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Village Chicken Production Constraints and Opportunities in Western Zone of Tigray, Northern Ethiopia

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Abstract
The survey was aimed at assessing village chicken production opportunities and constraints in western zone of Tigray. Multi stage sampling produres were employed to select weredas, sample kebeles and respondents in which three rural weredas were selected by purposive sampling technique; stratified purposive techniques were employed to select nine sample kebeles and purposive random sampling techniques were used to select a total of 385 respondents. Pretested well –structured questionnaire and focused group discussion were employed to generate data. Household characteristics were analyzed using descriptive statistics of SPSS 16. Kruskal- Wall's test option of Non-parametric tests of SPSS 16 was employed to test proportion difference of each variable among the altitudes. Ranking index was employed to rank both identified constraints and common poultry diseases. Disease (1st) and predators (2nd) were the major village chicken production constraints. Newcastle disease (1st), fowl salmonella (2nd), coccidiosis (3rd), fowl typhoid (4th), fowl cholera (5th), fowl pox (6th) and fowl coryza (7th) were the major and economically important diseases that hinder the expansion of village chicken production in the study area. On the other hand, market access, feed access, drinking water access, and diversified agro- ecological zones of the study area and ease management of village chicken were the identified opportunities of village chicken production. Chickens are considered as movable poor man's bank because of Ease management of village chicken and their short reproduction cycles. Therefore, technical and institutional interventions are very imperative to lessen the prevailing constraints together with designing, planning and implementing community based and agro-ecologically friendly holistic breeding and production improvement programmes in order to ensure sustainable improvement, utilization and conservation of the identified opportunities and the indigenous chicken genetic resources as whole.
Key Words: Constraints, Opportunities, Movable poor man's bank, Western Zone of Tigray

1. Introduction

Village chicken production has a fundamental role in capital build up, poverty, malnutrition and hunger reduction among the resource poor households in developing countries of the world because of their short generation intervals, low input requirements for production, good scavengers and adapters to harsh production environments (Besbes 2009). Village poultry are available asset to local populations throughout Africa and they contribute to food security, poverty alleviation and promote gender equality, especially in the disadvantaged groups and less favored areas of rural Africa where the majority of the poor people reside (RSHD 2011). On top of these merits, village poultry can provide the start of the owner climbing the "livestock ladders'' leading to other livestock species such as goats and cattle or serve as "transport (transitional) bridge" from small livestock to large livestock species production (Dolberg 2003).

Ethiopia has an estimated of 49.3million with indigenous chicken of non-descriptive breeds accounting 97.3%, hybrid chicken 2.32% and exotic breeds 0.38% (CSA 2011).Moreover, 97.3% of indigenous chickens has been distributed in different agro-ecological zones of Ethiopia (CSA 2011) and their distribution indicate their adaptive potential to different environmental conditions, diseases and other stresses (Halima 2007).Village chicken fulfills many roles in the livelihood of resources poor households of Ethiopia such as food security, income generation and others. Despite of their significant roles, rearing them has been considered as side line Agricultural activity.

However, the productive performance of local chickens is disproportional with their size and their low performances have masked their potential to boost the living standards of their owners and contribute to rural developments in Ethiopia. This has been attributed to their low genetic potential, prevalence of diseases and predators, limited feed resources, constraints related to institutional and socio-economic and limited skill management practices (Sonaiya 2000;Tadelle & Ogle 2001; Solomon *et al*. 2013; Nebiyu *et al*. 2013; Meseret 2010 ; Halima 2007; Ashenafi *et al*. 2004 and Nigussie *et al*. 2010) and lack of holistic impromvent strategies. Identification and better understanding of village chicken production environments, constraints and opportunities have paramount importance in designing, planning and implementing community based and agro-ecologically friendly holistic breeding and performance improvement programmes in order to ensure sustainable

improvement , utilization and conservation of local chicken genetic resources so as to boost their contribution to national rural based development strategies. Several studies on opportunities and constraints of village chicken production have been done in different parts of Ethiopia. However, little or no research on assessing opportunities and constraints of village chicken production had been done in Tigray and in particular in Western Zone of Tigray. Therefore, the study was designed to assess the critical opportunities and constraints of village chicken production in Western Tigray.

2. Materials and Methods

2.1. Description of Study Area

The study was conducted in the three rural weredas (Kafta Humera, Welkait and Tsegede) of Western Zone of Tigray Regional State, North West Ethiopia. It is one of the five administrative zones of Tigray regional state and it has four (4) districts (Setit Humera, Kafta Humera, Welkait and Tsegede) comprising of 81 kebeles with 77 rural kebeles (24, 25 and 28 kebeles from Kafta Humera, Tsegede and Welkait weredas, respectively) and 4 urban kebeles with distance range of 580–750 km from Mekelle, the capital city of Tigray. Setit Humera was not included in the study because it is represented by Kafta Humera. It covers an area of 1.5 million hectare with Kafta Humera accounts 48.13%, Setit Humera accounts 0.82%, Tsegede accounts 23.43% and Welkait accounts 27.62% (HARC 2013). The total cultivated land of the zone is 573,285 hectares (38.2%) while the uncultivated land accounts 927,000 hectares (62.8%). 341,195.25 hectares (36.8%) of the uncultivated land is covered by different plant species excluding Bowsellia and Acacia Senegal While 185,510 hectares (20%) of the unfarmed land is solely covered by both Bowsellia and Acacia Senegal. The zone consists of three agro-ecological zones (lowland, midland & highland).75%, 15.7% and 9.3% of the land coverage of the zone is Kolla(lowland), weynadegga (midland) and dega (highland), respectively.

The geographical location of the zone is 13°42′ to 14°28′ north latitude and 36°23′ to 37°31′ east longitude (Mekonnen *et al*. 2011).The annual rainfall of the zone ranges from 600 mm to 1800 mm while the annual temperature ranges from 27^0c to 45 ^{0}c in the lowland areas (Kolla) and 10^0c to 22 ^{0}c in both midland and highland areas of the zone. The altitude of the zone ranges from 500- 3008 m.a.s.l. The zone shares borders with Tahtay Adibayo, Tselemti and Asgede Tsimbla in the East, Sudan in West, Amhara region in South and Eritrea in the North. The study area represents a remote, tropical climate where extensive agriculture is performed manually by large numbers of migrant laborers.

