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**Study on assessment of constraints,
opportunities and waste management of village
poultry production system in and around
Gerado, South Wollo Ethiopia**

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Abstract

Village poultry production system supports the lives of millions of people in Ethiopia. However, the productivity of village poultry has been limited by different critical constraints. A questioner survey study was carried out to assess the constraints, opportunities and waste management of village poultry production in and around Dessie from February 2021 to April 2022 on five selected kebeles. Simple random probability sampling method was employed to select 220 household. The data was collected through household investigation and personal interview using standard, semi-structured open and closed-ended questionnaires. Regarding to housing system of village poultry, majority of the respondents' constructed separate house for their poultry were (47.3%). In the current study, health measurement of the respondents taken during disease outbreak revealed that 21.4% of the respondents treat their chicken by traditional medicine, 25% of the respondents consult a veterinarian, 22.3% sell their chicken and majorities (31.4%) of the respondents do nothing. In this study the common predators were assessed and the finding reveals that 21.4% are cats and 28.2%--- are vultures. 71.8% of the respondents' access markets and 77.3% do not access extension services. Results on management of dead chicken showed that 39.1% of the households discard dead chicken for use as feed for domestic carnivores while 36.8% discard dead chicken by throwing on the ground. The critical constraints in the study areas were (lack of adequate vaccination (34.8%), disease (25.9%), lack of adequate veterinary service (18.6%), housing, lack of adequate feed and clean water (9.5%), market constraints (6.4%) and predation (4.8%). The

use of dead chicken as a source of feed for domestic carnivorous animals (39.1%) and throwing on the ground (36.6) and sharing of food materials with poultry were also implicated in the area. Therefore, to improve productivity, there should be proper daily management (feeding, watering and housing), regular training, provision of adequate extension and veterinary services, vaccination scheduling, disease and predator control and construction of local markets.

Keywords: Constraints, Opportunities, Village poultry, Waste management

1. Introduction

The word "poultry" comes from the French/Norman word poule, itself derived from the Latin word pullus, which means small animal. The term poultry refers to all domesticated birds kept for the production of eggs and meat for human consumption including domestic fowl (chicken), turkeys, ducks, geese, guinea fowls, ostriches and others (David et al., 2015). Archaeological evidence suggests that domesticated chickens existed in China at least 8,000 years ago with subsequent spread to Western Europe and other parts of the world by land and by sea. Domestic chickens appeared in Africa many centuries ago; they are now an established part of African life (Hata et al., 2021).

Poultry is the largest livestock group in the world estimated to be about 23.39 billion consisting mainly of chickens, ducks and turkeys and has remained to be an important in the improvement of food security and livelihood and contributing to about 28-30% of all animal protein consumed in the world (Goraga et al., 2016). Global production of chicken meat has increased by 42% in the past decade from just fewer than 80 million metric tons in 2007 to 109 million in 2017 (Wind horst, 2017). China is by far the largest global egg producer accounting for 38% of the world's production in 2017 (Yang et al., 2018).

In Africa, poultry production has gradually grown over the past decades from a mainly backyard keeping system to a more professional and commercial poultry value chain. This is due to several factors which include the establishment of hatcheries, feed input suppliers, housing equipment, veterinary services and slaughtering facilities (Mujyambere et al., 2022). Indigenous breeds still contribute meaningfully to poultry

meat and egg production and consumption in majority of developing countries, where they make up to 90% of the total poultry population (Mujyambere et al., 2022).

In Ethiopia, the agricultural sector is a cornerstone system known to possess desirable characteristics such as the economic and social life of the people. Ethiopia is endowed with over 60 million poultry (Central Statistics Agency, 2020), of which 94.3% were indigenous chickens reared under village management system, while 3.21% and 2.49% were cross and exotic breeds respectively and were reared under intensive and semi-intensive management system (Alemayehu, 2017). An increase in population, urbanization and anticipated income growth in the World and Africa in general and in Ethiopia in particular is believed to influence the demand for foods of animal origin (Cockx et al., 2020).

