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Study of Indigenous Chicken Production System in Bench Maji Zone, South Western Ethiopia

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Keywords: *indigenous, production, clutches, broodiness, hatchability.*

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Study of Indigenous Chicken Production System in Bench Maji Zone, South Western Ethiopia

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Abstract- Indigenous chickens in Ethiopia are found in huge numbers distributed across different agro ecological zones under a traditional family-based scavenging management system. This indicates that, they are highly important farm animals kept as a source of animal protein and income to most of the rural populations. Religions and cultural considerations are also amongst the reasons for keeping chickens by resource poor farmers in Africa. Similarly, households in Ethiopia keep birds for household consumption, sale and reproduction purposes including other social and cultural roles. Ethiopia, with its wide variations in agro-climatic conditions, possesses one of the largest and the most diverse plant and animal genetic resources in the world. Therefore, this study was conducted from September 2013 to May 2014 in nine selected kebeles and South bench Woreda's located in Bench Maji Zone of South western of Ethiopia with the objective to describe indigenous chicken husbandry practices and production system. The study involved both questionnaire survey and a participatory group discussion. A total of 180 indigenous chicken owning farmers and 660 chickens (180 cocks and 480 hens) aged more than 6 month were considered under field condition. Significant ($p<0.05$) differences were found among the districts in traits. The frequency of egg set to broody hen/year was 1.95 in north-bench, 1.98 in sheko and 2.10 in south-bench, average number of eggs set to broody hens was 12.11 in north-bench, 11.72 in sheko and 11.27 in south-bench of which the average percentage of hatchability was 77.97% in North bench, 75.51% in Sheko and 80.92% in South bench. The average number of clutches per hen per year of village chicken were non-significant ($P<0.05$) among the study districts. North-bench chickens had (3.65) mean number of clutch per hen per year, sheko (3.67) and south-bench (3.64) chickens, respectively. The number of eggs per clutch found in the current study was 14.43, 14.74 and 14.81 in north-bench, sheko and south-bench respectively. Generally developing appropriate production programs for village conditions requires defining the production environments, identifying the breeding practices, production objectives, trait preferences of rural farmers and unique characteristics of indigenous chicken ecotypes were observed in the study area.

Keywords: indigenous, production, clutches, broodiness, hatchability.

I. Introduction

Indigenous chicken productivity is low as compared to exotic breeds with average annual egg production of 60 eggs. Low productivity is also due to low hatchability and high mortality of indigenous chicken. This initiates the government to modernize poultry production by introducing exotic breeds and encouraging more productive technologies. This indiscriminate introduction of exotic genetic resources, before proper characterization, utilization and conservation of indigenous genetic resources is thought as the main cause of the loss of indigenous chicken genetic resource (Halima, 2007). Disease (Serkalem *et al.,* 2005), predation (Halima, 2007), market system (Bogale, 2008), management and production system (Fisseha, 2009; Fisseha *et al*., 2010a) are major constraints of chickens in scavenging production system of Ethiopia.

Provision of animal protein, generation of extra cash income and religious /cultural considerations are amongst the major reasons for keeping village chickens by rural communities (Alders *et al*., 2009). Nearly all rural and peri-urban families in developing countries keep a small flock of free range chickens (Jens *et al*., 2004). The total chicken population in the country is estimated to be 50.37 million (CSA, 2012/13). The majorities (99 %) of these chickens are maintained under traditional system with little or no inputs for housing, feeding or health care (Tadelle and Ogle, 2001). This indicates that traditional chicken production is practiced by every family in rural Ethiopia because they provide protein for the rural population and generate family income. Therefore, this study was aimed to generate the relevant information regarding the indigenous chicken production system of Bench Maji Zone. Hence, the objective of this study was to describe indigenous chicken husbandry practices, and production systems of indigenous chicken type's in Bench Maji Zone.