Throughout the zone, livestock agriculture is the predominant economic activity with about 95% of the total population engaged directly or indirectly in it (Mekonnen *et al*. 2011).Main cattle breeds raised in the Western Zone are the local Arado (in both high land and mid land areas) and Begait cattle (in lowland areas). Semi-intensive production is practiced in Humera district, which is more urban, while extensive production system is dominant in the Welkait and Tsegede districts. The main crops cultivated in the lowland areas of the zone are sesame, cotton and sorghum while teff, wheat, barley, noug, lentils, finger millet, field peas and fababeans are cultivated crops in both midland and high land areas of the zone.

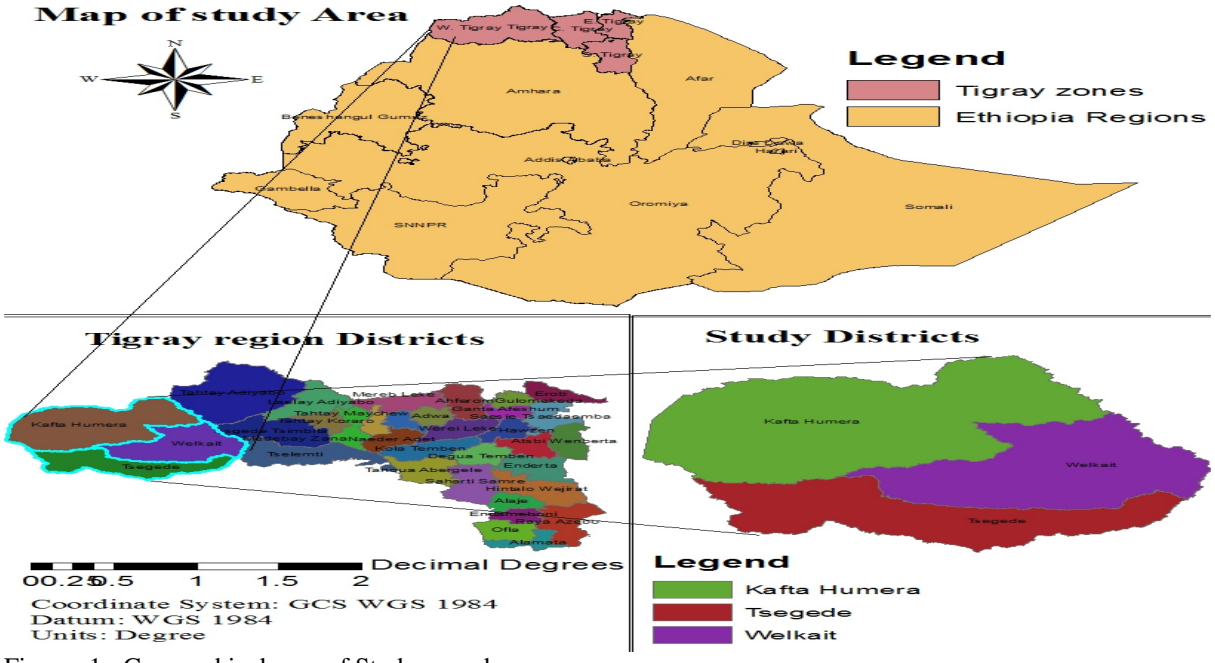

Figure -1: Geographical map of Study woredas

2.2. Sampling Techniques:

Three rural (welkait, Tsegede & Kafta Humera) weredas were purposely selected. All kebeles (smallest administrative units in Ethiopia) of three weredas were stratified in to three agro-ecological zones namely lowland, midland and highland (kebeles of both welkait and Tsegede weredas were stratified in to lowland, midland and highland but kebeles of Kafta Humera were stratified in to lowland and midland agro-ecological zones as it only comprises midland and lowland areas). Based on the village poultry population density, chicken production potential and road accessissibilty, four, three and two kebeles were purposely selected from lowland, midland and highland agro-ecological zones, respectively. A total of **385** farmers who keep a minimum of three and above local chickens were selected from household package beneficiary's registration book of each selected kebele using purposive random sampling technique. The number of respondents per each sample kebeles was determined by **proportionate sampling technique** based on the households' size of the sample kebeles.

2.3. Sample Size Determination

The required total respondents were determined using the formula by Cochran (1963) for infinite population (infinite population ≥ 50,000)**.**

$\mathbf{N_o = \underline{Z^2pq}/e^2}$

Where $N_{o=}$ required sample size

$\mathbf{Z^2}$ =is the abscissa of the normal curve that cuts off an area at the tails (1-α) (95%=1.96)

e = is the margin of error (eg. ±0.05% margin of error for confidence level of 95%)

p = is the degree of variability in the attributes being measured refers to the distribution of attributes in the population

q= 1-p.

$\mathbf{N_o = \underline{Z^2pq}/e^2} = [(1.96)^2 \text{ x } (0.5)\ (0.5)]/\ (0.05\text{x}0.05) = [3.8416 \text{ x}0.25]/\ (0.0025) = 0.9604/0.0025 = 385$ farmers

The numbers of respondents (farmers) per single selected kebele were determined by proportionate sampling technique as follows:

$\mathbf{W = [A/B] \text{ x } N_o}$, where **A**=Total number of households (farmers) living per a single selected kebele, **B**= Total sum of households living in all selected sample kebeles and $\mathbf{N_o}$ = the total required calculated sample size

2.4. Data Collection

Data on household characteristics, constraints and opportunities of village chicken productions and common diseases and predators were collected through individual interview using pretested well structure questionnaire and this was augmented with one focused group discussion per each agro-ecology with 10-12 discussants per each group.