The productivity of village poultry has been limited by the scarcity of feed, poor housing, availability of large numbers of predators, market constraints, poor veterinary service, and frequent occurrence of infectious disease (Negash, 2020). Native chickens are known for some of their uniqueness such as they are thermo resistant, resistant to some diseases, good egg and meat flavor, hard egg shell and their output can be generally expanded more rapidly and easily, good foragers, efficient mothers, and they require minimal care to grow. Compared to other animals, chickens have shorter generation interval and higher feed conversion efficiency, thus providing a cheap source of animal protein. Chicken meat is the most palatable and easily digestible animal meat and contains essential amino acids required for human beings, and eggs are richly endowed with nutrients (Lordelo et al., 2020; Dalle Zotte et al., 2020).

The most serious environmental concern in village poultry sector arises from the existing poor waste management and disposal of poultry carcasses practices. The by-products of poultry production are of high value if managed and recycled properly, regardless of flock size. Worldwide, there are several ways of disposing of poultry waste including; burial, burning, feed for livestock (as a feed) and as a fertilizer (Desta, 2021). Improper disposal of dead poultry carcasses on the ground is common in rural areas of many developing countries including Ethiopia. This can contribute to water-quality problems especially in areas prone to flooding (Gelli et al., 2019). Village poultry production adversely affects the environment in numerous ways either through poor management of manure and litter or anywhere disposal of dead chickens. As a result, environmental regulation is developing worldwide and village poultry producers have to comply with it (Seidavi et al., 2019).

Even if backyard poultry production supports the life of many farmers in and around Dessie, first, little attention was given to the development of the village poultry production system and there were limited documentations about the constraints opportunities and waste management of backyard poultry production. 'Therefore, the objectives of this study was; to assess the constraints, opportunities and waste management of village poultry production system in and around Dessie town.

2. Materials and Methods

2.1. Study Area

The study was carried from December 2022 to April 2023 on three purposively selected kebeles (Abaso, Dessie gerado, and Dessie bilen) household on constraints and opportunities of village poultry kept by farmers living in and around Dessie city. Dessie city is located in the Amhara Region and sits at a latitude and longitude of 11°8'N 39°38'E, with an elevation between 2,470 and 2,550 meters above sea level. Dessie is 400 km to the north of Addis Ababa the capital city of Ethiopia. It has a population of more

than 200,000 people in over 30 wards (Gabrielli et al., 2021). It is located in low-shrouded mountains and hills and has a subtropical highland climate, more to the east; it is characterized by a hot semi-arid climate. The area is characterized by its average high temperature during May and June which ranges from 24.50c and 25.30c respectively. The area has low temperature during November and December which is about 4.10c. Precipitation of the area is characterized by two distinct wet and dry seasons. The area receives its average highest and lowest rainfall during August and November which is about 283 mm and 20 mm respectively (Abegaz and Abera, 2020). These agro-climatic zones are inhabited with different plant and animal species. Crop-livestock mixed production system is the most important components of subsistence farming system in the study area and are assumed to be more valuable to assure food security of the community (Escarcha et al., 2018).

2.2. Sample Size Determination

The total households included in the study were determined according to the formula given by Cochran's formula (Cochran, 1965) (Tang et al., 2021);

Sample size = $Z^2 pq/e^2$, where n= Sample size and e= Standard error, q=(1-p) and p= proportion. By using the standard error of 0.13, proportion of 0.5 and 95% confidence level

$N = (1.96)^2 \cdot 0.5(1-0.5)/(0.13)^2 = 210$. Therefore, the data were collected from 210 households.

2.3. Study Design and Sampling Procedure

The survey study was carried out from February 2021 to September 2021. A total of five kebeles with different agro-ecological regions (BoruMeda, Hayiq, Kutaber, Dessie town, and Titta) were purposely selected. The selection of the kebeles was carried out based on the accessibility, easy of logistic and nearness to Dessie town. Simple random probability sampling method was employed to select a total of 220

household from all the kebeles and 44 households were selected from each kebele. During the study period, the respondents were selected based on rearing of chicken under village chicken production and willingness to participate in the survey.

2.4. Data Collection

The data was collected through household investigation and personal interview using standard, semi-structured open and closed-ended questionnaires. Primary data were collected from the direct observation and inspection of flock dynamics, housing and marketing, vaccination of flocks, feeding and watering practices of different poultry houses under the study areas. The hygienic practices of the poultry houses were observed carefully and the personnel were interviewed using standard, pre-tested, semi-structured open and closed-ended questionnaires about their knowledge concerning poultry management in their locality. The households were interviewed for methods of waste management and methods of discarding dead birds. The obtained data were analyzed in

accordance with the purpose of the study. Finally, Recommendations were forwarded based on the direct observation, respondents response and interview results.

