 (12.5%)		
Chicken entry type					
Birth /hatch home	28 (70%)	27 (67.5%)	55 (68.75%)	55.07	0.000
Purchase	11 (27.5%)	13 (32.5%)	24 (30%)		
Types of chicken exit					
Death due to disease	22 (55%)	17 (42.5%)	39 (48.75%)	63.10	0.000
Death due to accident	2 (5%)	4 (10%)	6 (7.5%)		
Due to predator	4 (10.0%)	7 (17.5%)	11 (22.5%)		
Sale as live chicken	7 (8.75%)	4 (5.0%)	11 (13.75%)		
Lost strayed (theft)	0 (0.0%)	3 (7.5%)	3 3.75%)		
For festivity/sacrifice	5 (12.5%)	5 (12.5%)	10 (12.5%)		

Accident = sudden death mechanically such as immersed in water, trampling by human or animal.

primary reasons to prefer an exotic breed is the production of more eggs with large size and possession of large body size, as compared with the local breeds. The study is in line with (Nigussie et al., 2010) who stated reasons of breed preference include; number of eggs and adaptation, reproduction (broodiness and hatch ability), *qumena* (body conformation), growth/weight, comb type and plumage color.

The main sources of foundation stock in the study districts are dominantly through purchased (77.5%), on farm (birth, hatch in home from local chicken or machine 11.3%) and followed by gift (12.5%). In Horro woreda, foundation stocks are bought from markets or directly from contacts within the neighborhood (Tadelle et al., 2013). 98.8% of the respondents in the study districts practice chicken entry. The most commonly practiced chicken entry through birth (hatch on farm from local hen or machine 68.8%) and purchased (30.0%). The study is similar with (Khan et al., 2015) as stated birth (household hatched), purchase and gift as the major chicken entries in Pakistan. The dominant chicken type during the chicken entry; chicks (41.3%), grower female (26.3%), hen (16.3%), grower male (11.3%) and lastly cock (3.8%). 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 (Nebiyu et al., 2013).

Chicken exit in chicken production system is a common practice. In the study districts the whole respondents (100%) practiced chicken exit. The most common type of chicken exit is caused by death due to disease (48.8%), died due to predators (13.8%), due to sale live chicken (13.8%), sacrifice/festivals (12.5%), died due to accident (7.5%) and lost strayed (3.8%). Among the various

reason of chicken exit studied in Pakistan were stated as; death due to diseases and slaughter as home consumption as for chicken exit (Khan et al., 2015).

Chicken management and activities

Chicken feed resource and feeding practice

The major feed resources and feeding practice of chicken in the study area as mentioned by the respondents are summarized in Table 6. There is no planned feeding of rural household chicken in Ethiopia and the scavenging feed resources are almost the only source of feed. According to the study, the whole respondents (100%) reported to practice scavenging system with supplementary feeding. The result is in line with the findings (Zemene et al., 2012) who reported 100% chicken owners in west Amhara region provide supplementary feed. Another study in Bench Maji Zone, southern Ethiopia indicated that 100% of the respondents practice scavenging system with supplementary feeding (Getachew et al., 2016). The result of this study also agrees with that of (Asefa, 2007) and (Mekonnen, 2007) who reported 95-98% of the smallscale household poultry producers in Awassa Zuria and Dale offer supplementary feeding to their chickens. According to (Tekalegn, 2017) in Sidama Zone 99.2% of the smallholder farmers provide supplementary feeds to their chicken.

Grains and commercial feeds are the major supplementary feeds offered; the amount of each supplementary feed depends on season of the year, quantity and availability of the resources at household level. As it is shown in the Table 6 grain feed incorporates

Table 6. Feed resources and feeding practice of chicken in the study districts.