2.5. Statistical Analysis

The qualitative household characteristics were analyzed using descriptive statistics of frequency procedures and cross-tabulation of SPSS version 16(2007). The **Kruskal-Wallis Test** option of the **non-parametric tests** of **SPSS** was employed to test the effects of the agro-ecology on the proportion of each qualitative survey data.

2.6. Ranking of Poultry Production Constraints and Common Poultry Diseases:

Identified village chicken productions constraints and opportunities during the individual interviews were prepared into separate flip charts and presented to each group for rating them according to their order of importance. Symptoms of each poultry disease were identified during individual interview of the survey. Every identified symptom was translated in to its respective common name based on the case book records of poultry diseases in the Animal Health Clinics of each agro-ecological zone of the study area. This was done with greatest involvement of the experienced veterinarians of Animal health clinics in each agro-ecological zone of the Zone. Upon translation, the common poultry diseases were presented to the established Focused group discussion members of each agro-ecology of the zone for ranking.

The rank of constraints and common poultry diseases from individual respondent obtained through direct interview in the survey was analyzed using Ranking index**:**

Index =Sum (n x number of HHs ranked first) + (n-1) x number of HHs ranked second + (n-2) x number of HHs ranked third +…+ 1xnumber of HHs ranked last) for one factor divided by the sum of (nxnumber of HHs ranked first+ (n-1) x number of HHs ranked second+…. +1x number of HHs ranked last) for all factors, and where n=number of factors under consideration. The variable with the highest index value is the highest economically important (Kosgey 2004).

3. Result and Discussion

3.1. Household Characteristics of the Respondents:

Overall, 83.4% of the total respondents were male headed while the remaining 16.6% of the respondents were

female headed households (Table 1). There was no variation with respect to the proportion of both sexes of the respondents across all agro-ecologies. However, the proportions of male headed households (80%, 86.3% and 85.1%) were higher than female headed house households (20%, 13.7% and 14.9%), respectively, in lowland, midland and highland agro-ecologies of the study area. However, contrasting results have been reported from Gomma district of Jimma zone (Meseret 2010), North West Ethiopia (Halima 2007) and Ada'a and Lume districts of East Shewa of Ethiopia (Tadesse *et al*. 2013) that the proportions of females (70%, 74.16% and 65.6% & 70%) were higher than males (30%, 25.84%, and 34.4%& 30%) headed households, respectively.

The result revealed that 97.1% of the total interviewed households were farmers where as the remaining 0.8%, 1.8% and 0.3% of the respondents were merchants, government workers and carpenters, respectively in the study area. Proportions of the respondents' occupations had no differed among agro-ecologies. However, highest proportions of the respondents were engaged in farming activities as a means of their livelihood in all agro-ecologies. Similar results have been reported from Gomma district of Jimma zone by Meseret (2010).

The analysis for educational status of the respondents disclosed that 41.3% of the respondents were illiterate while 24.4% of them were found to be capable of reading and writing in the study area. About 15.3%, 11.4%, 6.5% and 1% of the literate respondents had gone through primary first cycle (1 -4), primary second cycle (5-8), high school (9-12) and diploma program (12 +3), respectively. The proportions of the educational status of the respondents were significantly varied across agro-ecologies. The proportions of illiterate respondents in the lowland (34.4%) were lower than in midland (48.9%) and highland (42.6%). This indicates that households have better access to educational services as compared with either of the agro-ecologies. Generally; the highest proportions of the respondents were illiterate in each agro-ecology. Educational status identified under the current study was much better than illiterate (82.12%) reported from North West Ethiopia (Halima 2007). However, it was lesser than from those reported from Bure district of North West Ethiopia (Moges *et al*. 2010), Gomma district of Jimma zone (Meseret 2010) and both Ada'a and Lume districts of East Shewa of Ethiopia (Tadesse *et al*. 2013).

The result of the survey revealed that 93.5% of the total respondents were Orthodox Christian while the remaining 6.5% of them were Muslim in the study area. There were significant variations with respect to the proportions of respondents following different religious types among agro-ecologies. Higher proportions of Orthodox Christian followers were observed in lowland agro-ecology (97.5%) than in highland (92%) and midland (89.3%) agro-ecologies. However, higher proportions of Muslim followers were obtained from midland agro-ecology (10.7%) than from both highland (7.4%) and lowland (2.5%) agro-ecologies. In contrast, Meseret (2010) reported that 86.1% and 12.8% of the respondents were followers of Muslim and Orthodox Christian, respectively in Gomma district of Jimma zone. Dawit (2010) also reported fairly similar proportion of Orthodox Christian followers (99%) and Muslim followers (1%) Atsbi-Wonberta wereda but dissimilar proportions of both Orthodox Christian (75%) and Muslim (25%) followers in Alamata Wereda of Tigray region.

The analysis for the marital status of the respondents revealed that 82.1% of the total interviewed respondents were married where as the remaining 7%,10.6% and 0.3% of the respondents were divorced, widow/widower and unmarried , respectively in the study area. Proportions of the respondents' marital status were not varied across agro-ecologies. The occurrences of married respondents under the current study (82.1%) was lower than from the result reported from Gomma wereda of Jimma zone (97.2%) (Meseret 2010) and from western Amhara administrative region (90.3%) (Worku *et al*. 2012) but higher than from frequency of married respondents reported from selected chagni town, Awi-Administrative zone of Amhara region (71%) (Ayalew & Adane 2013).

The result also disclosed that the average age of the households in both midland (47.92±12.09 years) and lowland (47.46±12.3 years) was significantly higher than highland agro-ecology (42.95±10.82 years) (Table 1). Generally, the average age of the households in the study area was 46.51±12.05years. . This result is much higher than the 36.9 and 37.7 years reported by Tadesse *et al* (2013) in Ada'a and Lume districts of East Shewa, respectively. It was also slightly higher than 41.02, 40.86 and 43±10.9 years reported by Solomon et *al* (2013), Moges *et al* (2013) and Worku *et al* (2012) in Metekel zone of Northwest Ethiopia, Bure district of North West and west Amhara region of Ethiopia, respectively.