2.5. Data Analysis

Collected data was summarized and entered into Microsoft excel spreadsheet and analyzed using statistical package for social science (Version, 21) and descriptive statistics such as percentage.

3. Results

3.1. Demographic Characteristics of the Respondents

The current findings revealed that out of 210 households, 46.7% of the respondents were males and the remaining 53.3% were females. The educational level of the respondents revealed that majority of the respondents had achieved illitrates by 35.7% followed by 26.2% primary educational level, 23.8% secondary educational level and 14.3% degree level (table 1).

Table 1: Demographic characteristics of the respondents

Risk factors	Catagories	Percent(%)
Sex	Male	98(46.7)
	Femal	112(53.3)
	Total	210(100)
Age	18-30	24(14.4)
	31-40	87(41.4)
	41-50	62(29.5)
	>50	37(17.6)
	Total	210(100)
Educational level	illitrate	75(35.7)
	Primary	55(26.2)
	Secondary	50(23.8)
	Degree	30(14.3)
	Total	210(100)

3.2. Chicken Breeds Reared

In this study 16.7%, 35.2% and 48.1% of the respondents responded that the source of chicken for their household were from agricultural office,

hatching at home and purchase from the market respectively. The result also showed that, 17.6%, 40.5% and 41.9% of the respondents were rearing exotic breeds, cross chicken breeds and local chicken breeds respectively (table 2).

Table 2: Chicken related characteristics

Variables	Catagories	Percent(%)
Sources of chicken	Agricultural office	35(16.7)
	Hatching at home	74(35.2)
	Purchase	101(48.1)
	Total	210(100)
Breed	Exotic	37(17.6)
	Hybrid	85(40.5)
	Local	88(41.9)
	Total	210(100)

3.3. Constraints of Poultry Production

3.3.1. Housing

The current study revealed that 28.1% of the respondents provide night shelter only, 46.2% of the respondents' constructed separate house, 11.9% and 13.8% housed with themselves and with other animals respectively. The findings also revealed that 42.9% of the respondents do not provide litter material while 57.1% of the

respondents provide litter material for their poultry flock where teff straw, wheat straw, and cotton waste were ranked from 1st, 2nd and 3rd in descending approach. In this study, the hygienic level of the poultry houses showed that 31.0% of the poultry houses were poor in their hygienic condition where as 43.3% of the poultry houses had moderate hygienic level and the left 25.7% of the poultry houses were in good hygienic conditions (table 3).

Table 3: Poultry housing

Variables	Catagories	Percent(%)
Types of housing	Night shelter only	59(28.1)
	Seperated poultry house	97(46.2)
	House with people	25(11.9)
	House with other animal	29(13.8)
	Total	210(100.0)
Types of litter materials	Not used litter material	90(42.9)
	Cotton	30(14.3)
	Teff straw	48(22.9)
	Wheat straw	42(20.0)
	Total	210(100.0)
House hygiene	Poor	91(43.3)
	Medium	65(31.0)
	Good	54(25.7)
	Total	210(100.0)

3.3.2. Feeding and watering

In this finding, feeding practice revealed that 20.0% of the respondents do not provide supplementary feed for their flock while the remaining 80.0% (36.7% practice scavenging system and provide some supplements, 20.0% provide kitchen waste (left over and homemade feed) and 23.3% purchased feed (complexes feeds). The respondents detailed that 30.5%, 25.7%, 20.0% and 4.3% provided wheat and maize, kitchen waste, wheat bran and limestone

respectively as a source of supplementary feed and 19.5% green forage and insects (table 4). Watering practice in the current study revealed that 11.4% of the respondents do not provide water for their chicken flocks, whereas (88.6%) of the respondents provide water for their chicken. Frequency providing water to chickens were once a day (16.7% only during the morning, 29.5% twice a day (during the morning and afternoon) and 42.4% of the households chickens access free water (table 4).