List of activities	Study districts (N, %)		Overall %	X2	P_value	
	Tahtay Michew	Mereb Leke				
Feeding frequency	Morning only	7 (17.5%)	8 (20.0%)	15 (18.75%)	65.80	0.000
	After noon	0 (0.0%)	3 (7.5%)	3 (3.75%)		
	Morning and afternoon	23 (57.5%)	15 (37.5%)	38 (47.5%)		
	Morning and evening	1 (2.5%)	3 (7.5%)	4 (5.0%)		
	Morning, afternoon and evening	6 (15%)	9 (22.5 %)	15 (18.75%)		
	Always available/ <i>ad libitum</i>	3 (7.5%)	2 (5%)	5 (6.25%)		
Types of supplementation	Grain (maize and sorghum)	35 (87.5%)	34 (85%)	69 (86.25%)	45.26	0.000
	Legume (chickpea, nut)	1 (2.5%)	2 (5%)	3 (3.75%)		
	Wheat bran	1 (2.5%)	3 (7.5%)	4 (5.0%)		
	Kitchen waste (left over food)	3 (7.5%)	0 (0.0%)	3 (3.75%)		
	Other (vegetables e.g Cabbage)	0 (0.0%)	1 (2.5%)	1 (1.25%)		
Feeding practice	Put in to container	12 (30%)	13 (32.5%)	25 (31.25%)	11.25	0.001
	Throw on bare ground	28 (70%)	27 (67.5%)	55 (68.75%)		
Sources of feed	From own farm (Home)	28 (70%)	26 (65%)	54 (67.5%)	43.22	0.000
	From purchase	6 (15%)	11 (27.5%)	17 (21.25%)		
	Both	6 (15%)	3 (7.5%)	9 (11.25%)		

up to 86.3% of the total supplementary feeds in the study districts. The finding concurs, with the results of (Tekalegn, 2017) where almost all the chicken owners provide supplementary feeds such as wheat, maize and sorghum. About 47.5% of the respondents offer supplementary feed twice a day (morning and afternoon). Out of the total respondents 88.8% get their supplementary feed from their own (produced at home) and through purchasing. The feed is usually offered by putting/throwing on the bare ground (for adult chicken collectively) and by putting on container (for chicks).

According to the survey and the focus group discussion conducted in the study districts, 93.8% of the respondents provide water to their chicken in a container and the main source of water for their chicken was hand pump, bore hole and stream water which they provide once daily. Watering trough used in the area includes; locally made broken clay material, flat plastic, stone and woody material.

Chicken housing system

In the current study 96.9% of the respondents reported that there is no separate chicken house/free range/throughout the whole year during the day time in the study districts, while during the night time 93.65% of the respondents stated that the chickens were kept in chicken house (coop, basket, mud made material, iron sheet), in home kitchen (perch), confined cage and others such as hanged on window, hanged with gabion outside roof of a house and hanged on a tree. This result

was similar to the case reported by (Meseret, 2010; Eskinder, 2013) who suggested 94.4% in Gomma woreda and 92.06% in both Horro and Jarso have no separate poultry house, respectively. In contrast to the study districts, (Halima, 2007; Wondu et al., 2013; Solomon et al., 2013) reported that about 51, 63 and 48% of chicken producers in Northern Ethiopia, respectively had separate sheds for their chickens.

A study conducted in Halaba district, Southern Ethiopia (Yemane, 2009) indicated that there was no chicken house built exclusively for chicken outside the main house. Whereas, a study conducted in Sudan (Khalafalla et al., 2000) reported that 48.7% of the household provided overnight housing for the birds and chickens in 20.6% of the households were kept overnight within the main house, while 12.8% of the birds perched in trees or roofs. (Halima, 2007; Wondu et al., 2013) reported that 50.77 and 63%, respectively, of farmers kept their chickens outside the main house which is exclusively made for chickens in North Western Ethiopia. (Solomon et al., 2013) in North Western Ethiopia, Meketel Zone, also reported that only 48% of the respondents constructed separate houses for their birds; the other 52% kept in various overnight sheltering places.

Chicken diseases

The results of this study indicated that chicken diseases are widely spread in the study districts. According to the survey study the most common disease includes; New Castle, Coccidiosis, Gumbero / Infectious Bursal Disease.

Table 7. Housing system of chicken in the study districts at various seasons (day vs night).

Season	Housing system	Study districts (N, %)		Overall %	X ²	P_value
		Tahtay Michew	Mereb Leke			
Dry_(day time)	Free range/no house/ Kept in home (kitchen)	39(97.5%) 1(2.5%)	38(95%) 2(5%)	77(96.25%) 3(3.75%)	64.80	0.000
	Free range	2(5%)	3(7.5%)	5(6.25%)		
Dry (night)	Chicken house	22(55%)	24(60%)	46(57.5%)	72.20	0.000
	Kept in home/kitchen	9(22.5%)	11(27.5%)	20(25%)		
	Confined in cage	0(0.0%)	1(2.5%)	1(1.25%)		
	Other	7(8.75%)	1(2.5%)	8(10%)		
Wet (day time)	Free range	39(97.5%)	39(97.5%)	78(97.5%)	72.20	0.000
	Kept in kitchen	1(2.5%)	1(2.5%)	2(2.5%)		
Wet (night)	Free range	3(7.5%)	3(7.5%)	6(7.5%)		
	Chicken house	22(55%)	25(62.5%)	47(58.75%)		
	Cage	0(0.0%)	1(2.5%)	1(1.25%)		
	Other	6(15%)	0(0%)	6(7.5%)		