II. Materials and Methods

Description of the Study Area: This study was conducted in Bench Maji Zone (BMZ) which is located in the south western part of Ethiopia. BMZ is found at distance about 561km from Addis Ababa and 842 km from the regional capital Hawassa. It is bordered with Keffa Zone in North, Debub Omo in North East, Sheka Zone in South West,

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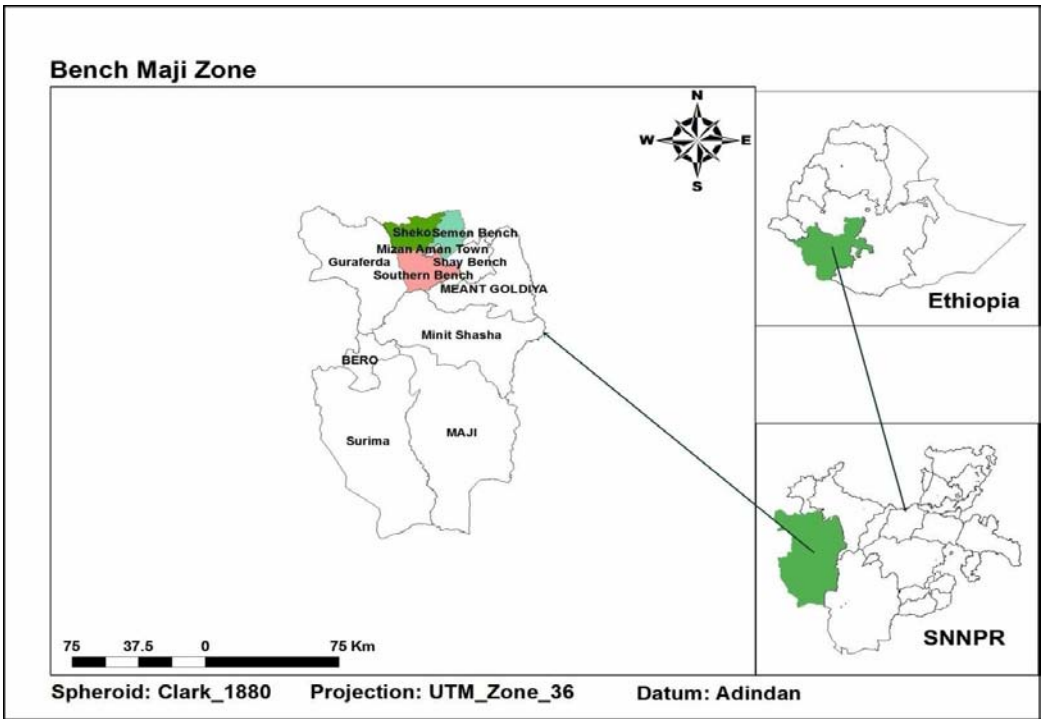
with Gambella and South Sudan Republic in South direction (BMZARD, 2014). Agro-ecologically, BMZ, consists of 52 percent lowland (500-1500 m.a.s.l), 43percent intermediate highland (1500-2300 m.a.s.l) and 5percent highland (>2300 m.a.s.l). It has an altitude ranging from 500-2500 m.a.s.l. The mean annual temperature varies from 15.1^{0C} - 27.5^{0C}. The mean annual rainfallranges from 400-2000 mm (BMZARD, 2014). Bench MajiZone has 10 districts from which this study involved threedistricts; namely North-bench, Sheko and South-bench.