The mean family size with age of less than or equal to 14 years (younger unproductive age) in the midland (2.29±1.58) was significantly higher than from lowland (1.93±1.31) but not from highland agro-ecology (2.22±1.37). Similarly, the mean family size in the productive age category (≥15 and ≤ 60 years) was not significant different among the agro-ecological zones of the Zone. The mean family size in the older unproductive age category (> 60 years) in midland (0.26±0.97) did not statistically different from low land (0.13±0.39) but significantly greater than from highland agro-ecology (0.04±o.25). Overall, the average family size in the younger unproductive age (≥14 years age), productive age category (≥15 and ≤60 years age) and older unproductive age category (>60 years) was 2.12±1.43, 3.79±2.00 and 0.15±0.64, respectively in the study area.

Regardless of the age category, the mean of total family size in the midland agro-ecology was 6.40±2.55 which was significantly different from lowland (5.67±2.12) but not from highland agro-ecology (6.06±2.38). In

general, the mean of total family size in the study area was 6.01±2.35. This result is higher than the average family size (4.02) per household, reported by Solomon *et al* (2013) in Metekel zone of Northwest Ethiopia but comparable with the findings of both Worku *et al* (2012) and Moges *et al* (2013) who reported that 6.0±2.00 and 6.19±2.17 was the average family size in West Amhara region and Bure district of North West Ethiopia, respectively.

3.2. Constraints of Village Chicken Production

The results from both Focused group discussion and respondents' interview revealed that disease and predators were the first and second main constraints that devastating chicken productivity in the study area (Table 2). Pertaining to constraints of agro-ecological zone wise, disease and predators were the first and second chicken production constraints in all lowland, midland and highland agro-ecological zones of the study area. However, weak extension support was the third poultry production constraint in lowland agro-ecology (Table 2) whereas capital scarcity was the third most important chicken production constraints in both midland and highland agro-ecological zones of Western Tigray (Table 2). Comparable results have been reported from Rift valley of Oromia by Hunduma *et al* (2010) which stated that disease, predators, lack of proper health care, poor feeding; poor marketing information and replacement of indigenous chickens by exotic chickens were found to be major barriers of chicken production. In the same way, Bogale (2008) also reported that diseases (48.6%) and shortage of supplementary feeds (19.4%) were the most important chicken production constraints in Fogera District. In other study, diseases and predators were the first and second major constraints that cause loss of chickens in North West Ethiopia (Halima 2007).Addisu *et al* (2013) had also recently reported that diseases (60.13%), feed shortage (20.59%), predators or theft (19.8%) were the most economically important constraints of chicken production in North Wollo zone of Ethiopia. A study conducted in Mekele zone of North West Ethiopia also revealed that seasonal outbreak of diseases and predators were major factors that cause loss of chickens, and lack of credit services, limited skill of management practices and low productivity of local chickens were outlined as major constraints of chicken production (Solomon et *al*. 2013). The result of a survey carried out in Northern Gondar of Amhara Regional state of Ethiopia also disclosed that diseases(1^{st}), predators (2^{nd}), shortage of supplementary feeds(3^{rd}), poultry housing problems(4^{th}) and lack of veterinary health services (5^{th}) were the most important constraints of village chicken production under urban system (Wondu *et al*. 2013). This result also fairly similar with the reports of Mapiye *et al* (2008) in Zimbabwe which indicated that shortage of feed, poor health and housing management, and socio-economic constraints (lack of markets, poor marketing management, poor infrastructural and institutional support) were the main factors that hampered village chicken productivity. It also somewhat corroborates the findings of Tadelle and Ogale (2001) who reported that diseases, scarcity of extension service, predators and parasites were the most serious constraints of village chicken production in the highland agro-ecology (Derek Wonz) while diseases and scarcity of extension services were outlined as most serious constraints of village chicken production in both midland (Gende Gorba) and lowland (Awash) agro-ecological zones of the Centeral highlands of Ethiopia. Likewise, Solomon *et al* (2013) reported that seasonal disease outbreak (mainly Newcastle disease), predators, lack of credit services, limited skill of management practices (improved feeding and housing) and low productivity of local chickens were the major identified constraints of village chicken production in Metekel zone of Northwest Ethiopia . Ayalew and Adane (2013) also reported comparable results in selected Changni town in Awi- administrative zone of Amhara region in which poultry diseases, inadequate veterinary and extension services and high feed costs were the major constraints affecting village chicken production in the area. In the same way, Nkululeko (2013) also reported that outbreak of diseases, predators, theft, shortage of feed and housing problems at night were the major challenges of poultry farming in the Zhombe communal lands of Zimbabwe. Kingori *et al* (2010) also reported that low genetic potential of genotypes; poor nutrition, diseases and improper management were the critical challenges of village poultry production in Kenya. Fairly similar results have also been reported from three agro-ecological zones (Coastal Savannah, Rainforest and Guinea savannah) of Ghana by Hagan *et al* (2013) in which diseases (notably Newcastle disease), predators and theft were found to be the main causes of loss of birds or reduction in chicken flock size.

However, Worku *et al* (2012) reported slightly different findings in which predators (97.6%) as primarily and diseases (2.4%) as secondary major constraints of village chicken production in West Amhara Region of Ethiopia. Contrasting results have been also reported from Mid Rift Valley of Oromia by Samson and Endalew (2010) in which predators (birds of prey, cats and dogs and wild animals)(65.3%), diseases(34%) and accident (0.7%) were the largest threat to village chicken production in the area.