Table 4: Feeding and watering

Variables	Catagories	Percent(%)
Types of feeding	Scavenging only	42(20.0)
	Scavenging with suplement	77(36.7)
	Home made feed	42(20.0)
	Purchased feed	49(23.3)
	Total	210(100.0)
Type of feed	Limestone	9(4.3)
	Green forage and insects	41(19.5)
	Wheat bran	42(20.0)
	Kitchen waste	54(25.7)
	Wheat and maize	64(30.5)
	Total	210(100.0)
Do you provide water	No	24(11.4)
	Yes	185(88.6)
	Total	210(100.0)
Frequency of water	No provision of water	24(11.4)
	Morning only	35(16.7)
	Morning and afternoon	62(29.5)
	Free access	89(42.4)
	Total	210(100.0)

3.3.3. Disease, vaccination and risk aversion

In the present study, 79.0% of the respondents have knowledge about disease prevalence in their locality and the remaining 21.0% of the respondents did not have knowledge about diseases most commonly occurring in their locality. Among 79.0% of the respondents have knowledge about disease in their locality, only

31.9% of the respondents practice vaccination and 68.1% of the respondents do not practice vaccination. Measurements taken when the chickens were sick indicated that 22.9% treated their chicken by traditional medicine, 25.7% consulted a veterinarian, 23.3% sold their chicken and the remaining 28.1% of the respondents did nothing when their chickens were sick (table 5).

Table 5: Disease, vaccination and risk aversion

Variables	Catagories	Percent(%)
Awarness on common diseases	No	44(21.0)
	Yes	166(79.0)
	Total	210(100.0)
Practice of vaccination	No	143(68.1)
	Yes	67(31.9)
	Total	210(100.0)
Measurement taken for sick	Treating with traditional mediciene	48(22.9)
	Consulting aveterjnarian	54(25.7)
	Selling	49(23.3)
	Do nothing	59(28.1)
	Total	210(100.0)

3.3.4. Predation, veterinary extension and training

In the present study, 38.6% of the respondents had complained that there were no predators in their locality where as 61.4% of the respondents responded a lot of predators present in their locality cats (22.4%), dogs(5.7%), foxes(1.4%),

hyena(2.4%) and Vultures (29.5%) (table 6). In the current study, veterinary extension and training service revealed that 76.2% and 63.8% of poultry households do not access extension services and training on poultry production while only 23.8% and 36.2% access extension service and got training respectively (table 6).

Table 6: Presented predators, access to training and extension service

Variables	Catagories	Percent(%)
Predators	No predators	81(38.6)
	Wild cats	47(22.4)
	Dogs	12(5.7)
	Foxes	3(1.4)
	Hayena	5(2.4)
	Vultures	62(29.5)
	Total	210(100.0)
Access to extension services and agents	No	160(76.2)
	Yes	50(23.8)
	Total	210(100.0)
Access to traning	No	134(63.8)
	Yes	76(36.2)
	Total	210(100.0)

3.3.5. Market restriction

In the current study, accessibility of market showed that 24.8% of the respondents' do not access to market while the remaining 75.2% of the respondents could access the market. The season of buying chicken showed that 16.7%,

18.1%, 26.7% and 38.6% of the respondents buy chicken on kiremt, belg, tseday and bega respectively. On the other hand 8.6%, 11.0%, 33.3% and 47.1% of the respondents sell their chicken on tseday, bega, belg and kiremt respectively.

Table 7 Market restriction

Variables	Catagories	Percent(%)
Market access	No	52(24.8)
	Yes	158(75.2)
	Total	210(100.0)
Chicken buying season	Belg	38(18.1)
	Kiremt	35(16.7)
	Tseday	56(26.7)
	Bega	81(38.6)
	Total	210(100.0)
Chicken selling season	Belge	70(33.3)
	Kiremt	18(8.6)
	Tseday	99(47.1)
	Bega	23(11.0)
	Total	210(100.0)

3.4. Major Challenges and Waste Management in the Areas

In this study, the critical constraints in the area showed that lack of adequate vaccination (36.7%), disease (20.5%), lack of adequate veterinary service (19.5%), housing, lack of adequate feed and clean water (9.5%), market constraints (5.7%) and predation (5.7%) were the major constraints in the area(table 8). In addition,

the current result showed that 17.1% of the respondents do not manage the waste of their poultry properly while 82.9% of the households manage the wastes from the poultry houses properly. Also, the finding revealed that 38.6% of the households discard dead chicken for use as feed for domestic carnivores such as dog and cats while 8.6%, 16.7% and 36.2% discard dead chicken by burning, burying and throwing on the ground respectively (table 8).