❖ Map of the study area

a) Sampling Techniques for Data Collection

A rapid field survey was made prior to the actual survey work to explore the available knowledge about the type, distribution and utility of chicken types. The data on distribution and numbers of indigenous chickens were taken from office of Agriculture and Rural Development (BMZARD) of each district in the zone before starting the field work. Then three districts and a total of nine peasant associations (PAs) were selected based on the information gathered through the rapid field survey to the main road and consultations with Woreda's Agricultural experts and extension agents. A total of 180 households (60 from each district) were sampled for interview from the selected PAs.

b) Data Collection Procedure

The data were generated through observation, administering a structured questionnaire organizing group discussion and from secondary sources.

c) Data Management and Statistical Analysis

All data were coded and recorded in Microsoft excel sheet. Statistical analyses were made separately for male and female chicken on variables that varied on sex; otherwise the data were merged and analyzed together.

d) Descriptive Statistics

Statistical analysis system (SAS) version 9.2 (2008) was used to carry out descriptive statistics variables of the identified indigenous chicken populations production systems.

e) Univariate Analysis

A general linear model procedure (PROC GLM) of the SAS was employed for quantitative variables to detect statistical differences among sampled indigenous chicken populations. For mature animals, sex and location of the experimental indigenous chickens were fitted as fixed independent variables. The effects of class variables and their interaction were expressed as Least Square Means (LSM) ± SE. Mean comparisons were made using Turkey's studentized range test method at $P<0.05$.

III. Results and Discussion

a) Characterization of the Poultry Production System

i. Socio-economic status and respondent's profile

General characteristics of the respondents studied were presented in Table 1. From the total interviewed village chicken owners in the study area, more than half (72.78 %) and (27.22 %) were male and females, respectively. The average age of respondents

was 36.91 years in north-bench, 39.73 years in Sheko and 35.63 years in south-bench.

ii. *Purpose of keeping indigenous chickens*

Importance and uses of poultry production in the context of smallholder farmers were multi-directional (Table 2). The results of rankings from north-bench and sheko districts had shown that chickens as source of egg production was the first and second in south-bench district. From the result of ranking in all districts the purpose of egg for hatching was the first most important. This is similar to Fisseha *et al*. (2010a) who reported that the use of eggs for hatching (71.7%) was the first function of eggs in Bure woreda of northwest Amhara.

b) Flock composition and characteristics

The mean values of chickens in different age category and proportion of the respondent owning different size of chickens are shown in Table 3. The value reported in this work is higher than 7.10 chickens per household reported by Tadelle and Ogle (1996) for the central highlands of Ethiopia and 8.8chickens per household reported by Asefa (2007) for Awassa Zuria and lower than the case reported by Fisseha *et al.,* (2010b) which reported a mean flock size of 13 and 12 chickens per household for Bure and Fogera woreda in Ethiopia, respectively.

i. *Feeding*

All chicken owners provided supplementary feed. Inadequate of supplementary feed is one of the characteristics of a free-ranging backyard poultry production system (Gueye, 2003). However, in this study 100 % of the respondents practiced scavenging system with supplementary feeding (Table 4). This is similar with the findings of Zemene *et al.* (2012) who reported 100% chicken owners in west Amhara region provided supplementary feed. Another study in Dale, Wonsho and Loka Abaya Woreda's of southern nation nationality people regional state, (Mekonen, (2007) indicated that 98.1 % of the households offer supplementary feed. All of the respondents who practiced supplementary feeding system used home grown crops such as maize, sorghum, wheat, banana and household scraps to feed their chickens.

ii. *Watering*

Concerning the frequency of watering, more than half of chicken producers (57.78%) provided water adlibitum (making water available every time) (Table 5). Halima (2007) also reported that 99.5% of chicken owners in north-west Amhara provided water to village birds. The source of water, the water given to chickens was drawn from rivers (72.22%), and hand operated (27.78%). The present study also indicated that all chicken owners (100%) had watering trough. Broken clay material, (locally called *"shekila")*, wooden trough, plastic made through and metal made trough were used as watering trough in all districts.

iii. *Housing*

Housing is the most important to chickens as it protects them against predators, theft, rough weather and provides shelter for egg laying and broody hen. This result is similar with the case reported by Mekonen (2007), Meseret (2010) and Eskinder (2013) who reported 97.6 % in Dale, Wonsho and Loka Abaya Woreda's of southern nation nationality people regional state, 94.4% in Gomma woreda and 92.06% in both Horro and Jarso respectively. However, the result contradicts the reports of Halima (2007) and Bogale (2008) who evidenced that, majority of the rural households (51%) of northwest Ethiopia and 59.7% of Fogera woreda had separate sheds for their chickens, respectively.

