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VILLAGE CHICKEN PRODUCTION AND MARKETING IN WEST GOJJAM ZO ETHIOPIA

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ABSTRACT

Chicken production in West Gojjam zone was characterized by using indigenous chicken with low input-output level. Despite its diverse socio economic role for smallholder farmers, production and productivity of village chicken was very low. As the result, chicken producers were not benefited from the sector. Therefore, this study was conducted with the aim of characterizing chicken rearing practice, flock dynamics and determining the off-take rate of village chicken production system. It was conducted in West Gojjam Zone of Ethiopia. Multi-stage sampling technique was used to select representative respondents. A total of 500 farmers were interviewed. In the study area, the average numbers of local and exotic chickens kept by smallholder producers were 8.44+0.42 and 0.49+0.10chicken, respectively with the overall mean 8.93+0.42chicken. The flock structure was highly dominated by young chicks (3.82+0.28) and hen (2.47+0.09). The average chicken migrated into the flock per household per annum was 10.32+ 0.80 birds, whereas the outflow from the flock was 16.62+0.85birds. The number of chicken was higher at the middle of the year than the beginning and end of the year. On average, 2.9+0.12 layer chickens were kept per household. From which, in average 307.2+ 20.2 eggs were produced from local and improved breed in a year. Marketing in the district and PA were important marketing places for egg and live birds with the off-take rate of 34.94%. To improve chicken production in the study area, adaptive improved chicken breed should be introduced. Strategic vaccination, semi scavenging practices should be introduced and promoted in order to reduce chicken mortality. Capacity building through training and intensive follow up should also be made in order to enhance the level of awareness of smallholders on improved small scale poultry keeping practices.

Keywords: Flock dynamics, Flock structure, Chicken production, Off-Take rate, Marketing place, Indigenous breed, Exotic breed.

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Contribution/ Originality

This research contributes a lot in filling village chicken production knowledge gap in West *Gojjam* Zone. It reveals that how village chickens are reared, the nature of flock dynamics, chicken mortality rate and its cause, how to calculate off-take rate in chicken production, egg production and its purpose. Finally, it also gives insight the marketing place of live chicken and egg.

1. INTRODUCTION

Poultry production in Ethiopia is characterized by use of predominantly indigenous ecotypes with low input-output levels. It is widely practiced in many part of the country [1]. The production is mainly practiced under a

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traditional family-based management system [2] with irregular supplies of feed and water, poor healthcare and housing system [3]. Unlike other livestock farming, majority of village chicken (about 92.4%) are owned by females and childrenfamily members [4] since they require low capital, little supplied feed and the readily available household labor [5].

Village chicken production has diverse socioeconomic roles [1]. Majority of chicken keepers use chicken for sale to cover household expenditure (44%), home consumption (24%), cultural and religious ceremonies (22%) and means of saving (10%) in the rural family [4]. Village chicken production is also used as source of high quality protein food to smallholder farming families [4]. About 78,000metric tons of egg and 72,300 metric tons of meat are obtained from chicken production in the country more than 90% of which comes from indigenous chickens [2].

Village chicken production is widely practiced and economically important sector in *Amhara* region. In the region, the total poultry population is estimated at 14,610770 chickens [6]. North Gondar and West *Gojjam* zones are the largest poultry producer zones of the region and they account for 24.8% and 15.5% of the region's poultry population, respectively (ibid). Almost every farmer rears chicken in varying number of flock size for the purpose of producing egg and meat for household consumption, income generation, hatching and rearing of chicks for replacement of flock [1]. According to Fisseha, et al. [7] the most dominant (82.9–95.6%) chicken production system in *Bure* and *Fogera* districts was scavenging production system using indigenous chicken ecotypes (95–96.8%) with only seasonal feed supplementation. Researches in different years and places in the region revealed that the average flock size per household varies from year to year and place to place. For example: the total chicken flock size per household in East *Gojjam* zone was less than 18 chickens [1] in *Bure* district the size was 13 chickens [7] and in North Gondar16 chickens [8]. All groups of chicken were also kept together without age separation (ibid). This information implies that information in village chicken production, use pattern and marketing practices of the region particularly in West *Gojjam* zone was very scarce. Although some studies were conducted on poultry production systems in West *Gojjam* zone, they were not comprehensive enough and did not relate to chicken production and flock dynamics in village chicken production system. Some of the studies were also location specific. Therefore, understanding the prevailing village chicken structure and the nature of flock dynamic is essential to develop location specific development strategy and to introduce technological options for particular problem and location. Consequently, this study was initiated to generate relevant information about village chicken production and marketing practices and to suggest improvement options.