Table 8 Major Challenges and Waste Management in the Areas

Variables	Catagories	Percent(%)
Major challenging constraints	Diseases	43(20.5)
	Inadequate veterernery service	41(19.5)
	Predation	12(5.7)
	Improper housing,lacke of adequate feed and water	20(9.5)
	Inadequate vaccination	77(36.7)
	Market constraints	12(5.7)
	Others	5(2.4)
	Total	210(100.0)
Discarding methodes	Burying	35(16.7)
	Throwing any where	76(36.2)
	For domestic animals	81(38.6)
	Burning	18(8.6)
	Total	210(100.0)
Waste managment	No	36(17.1)
	Yes	174(82.9)
	Total	210(100.0)

4. Discussion

The current findings indicated that 46.7% of the respondents were males and the remaining 53.3% were females. The findings were in line with the report of Getu and Birhan, (2015) (57.8%) and Oladunni and Fatuase, (2014) (54%) females from North Gondar and Ondo State of Nigeria. On the other hand, the results did not agree with the report of Getiso et al. (2015) (70.8% males); Moges et al. (2010) (70% males) and Azanaw, (2017) (74.6 % males) from Kambata Tambaro and Wolaita Zones, Bure district of North west Ethiopia and Tegede District of North Gondar respectively. On the other hand 100% female respondents were reported from Jorhat district of Assam of India by Deka et al. (2013). This could be due to the fact that females stay home and were involvement in most of the home work.

The educational level of the respondents showed that majority (64.3%) of the respondents were literate and the findings were in accordance with the study results reported by Oladunni and Fatuase (2014) from Ondo State of Nigeria, who reported 38.1% secondary, 28.3 primary and 33.6 illiterates. This briefly tell us the majority of the respondents in the study areas were educated but the poultry production system undergoing was backyard/ extensive. In contrast, the findings did not match primary schooled respondents of Deka et al. (2013) from Jorhat district of Assam of India (67%), 73.4% and 63.1% illiterate respondents of Getu and Birhan, (2015) and Conteh and Sesay, (2019) from North Gondar Zone and Moyamba District of Sierra Leone and 47.2% elementary schooled respondents of Fesseha, (2020) from Damot Sore District of Wolaita Zone. This could be due to relatively higher access to schools and better expansion of education in the area.

The present study revealed that the source of chicken for the majority of the households were purchased (48.1%), hatching at home (35.2%) and agricultural office (16.7%) and the findings were in line with of Azanaw, (2017), 56.7% from

Tegede District of North Gondar, 44.8% of Tadesse, (2014) from Central Tigray and 46.7% Salo et al. (2016) from Lemo District of Hadiya Zone that the source of chicken was purchase. However, Mandal et al. (2016) and Rahman et al. (2017) from Uttar Pradesh and Mizoram of India reported that 100% and 75.5% of the households get chicken through natural hatching at home. In contrast to the above findings, Conteh and Sesay, (2019) from Moyamba District of Sierra Leone reported lending (38.9%) and exchange (27.2%) as the major source of chicken in the area. This could be due to an increase in demand of highly productive chicken breeds, highly productivity and reproductive performance of farm purchased chicken breeds.

Regarding to poultry breed the majorities (41.9%) of the respondents were rearing local chicken breeds, followed by cross breeds (40.5%) and to least extent exotic breeds (17.6%). These findings were slightly in support of study results found by Mohamed et al. (2016) from, Jigjiga Zone of Somali, who reported 24.95% cross, 17.6% exotic and 67.6% local chicken breeds. ----- 52.3% of the people rear cross and exotic chicken breeds, which are more productive, which may be a serious problem for the genetic erosion of the highly disease resistant, broody and tropical climate adapted indigenous chicken breeds. However, the current findings were contradicting with the findings of Moges, (2014) and Getu and Birhan, (2015), Assefa et al. (2015) and Yitbarek and Atalel, (2013) from Enkulal Watershed North Gonder, Arbegona Woreda of Sidama Zone and Debsan Tikara Keble (Gondar Zuria) reported 96.8%, 100%, 93.3% and 93.9% of the household's rear local chicken breeds respectively. This might be because of high disease resistant, broody nature, local preference for local chicken egg and meat and tropical climate adapted nature of indigenous chicken breeds.

