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Assessment of Some Breeding Parameters of Local Chicken Breeds in Hadiya Zone of Southern Region, Ethiopia

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Abstract:- This study was conducted in Hadiya Zone of Southern region, Ethiopia with an objective to assess the breeding practices and performance of the local chicken populations in the study area. Multi-stage sampling method was used for selecting the study districts and participants based on the potential of the poultry genetic resources and accessibility towards the research sites. Among purposively identified local owners, a total of 180 households having chickens (90 from each district) were randomly selected for interview. Both primary and secondary data were collected during the survey. Majority of the farmers respond as they were culling their chickens for different reasons. Among them the higher proportion of the farmers in the study area had given the response as they were culling their chickens for poor production followed by culling for health status. In case of brooding, for majority of the respondents the strong broody behavior of the chickens was considered as a selection criteria followed by moderately broody behavior. Some others preferred criteria like mothering ability of the hens, growth rate, safeguard and body size of the chicks. Mean egg production/clutch in this study was 10.73eggs/hen. The average clutch number of the indigenous chicken was 3.72/year. Local chickens are well adapted to the tropics, resistant to poor management, feed shortages, tolerate to diseases and provide better test of meat and eggs than exotic chicken. However, they are poor in performance in terms of sexual maturity, egg size, growth rate, clutch size and hatchability. So, it is better to give emphasis for their management in order to get relevant production from local chickens.

Keywords:- *Breeding Practices, Local Chickens, Performance .*

I. INTRODUCTION

Poultry is the largest domestic animals and estimated to be about 23.39 billion at the global level (FAOSTATA, 2012). According to the CSA (2005) reported 31 million for both the indigenous and commercial chickens while CSA (2016) the total chicken population in Ethiopia is estimated to be 56.87 million of which 95.86%, 2.79% and 1.35% are indigenous, hybrid and exotic breeds, respectively.

The production performance of indigenous scavenging chickens of Ethiopia is low because of their low genetic potential, high mortality and longer reproductive cycle, such as slow growth rate, late sexual maturity and broodiness for extended period (Besbes, 2009). Indigenous chickens are small in body size and lay small sized eggs (Pedersen, 2002; Gondwe, 2004). Indigenous chickens withstand harsh environmental conditions, and perform better under poor management conditions than cross and exotic breeds. Local chicken are well known to possess desirable characters such as strong maternal instinct, and hatch their own eggs. They are excellent foragers; resistance to common poultry disease, preferable in meat and egg quality (flavor) and produce hard egg shells (Abdelqader *et al*., 2007).

Although chickens are very important in the economic contribution of the Ethiopian development, it is not proportional to the huge chicken population of the country, attributed to the presence of many constraints (Aberra, 2000). There is no reliable data indicating the annual contribution of village poultry to household animal protein consumption and family income and productivities in Hadiya Zone. Moreover, the productivity status of the indigenous chicken based village poultry production system and the management practices and marketing environment are not well studied in the study areas. These were the case, to conduct this research with the following objectives.

- To assess the breeding practices and performances of local chickens.

II. MATERIALS AND METHODS

- *Description of the Study Area*

This study was conducted in two districts of Hadiya Zone (Ana Lemo and Gibe) of the Southern Regional State of Ethiopia. Hadiya Zone is located at about 232 km from Addis Ababa, the capital city of Ethiopia. Hadiya Zone has a total land size of 0.35 million hectare and comprises of three distinctive agro ecological zones (low, mid and highland); the high altitude of >2500 masl (23.7%), mid-altitude ranging between 1500 and 2500 m.a.s.l (64.7%) and low altitude of <1500 m.a.s.l (11.6%) with mean average temperature of 22.02º C & the mean annual rainfall of 1260 mm. The total of Human population of Hadiya Zone is 1.3 million (Hadiya Zone Finance and Economic Development Department, 2018).