Chicken House includes, Coop, hut, wooden, rock, brick, iron sheet and mud made small house; Others: Hanged on tree, home compound, window and gabion

A survey conducted in Southern Ethiopia identified Fowl cholera followed by New Castle Disease, Coccidiosis, Fowl influenza [Infectious Bronchitis], Fowl pox, Fowl typhoid and Salmonella to be the major poultry diseases respectively (Aberra and Tegene, 2007).

Household labor contribution for smallholder chicken production

Chicken management activities and the average time spent in minutes per week by different household members are presented in Table 7. The survey results indicated that approximately 60% of the respondents are engaged in feeding and watering, followed by 22.5% in cleaning bird sheds and 16.3% in egg collection. As shown in Table 7, more time (22.15±4.95 min per week)

was spent by female households than other household categories. This indicates a higher level of women's participation in poultry management practices compared to other household members. This result aligns with Tekalegn (2017), who found that females play a leading role in smallholder poultry production, followed by children, while men were dominant in shelter construction (60%) and treating chickens (40%). Similar results were reported by Riise et al. (2004) and Taddelle et al. (2003), who found that women and children were generally in charge of village chicken husbandry practices in developing countries.

Conclusion

The productivity of indigenous chickens could be

enhanced through improved management practices, including housing, feeding, vaccination, establishment of foundation stock, and allocating more time for chicken monitoring. Therefore, agricultural research institutions, higher education institutions, non-governmental organizations, and other stakeholders should prioritize addressing these gaps in chicken production.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Aberra M, Tegene N (2007). Study on the characterization of local chicken in Southern Ethiopia. Proceedings held in