The present study revealed that the majority of the households constructed a separate house (46.2%) for their poultry followed by night shelter only (28.1%), house with them themselves

(11.9%) and with their animals (13.8%). The current findings were coherent with Waktole et al. (2018) and Zewdu et al. (2013) from Asella district of Oromia, and Metekel zone of Ethiopia, that 48% and 45.8% of the households construct separate house for their chicken flock. This could be due to adequate knowledge of households about housing, high wind during night time and low risk of theft. Reports by Moges et al. (2010), Abera and Geta, (2014), Addisu et al. (2013) and Salo et al. (2016) from Bure district of North west Ethiopia, Halaba, Haramaya, North Wollo and Lemo District of Hadiya Zone were contradicting with the current findings. The authors reported that only 14%, 22%, 12%, 10.5%, 11.7% and 15.36% of the households constructed separate house for their flock and 79.1%, 45%, 77.5%, 77.5%, 58.86%, and 60% of the households house their chicken flock within their dwelling respectively. This could be due to lack of awareness about housing, high risk of predator and theft.

The present study findings revealed that 42.9% of the respondents do not provide litter material while 57.1% of the respondents provide litter material for their poultry flock where teff straw, wheat straw and cotton waste were ranked from 1st, 2nd and 3rd in descending approach. The present findings were in support of results reported by Tadesse et al., 2013 and Alem, 2013 from East Shewa and Central Tigray. In contrast to the above findings, ash, sand and paper were reported by Alam et al. (2014) from Mymensingh district of Bangladesh. This could be due to variation in local availability of material in different areas.

Maintaining the hygiene of the resting places of chicken is very essential to reduce the outbreak of infectious diseases. Based on the observational survey, the hygienic level of the poultry houses showed that 43.3% of the poultry houses were poor in their hygienic condition where as 31.0% of the poultry houses had moderate hygienic level and the left 25.7% of the poultry houses were in good hygienic conditions. Likewise Habte et al. (2015) from Amaro district reported that the resting places of the chicken were in poor

hygienic condition. However, Musyoka et al. (Musyoka et al., 2017) and Blackie, (2014) from Kikumini/ Muvau and Kithungo/ Kitundu wards of Makueni County, Kenya and Accra of Ghana revealed that 74.9% and 70.8% of the households maintain the hygienic condition of their poultry houses in the areas respectively. This might be because of an low awareness about the hygienic and health practices of poultry and their houses in the area.

Scavenging is a dominant feeding system in village poultry production system. The majority (80.0%) of the respondents provide feed for their chicken of which (20.0% provide kitchen waste (left over and homemade) feed, 30.5% (maize and wheat) and 23.3% (complex purchased feed). Thus, the current finding was comparable with study findings reported by Blackie, (2014) (80.9%) from Accra Region of Ghana, Zewdu et al. (2013) (92.5%) from Metekel zone of Ethiopia, Larbi et al. (2013) (90%) from South of Tunisia; and Salo et al. (2016) (95.6%) from Lemo District of Hadiya Zone.

The present study showed that 11.4% of the respondents do not provide water for their chicken flocks whereas (88.6%) of the respondents provide water for their chicken. The current findings were coherent with Tadesse et al. (2017) (96%) from East Shewa and Salo et al. (2016) (84.4%) from Lemo District of Hadiya Zone. However, Tadesse, (2013) from Central Tigray reported that 100% of the households provide water for their chicken flock. This could be due to better access to water, improved daily management system, higher educational statuses and easier local availability and proximity of water sources.

In the current study, 79% of the respondents have knowledge about disease prevalence in their locality and only 31.9% of the respondents practice vaccination. The current findings were to some extent in accordance with the report of Fesseha, (2020) (27%) from Damot Sore District of Wolaita Zone and Dinka et al. (2010) (31%) from Rift Valley of Oromia practice vaccination. The findings were against the data reported by

Adedeji et al., (2014) from Osun State of Nigeria, who reported that 94.74% of the households practice vaccination. This could be due to adequate vaccination schemes in the area. On the other hand Mandal et al. (2016) and Moges et al. (2010) from Uttar Pradesh of India and Bure district of North Western Ethiopia reported that (100%) and (96.4%) of the households do not practice vaccination, which was higher than the present finding. This could be primarily due to lack of adequate vaccination schemes, lack of knowledge about the significance of vaccination and poor perception of the residents to vaccination.