3.3. Diseases and Predators

The survey also revealed that both diseases and predators are highly prevalent in the study area (Table 3). The results of both respondents 'interview ranking indices and Focused discussion groups revealed that Newcastle disease(1^{st}), fowl salmonella (2^{nd}), coccidiosis(3^{rd}), fowl typhoid (4^{th}), fowl cholera (5^{th}), fowl pox (6^{th}) and fowl

coryza (7th) were the major and economically important diseases that hinders the expansion of village chicken production in the study area (Table 3). Specifically, Fowl salmonella (1st), Newcastle disease (2nd), coccidiosis (3rd), fowl typhoid (4th), fowl cholera (5th), fowl pox (6th) and fowl coryza (7th) were the main prevalent diseases in lowland agro-ecology (Table 3). On the contrary, Newcastle disease (1st), fowl salmonella (2nd), coccidiosis (3rd), fowl typhoid (4th), fowl cholera (5th), fowl pox (6th) and fowl coryza (7th) were the most economically important poultry diseases in the midland agro-ecology (Table 3) while newcastle disease (1st),coccidiosis (2nd), fowl salmonella (3rd), fowl typhoid(4th), fowl cholera (5th), fowl pox(6th) and fowl coryza(7th) were the main prevalent poultry diseases in the high agro-ecology(Table 3). Likewise, Meseret (2010) reported that Newcastle disease (34.42%), infectious bronchitis (27.92%), infectious bronchitis and external parasites (25.97%) and coccidiosis (11.69%) were the most economically important poultry diseases in Gomma wereda of Jimma zone. Similar results have been reported from Fogera district (Bogale 2008) and rift valley of Oromia (Hunduma *et al*. 2010) that newcastle disease (Fengil) was found to be the most economically important poultry disease in both areas. Besides, Mazengia (2012) also reviewed that Newcastle diseases, infectious bursal disease and Marek's diseases become serious threats to poultry production in Ethiopia. In Nigeria, Adedeji *et al* (2014) also reported that coccidiosis and Newcastle disease were the major diseases affecting poultry keeping in Ilesha west local government area of Osun state. In the same way, Zahradden *et al* (2010) also reported that disease outbreak was the major militating factor against poultry production and high cost of feeds as well as the cost of diseases treatments were also limiting factors in the poultry production. Among the diseases, fowl pox (17.6%), fowl cholera (17.6%), Gumboro (11.8%), Newcastle disease (23.5%), fowl typhoid (23.5%) and coccidiosis (5.9%) were the reported causes of disease incidences among farmers in the Taraba state of Nigeria.

Fentie *et al* (2013) also recently reported that poor health care, incidence of predation, poor housing and feeding management were the major constraints of village chicken production of which poultry diseases (46.2%) and predation (27.1%) were the most predominant causes of chicken loss .New castle disease was the biggest constraints of family chicken production in North Gondar of Northwest Ethiopia.

Prevalence of predators was the second pronounced constraints of village production in the study area. The results of both individual interview and focused group discussion showed that birds of prey (Black kite, Milvus migrans locally known "Shilla" and Augur buzzard, Bueteo rufofuscus, locally known as "Chilfit"), the Abyssinian Genet, Genetta Abyssinica locally known as "Silhlohot"), Abyssinian cat locally called "Mutsu"), domestic cats, dogs,Snakes and rats (locally called"AnchiwaEimer") were the most commonly important predators that cause losses of village chickens in the study area even if their prevalence rates vary across the agro-ecological zones. This is somewhat similar with the findings of Hunduma *et al*. 2010) revealed that birds of prey locally called "Culullee" (34%), cats and dogs(16.3%) and wild animals (15%) were identified as the major causes of village chicken mortality in Oromia Rift Valley of Ethiopia. Mekonnen (2007) also reported that snakes, rats, dogs, cats and foxes were main predators that caused losses especially in young birds in Dale, Wonsho and Loka Abaya weredas of SNNPRs. Likewise, Aberra (2000) also reported that wild birds (eagle, hawk, etc) and wild cat (locally called "Shelemetma") were the most common chicken predators during the dry and rainy seasons, respectively in the southern part of Ethiopia.

3.4. Household Experience of Poultry Disease and Sources of Chicken Infection

The Survey indicated that there was insignificant variation with regard to the proportions of households with serious disease outbreak experiences among the agro-ecologies (Table 4). Generally, 99% of the total households interviewed had experience of serious disease outbreak and they recognized sick birds through observing symptoms of the poultry disease while the remaining 1% of them hadn't experience of serious disease outbreak. On the contrary, proportions of respondents who practiced different techniques of treating sick birds differed across agro-ecologies. Highest proportions of households treated their sick birds by themselves either by purchasing drugs from private clinics or traditional treatments in lowland (84.4%) as compared with both midland (66.4%) and highland (68.1%) agro-ecological zones of the study area. However, greatest proportions of respondents called in either veterinarians or development agents for treating the sick birds in midland (23.7%) in comparison with both highlands (22.3%) and lowland (14.4%) agro-ecologies. Overall, 74.3% of the respondents treated their sick chickens by themselves followed by called in either veterinarians or development agents (19.5%), cull/kill them immediately (0.3%) and slaughter them immediately for home consumption (0.5%) while 4.4% of them did nothing for treating chickens when their chickens become sick. This result is somewhat comparable with the findings of Meseret (2010) in Gomma Wereda of Jimma zone in which (36.7%) of the farmers treated sick birds by themselves followed by sell them all immediately (30.6%), slaughter them for home consumption and sell them all immediately(20.6%) and slaughter them for home consumption (12.2%).

No significant variations were observed with respect to the proportions of households who practiced either of the two techniques of managing dead birds (throwing and burying) across the agro-ecologies. In general, 91.2% of the respondents threw away dead chickens in and around their backyards which are accessible to pet animals (cat, dogs), wild cats (Mutsu), wild birds and other live chickens while they are scavenging / searching

feeds. As a result, there may be a contamination of both waterers and feeders by either of pet animals or wild predators which may serve as a means of disease/ infection/ transmission among wild and domestic chickens, wild/domestic predators and domestic chickens. Only 8.8% of the total respondents had practiced burying of dead chickens with the perception of minimizing disease transmission among domestic chickens and pet animals to domestic chickens and keeping the sanitation of both family dwelling and backyards properly. This result is in agreement with that of Meseret (2010) who reported that 91.1% of the respondents threw away dead chickens in Gomma wereda of Jimma zone. Similarly, Nebiyu *et al* (2013) reported that farmers offered dead chickens to pet animals (83.6%) and burying (16.4%) as a means of dead birds disposal in Halaba district of Southern Ethiopia

The households responded that the sources of chickens' infections were either of chickens from market (26.2%), chickens from neighbors (2.9%) ,both chicken from market and neighbors (2.3%), contaminated feeds (dead chicken body and same waterers used pet animals, wild birds and domestic chicken)(1%), fluctuations of temperature and cold (0.5%), both chickens from market and contaminated feeds(1%) and dirty poultry house and non-chemical spraying properly (0.5%) while the remaining 64.7% of the respondents replied that chickens 'infections arose unknowingly. Similarly, Bogale (2008) also reported that incoming flock (chicken from market) (51.4%), own flock (37.5%) and flocks from neighbors (20.8%) were found to be major sources of chicken infections in Fogera district.