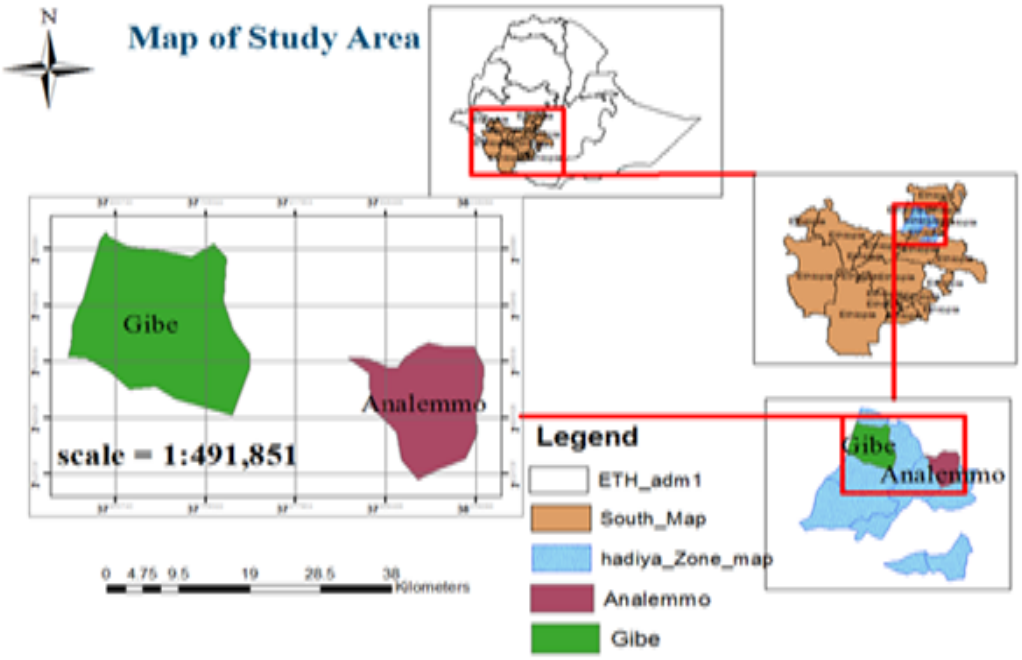

Fig 1:- Map of study areas

➢ *Sampling Techniques and Selection of Participants*

Multi-stage sampling method was used for districts and participants' selection based on the potential of the poultry genetic resources and accessibility towards the research sites. A total of 180 households having chickens (90 from each district) were randomly selected for interview.

➢ *Data Collection*

Number of kebeles in each woredas and a number of chickens in each kebeles were collected from two districts of Livestock and Fisheries Development Office. Both primary and secondary data were collected during the survey. The primary data were collected by interviewing households with the use of pre-tested semi-structured questionnaire and field observation. The primary data collected include chicken breeding practices, culling practices and their performances (egg production, number of clutches, age at first egg, age at first mate and likes) of indigenous chickens. The secondary data were collected from the recorded documents of the Woreda livestock and fishery development offices and relevant documents and published literatures. Focused Group Discussion (FGD) involving development agents, Kebeles leadership, animal production experts and relevant key informants were also conducted in this study to enrich the idea through the document.

➢ *Statistical Analysis*

All collected data were analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics such as mean, range, frequency and percentage were calculated. Tables and figures were used to present summary statistics such as mean, SD and percentages. Chi- square procedure was also carried out to examine significance difference of ordinal and nominal data and independents sample T-test procedure was used for mean separation of woredas.

The statistical model used to analyze the survey data was:

$Y_{ij} = \mu + W_i + E_{ij}$; Where,

Y_{ij} = the value of the respective variable mentioned above pertaining to the ith woreda (i=2, Anlemo and Gibe Woredas respectively),

μ = overall mean of the respective variable,

W_i = the effect of ith woredas (*i*= 1-2, Anlemo and Gibe respectively) and respective variable

E_{ij} = random error.

III. RESULT AND DISCUSSION

A. Culling Practice

Culling is one of the techniques of breeding practices through elimination of less fitting group of chickens from the population. About 73.3% of the farmers were gave the response as they were practicing a culling of their chickens for different reasons. Among those, 39.4% and 25% of the respondents cull their chickens based on the level of productivity (for poor production) and health status (when they got sick). The remaining 13.6%, 12.9% and 9.1% of the respondents were culled their chickens due to frequency of broodiness, sale and home consumption and for old age and feed shortage (Table 1). This result is in line with the study which was conducted by (Moreda, 2013; Zemelak, 2016;

Halima *et al*., 2007 and Muchadeyi *et al*., 2009), who reported that diseases, low productivity and lack of feed are some of the major causes of culling of chickens in different parts of Ethiopia.

There was a significant difference ($p<0.05$) in culling reason in both districts; which indicated that poor productivity was highly prioritized in Gibe than Anlemo.