c) Culling practice and factors determining culling

In the study district, respondents have their own criteria and strategies of culling chicken. The determinant factors of culling chicken are given in Table 7. As the result from the table indicated, most of the respondents in north-bench (66.67%), Sheko (65%) and south-bench (56.67 %) had their own indigenous knowledge of culling chicken for the reason of poor productivity, old age and illness. This result is in agreement with the case reported by Halima (2007) who reported 74.7% of the respondents in northwest Ethiopia cull their chicken because of poor productivity and old age.

d) Traditional methods of breaking broodiness

Traditional methods for breaking broodiness are given in Table 8. 'Although broodiness in local chicken is an important trait and the most essential means of egg incubation'. It is one of the major reasons for the low egg productivity. Almost all of the respondents indicated that broodiness characteristics were common in their flock in which 78.34% in north- bench, 63.32 % in Sheko and 81.67% in south-bench practiced the traditional methods hanging upside down, tying wings, taking to another place and hide brooding nest of breaking broodiness that a hen resumes laying of eggs in order to increase the number of eggs obtained from a single chicken in a certain period of time.

e) Egg incubation, hatchability and Chick survival

Average number of eggs set to broody hen, average hatch rate, percentage of hatchability, survival rate of chicks to 8 weeks age and its percentage are given in Table 9. The frequency of egg set to broody hen/year was 1.95 in north-bench, 1.98 in sheko and 2.10 in south-bench, average number of eggs set to broody hens was 12.11 in north-bench, 11.72 in sheko and 11.27 in south-bench of which the average percentage of hatchability was 77.97% in North bench, 75.51% in Sheko and 80.92% in South bench. This

hatchability percentage seems relatively satisfactory as Sonaiya and Swan (2004) reported, hatchability using a broody hen around 80% to be normal, but a range of 75% to 80% is considered to be satisfactory. Similarly this hatchability performance is less than that of village hens reported by different researchers as follows: a hatchability performance of 82.6% was reported in Bure woreda, Ethiopian local breed chicken by Fisseha *et al*., (2010a) and an average hatchability of 82% reported in communal area of Zimbabwe by Kusina*et al.*, (2000). However, this hatchability performance is more than the 70.5% obtained by Tadelle (2003) for five regions in Ethiopia.

f) Reproductive and Productive performance of local chicken

The mean age at first lay, number of clutches per hen per year and number of eggs per clutch per hen are given in Table 10. According to the current study, the average age at first lay of village chicken and the average age at first mating were significant ($P<0.05$) among the study districts. North-bench and South-bench had relatively higher values which is 5.92 and 5.82 months for mean age of female at first lay, and 5.77 and 5.83 months for mean age of male at first mating, respectively, Sheko had lower values which is 5.50 months for mean age of female at first lay and 5.61 months for mean age of male at first mating. This shows pullets and cockerels found in sheko relatively matured faster than chicken of the other districts. The overall mean age at first lay (5.75 months) recorded in this study was similar with Mammo (2006) and Halima (2007), who reported 5.35 and 5.5 months of mean age at first lay respectively for chickens and shorter than 6.8 months reported by Tadelle *et al.*(2003). The overall mean age at first mating for cockerels (5.74 months) is in agreement with the findings of Halima (2007) and Bogale (2008), who reported 5.5 and 5.87 months respectively and shorter than 6.15 month reported by Fisseha *et al.,* (2010a).

