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## Indigenous Chicken Production and the Innate Characteristics

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### ABSTRACT

This study reviews related research results and facts of indigenous chicken production and their innate characteristics with the aim of delivering synthesized and summarized information to the beneficiaries. Poultry contributes the largest parts of animal-source foods. Chicken is the most constituents of poultry species in Africa and the locals are the most commonly distributed across every corner of the tropical countries. Relatively, indigenous chickens have a capacity to resist disease, able to utilize low quality feeds and their products are preferred by consumers. In Ethiopia, indigenous chicken production system is a traditional type which is characterized by small flock size and is usually affected by disease outbreaks. Sharing the house of a family is the farmers' sheltering method of chickens at night and scavenging is the main source of feeds with unplanned breeding practices. Over the years, poultry populations and per capita consumption of eggs and poultry meat has been declining in Ethiopia. Indigenous chickens have a large morphological variation. Overtimes, social cultures and beliefs of most of the community have been influenced by these morphological variations. Those, indigenous birds which have got red or white plumage colors combined with pea shaped comb-types always fetches higher price than their counterparts. The result showed that micro-satellites of indigenous chicken population were highly polymorphic. Generally, the huge gene pool resources should be protected from genetic erosion and be used for improvement through traditional selections together with genomic technology. It is concluded that any indigenous chicken improving program should incorporate the production objectives and traits preferences of the society.

**Key words:** Indigenous chicken, innate characteristics, morphological appearances, production-systems, traits

### INTRODUCTION

Although, malnutrition is a common phenomenon in the developing world, an increased demand for quality protein is being seen in these countries. Based on such demands, there is a greatest increase in the production of poultry and pigs (Mengesha, 2011). Out of which, poultry is the one that contributes the largest parts of animal-source foods (FAO, 2000; Permin and Pedersen, 2010). The species of chicken is the largest constituents of poultry population (Gueye, 2003; Yami, 1995) and the indigenous once are the most commonly distributed across every corner of the tropical countries of Africa. Moreover, as a consequence of natural selection, indigenous breeds have shown to be more disease resistant (Minga *et al.*, 2004) more capable of utilizing low quality feeds (Farrell, 2000). Since, indigenous chickens in Africa are hardy, adaptive and are preferred by consumers, these ecotypes remain predominant in African villages (Kitalyi, 1998).

In this regard, CSA (2005) reported from Ethiopia that about 98% of the total national poultry population consists of indigenous chickens that sharing about 60% of the total chicken population of East Africa (Mekonnen *et al.*, 1991). The indigenous chicken always fetches better price than exotics because of its taste and flavor. Ethiopia has a wealth of indigenous chicken genetic resources with unique meat and/or egg qualities, a low susceptibility to stress and other useful characteristics. Considerable variation in genetic and morphology of indigenous chickens in Ethiopia is potential resource (Mengesha *et al.*, 2011) for improvements. Chicken production in Ethiopia has been contributing a lot to improving nutrition, gender participation and income for rural communities of a country (Mengesha and Tsega, 2011; Aklilu, 2007; Mengesha, 2006). Moreover, social cultures and believes of most of the rural community have been highly attached and attracted by these morphological variations of the birds in a country.

However, productivity of local chickens is poor in the tropics that attributed by low genetic potential, feed problems and diseases (Yongolo, 1996; Alexander, 2001). Although, it is an appropriate system, a periodic disease outbreaks and inadequacy of Scavenging Feed Source (SFS) are common limiting factors that affect performances of village chickens in Ethiopia (Mengesha *et al.*, 2008a). Consequently, there has been a gradual decline in a country's poultry populations.

To improving these chicken ecotypes, efforts on traditional selection, crossing and genomic approaches were being started in Ethiopia. However, there is a limitation to reviewing these and other related information and thereby to delivering such synthesized and summarized data to the beneficiaries.

Therefore, reviewing sensible findings on indigenous chicken production and their innate characteristics seems to be a milestone area to deliver synthesized information to the beneficiaries. Moreover, reviewing the innate characteristics of indigenous chicken will contribute to the future plans of conservation and improving local chicken production in the country. Based on this outlined background, the objective of this paper was:

- Review indigenous chicken production scenarios and their innate characteristics and thereby to deliver synthesized information for beneficiaries

Most of the related research findings of indigenous chicken production and their innate characteristics in Ethiopia and some related issues from other countries were reviewed. Related reports which focus on characteristics of indigenous chickens, were also reviewed. Considerable performance data of indigenous chicken at different ages and management conditions were also collected and reviewed. Various morphological characteristics of indigenous chicken and their distribution rates were also reviewed and sourced. Findings on genetics of indigenous chickens that have been reported by various scholars were also reviewed and synthesized.

**Outlined description of indigenous chicken productions:** Broodiness (maternal instinct) is a pronounced character of these birds. Indigenous chicken are characterized by low production performance viz slow growth, late maturity and are affected by high mortality. The mean annual egg production of indigenous chickens is estimated at around 60 small eggs. The eggs have thick shells and a deep yellow yolk color (Yami and Dessie, 1997).