1.1. Objectives of the study

- To characterize village chicken production practice in the study area
- To analyze chicken flock dynamics
- To determine the off-take rate of village chicken system
- To analyze chicken and egg use pattern and their marketing places

2. RESEARCH METHODOLOGY

2.1. Description of the Study Area

The study was conducted in West *Gojjam* zone, North West of Ethiopia. West Gojjam zone is one of the 10 zones in Amhara region and lies between 36° 30' to 37° 5' Longitudes East and 10°16' to 11°54' Latitudes North. The zone encompasses nine districts. For this study, *Bahir Dar Zuriya*, *Mecha*, *Yilmana-Densa*, North *Achefer*, *Gonji-Kolela*, *Quarit*, and South *Achefer* districts were included in the survey. West *Gojjam* zone has a total of 2.63 million human populations. Of these 1.32 million are male and 1.31 million are female. The total land area of the zone is 13,280 km². Its elevation varies from 1500 to 3500 m.a.s.l. Most of the districts (75%) in the zone have ambient temperature ranging from15–20°C and the remaining (17%) have 20–27°C [9].

2.2. Sampling Techniques, Data Collection and Statistical Analysis

Multistage sampling procedure was used to select representative respondents for this study. From the study zone, seven districts were selected purposively based on LIVES's project districts and potentially affected districts. The study districts were classified broadly into three agro-ecologies such as lowland, midland and highland. The altitudinal range for the study area is from1648to 3083m.a.s.l.From these districts, 58 Peasant associations (PAs) were selected randomly across the three agro-ecologies. Proportional sampling technique was used to determine the sampling size of each PA. Once the sampling size of each PAs determined, the households were selected randomly from sampling framework using Research Randomizer software with the aid of internet. Therefore, a total of 500 poultry keepers were participated for this interview. Of which, 17.5% of them were women poultry producers. Survey was conducted in 2014 and referring to the 2012/2013 production season.

Descriptive statistics was used to analyze and present the data. To characterize chicken flock structure at the household level, the average flock size and their composition such as cocks, hens, pullet, and chicken were analyzed.

Regarding flock dynamics, it was analyzed using the number of incoming and outgoing chickens of the household in a defined year by considering number of hatched, purchased and gift from others as inflow chickens; and slaughtered, dead, given to others, lost due to theft and sold were considered as outflow chickens. Besides, the trend in chicken flock size at different seasons of the year was also analyzed to see fluctuations in flock size in the year. To determine the off-take rate of village chicken production system, Net Commercial off-take rate was analyzed to determine the contribution of village chicken production system in supplying live birds to the market. It was given as the number of chicken sales minus purchases made by the households as a percentage of the average stock. According to Asfaw and Mohammad [10] net-commercial off-take rate was calculated as below.

$$\textit{Net commercial off-take rate} = \left(\frac{\text{Sales}-\text{purchases}}{0.5(\text{Openingstock}+\text{Endingstock})}\right)*100$$

The statistical tools such as percentages, frequencies, mean and standard deviations, standard error of mean were used to describe and present the data. T-test was also used to test the significance of variations across particular parameters for continuous variables.