The average number of clutches per hen per year of village chicken were non-significant ($P<0.05$) among the study districts (Table 10). North-bench chickens had (3.65) mean number of clutch per hen per year, sheko (3.67) and south-bench (3.64) chickens, respectively. The overall mean number of clutch per year (3.65) recorded in this study was lower than Fisseha *et al.*(2010b) and Eskinder (2013) who reported 3.83, 5.2 and 3.94 per year respectively. This might indicate the variation of broodiness behavior among the Ethiopian ecotypes. The number of eggs per clutch found in the current study was 14.43, 14.74 and 14.81 in north-bench, sheko and south-bench respectively. The number of eggs per clutch found in this study agrees with the reported values of 15.0 and 12.94, 15.7 and 14.9 eggs in Horro, Jarso, Bure and Dale Woreda's, respectively. (Eskinder 2013,Fisseha *et al.*2010b) and lower than the 17.7 average eggs per clutch per hen reported by Tadelle (2003) for five regions in Ethiopia. Accordingly, the total egg production per hen per year of local hens was estimated to be 52.34, 53.94 and 53.71 innorth- bench, sheko and south-bench, respectively.

g) Effective population size and rate of inbreeding

The current study showed that 76.67 % in north-bench, 73.33 % in sheko and 70.00% in south- bench respondents had their own breeding cocks while the rest shared breeding males with neighbors (Table 11). To get some impression on the effective population size and rate of inbreeding over generations, effective population size was calculated based on the flocks of farmers who possessed their own breeding males. As shown in Table 11, the effective population size ranged from 4.79 (north-bench) to 3.81 (sheko) and 3.79 (south-bench) which implies the number of breeding individuals was very small. This result was smaller than the reported effective population size of 4.17 for Mandura, 4.94 for Horro and 5.22 for Konso village chickens by Nigussie *et al.*(2010a) and the present study is in line with effective population size of 3.73 and 4 for Horro and Jarso, respectively reported by Eskinder (2013).

h) Health management and disease

The results pertaining to disease outbreak among the chickens in the studied districts are presented in Table 12. The result indicated that 68.33% in north-bench, 63.33% in sheko and 48.33% in south-bench village chicken owners experienced chicken disease outbreaks in the last 12 months. During farmer group discussions, the major diseases and parasites easily recognized by the villagers were Newcastle disease (*'fingile'*) and lice (Q*inqin* or *susii)*, respectively.The results also indicated that a traditional treatment (ethno-veterinary) was the major type oftreatment used by majority of village chicken owners in all the study districts for diseases like Newcastle. Accordingly, provision of local alcohol ('*Katikala or areqe'*), 'kerebicho'through smoking, lemon (*citrus limon*), '*Feto'* (Brasica spp), garlic (Allium sativum), andhuman antibiotics like tetracycline mixed with feed and/or drinking water and bleeding ofwing veins of sick birds against Newcastle disease were the most widely used type oftraditional treatments.

i) Challenges of village chicken production system

The rankings had shown that disease and predator were the major and economically important constraints for the production system of the districts (Table.13). Although predation was mentioned as an important problem in the entire study district, it is identified as a major economically important constraint in village chicken production system. The group discussion result revealed that there are problems associated with predators in all studied districts such as

wild birds of prey (locally called "chilfit"); cats (both domestic and wild) and dogs. Similarly, the results of a study by Mekonen (2007) in southern region of Ethiopia Halima (2007) in north-west Ethiopia and Zemene (2011) from Amhara region indicated that predators are the major constraints in village chicken.

Table 1 : Socio-economic characteristics of the respondents in village chicken production system.