3.5. Opportunity of Village Chicken Production

Feed access was outlined as an opportunity of village chicken production in the study area during both the Focused group discussion and individual interview of the survey. Because the zone as a whole and the lowland in particular is the Center of mechanized Agriculture investment area in Tigray region. Besides, there are several private organizations (Guna private organization, Hiwot Mechanization Private Organization, Warka Trading Private Company & Sesame Hauling Private Company) have engaged in production and processing of cash crops particularly Sesame and cotton for instance refining and exporting sesame and processing and extraction of edible oil from cotton seed . This indirectly increases the availability of cotton seed cake and sesame refining left over as protein supplementary feeds with affordable prices for chicken in particular and in general livestock producers in the area. In addition to these, all investors engaged in Agriculture have been producing sesame and sorghum in mechanized way and larger scale.

Market access is also cited as another pronounced opportunity of village chicken production in the study area. Since the study area shares borders with Sudan in West and Eritrea in the North which increase the marketing opportunity for village chicken producers to sell their chicken products with better price. Moreover, the lowland agro-ecology of the zone is the center of investment zone and in particular Kafta Humera is the center of Sesame investment zone. Due to this fact, different investors from different corners of Ethiopia as well as from Sudan, Eritrea, Nigeria and Senegal are engaging in different investment areas of the study area.

Drinking water access for all human and livestocks as well as for irrigation is another opportunity for sustainable livestock productivity in the zone. Tekezze, Kazza and Bahireselam are the three main rivers used for all purposes. **Diversified agro- ecological zones of the zone** is another opportunity for genetic improvement of indigenous chicken populations. Because diversified agro-ecological zones is an indicator for the existence of different livestock populations with diversified phenotypic performances and high genetic variability.

Ease management of village chicken production in relation to large livestock is also considered as opportunity for the growth development of village chicken production. Indigenous chickens are reared with low inputs and managed by every family member from children to very old persons. Chickens are considered as poor man's bank/immediate source of income for any duties/ by small scale farmers in the study area because they have short generation interval in comparison to other livestock species. A man with a chicken is considered as a man who deposited money in a bank. This result corroborates the findings of Melkamu and Wube (2013) in which market access (36%), credit service (28%), feed access (20%) and training and extension (16%) were the opportunities of village chicken production in Debsan Tikara kebele at Gonder Zuria woreda, North Gonder of Ethiopia.

4. Conclusion

The result of the survey revealed that village chicken fulfills many roles in the livelihood of small scale farmers**.** The productivity of village chicken remains below the expected because of different prevailing constraints. Diseases (1^{st}), predators (2^{nd}), capital scarcity (3^{rd}), weak extension support (4^{th}), lack of veterinary services (5^{th}), land scarcity (6^{th}), lack of credit services (7^{th}), lack of poultry market place(8^{th}), lack of road access for poultry product transportation(9^{th}), labor scarcity(10^{th}), lack of market oriented improved chicken breeds(11^{th}) and theft or poor housing(12^{th}) were the major constraints that hampered chicken productivity in the study area. Among the diseases, Newcastle disease (1^{st}), salmonella (2^{nd}) and coccidiosis (3^{rd}) were the major economically important diseases that hindered village chicken production. On the other hand, market access, feed access, drinking water access, diversified agro-ecological zones and ease management of village chickens were the

pronounced major opportunities of village chicken production in the study area. Technical and institutional interventions from concerned bodies are very imperative to lessen the prevailing constraints and to uplift their productivity together with designing, planning and implementing community based and agro-ecologically friendly holistic breeding and production improvement programmes in order to ensure sustainable improvement, utilization and conservation of the identified opportunities and the indigenous chicken genetic resources as whole.

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Table 1: Demographic Characteristics of Households (% of respondents)

Household characteristics	Agro-ecological zones				X^2-test	P - value
	High (n=94)	Mid (n=131)	Low (n=160)	Total (N=385)		
Sex of households					2.299(ns)	0.317
Male	80(85.1)	113(86.3)	128(80)	321(83.4)		
Female	14(14.9)	18(13.7)	32(20)	64(16.6)		
Household occupation					5.459(ns)	0.065
Farmer	89(94.7)	126(96.2)	159(99.4)	374(97.1)		
Merchant	-	2(1.5)	1(0.6)	3(0.8)		
Government worker	4(4.2)	3(2.3)	-	7(1.8)		
Carpenter	1(1.1)	-	-	1(0.3)		
Educational status					6.126(*)	0.047
Illiterate	40(42.6)	64(48.9)	55(34.4)	159(41.3)		
Read and write	21(22.3)	31(23.7)	42(26.3)	94(24.4)		
1^{st} -4^{th}	15(16)	15(11.5)	29(18.1)	59(15.3)		
5^{th} -8^{th}	9(9.6)	14(10.7)	21(13.1)	44(11.4)		
9^{th} -12^{th}	6(6.4)	6(4.6)	13(8.1)	25(6.5)		
12 +3	3(3.2)	1(0.8)	-	4(1)		
Religion of households					8.116(*)	0.017
Orthodox	87(92.6)	117(89.3)	156(97.5)	360(93.5)		
Muslim	7(7.4)	14(10.7)	4(2.5)	25(6.5)		
Marital status of households					3.058(ns)	3.058
Married	80(85.1)	111(84.7)	125(78.1)	316(82.1)		
Divorced	7(7.4)	7(5.3)	13(8.1)	27(7)		
Widow /widower	7(7.4)	13(9.9)	21(13.1)	41(10.6)		
unmarried	-	-	1(0.6)	1(0.3)		
Age (years)	42.95 ± 10.82^{b}	47.92 ± 12.09^{a}	47.46 ± 12.35^{a}	46.51±12.05		
≤14 years	2.22 ± 1.37^{ab}	2.29 ± 1.58^{a}	1.93 ± 1.31^{b}	2.12±1.43		
≥15 and ≤ 60	3.81 ± 2.09^{a}	4.02 ± 2.20^{a}	3.59 ± 1.75^{a}	3.79±2.00		
> 60 years	$0.04\pm o.25^{b}$	0.26 ± 0.97^{a}	0.13 ± 0.39^{ab}	0.15±0.64		
Total Family size	6.06 ± 2.38^{ab}	6.40 ± 2.55^{a}	5.67 ± 2.12^{b}	6.01±2.35		