3. RESULTS AND DISCUSSION

3.1. Chicken Production Characteristic

3.1.1. Breed Types

As illustrated in table 1, in West *Gojjam* zone, on average 8.93±0.42 chickens were kept per household. Of which, 8.44±0.42 were indigenous and 0.49± 0.10 were improved. The mean variation between indigenous and improved chicken breeds was significant (P<0.01). The overall mean value of the current study is in line with Nebiyu, et al. [11] who reported that the overall mean chicken per household was 8.5± 0.28. However, mean value of this study was higher than values reported by Meseret, et al. [12] (6.23±4.4) and lower than that of Fisseha, et al. [13] in North West of *Amhara* region (13.7±1.1), Samson and Endalew [4] in mid rift valley (12.76) and Mekonnen [14] in Southern Ethiopia (9.22±0.35). The mean value for local chicken of this study was considerably lower than that of Melese and Melkamu [1] in East *Gojjam* (12.66±5.99) and Samson and Endalew [4] in mid rift valley of Ethiopia (12 chickens). This result implies that village chicken production system in West *Gojjam* zone has been relying mainly on indigenous breed and perhaps it could result in less egg and poultry meat production in the household.

Table-1. The average flock size of indigenous and improved chicken

Breed type	Mean	Std. error	t-value	Sig. value
Local	8.44	0.42	16.088	0.00
Exotic	0.49	0.10		
Overall	8.93	0.42		

Source: 2014 cross-sectional survey

3.2. Flock Size and Structure

As showed in table 2, chicks (42.78%) and hens (27.66%) were the dominant chicken types in the flock structure of village chicken production system in the study area. The proportions of pullet and cock in the flock structure were 18.81% and 10.75%, respectively. In the flock composition, the average numbers of young chick, hen, pullet and cock per household were 3.82±0.42 and 2.47±0.09, 1.68±0.16 and 0.96±0.06, respectively. This young chicken dominant flock structure was in line with the study of Tadelle, et al. [3] in Ethiopia, Addis and Malede [8] in North Gondar, Nebiyu, et al. [11] in *Halaba* district and Wondu, et al. [15] in urban poultry production in Southern part of Ethiopia. Overall mean value of young chicks of the current study agreed with the reports of Nebiyu et al., (3.2± 0.23 chicks). However, this result is not in line with Addis and Malede [8] and Wondu, et al. [15] who reported the average numbers of young chicks to be 9.07± 0.28 and 4.91± 0.43, respectively.

Table-2. Flock size and composition per household

Chicken groups	Mean	Std. error	Composition %
Cock	0.96	0.06	10.75%
Hen	2.47	0.09	27.66%
Pullet	1.68	0.16	18.81%
Chick	3.82	0.28	42.78%
Total	8.93	0.42	100%

Source: 2014 cross-sectional survey

3.3. Flock Dynamics

3.3.1. In-Flow and Out-Flow of Chickens

In any village chicken production system, chickens could be migrated into the flock through hatching, purchasing and gift from others. At the same time, chicken could also be migrated out from the flock through slaughtering, death, gift, theft and sale. As shown in table 3, in the study area, the average number of chicken migrated into the flock per household per annum was 10.32± 0.80, whereas out-flow from the flock was 16.62± 0.85 chickens. This study disagreed with the study of Nebiyu, et al. [11] in *Halaba* district who reported that the average numbers of chicken migrated into the flock and migrated out from the flock was 28.3±0.28 and 22.9±0.29, respectively. From the total in-flow of chickens into the flock, on average 9.88±0.80 chickens were from hatching and 0.44±0.05chickens were from purchasing, whereas the contribution of gift from others was very negligible.

Regarding out-flow of chicken from the flock, chicken death has taken the highest share. On average, 10.49±0.62 and 2.32± 0.14 chickens migrated out from the flock due to death and slaughtering for household consumption, respectively. The mean values of out-flowing of chickens from the flock due to theft and gift to others were 0.13±0.03 and 0.12±0.03chickens, respectively. This implies that majority of chickens that migrated into the flock came from hatching, whereas death was the major out-flow of chickens from the flock. Similar result has been reported by Nebiyu, et al. [11] that the major means of in-flow and out-flow of chickens from the flock were hatching (27.0±0.28) and death (15.5±0.22), respectively, though their mean values were much higher than the results of the current study. Similarly, Tadelle, et al. [3] reported that higher mean values of out-flow due to selling (5.5±0.18) and slaughtering (3.1±0.09) than the mean values of current study.