Parameters	Districts			Over all
	North bench	Sheko	South bench	
Age of the respondents	36.91±0.93ab	39.73±0.97a	35.63±0.77b	37.42±0.89
Family size/HH	5.80±0.33	5.27±0.23	5.48±0.22	5.52±0.26
Sex		(frequency, (%)		
Male	46 (76.67)	42 (70.00)	43 (71.67)	131 (72.78)
Female	14 (23.33)	18 (30.00)	17 (28.33)	49 (27.22)
Educational background				
Illiterate	14 (23.33)	11 (18.33)	22 (36.67)	47 (26.67)
Read & write	29 (48.33)	17 (28.33)	4 (6.67)	50 (27.78)
Primary education	13 (21.67)	25 (41.67)	27 (45.00)	65 (36.11)
Secondary education	4 (6.67)	7 (11.67)	7 (11.67)	18 (10)
Livestock holding/HH		Mean ±SE		
Cattle	4.03±0.25a	2.45±0.13b	2.63±0.18b	3.04±0.19
Sheep	2.75±0.27a	1.50±0.18b	1.40±0.17b	1.88±0.21
Total Chicken	11.62±0.83a	6.10±0.44b	9.58±0.72a	9.1±0.67
Goat	0.82±0.12a	0.70±0.17ab	0.32±0.11b	0.61±0.13
Donkey	0.12±0.05	-	0.03±0.02	0.05±0.03
Mule	0.05±0.03	-	0.02±0.01	0.05±0.03
Horse	0.08±0.04	0.05±0.04	-	0.04±0.03
Land holding/HH	1.21±0.10a	0.71±0.09b	0.49±0.02b	0.8±0.43

a, b, means with different superscript letters across a row are significantly different at p<0.05; ns= non significance, HH=interviewed households.

Table 2 : Purpose of village chicken rearing and eggs

Districts	Purpose of chickens			Purpose of egg		
	Income	Consumption	Egg production	Income	Consumption	Hatching
north bench						
Rank1	18	10	32	12	16	32
Rank2	31	20	7	29	18	13
Rank3	16	24	14	19	26	15
Index	0.38	0.27	0.35	0.31	0.31	0.38
Sheko						
Rank1	24	8	28	21	9	30
Rank2	31	9	19	30	11	17
Rank3	5	41	13	5	40	13
Index	0.39	0.23	0.38	0.36	0.25	0.39
south bench						
Rank1	30	9	21	23	8	29
Rank2	26	6	28	27	9	24
Rank3	4	45	11	10	43	7
Index	0.41	0.23	0.36	0.37	0.24	0.39

Index=sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular trait divide by sum of [3 for rank 1+ 2 for rank 2 + 1 for rank 3] for all traits.

Table 3 : Chicken flock size per household by different age and sex groups

Age and sex	Districts								
	North-bench			Sheko			South-bench		
	Mean ± SE	Range	% N	Mean ± SE	Range	% N	Mean ± SE	Range	% N
Hens	4.18±0.37[a]	14	37.29	3.07±0.19[b]	8	48.17	3.52±0.32[ab]	17	37.45*
Cocks	1.68±0.19	8	15.01	1.38±0.15	5	21.73	1.30±0.16	5	13.81[ns]
Pullets	2.10±0.24[a]	10	18.72	0.93±0.18[b]	6	14.66	1.28±0.15[b]	4	13.63*
Cockerels	1.15±0.19[a]	8	10.25	0.32±0.10[b]	3	4.97	1.27±0.17[a]	5	13.45*
Chicks	2.10±0.47[a]	13	18.72	0.67±0.21[b]	7	10.47	2.05±0.43[a]	18	21.77
Average no. of chickens/ HH	11.62±0.83		-	6.10±0.44	-	-	9.58±0.72	-	-

a, b means in the same row with different superscripts are significantly different (P< 0.05); HH= household; SE= Standard error, ns= non –significance ,N= number of sample population.