For about half (48.5%) of the farmers in this study, culling was practiced for selling purpose to generate family income. Whereas, 37.9% of farmers and 13.6% of the respondents were practiced culling for the purpose of home consumption only and both for home consumption and selling purposes, respectively.

Parameters	**Districts**					
	Anlemo(N=90)		**Gibe (N=90)**		**Overall (N=180)**	
Practices of culling	N	%	N	%	N	%
Yes	67	74.4	65	72.2	132	73.3
No	23	25.6	25	27.8	48	26.7
Purpose for culling						
Consumption for home	11	16.7	7	10.8	18	13.6
Sale for cash income	33	49.3	31	47.7	64	48.5
Home consumption & sale for income	23	34.4	27	41.5	50	37.9
P-Value	**0.54ns**					
Reasons for culling						
Poor productivity	21	31.3	31	47.7	52	39.4
Old age and lack of feed	3	4.5	9	13.8	12	9.1
Sickness	20	29.9	13	20.1	33	25
For sale and home consumptions	11	16.4	6	9.2	17	12.9
Frequency of broodiness	12	17.9	6	9.2	18	13.6
P-Value	**0.04***					

Table 1:- Culling Practices of Chickens

N*= Total number of respondents, ns= non-significant, *= significant*

B. Breeding practices and the sources for breeding heads

There might be different sources to have chickens for their owners. Purchase from market, hatched in the flock and a gift were reported to be the sources of chickens and accounted for about 56.7%, 29.4% and 13.9 % in this study, respectively (Table 2). The scavenging chicken production system in the study area is characterized by lack of systematic breeding program (uncontrolled mating systems). Approximately half of the farmers (48.9%) who involved in this study were prioritized the breeding value on the male line. The remaining 22.2 and 28.9% farmers were placed the breeding value on the female line and both on the male and the female lines respectively. This result is not comparable to the study of Solomon *et al*., (2013), who reported that about 55.2, 20 and 24.8% of the respondents place breeding value on male, female and on both male and female in Metekel Zone of Northwest Ethiopia, respectively.

While looking the selection habit 92.2% of the farmers select breeding chickens based on their feather colors. This result is not similar to the result that was conducted by Matiwos *et al*., (2015) who reported that chickens which produce a large number of eggs, hens having good mothering ability and chickens with big body size and large eggs were preferred by farming community during chicken selection for breeding purpose.

In case of brooding, for majority of the respondents (70.5%) the strong broody behavior of the chickens was considered as a selection criteria followed by moderately broody behavior (17.8%) and poor broody (11.7%) in the study area.

About 45.6% of the respondents make the selection considering mothering ability and about 35% of the respondent's select breeding hens based on the hatching history and ability to escape from predators in both districts. The remaining 11.1% of the respondents select good mothering hens on the basis of their duration of sitting on their eggs, while 8.3% of the respondents select the breeding hen on the basis of their care of their chicks after hatching. About 40%, 28.3%, 22.3% and 8.9% of the respondent's select broody hen's based on large body size, previous hatching performance, ample plumage feather cove and frequency of broodiness, respectively in the study area. According to Nigussie *et al*., (2010) beside other quantitative traits, morphologic traits such as plumage color and comb type have significant economic values.

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Parameters	Districts					
	Anlemo (N=90)		Gibe (N=90)		Overall(N=180)	
Selections practice in terms of sex	**N**	**%**	**n**	**%**	**N**	**%**
Male	54	60	35	37.8	88	48.9
Female	13	14.4	27	30	40	22.2
Male and Female	23	25.6	29	32.2	52	28.9
P-Value	**0.006****					
Select chicken based on feather color						
Yes	86	95.6	80	88.9	166	92.2
No	4	4.4	10	11.1	14	7.8
First sources of chicken						
Market	52	57.8	50	55.6	102	56.7
Family	25	27.8	28	31.1	53	29.4
Gift	13	14.4	12	13.3	25	13.9
P-Value	**0.88**^{ns}					
Selecting hens on the basis of broody behavior						
Frequently broody behavior	59	65.6	68	75.6	127	70.5
Moderately broody behavior	21	23.3	11	12.2	32	17.8
Poor broody behavior	10	11.1	11	12.2	21	11.7
Mothering ability						
Good ability of sitting during hatching	6	6.7	14	15.6	20	11.1
Good feeder of the chickens after hatching	8	8.9	7	7.8	15	8.3
Good hatching history	45	50	37	41.1	82	45.6
Good protector from predators	31	34.4	32	35.6	63	35
P- Value	**0.25** ^{ns}					
Criteria for broody hens selection						
Larger body size	37	41.1	35	38.9	72	40
previous hatching performance	26	28.9	25	27.8	51	28.3
Ample plumage feather cover	18	20	23	25.6	41	22.8
Broodiness	9	10	7	7.8	16	8.9
P- Value	**0.82**^{ns}					