The present study on health measurements during disease outbreak showed that 22.9% treated their chicken by traditional medicine, 25.7% consulted a veterinarian, and 23.3% sold their chicken while 28.1% of the respondents did nothing when their chickens were sick. Thus, the current findings were in correspondence with reports of Musyoka et al. (2017) reported (28.4%, 36.5%, 19.4% and 31.3%) from Makueni county of Kenya practice treating with traditional medicine, consult veterinarian, sell, and do nothing respectively. In contrast to the above findings, Terefe et al.(2018) reported that households from Minjar Shenkora District of Amhara consult veterinarian (52.8%), treat their chicken with traditional medicines (14%), slaughter sick chicken for home consumption (6%) and sell chicken (5.2%) when their chickens got sick, which is higher than the current findings. Contrast to both findings Guteta and Abegaz, (2018) from East Shoa Zone found 32.2%, 50.6% and 56.1% of the households use prophylaxis when their chicken got sick.

In the present finding, predation was another constraint in and around gerado city and 38.6% of the respondents had complained that there were no predators in their locality whereas vultures (29.5%), wild cats (22.4%), dogs (5.7%), hyena (2.4%) and foxes (1.4%) were responded as the common predators in the area. Similarly, Getiso et al. (2016); Dinka et al. (2010); Markos et al.(2014) and Moges et al. (2014) from Kambata Tambaro and Wolaita Zones, Rift Valley of Oromia, Central Ethiopia, Western Tigray,

Northern Ethiopia and Enkulal Watershed of Dera District of Amhara respectively reported vulture, cats and dogs as a common predator in these areas. However, the findings mismatches the result revealed by Waktole et al. (2018); Tadele et al.(2019); Abera and Geta, (2014) and Tarekegn et al. (2015) from Asella district of Arsi zone, Kaffa Zone, Haramaya District and Eastern Ethiopia that monkey, eagles, hawks, theft and shelemetmat were the major predators in these areas. This might be because of the high density of forest in the Southern and Oromia regions of Ethiopia, which served as a home for large number of wild animals and birds of prey.

Market accessibility is very important for conducting exchange of goods, animal products, sales, purchase and other personal needs. In the current study, majority (75.2%) of the respondents could access the market. Likewise, both Dinka et al. (2010) and Rahman et al. (2017) from Rift Valley of Oromia and Mizoram of India found that 78% of the households access market. This could be due to relatively poor transport services, lack of road access to the markets and long distance of the markets from the residence of the households. Although Issa et al. (2013) from Chad found that 100% of the poultry keepers' access market. This could be due to improved market and transportation system in Chad.

Season of purchase of chicken is very important as there is seasonal variation in disease occurrence and this study revealed that purchase chicken from bega sequenced by tuesday, belg and kiremit and the findings were in comparable to the reports of Waktole et al. (2018), (51.7% September-December, 29.2% from January to April and 19.2% June-august from Asella district of Arsi zone. The present study revealed that the selling of chicken took place in the study areas mainly tuesday, belg, bega and kiremt. The findings were in association of the report of Dinka et al. (2010), (38% September- November, 23% March- May, 10% December- February, and 9% June-August). This could be due to an increase in the frequency of holidays, between September-November and March-April.

Access to extension services and obtaining training on production systems is a critical headache in majority of the developing countries including Ethiopia. Similarly, 77.3% and 65.5% of poultry households do not access extension services and do not get training on poultry production respectively. The current finding matches the result of Lal et al. (2019) (and Fesseha, (2020) (from Andaman and Nicobar Islands and Damot Sore of Wolaita Zone that (93.3% and 89.58%) and (80% and 96%) did not got training and access extension service respectively. Opposite to the above findings, both Rahman, (2017) and Deka, (2013) from Mizoram and Assam of India found that 100% of the respondents neither access extension agent nor got training on village poultry production. Although, higher positive results were reported by Moges et al. (2014) and Yitbarek and Atalel, (2013) from Enkulal Watershed of Dera District of Amhara and debsan tikarakeble of North Gonder, which revealed that (48.2% and 42%) and (80% and 86%) of the households access extension services and got training about poultry farming such as proper feeding, housing and health care. This could be due to lack of awareness within communities, lack adequate of knowledge about the availability of the service, inadequate skilled man power and inaccessibility of the extension agent.