- Awassa, March 16-17.
- Asefa T (2007). Poultry management practices and on farm performance evaluation of Rhode Island Red (RIR), Fayoumi and local chicken in Umbullo Wachu watershed. Department of Animal and Range Sciences: Hawassa College of Agriculture, Awassa.
- Central Statistical Agency CSA (2016). Federal Democratic Republic of Ethiopia Central Statistical Agency Agricultural Sample Survey 2016/17 [2009 E.C] Volume II. Report on Livestock and Livestock Characteristics. 573 Statistical Bulletins: Addis Ababa, Ethiopia.
- Eskinder A (2013). On-farm phenotypic characterization of indigenous chicken and chicken production systems in horro and Jarso districts, Oromia regional state. MSc Thesis, Submitted to the Department of Animal and Range Sciences, Haramaya University, Ethiopia.
- Food and Agriculture Organization of the United Nations (FAO) (2010). Chicken genetic resources used in smallholder production systems and opportunities for their development, by P. Sørensen. FAO Small holder Poultry Production 5:32.
- Fisseha M, Abera M, Tadelle D (2010). Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North West Ethiopia. African Journal of Agricultural Research 5(13):1739-1748.
- Gerima GT, Meseret Y, Teddy AA (2016). Socio-economic characteristics of poultry production in lowland and midland agroecological zones of central Tigray, Ethiopia. African Journal of Poultry Farming 4(6):149-158.
- Getachew B, Kefelegn K, Negassi A (2016). Study of indigenous chicken production system in Bench Maji Zone, South Western Ethiopia. Global Journal of Science Frontier Research: D Agriculture and Veterinary 16(2)
- Halima H (2007). Phenotypic and genetic characterization of indigenous chicken populations in North West Ethiopia: PhD thesis submitted to the faculty of natural and agricultural sciences department of animal, wildlife and grassland Sciences: University of the Free State, Bloemfontein, South Africa.
- Hunduma D, Regassa C, Fufa D, Endalew B, Samson L (2010). Major Constraints and Health Management of Village Poultry Production in Rift Valley of Oromia, Ethiopia. American-Eurasian Journal of Agriculture and Environmental Science 9:529-533.
- Khalafalla Al, Awad S, Hass W (2000). Village poultry production in the Sudan. Department of micro biology, Faculty of veterinary science, University of Khartoum, Khartoum, North Sudan.
- Khan MS, Rehman MS, Ibrahim MNM, Okeyo AM (2015). Flock composition and pattern of entry and exit of village chickens in Punjab (Pakistan), Tropical Agricultural Research 26(3).
- Kyule NM, Mwangi JG, Nkurumwa OA (2014). Indigenous chicken marketing channels among small-scale farmers in Mau-Narok division of Nakuru County, Kenya. International Journal of Social Science Entrepreneurship 1(9):55-65.
- Lawal JR, Bello AM, Balami SY, Wakil Y, Yusuf ZB, Dauda J, Mshelia ES, Mana HP, Adam MK, Biu AA (2016). Prevalence and economic significance of ectoparasites infestation in village chickens (*Gallus gallus domesticus*) in Gombe, Northeastern Nigeria. Direct Research Journal of Agriculture and Food Science 4(5):94-103.
- Mearg F (2016). Phenotypic characterization of local chicken Ecotypes in the central zone of Tigray, in Northern Ethiopia. MSc Thesis, Jimma University.
- Mekonnen G (2007). Characterization of smallholder poultry production and marketing system of Dale, wonsho and loka abaya weredas of southern Ethiopia. Msc. Thesis presented to the School of Graduate Studies of Hawassa University.
- Mekonnen H, Mulatu D, Kelay B, Berhan T (2010). Assessment of the nutritional status of indigenous scavenging chicken in Ada'a district, Ethiopia. Tropical Animal Health Production 42:123-130.
- Meseret M (2010). Characterization of village chicken production and Marketing system in gomma woreda, jimma zone, Jimma University, Ethiopia (M.Sc Thesis), p.110.
- Moges F, Abera M, Tadelle D (2010). Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North West Ethiopia. African Journal of Agricultural Research 5(13):1739-1748.
- Muchadeyi FC, Eding H, Wollny CBA, Groeneveld E, Makuza S M, Shamseldin R, Simianer H, Weigend S (2007). Absence of population sub-structuring in Zimbabwe chicken ecotypes inferred using microsatellite analysis, Animal Genetics 38:332-339.
- Musa LMA, Peters K.J, Ahmed MKA (2006). On farm characterization of Buntana and kenana cattle breed production systems in Sudan. Livestock Research for Development. 18:56-61.
- Nebiyu Y, Brhan T, Kelay B (2013). Characterization of Village Chicken Production Performance under Scavenging System in Halaba District of Southern Ethiopia. Ethiopian Veterinary Journal 17(1):69-80.
- Nigussie D, van der Waaij LH, Taddelle D, van Arendonk JA (2010). Production objectives and trait preferences of village poultry producers of Ethiopia: implications for designing breeding schemes utilizing indigenous chicken genetic resources. Tropical Animal Health and Production 42(7):1519-1529.
- Riise JC, Permin A, Mc Ainsh CV, Frederiksen L (2004). Keeping village poultry. A technical manual on small-scale poultry production: Network for Small Holder Poultry Development
- Solomon Z, Binyam K, Bilatu A, Ferede A (2013). Village chicken production systems in Metekel zone, Northwest Ethiopia, World Journal of Agricultural Resource 2(9):256 -262.
- Tadelle D, Million T, Alemu Y, Peters KJ (2003). Village chicken production systems in Ethiopia: 2. Use patterns and performance valuation and chicken products and socio-economic functions of chicken. Livestock Research for Rural Development 15(1).
- Tadelle D, Wondmeneh EW, Waaij LV, Zegeye F, Solomon GS, Mwai O, Arendonk JV (2013). Village chicken production in the central and western highlands of Ethiopia: Characteristics and strategies for improvement, ILRI (aka ILCA and ILRAD).
- Tekalegn Y, Etalem T, Getinet A (2017). Poultry Feed Resources and Coping Mechanisms of Challenges in Sidama Zone, Southern Ethiopia.
- Wondu M, Mehret M, Berhan T (2013). Characterization of urban poultry production system in Northern Gondar, Amhara Regional State, Ethiopia. Agriculture and Biology Journal of North America 4:192-198.
- Yemane N (2009). Characterization of village chicken production performance under scavenging system in Halaba district of southern Ethiopia. Ethiopian Veterinary Journal 17(1):68-80.
- Zemene W, Aberra M, Yosef T (2012). Assessment of village chicken production system and the performance of local chicken populations in west Amhara region of Ethiopia. Animal Production Advanced Journal 2(4):199-207.