Table 2:- Management, breeding and selection Practices of local Chickens
n =frequency, ns= statistically non-significant deference between row both districts (P>0.05), ** = statistically significant between row of two districts of study areas (P<0.01).

More than 45% of the farmers in this study were preferred in selecting medium body size; whereas 42.8% of the respondents were motivated to select the heavy body sized chickens for breeding purpose and the remaining 11.7% farmers were interested in selecting the small size (light) chickens for breeding purpose (figure 1).

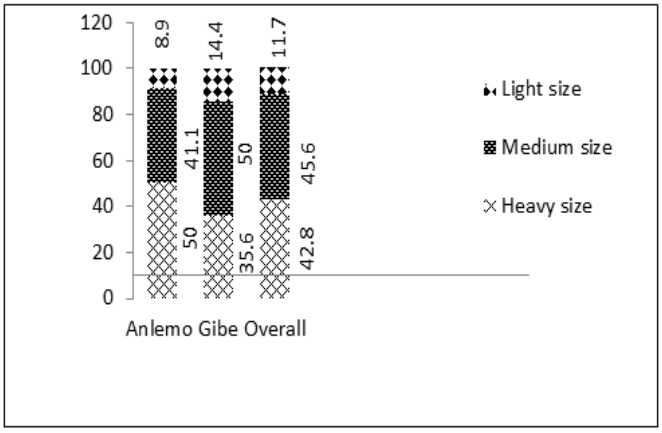

Fig 1:- Select based on body weight of chickens in study areas

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About 81.7% of respondents reported to be engaged in selections of chickens for breeding purposes based on productivity in both study areas (Figure 2).

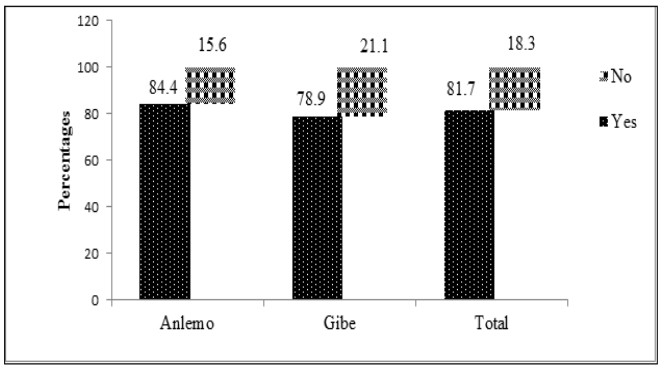

Fig 2:- Select chicken for breeding

In this study 47.8%, 30.6% and 21.7% of the respondents reported that as they selected their breeding chickens based on comb types with preference to double (Rose), single comb and both single and double comb respectively (figure 3).

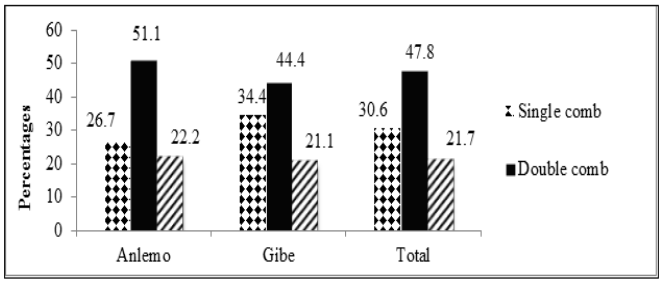

Fig 3:- Select chickens basis of comb type to prefer

C. Performance of Indigenous Chickens

➢ *Age at sexual maturity*

The results of this study revealed that, mean age at sexual maturity was 6.23 months (for pullets) and 5.94 months (cockerels) in Hadiya Zone indicating that the age at sexual maturity of cockerels is faster than that of pullets attributed to the better scavenging ability of the cockerels. The report in this study is longer than that of (Safa and Degnet, 2016), who reported that mean sexual maturity of female chickens (pullets) is 22.93 weeks and male was 23.18 weeks in Lemo District, Hadiya Zone, Ethiopia and Hailu *et al., (*2013), who reported that mean sexual maturity of 24.25 and 23.84 weeks for males and females respectively, in North Wollo, Amhara region. Unlike wise, this report was indicating that shorter time while comparing to the result conducted by Mekonnen (2007) who reported that age at first egg of pullets was 7.07 months for indigenous pullets of Dale Woreda.