* ($p<0.05$) or significant at p (0.05), ns ($p>0.05$) or insignificant at p (0.05) & n=number households interviewed.

Table 2: Poultry production constraints in three agro-ecological zones of Western zone of Tigray

Lowland agro-ecology													
Factors	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Index
Disease	123	37	1	0	0	0	0	0	0	0	0	0	0.151
Predators	28	95	27	6	4	0	0	0	0	0	0	0	0.140
Capital scarcity	5	22	19	5	12	26	18	31	19	3	0	0	0.093
Lack of credit services	0	0	0	18	20	37	41	30	12	2	0	0	0.082
Labor scarcity	0	0	0	0	0	4	2	1	24	37	92	0	0.035
Lack of market place	0	0	0	24	20	28	47	29	12	0	0	0	0.084
Weak extension support	0	0	37	52	53	18	0	0	0	0	0	0	0.111
Lack of veterinary services	0	0	62	50	43	5	0	0	0	0	0	0	0.116
Land scarcity	4	6	15	5	8	21	43	57	1	0	0	0	0.085
Lack of road access for poultry product trans.	0	0	0	0	0	14	5	5	68	68	0	0	0.050
Lack of market –oriented improved breed (s)	0	0	0	0	0	7	4	7	24	50	68	0	0.039
Theft or poor housing system	0	0	0	0	0	0	0	0	0	0	0	160	0.013
Poultry production constraints in **midland** agro-ecology of Western zone of Tigray													
Disease	91	34	6	0	0	0	0	0	0	0	0	0	0.149
Predators	26	83	22	0	0	0	0	0	0	0	0	0	0.141
Capital scarcity	10	12	35	55	4	15	0	0	0	0	0	0	0.121
Lack of credit services	0	0	0	0	17	20	31	30	31	2	0	0	0.073
Labor scarcity	0	0	0	0	1	0	0	6	9	66	49	0	0.036
Lack of market place	0	0	0	0	13	20	20	28	30	19	1	0	0.067
Weak extension support	0	0	28	22	35	30	15	0	0	1	0	0	0.104
Lack of veterinary services	0	0	40	48	42	1	0	0	0	0	0	0	0.115
Land scarcity	4	2	0	6	5	24	33	33	24	0	0	0	0.077
Lack of road access for poultry product trans.	0	0	0	0	14	21	32	32	28	4	0	0	0.072
Lack of market –oriented improved breed (s)	0	0	0	0	0	0	0	2	9	39	81	0	0.032
Theft or poor housing system	0	0	0	0	0	0	0	0	0	0	0	131	0.013

*R1, R2, and R3…R12=Rank 1, 2, 3…12, respectively; and Index=Sum of (12 for Rank1+11 for Rank2+…+1for Rank12) given for an individual factor divided by the sum of (12 for Rank 1+ 11 for Rank 2+…+ 1 for Rank 12) for overall factors.

Table 2 (Continued)

Highland agro-ecology													
Traits	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Index
Disease	66	20	8	0	0	0	0	0	0	0	0	0	0.149
Predators	18	66	10	0	0	0	0	0	0	0	0	0	0.142
Capital scarcity	8	7	20	38	3	14	3	0	0	1	0	0	0.117
Lack of credit services	0	0	0	0	16	14	21	21	21	1	0	0	0.074
Labor scarcity	0	0	0	0	0	0	0	10	2	50	32	0	0.037
Lack of market place	0	0	0	1	10	18	13	18	23	11	0	0	0.069
Weak extension support	0	0	18	19	18	27	11	1	0	0	0	0	0.103
Lack of veterinary services	0	0	38	27	29	0	0	0	0	0	0	0	0.117
Land scarcity	2	1	0	9	11	5	28	16	22	0	0	0	0.078
Lack road access for poultry product trans.	0	0	0	0	7	16	18	26	25	2	0	0	0.070
Lack of market –oriented improved breed (s)	0	0	0	0	0	0	0	2	1	29	62	0	0.031
Theft or poor housing system	0	0	0	0	0	0	0	0	0	0	0	94	0.013
zone wise poultry production constraints in Western Tigray													
Disease	280	91	14	0	0	0	0	0	0	0	0	0	0.1561
Predators	72	244	59	6	4	0	0	0	0	0	0	0	0.1465
Capital scarcity	23	41	74	98	19	55	21	31	19	4	0	0	0.1129
Lack of credit services	0	0	0	6	53	34	93	81	64	5	0	0	0.0676
Labor scarcity	0	0	0	0	1	4	2	17	35	153	173	0	0.0374
Lack of market place	0	0	0	7	43	38	80	75	65	30	1	0	0.0652
Weak extension support	0	0	83	93	106	75	26	1	0	1	0	0	0.1111
Lack of veterinary services	0	0	140	81	114	1	0	0	0	0	0	0	0.1057
Land scarcity	10	9	15	20	24	50	104	106	47	0	0	0	0.0844
Lack of road access for poultry product trans.	0	0	0	6	21	37	55	63	121	74	0	0	0.0635
Lack of market –oriented improved breed (s)	0	0	0	0	0	7	4	11	34	118	211	0	0.0361
Theft or poor housing system	0	0	0	0	0	0	0	0	0	0	0	385	0.0134

*R1, R2, and R3…R12=Rank 1, 2, 3…12, respectively; and Index=Sum of (12 for Rank1+11 for Rank2+…+1for Rank12) given for an individual factor divided by the sum of (12 for Rank 1+ 11 for Rank 2+…+ 1 for Rank 12) for overall factors.