Table-3. In-flow and out-flow chickens per household Flock dynamics

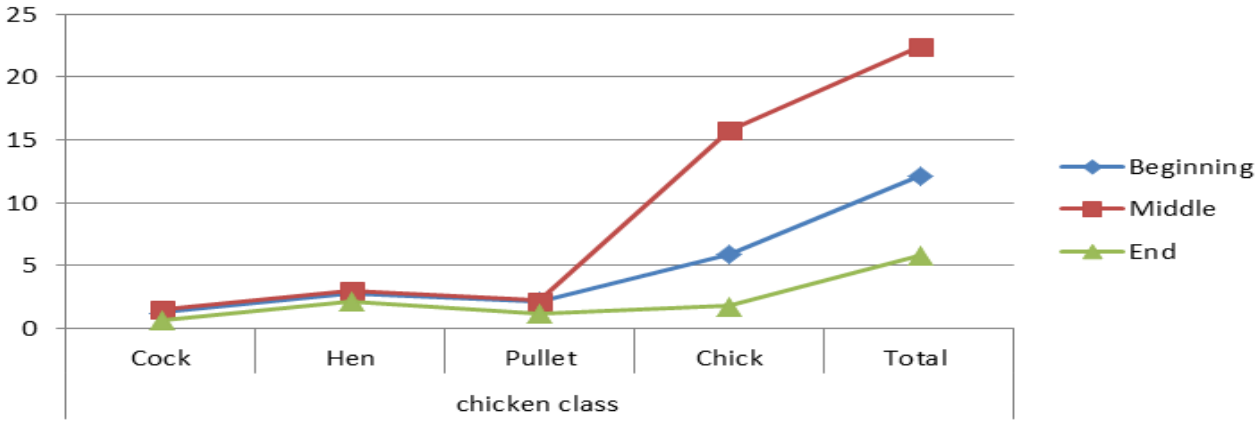
Variables	Mean	SE (mean)
Migration to the flock	**10.32**	**0.80**
Hatching	9.88	0.80
Purchasing	0.44	0.05
Obtaining as gift	0.007	0.004
Migration out from the flock	**16.62**	**0.85**
Slaughtering	2.32	0.14
Death	10.49	0.62
Gift to others	0.12	0.03
Theft	0.13	0.03
Sale	3.56	0.37

Source: 2014 cross-sectional survey

3.4. Trends of Chicken Numbers across the Year

As shown in graph 1, the average number of chickens kept by the household could vary in different seasons of the year. The average number of chickens in dry season was higher than that of the beginning and end of the year which are the rainy season of the year in the study area. This is due to adequate feed availability, less disease and predator prevalence in the middle of the year, whereas in the two ends of the year, all the aforementioned problems become serious for chicken production due to higher rainfall, muddy scavenging areas, dense vegetation to hide predator and lower temperature for young birds. As the result, loss of chickens in the household became higher at the beginning and the end of the year.

In the beginning and the middle of the year, the average number of cock, hen and pullet had similar value which ranged from one to four chickens, whereas the mean value of chicks in the middle of the year (15.76) was higher than the average number at the beginning (5.85) and end (1.79) of the year. Finally, at the end of the year the average numbers of all types of chicken dropped into just about between one and two. In all three seasons, fluctuation of the average number of cock, hen and pullet was small throughout the year, whereas the mean difference of chicks was highly fluctuating across the seasons of the year. In the beginning, middle and end of the year, the overall mean number of chicken kept per household were 12.07, 22.4 and 5.79, respectively.



Graph-1. Trend of average number of chickens per household across the year of 2012/13 (September-August)

Comparatively, the average number of chickens at the beginning of the year was higher than that of the end of the year. This implies that the numbers of chickens declined and its contribution for the next year chicken flock building becomes less. At the same time, it is signal to take some corrective measures to reverse the trend.

3.5. Chicken Mortality

3.5.1. Mortality Rate

With various reasons the number of chicken in the flock can be reduced. As shown in table 4, the major cause of out-flows of chicken from the flock was death (10.49±.62). From which, 80.65 % of the death was attributed to

young chicks. On average, 8.46±0.55 young chicks have been died per household in year. However, the mortality rate of the other chicken class in the study area was relatively lower than younger chicks – pullet (8.87%), hen (7.53%) and cock (2.96%). The average death numbers of pullet, hen and cock per household per year were 0.93±0.16, 0.79±0.07 and 0.31±0.05, respectively. This finding implies that the mortality rate of chicks was higher as compared to other chicken categories. It has a great negative effect on the building of chicken flock and on continuity of chicken rearing in village chicken production system.