Local chickens are well adapted to the tropics, resistant to poor management, feed shortages, tolerate to diseases and provide better test of meat and eggs than exotic chicken (Tadelle and Ogle, 2001). However, they are poor in performance in terms of sexual maturity, egg size, growth rate, clutch size and hatchability (Bogale, 2008; Fisseha, 2009; Meseret, 2010). Mean age of Market and slaughter age of cockerels and pullets chickens was assessed to be about 5.84 and 6.58 months, respectively. There was variations between the different districts of the study area in age of market and slaughter of the indigenous female chickens ($P<0.05$).

➢ *Egg Production Performances*

Mean egg production/clutch in this study was 10.73eggs/hen. This report is revealed that lower egg production than that of (Halima, (2007), who reported that an average productivity of 9–19 eggs/clutch in North-West Ethiopia. There was no significant difference ($P>0.05$) between the studied districts, in egg production performance of the indigenous chickens per clutch. Moreover, egg production/clutch/hen assessed in this study was lower than the report conducted by Meseret, (2010), who reported that 12.92 eggs/ clutch/hen in Gomma Woreda of Jimma Zone. According to CSA (2003) the national average for the Ethiopia indigenous chicken was 12eggs/clutch/hen. The result of the current study was lower than that of Hailu *et al*., (2013), who reported 12.64 egg /clutch/ hens from North Wollo, Amhara region. Poor management might be the case for lower egg production of the hens in current study area while comparing to most reports of different scholars as discussed above.

The average clutch number of the indigenous chicken was 3.72/year. The average number of clutches per year was reported to be 3.96 for Anlemo Woreda, the value of which was higher than that of Gibe Woreda (3.48). This result is lower than 4.12 average number of clutch per year, reported by Safa and Degnet, (2016), in Lemo district. However, this is higher than the report of Meseret, (2010) who reported that 3.43 clutches /year in Gomma Wereda of Jimma Zone. The mean annual egg production of the local chickens of this study was assessed as 41.49 eggs /hen. The egg production per year is somehow higher than the report of Fikere, (2000), who reported that 36-42 eggs/year/head (39 eggs/year) from Ambo Woreda of Oromia Regional State, unlike wise, lower than the report conducted by (Meseret, 2010), who reported that the mean annual egg production was 43.84 eggs/hen/year in Gomma Woreda of Jimma Zone. It is also lower than that of Mekonnen, (2007), who reported that 55eggs/year/head in Dale Woreda from local chickens.

Mean number of incubation/year (hatches/year) was 1.87 in this study area. Mean number of days per clutch was 24.18 days. The average weaning age of indigenous chickens in study areas was 2.13 months. This report is indicating the longer time comparing to the study conducted by (Bogale, 2008) who reported that average number of chicks of weaned age was 7.63 weeks in Fogera and the report of Addisu,

(2013) who reported that 4.59 weeks of chick's weaned age in Amhara region.

Mean eggs set/hen was assessed as 10.57 eggs in Anlemo and 9.98 eggs in Gibe districts; with 81% of hatchability in the study area. There was no significant difference in hatchability between the two districts. The chick survival rate up to the 8th weeks was 29% in Anlemo and 39% in Gibe district. There was highly significant difference (P<0.001) between two districts for chicks survival rates.