Table 3: Ranking of common poultry diseases in three agro-ecological zones of Western Tigray

Name of disease	Symptoms	R1	R2	R3	R4	R5	R6	R7	Index
Lowland agro-ecology									
Fowl salmonella	Yellowish green droppings(diaharia)	97	14	8	20	18	0	2	0.218
Newcastle disease	Upward neck erection, diaharia, unable to move, dullness	40	82	17	13	5	2	0	0.215
coccidiosis	Reddish diaharia, loss of appetite	0	33	74	25	11	15	1	0.170
Fowl typhoid	Loss of appetite ,thirsty ,yellowish diaharia, respiratory difficulty	19	8	17	58	48	9	0	0.153
Fowl cholera	Greenish diaharia, discharge from eye, swelling of wattle	2	10	32	34	68	11	2	0.107
Fowl coryza	Face swelling ,discharge from mouth and noise	1	0	0	0	6	100	52	0.063
Fowl pox	Swelling of eye, become blind, highly communicable	0	12	11	9	3	22	102	0.074
Midland agro-ecology									
Fowl salmonella	>>	56	3	32	10	22	4	0	0.192
Newcastle disease	>>	57	56	5	3	4	2	0	0.222
coccidiosis	>>	0	34	51	20	5	14	3	0.165
Fowl typhoid	>>	3	21	7	39	30	27	0	0.136
Fowl cholera	>>	4	3	26	25	60	9	0	0.133
Fowl coryza	>>	0	0	0	0	5	53	69	0.053
Fowl pox	>>	7	10	6	30	1	18	55	0.099
Highland agro-ecology									
Fowl salmonella	>>	19	2	29	11	27	3	1	0.164
Newcastle disease	>>	61	26	2	0	1	2	0	0.233
coccidiosis	>>	0	38	15	25	2	10	2	0.167
Fowl typhoid	>>	5	23	8	16	7	33	0	0.141
Fowl cholera	>>	3	1	28	9	48	1	2	0.136
Fowl coryza	>>	0	1	1	1	3	32	54	0.055
Fowl pox	>>	4	1	9	30	4	11	33	0.103
Zone wise									
Fowl salmonella	>>	172	19	69	41	67	7	3	0.193
Newcastle disease	>>	158	164	24	16	10	6	0	0.219
coccidiosis	>>	0	105	140	70	18	39	6	0.165
Fowl typhoid	>>	27	52	32	113	85	69	0	0.142
Fowl cholera	>>	9	14	86	68	176	21	4	0.134
Fowl coryza	>>	1	1	1	1	14	185	175	0.058
Fowl pox	>>	11	23	26	69	8	51	190	0.089

*R1, R2, and R3…R10=Rank 1, 2, 3…10, respectively; and Index=Sum of (10 for Rank1+9 for Rank2+…+1for Rank10) given for an individual disease divided by the sum of (10 for Rank 1+ 9 for Rank 2+…+ 1 for Rank 10) for overall diseases.

Table 4: Households' Experiences with regard to poultry diseases

Variable	Agro- ecological zones				X^2-test value	p-value
	Highland n (%)	Midland n (%)	Lowland n (%)	Total n (%)		
Do you experience serious disease outbreak?					0.569(ns)	0.752
Yes	93(98.9)	129(98.5)	159(99.4)	381(99)		
No	1(1.1)	2(1.5)	1(0.6)	4(1)		
How do you recognize sick birds?					0.00(ns)	1.00
By observing symptoms	93(98.9)	129(98.5)	159(99.4)	381(99)		
What do you do when the birds are sick?					15.776(*)	0.000
Treat myself	64(68.1)	87(66.4)	135(84.4)	286(74.3)		
Call in veterinarians /development agent /	21(22.3)	31(23.7)	23(14.4)	75(19.5)		
Cull / kill them all immediately	1(1.1)	-	-	1(0.3)		
Slaughter them all immediately for home consumption	1(1.1)	1(0.8)	-	2(0.5)		
I do nothing	6(6.4)	10(7.6)	1(0.6)	17(4.4)		
What do you do with dead birds?					2.092(ns)	0.351
Throwing	89(94.7)	119(90.8)	143(89.4)	351(91.2)		
Burring	5(5.3)	12(9.2)	17(10.6)	34(8.8)		
Do your chickens scavenge mixed with your neighbors?					1.858(ns)	0.395
yes	88(93.6)	123(93.9)	144(90)	355(92.2)		
no	6(6.4)	8(6.1)	16(10)	30(7.8)		
Sources of chickens ' infection					4.301(ns)	0.116
chickens from market	19(20.2)	44(33.6)	38(23.8)	101(26.2)		
Chickens from neighbors	-	2(1.5)	9(5.6)	11(2.9)		
Chickens from both market & Neighbors	-	2(1.5)	7(4.4)	9(2.3)		
Contaminated feed (dead chicken body) & use the same water drinking containers with wild birds ,cats, dogs	1(1.1)	2(1.5)	1(0.6)	4(1)		
Fluctuations of temperature & coldness	-	1(0.8)	1(0.6)	2(0.5)		
chickens from market & contaminated feed	-	-	4(2.5)	4(1)		
Dirty poultry house & non-chemical spraying properly	-	1(0.8)	1(0.6)	2(0.5)		
Unknown	73(77.7)	77(58.8)	99(61.9)	249(64.7)		

* ($p<0.05$), ns ($p>0.05$) and n=number of respondents interviewed per agro-ecology

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