Table 4 : Type and provision of supplementary feeding for chicken

Supplementary feeds (Percent)	Districts		
	North-bench	Sheko	South-bench
Provision of Supplementary feeding			
Yes	100	100	100
No	-	-	-
Type of supplementary feeds[a]			
Maize	100	66.67	100
Sorghum	86.67	70	80
wheat	-	3.33	-
Banana	11.67	6.67	3.33
Household scraps	30	23.33	43.33

[a]=*Percentages do not add up to 100% since respondent's selected more than one feed type.*

Table 5 : Source, Practice and frequency of watering for chickens

Factors	Districts			Overall mean
	North-bench	Sheko	South-bench	
Provision of water to chicken				
Yes	100	100	100	100
Source of water for chickens				
Pipe water (hand operated)	38.33	21.67	23.33	27.78
River	61.67	78.33	76.67	72.22
Frequency of watering				
Once a day	-	-	-	-
Twice a day	21.67	16.67	18.33	18.89
Three times a day	20	23.33	26.67	23.33
Offered freely (*ad libitum*)	58.33	60	55	57.78
Type of water Trough				
Brocken clay material	21.67	16.67	20	19.45
Wooden trough	18.33	15	21.67	18.33
Plastic made	45	55	46.67	48.89
Metal made trough	15	13.33	11.67	13.33

The present study also indicated that all chicken owners (100%) had watering trough.

Table 6 : Housing and reasons for not having separate shelter for chickens

Housing conditions (%)	Districts			Overall mean
	north-bench	sheko	south-bench	
Housing				
Perches in the veranda	6.67	8.33	3.33	6.11
Perches in the main house	80	73.33	75	76.11
Separate shelter	8.33	5	6.67	6.67
Perches in the kitchen	5	13.33	15	11.11
Reason not having separate shelter				
Risk of theft	43.33	26.67	16.67	28.89
Less attention given to poultry	20	28.33	23.33	23.89
Risk of predators	13.33	11.67	28.33	17.78
Lack of construction material	15	26.67	21.67	21.11
Small flock size	8.33	6.67	10	8.33

Table 7 : Culling practice and factors determining culling

Factors (%)	district			
	North-bench	Sheko	South-bench	Overall mean
Culling practices				
Yes	66.67	65	56.67	62.78
No	33.33	35	43.33	37.22
Factors determining Culling [a]				
Poor productivity	45	43.33	41.66	43.33
Unwanted plumage color	21.67	23.33	26.67	21.11
Old age	25	23.33	18.33	22.22
Illness	11.67	10	15	12.22
Excess in number	3.33	5	1.67	3.33

[a=] *Percentages do not add up to the specific values since respondents selected more than one determinant factor.*

Table 8 : Traditional methods of breaking broodiness

Factors (%)	district		
	North-bench	Sheko	South-bench
Breaking broodiness			
Yes	75	61.67	63.33
No	25	38.33	36.67
Factors determining breaking broodiness [a]			
Hanging upside down	15	13.33	18.33
Tying wings	21.67	18.33	16.67
Taking to another place	25	23.33	26.67
hide brooding nest	10	5	8.33
Put other materials on brooding nest	6.67	3.33	11.67
Nothing	21.67	36.67	18.33

[a=] *Percentages do not add up to the specific values since respondents used more than one determinant factor.*

Table 9 : Hatchability performance of local hens in north-bench, sheko and south-bench districts

Variables	Districts			Over all mean
	north-bench	sheko	south-bench	
egg set to broody hen/year (Mean±SE)	1.95 ± 0.03^{b}	1.98 ± 0.02^{b}	2.10 ± 0.04^{a}	2.01 ± 0.03*
Average number of eggs set to broody hen (Mean±SE)	12.11 ± 0.20^{a}	11.72 ± 0.28^{ab}	11.27 ± 0.16^{b}	11.7 ± 0.21*
Average hatch rate (Mean±SE)	9.20 ± 0.21^{a}	8.85 ± 0.19^{a}	9.12 ± 0.17^{a}	9.06 ± 0.19^{ns}
Hatchability (%)	75.97	75.51	80.92	77.47
Survival rate of chicks to 8 weeks age (Mean±SE)	6.00 ± 0.18^{a}	5.78 ± 0.16^{a}	6.28 ± 0.16^{a}	6.02 ± 0.17^{ns}
Survival rate of chicks to 8 weeks age (%)	65.22	65.31	68.85	66.46

[a, b] *means in the same row with different superscripts are significantly different ($P < 0.05$); SE= Standard error.*

Table 10 : Reproductive andproductive performance of local chicken ecotypes.