Parameters	**Districts**						
	Anlemo(N=(90)		Gibe(90)		Over all(N=180)		
Age at sexual maturity	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**P-Value**
Av. age of local pullets at 1st egg laying (months)	6.17	0.63	6.28	0.80	6.23	0.72	0.3^{ns}
Av. age of cockerels at 1st mating (months)	5.77	0.562	6. 12	0. 671	5.94	0.641	0.000^{***}
Av. No. of eggs per clutch	10.87	2.05	10.6	1.84	10.73	1.95	0.36^{ns}
Av. No. of days per clutch	24.52	2.17	23.84	1.87	24.18	2.02	0.03^{*}
Average number of weaning age	2.31	0.69	1.99	0.73	2.15	0.71	0.003^{**}
Average number of clutch per year	3.96	1.22	3.48	1.38	3.72	1.30	0.02^{*}
Number of eggs per year	42.54	12.56	40.44	12.74	41.49	12.66	0.27^{ns}
Av. No. eggs per set	10.57	2.01	9.98	1.78	10.3	1.90	0.04^{*}
Hatchability %	79		84.4		81		0.74^{ns}
Chicks Surviving rate %	29		39		34		0.000***
Market and slaughter age of male	5.92	0.94	5.77	0.85	5.84	0.89	0.25^{ns}
Market and slaughter age of female	6.76	0.92	6.41	0.86	6.58	0.90	0.01*

Table 3:- Productive and Reproductive Performances of the indigenous chickens

*N= Total number of respondents, Av. =Average numbers, ns= non-significant (p>0.05), *= significant (p<0.05), ***=highly significant (p<0.001).*

Looking for the incubating hens, about 77.2% of farmers in the study area selected egg incubating hens based on size and brooding behavior. Among the respondents who involved in the interview for this study, about 50.6% respond as they set or place brooding hens in light and protected corners whereas, 30.6% were setting on any place where in the house and the remaining 18.8% were place in the dark and protected corner. Significantly (P<0.01) higher farmers in Anlemo district used light and protected corner for setting the brooding hen than Gibe district.

Parameters	**Districts**					
	Anlemo		**Gibe**		**Overall mean**	
Selecting size of hens used for incubating	**n**	**%**	**n**	**%**	**n**	**%**
Yes	76	84.4	63	70	139	77.2
No	14	15.6	27	30	41	22.8
The sources of eggs for incubation Purchase from market	16	17.8	20	22.2	36	20
Sharing Borrowed from neighbor	10	11.1	16	17.8	26	14.4
Laid at home	64	71.1	54	60	118	65.6
P-Value 0.26^{ns}						
Place for incubating hens						
In dark and protected corner	12	13.3	22	24.4	34	18.8
In light and protected corner	57	63.3	34	37.8	91	50.6
anywhere in the house	21	23.4	34	37.8	55	30.6
P-Value0.003**						

Table 4:- Selection methods of indigenous chicken for reproduction in study areas

*n=numbers of respondents, ns=no significant (P<0.05), **=significant (P<0.01),*

In the study 43.3, 35.6, 12.8 and 8.3% of the respondents avoid broody behaviors by disturbing the broody hen in the nest, hangs the broody hen upside down, deprive the broody hen feed and water and moving to neighbors, respectively. The storage of eggs for shelf life was at home in selected place, in cold room and inside cold container.

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Variables	Districts						
	Anlemo(N =90)		Gibe (N= 90)		Overall (N=180)		P-value
A practices to avoid broody behavior	n	%	n	%	n	%	
hanging the bird upside down	30	33.3	34	37.8	64	35.6	0.007**
depriving of the birds from feed &water	7	7.8	16	17.8	23	12.8	
Disturbing in the nest	49	54.4	29	32.2	78	43.3	
Moving to neighbors	4	4.4	11	12.2	15	8.3	
To store eggs to improve their shelf lives							0.26^{ns}
In cold room	35	38.9	28	31.1	63	35	
Inside cold container	19	21.1	15	16.7	34	18.9	
Any place at home	36	40	47	52.2	83	46.1	

Table 5:- Practice to avoid broodiness and eggs storing

*n=numbers of respondents, % = percentages of respondents, ns=no significant, **=significant*

About 44.4% and 71.1% of the respondents reported used clay pot and straw bedding as egg setting materials in Anlemo and Gibe district, respectively. Wheat and teff straws are used as egg setting materials for 28.9 and 14.4% of the respondents in Anlemo and for 26.7% and 14.4% of the respondents in Gibe districts, respectively (fig. 4).