The poor performances of indigenous chicken aren't only duet to genetics, but also lack of good managements (Mengesha *et al.*, 2008b). Local chicken are appropriate breeds for rural stallholders that fits the low or non inputting systems. They are adaptive to the environment and they can perpetuate naturally.

Reduction of flock sizes may be the attribution of the limited availability of Scavenging Feed Sources (SFS) in Ethiopia. Currently, shortage of SFS is aggravated by reduced land sizes of the backyards, deforestation of the homesteads and lack of decomposable materials from the vicinity areas of the backyards in the country. There has been a gradual decline in the Ethiopian chicken populations (FAO, 2008). CSA (2005) reported that about 98% of the total national poultry population consists of indigenous chickens which share about 60% of the total chicken population of East Africa (Mekonnen *et al.*, 1991). Although, estimated egg and poultry meat per capital consumption (in the mid 1990) was 57 eggs and about 2.85 kg (Yami and Dessie, 1997), respectively in Ethiopia, the current Ethiopian per capita egg and poultry meat consumption has been declining by 0.12 for poultry meat and 0.14 for eggs (USAID, 2006).

**Quantitative (measurable) traits of local chickens:** Reviewed data of measurable traits of indigenous chicken populations, including their distribution rates were collected and shown in Table 1. Quantitative traits of chickens have high economic importance for both indigenous as well as improved line-breeds of chickens. These gene traits of chickens can be expressed by measuring production traits that can mostly be affected by many genes. These traits can be also affected by the environment which the animal is exposed to. Productivity figures of indigenous chickens in some parameters were reviewed from various productions systems and expressed as their average results. The result revealed that average age at first egg laying of indigenous chicken was between 157 to 161 days. Average numbers of eggs per clutch of indigenous bird in the extensive chicken production systems was within the range of 12 to 15. Hossen (2010) reported that due to the effects of management intervention, average annual egg productivity of indigenous chickens was around 96 per hen.

Average egg weights of indigenous chicken ranged between 42 to 48 g. The hatchability percentage from total egg set was reported to be between 60 to 88%. Average body weights at hatching (at day old age) were between 27 to 37 g and their body weight at 22 weeks of age with intensive managements was also 1191.57 g (male) and 784.76 g (female). Halima (2007) reported that results of the microsatellites that studied on 7 indigenous chicken populations of Ethiopia were found to be highly (100%) polymorphic. Bhuiyan *et al.* (2005) reported that the minimum result for each generation with better responses in F<sub>2</sub> were obtained for selection of indigenous chickens in Bangladesh however, the same author added that small population size is one of the major factors for selections.

Some genetic characteristics of indigenous chickens are shown in Table 2. There is a relatively high genetic variation between groups of indigenous chickens in Ethiopia. Peters *et al.* (2011) reported that sufficient genetic variation existed for haematological parameters in the native chickens of Nigeria that maybe an indicator trait for further studies. Moreover, various scholars reported that indigenous chicken have immunocompetence and these traits will also help for traditional selection purposes. Msoffe *et al.* (2002, 2006) reported that free-ranging local chicken ecotypes in Tanzania differ in both productivity and selectable disease resistance potential (although, further study is required) to non-specific host immune responses.

**Qualitative traits of local chickens:** There are large variations in morphological appearances, conformation and body weights of indigenous chicken in Ethiopia. Broodiness (maternal instinct) is pronounced for indigenous chickens in Ethiopia. Tadelle (2003) and Halima (2007) reported that the names of the indigenous chicken groups were being called as chicken-ecotypes

Table 1: Measurable traits values of indigenous chickens at different rearing systems (RS)

Characteristics (parameters)	Values	RS	References			
Average age at first egg laying (months)	5.35	Scavenging	Mengesha <i>et al.</i> (2008b)			
	6.25 and 6.42	Scavenging	Halima (2007) and Moges (2009)			
Average number of clutch hen <sup>-1</sup> year <sup>-1</sup>	3	Scavenging	Hossen (2010)			
	4	Scavenging	Mengesha <i>et al.</i> (2008b)			
Average number of eggs per clutch <sup>-1</sup> hen <sup>-1</sup>	12 and 14	Scavenging	Hossen (2010) and Olwande <i>et al.</i> (2010)			
	15	Scavenging	Mengesha <i>et al.</i> (2008b)			
Average number of eggs produced year <sup>-1</sup> bird <sup>-1</sup>	45 and 96	Scavenging	Hossen (2010)			
Average egg weights (g)	48 and 42.8	Semi intensive	Olwande <i>et al.</i> (2010) and Halima (2007)			
Average egg hatchability (%) (from TES)	81 and 88	Semi intensive	Hossen (2010) and Olwande <i>et al.</i> (2010)			
Average b. wt. at hatching g bird <sup>-1</sup>	28.7 and 37	Intensive	Tadelle <i>et al.</i> (2003) and Demeke (2003)			
	36	Scavenging	Demeke (2003)			
Average BW (8, 12, 20, 22 or ≥24 weeks age) (kg bird <sup>-1</sup> )						
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8	12	20	22	≥24	RS	References
--	--	--	--	2.4	Intensive	Faruque <i>et al.</i> (2010)
--	--	--	1.2 (m) and 0.8 (f)	--	Intensive	Halima (2007)
--	0.41±0.02	--	--	--	Intensive	Tadelle <i>et al.</i> (2003)
--	--	--	--	1.5/male	Intensive	Teketel (1986)
--	--	--	1.04 (m) and 0.82 (f)	--	Intensive	Halima (2007)
--	--	--	0.824	--	Intensive	Kingori <i>et al.</i> (2003)
Average DM intake (8, 12, 20, 22 or ≥24 weeks age) (g head <sup>-1</sup> day <sup>-1</sup> )						
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8	12	20	22	≥24	RS	References
--	25.6±0.8	--	--	--	Intensive	Tadelle <i>et al.</i> (2003)
--	--	--	60.1	--	Intensive	Kingori <i>et al.</i> (2003)
Growth rate (8, 12, 20, 22 or ≥24 weeks age) (g head <sup>-1</sup> day <sup>-1</sup> )						
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8	12	20	22	≥24	RS	References
--	4.8±0.2	--	--	--	Intensive	Tadelle <i>et al.</i> (2003)
Average feed conversion ratio (8, 12, 20, 22 or ≥24 weeks age)						
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8	12	20	22	≥24	RS	References
--	3.04, 5.6	--	--	--	Semi intensive	Hossen (2010) and Tadelle <i>et al.</i> (2003)
7.0	4.2	--	--	--	Intensive	Demeke (2003)
--	--	--	--	9.02	Intensive	Kingori <i>et al.</i> (2003)