Traits (Mean ± SE)	Districts			Over all mean
	north-bench	sheko	south-bench	
Average age of cockerels at 1st mating (month)	5.77±0.08[a]	5.61±0.08[b]	5.83±0.08[a]	5.74±0.08*
Average age of pullets at 1st egg laying (month)	5.94±0.07[a]	5.50±0.06[b]	5.82±0.08[a]	5.75±0.07*
Number of clutches/hen/year	3.65±0.06[a]	3.67±0.06[a]	3.64±0.06[a]	3.65±0.06[ns]
Average number of eggs/clutch	14.43±0.15[a]	14.74±0.14[a]	14.81±0.13[a]	14.66±0.59[ns]
Estimated total egg production/ hen/year	52.34±0.77[a]	53.94±0.78[a]	53.71±0.83[a]	53.33±0.79[ns]

[a, b] means in the same row with different superscripts are significantly different (P < 0.05); SE=Standard error.

Table 11 : Effective population size and level of inbreeding

Factors	Districts			
	north-bench	sheko	south-bench	overall mean
Farmers rearing own breeding males (%)	76.67	73.33	70	73.33
Farmers not having breeding males (%)	23.33	26.67	30	26.67
Nm	1.68	1.38	1.3	1.45
Nf	4.18	3.07	3.52	3.59
Ne	4.79	3.81	3.79	4.13
ΔF	0.104	0.131	0.132	0.122

Nm= Number of breeding male, Nf= Number of breeding female, Ne= Effective population size ΔF= Rate of inbreeding.

Table 12 : Diseases and health management of chickens

Parameters	Districts		
	north-bench	sheko	south-bench
Experience of disease outbreak (%)			
Yes	41 (68.33%)	38 (63.33%)	29(48.33%)
No	19 (31.67)	22 (36.67%)	31(51.67%)
Measures taken when chicken sick (%)			
Treat with traditional medicine	43(71.67%)	47(78.33%)	44(73.33%)
service of veterinarian	5(8.33)	4(6.67%)	7(11.67%)
No action	12(20%)	9(15%)	9(15%)

Table 13 : Constraints of chicken production

District		Disease	predator	Theft	External parasite	problems Feed shortage	Lack of housing	Low poor-ductility	Lack of veterinarians
North bench	Rank1	27	15	3	4	3	5	2	1
	Rank2	7	9	8	5	7	3	5	3
	Rank3	3	5	4	5	4	7	6	5
	Index	0.31	0.22	0.09	0.09	0.09	0.09	0.07	0.04
Sheko	Rank1	29	13	-	5	6	5	2	-
	Rank2	8	10	7	6	9	7	5	3
	Rank3	4	6	3	7	6	9	8	7
	Index	0.31	0.19	0.05	0.1	0.12	0.11	0.07	0.04
South Bench	Rank1	16	23	-	7	5	3	1	5
	Rank2	15	11	-	8	6	5	4	3
	Rank3	13	9	-	-	8	6	7	5
	Index	0.27	0.30	-	0.11	0.11	0.08	0.05	0.08

Index=sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular trait divide by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all traits.

IV. Conclusions

The chicken production system of the study districts is a backyard extensive production system where local chicken ecotypes are managed mainly on scavenging with seasonal/conditional feed supplementation, especially during feed shortage and the major source of these supplementary feeds were home grown grains and household leftovers/by products. All chicken owners of the study area provided water to birds, especially during the dry season and river water was the major source of drinking water for village chicken in the study area. Only a few of the village chicken owners provided separate housing for their birds, but most of them shared their main houses with the chickens. The average flock sizes in the study districts were fairly more than the reports for most of other places in Ethiopia. The effective population size found in this study was very small which implies the number of breeding males and females was very small. Subsequently, high rate of inbreeding coefficient were estimated.

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