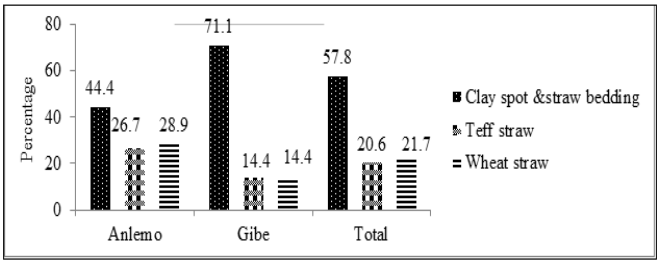

Fig 4:- Egg setting materials

The results of this study indicated that about 76.1% of the respondents consider the effect of seasonal variability on hatchability. About 90% of the respondents reported that the lowest percentage of hatchability might be occurred during the season ranging between June and September. In other way, 86.1% of the respondents reported that the best hatchability seasons ranging from Octobers to January; this indicated that the respondents used to incubate and brood their hen during the dry seasons. About 10.6% of the respondents respond that as season ranging between January and May is characterized by an outbreak of disease. According to 31.1% of the farmers' response, the highest chick mortality might be occurred within the first two weeks after hatching.

Parameters	**Districts**					
	Anlemo		Gibe		Overall mean	
The seasonal variability on hatchability	n	%	N	%	N	%
Yes	71	78.9	66	73.3	137	76.1
No	19	21.1	24	26.7	43	23.9
The worst seasons for hatchability						
April-May	11	12.2	7	7.8	18	10
June –Sept.	79	87.8	83	92.2	162	90
P-Value	0.32^{ns}					
Best seasons for hatchability						
Oct –Jan.	75	83.3	80	88.9	155	86.1
Feb.-May	15	16.7	10	11.1	25	13.9
P-Value	0.3^{ns}					
When the highest chick mortality occur after hatching (Weeks) mortality of chicks						
The 1st week	2	2.2	5	5.6	7	3.9
The 2nd weeks	24	26.7	32	35.6	56	31.1
The3rd weeks	42	46.7	24	26.7	66	36.7
The 4th weeks	8	8.9	19	21.1	27	15
The 5th weeks	14	15.6	10	11.1	24	13.3
P-Value	0.014*					

Dominant color of eggs shell in study areas						
White	68	76.7	68	75.5	137	76.1
Pale white	9	10	14	15.6	23	12.8
Pale	9	10	5	5.6	14	7.8
Pale brown	3	3.3	3	3.3	6	3.3
P-Value	0.53^{ns}					
The age of the birds increase, then the clutch period were:						
Increase	73	81.1	71	78.9	144	80
Decrease	6	6.7	9	10	15	8.3
No change	11	12.2	10	11.1	21	11.7
P-Value	0.71^{ns}					

Table 6:- Seasonality in hatchability and related characteristics
n=numbers of respondents, % = percentages of respondents, ns= non-significant between row of two woredas (P>0.05).

As to 64.4% of the response of respondents, eggs selections occurred at a time or before incubation. For about 28.9% of the respondents, base for egg selection was color; unlike to the majority of the farmers those did not consider selection of eggs based on its color as stated in the table below. About 73.9% of the respondents reported that, there is no treatment or practices of egg testing before incubation, and remaining 16.1% and 10% of the respondents were practiced testing and cleaning eggs before incubations using indigenous knowledge like, holding against sunlight.

Parameters	**Districts**					
	Anlemo		Gibe		Overall mean	
The treatments of the eggs by local methods	n	%	N	%	N	%
Test fertility seeing on upward to sun	19	21.1	10	11.1	29	16.1
Clean using cloths or other materials	11	12.2	7	7.8	18	10
No treat	60	66.7	73	81.1	133	73.9
Commonly used to incubation in local methods						
Natural	90	100	90	100	180	100
Artificial	0	0.0	0	0.0	0	0.0
Breeding cock						
Yes	69	76.7	75	83.3	144	80
No	21	23.3	15	16.7	36	20
Selects of eggs at a time or before incubation						
Yes	45	50	71	78.9	116	64.4
No	45	50	19	21.1	64	35.6
Select specific color on egg for incubation						
Yes	31	34.4	21	23.3	52	28.9
No	59	65.6	69	76.7	128	71.1

Table 7:- Eggs selection and treatments methods before incubation in the study areas.
n=numbers of respondents, % = percentages of respondent

IV. CONCLUSION

Local chickens are well adapted to the tropics, resistant to poor management, feed shortages, tolerate to diseases and provide better test of meat and eggs than exotic chicken. However, they are poor in performance in terms of sexual maturity, egg size, growth rate, clutch size and hatchability. As we can see these local chickens are very important in tropical areas even though faced a great challenges in productivity side. Off course the farmers in this study were selecting the chickens depending on different criteria which favor the environment. So, it is better to give emphasis for their management in order to get relevant production from local chickens.

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