Table-4. Death across chicken types

Chicken class	Mean	SE (mean)	Percentage
Cock	0.31	0.05	2.96%
Hen	0.79	0.07	7.53%
Pullet	0.93	0.16	8.87%
Chick	8.46	0.55	80.65%
Overall	10.49	0.62	100.00%

Source: 2014 cross-sectional survey

3.6. Cause of Mortality

Chicken can be died with various reasons in small hold chicken production system. As table 5 shows, disease (76.5%) was the major cause chicken death in the study area and followed by injury/ accidents (9.4%). It was not similar to of Nebiyu, et al. [11] report in Southern part of Ethiopia. According to him, predator (51.1%) was the major cause of chicken loss and followed by diseases (45%). However, similar result reported by Wondu, et al. [15] that the major cause of chicken losses in North *Gonder* was disease (47%) though its percentage value was smaller than the current study. The percentages of predator and poisoning in killing chicken in village chicken production system of the study area were 6.9% and 4.9%, respectively. Very few chickens were died due to getting old (0.2%) and other means (2.1%).

Table-5. Frequency distribution of causes of poultry death

Cause of death	Frequency	Percentage
Old age /natural death	1	0.2%
Disease	401	76.5%
Injury/accidents	49	9.4%
Poisoning (acaricide, snake bite)	26	4.9%
Predator	36	6.9%
Other causes	11	2.1%

Source: 2014 cross-sectional survey

3.7. Egg Production and Utilization

3.7.1. Egg Production

As table 6 shows, in West *Gojjam* zone, on average 2.9± 0.12 egg layer chickens were kept per household. Of which, 2.6±0.11 were local hen and 0.3± 0.12 were improved hen. Local hen in the study area has given, on average, 14.8± 0.23 eggs per a single egg production cycle. There was similar result reported by Nebiyu, et al. [11] in Southern Ethiopia (13.3 eggs/hen/ clutch (95% CI = 12.81 – 13.85)). However, the result of the current study was lower than the result of Melese and Melkamu [1] in East *Gojjam* zone (17.83±3.82). From a single improved hen in study area, on average 107.2±19.7 eggs were obtained per one production year. The average number of brooding cycle of local hen was 5.2±0.23. However, improved hens in the study area did not have any brooding behavior but they might stay long time without give any egg. With these numbers of egg layer chicken and productivity characters, on average 307.2± 20.2 eggs were produced per household per a year from both local (2001.1± 10.0) and improved (307.3± 20.2) hens.

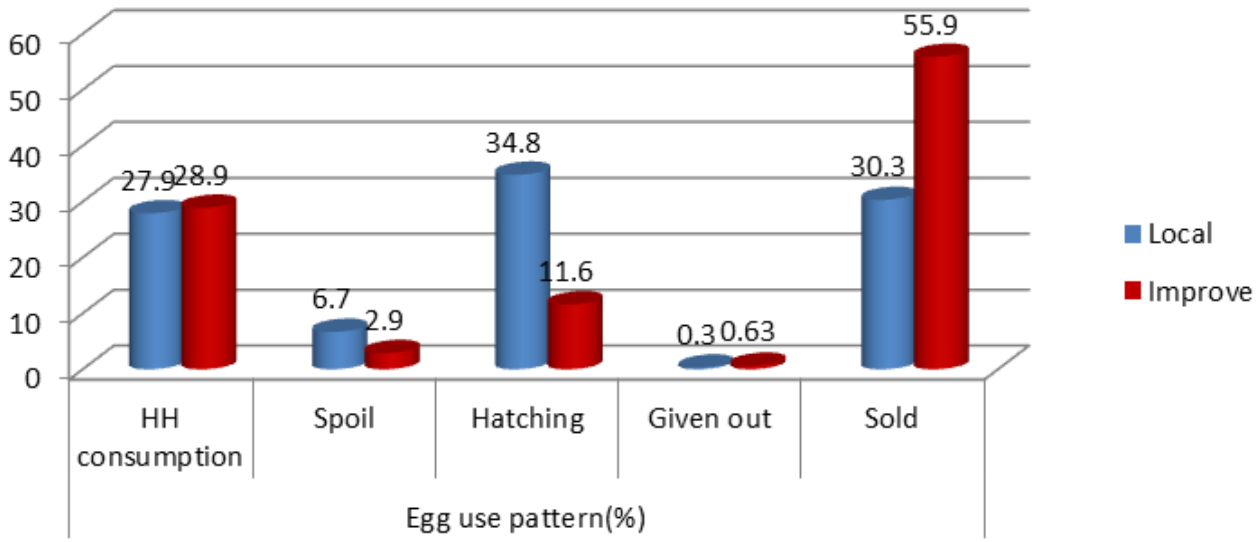
Table-6. Egg production and productivity