The critical constraints in the study areas were (lack of adequate vaccination (36.7%), disease (20.5%), lack of adequate veterinary service (19.5%), housing, lack of adequate feed and clean water (9.5%), market constraints (5.7%) and predation (5.7)% were the major constraints faced by village poultry producers living in and around Gerado and the findings were in support of the report of Tarekegn et al. (2015); Oladunni and Fatuase, (2014); Sonkar et al. (2020) and Ghasura et al.(2013) from East Hararghe of Ethiopia, Ondo State of Nigeria, India, and Banaskantha district of Gujirat of India respectively. Differently from the above findings Achamyelh, (2021) reported that lack of infrastructure and logistics were the major production constraint of village chicken production in Tero-Afta District of Jimma Zone.

The present finding were against the reports of Ebsa et al., (2019); Conteh and Sesay, (2019); Guteta and Abegaz, (2018); Getu and Birhan, (2014); Alam et al. (2014) and Tarekegn et al. (2015) from Bishoftu, Moyamba District of Sierra Leone, Lume District of East Shoa Zone, North Gondar Zone, Mymensingh district of Bangladish and Eastern Ethiopia sequentially, who reported that disease followed by predation were the major constraints and vaccination as a minor constraint of production in these areas. This could be due to frequent occurrence of diseases, inadequate knowledge about period of disease occurrence in the areas, low health measurement options, poor risk aversion strategies and high population of predators.

Management of poultry wastes is crucial to maintain the health statues of the chicken flock revealed that 82.9% of the households manage the wastes from the poultry houses properly. Similarly, discarding dead chicken is critical problem in many developing countries and current results indicated that 38.6% of the households discard dead chicken for use as feed for domestic carnivores such as dog and cats while 8.6%, 16.7% and 36.2% discard dead chicken by burning, burying and throwing on the ground respectively. Abera and Geta, (2014); Selam and Kelay, (2013) from Haramaya District of Oromia and Halaba reported higher results that (92.5%) and (86.8%) of the respondents throw dead chicken to dogs and cats. Addis et al. (2014) and Yemane et al. (2013) from Bahir Dar and Adaa District reported that 82% and 62.2% of the respondents throw dead chicken on the ground anywhere. This might be due to lack of adequate knowledge about management of dead chicken and poor knowledge about poultry disease transmission. Survey data showed that people in the study area share drinking and food materials with chicken flock, which may be because of inadequate knowledge about transmission of poultry, induced zoonotic and interspecies disease transmission.

Even though village poultry production system faced several challenges in the study area, an increase in educated man power which might

contribute to an improvement in daily animal management (feeding, housing and watering), rearing of highly productive and reproductive cross and exotic breeds coupled with an improving animal husbandry, expanding veterinary and animal extension services, an improving transportation and logistics, expanding local markets, an increasing awareness of farmers about hygienic practices of poultry houses and taking care of sick chicken and production of poultry vaccines in Ethiopia (easier availability of vaccines provides a bright future for village poultry producers in and around Dessie and also at national level.

An increasing awareness of farmers about poultry house provides a better way for controlling predator, which also leads to a significant improvement in village poultry production system in and around Gerado. This would be a fact that 46.2% of the respondents provide a separate house for their chicken flock. Similarly, an increase in educated man power in the area provides better ways of disposing and managing dead poultry and poultry wastes. This could reduce the associated effects of improper management of dead poultry and poultry waste products (environmental contamination and human and animal health effects).

5. Conclusion and Recommendations

The major poultry production system in the study area was the back yard. At this production system, the chickens are exposed to predators (like a cat, dog, wild birds, and others) and different types of diseases. The feeding activities did not appreciable; because the feeding practice of the processed feed was low or poor. As this results the chicken do not fulfill their nutritional need. The health management activities were very poor due to less practice of deworming, giving annual vaccination, access to extension service, and others. In conclusion, the poultry management system should be improved by modern production systems. Besides, practical based and continuous training should be given on the construction of

improved housing, proper feeding activities, and control of diseases and predators. Finally, poultry owners should be creating a strong relationship with the veterinary and extension service center.

6. References

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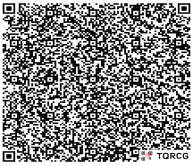
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