Breed	Average number of layers		Average number of eggs per cycle per layer		Average number of brooding cycle per year per layer		Average egg production per year per household	
	Mean	SE(mean)	Mean	SE(mean)	Mean	SE(mean)	Mean	SE(mean)
Local	2.6	0.11	14.8	0.23	5.2	0.02	200.1	10.0
Improved	0.3	0.06	107.2	19.7	0		107.2	19.7
Over all	2.9	0.12					307.3	20.2

Source: 2014 cross-sectional survey

3.8. Egg Use Pattern

As indicated in the graph 2, chicken producers have obtained egg from both local and improved chicken breeds. From the total local egg production, 34.8% of the egg was used for hatching, 30.3% was for selling to earn money and 27.9% was used for household consumption. Very small proportion of egg has spoiled (6.7%) and was given to others (0.3%). Unlike local egg, majority of exotic egg was sold (55.9%) and household consumption (28.9%). Only 11.6% of egg production was used for reproduction purpose. The rest 2.9% and 0.63% of egg was spoiled and given to others. This finding clearly shows that both local and exotic egg was not used for the same purposes. Local egg was mainly used for reproduction purpose, whereas exotic one was used for income generation.



Graph-2. Egg use pattern

Source: 2014 cross-sectional survey

3.9. Chicken and Egg Marketing

3.9.1. Chicken Off-Take Rate

The main reason for calculating the off-take rate was to estimate the size of live animal supply to the market. It is usually defined as sale or slaughter at the end or during a production cycle as a percentage of the initial stock [16]. Therefore, off-take rate of the village chickens production system in West *Gojjam* zone is calculated as below.

$$\textit{Net commercial off-take rate} = \left(\frac{3.56-0.44}{0.5(12.07+5.79)}\right)*100 = 34.94\%$$

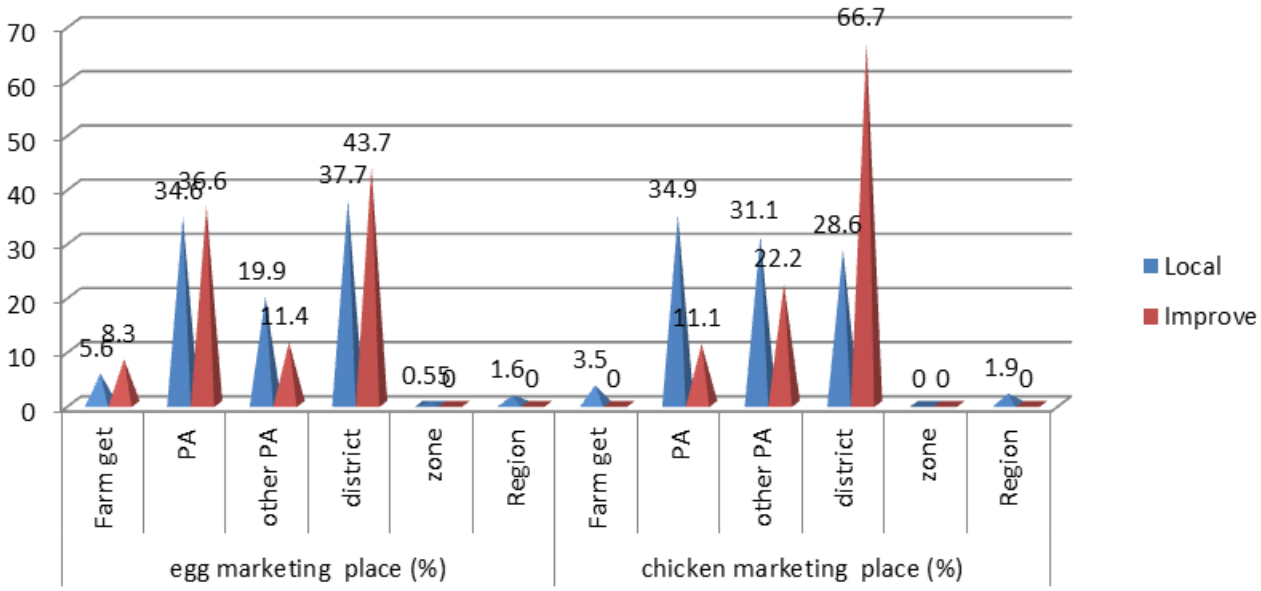
Chicken off-take rate of village chicken production in the study area was 34.94%. This positive value implies that the number of chicken sold exceeded the numbers of chicken purchased by poultry keepers in the study area. It clearly shows that, this village chicken production system had a great contribution in supplying chickens to the market. Hence, chicken producers in the study area were net sellers of live chicken. Even though chicken producers

in the study area were positive net chicken seller, their off-take rate was smaller than study of Mekonnen [14] in Southern Ethiopia (76.3%).

3.10. Marketing Place

Both live chicken and egg could be sold at different marketing places. Graph 3 shows, in the study area, large proportion of both local (37.7%) and exotic (43.7%) eggs were sold at district market places. PA marketing places were also important for village chicken producers to sale their local (34.6%) and improved (36.6%) eggs. Very small percentage of eggs were sold at farm get (i.e. 5.6% of local and 8.3% of improved) and other PA's marketing places (i.e. 19.9% of local and 11.4% of improved). The role of zonal and regional market places for village chicken egg producers was insignificant.

Regarding live chicken marketing, majority of improved chickens were sold at district marketing places (66.7%). The other 22.2% and 11.1% of improved chickens were sold at outside the PA and within the PA market places, respectively. No chicken producers have sold their improve chickens at farm get, zonal and regional market places. On the other hand, majority of local chickens were sold at inside the PA (34.9%), outside the PA (31.1%) and district (22.2%) market places. Few proportions of live chickens were sold at farm get (3.5%) and regional (1.9%) market place.



Graph-3. Chicken and egg marketing places

Source: 2014 cross-sectional survey

4. CONCLUSION AND RECOMMENDATION

The result of this study shows that village chicken production system in West *Gojjam* zone mainly relay on indigenous breed with very few number of exotic chickens per households. Chicks and hens were the dominant chicken categories in the flock structure. The size of flock was built up mainly using hatching, while death was the major factor for reducing the flock size. The major cause of death was diseases and it was more severe on young chicken. Chicken producers had various flock sizes at different seasons of the year. In the middle of the year, the number of chicken per household was relatively higher, whereas at the end of the year it was lower.

In the study area, the average number of layer hen per household is 2.9$\pm$ 0.12. From which, on average 307.2$\pm$20.2 eggs were obtained per year from both local and improved hens. District and PA markets were very important for both egg and live birds in the study area. There were also positive and good chicken off-take rate in the study area. Therefore, based on the result of this study, the following recommendations are suggested.

Since chicken producers mainly relay on indigenous ecotypes, efforts should be made to shift from keeping local and less productive chicken into improved and more productive and adaptive breed so as to improve chicken production and productivity in the zone.

Chicken death contributed the largest share for out-flow of chicken from households. It had a negative effect on chicken flock building and on economy of chicken keepers as well. Therefore, as a development strategy both governmental and non-governmental bodies should take a measures to reduce chicken mortality through strategic vaccination, improved feeding system and promoting semi-scavenging chicken rearing practice to prevent seasonal disease outbreak and attacking by predators. To do so, awareness creation should be made to improve small-scale poultry keeping practices to smallholder producers through intensive training and follow up.

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