DM: Dry mater, RS: Rearing systems used, TES: Total eggs set

and native-chickens, respectively. Some of the characterized and designated chicken ecotypes (native chickens) of Ethiopia by the same authors were: Tilili, Horro, Jarso, Tepi, Gelila, Debre-Elias, Melo-Hamusit, Gassay/ Farta, Guangua and Mecha. On the other hand, other scholars reported also that the names of indigenous chicken designated based on their plumage colors like for instances: Tikur (black), Nech (white), Key (Red) and extra in the country.

Plumage color of Ethiopian indigenous chicken is very much diversified. Commonly observed plumage colors of indigenous chickens are: red, white, black, multicolor, black with red strips, white with red strips and red-brownish.

Morphological variations of indigenous chicken ecotypes (between and within) are described in terms of comb types, shank types, earlobe types, plumage colors and other qualitative traits. The

Table 2: Some genetic traits and occurrence rates in the flocks (%)

Traits	Rate (%)	References
No. of alleles per chicken population	5.59	Halima (2007)
	5.80	Youssao <i>et al.</i> (2010)
	1.65	Al-Atiyat (2010)
	7.86	Ajayi (2010)
Heritability estimates of body weight was between	0.43 to 0.30	Ajayi (2010)
Genetic similarity coefficient between chicken groups was ranged between	0.635 to 0.860	Gao <i>et al.</i> (2008)
Heterozygosity value of indigenous chickens	0.16 (observed) and 0.08 (expected)	Halima (2007)
	0.55 (observed) and 0.55 (expected)	Youssao <i>et al.</i> (2010)
	0.58 (observed) and 0.39 (expected)	Al-Atiyat (2010)
	0.734 (expected)	Jian-Min <i>et al.</i> (2010)
A polymorphic information content of chicken population	0.69	Halima (2007)

Table 3: The most commonly appearing morphological traits of indigenous chickens and their distribution rates in the flocks

Plumage colors				Ear lob colors				References
White	Red	Black	Others	White	Red	White and red	Yellow	
18.0	15.0	7.0	16.0 brown	40.0	52.0	--	8.00	Dana <i>et al.</i> (2010a)
28.33	18.33	33.3	11.67	68.33	01.67	20.0	6.67	Bhuiyan <i>et al.</i> (2005)
7.78	--	32.22	26.7 (Mottled)	73.02	20.63	--	--	Egahi <i>et al.</i> (2010)
30.0	28.0	8.0	--	26.0	---	74.0	--	Bogale (2008)
25.49	16.44	7.79	22.2 (grayish)	--	--	--	--	Halima (2007)
18.8	20.0	13.9	18.9 (red-bro)	--	--	--	--	Halima (2007)
Shank colors				Comb colors				References
White	Red	Brown	Pale	Red	Brown	Pale	Others	
28.0	12.0		60.0	--	--	--	--	Bogale (2008)
13.99	9.61	11.98	64.42	--	--	--	--	Halima (2007)
35.0	11.6	21.0	31.0	55.00	35.0	10.0	--	Bhuiyan <i>et al.</i> (2005)
38.89	42.22	--	18.89	--	--	--	--	Egahi <i>et al.</i> (2010)
Comb shapes				Head shapes				References
Single	Pea	Rose	Others	Plain	Crest	Flat	--	
13.0	53.0	16.0	13.0 (duplex)	--	--	--	--	Bhuiyan <i>et al.</i> (2005)
26.0	24.0	50.0	---	14.0	86.0	---	--	Egahi <i>et al.</i> (2010)
13.34	50.72	16.6	13.4 (v-shape)	48.82	51.18	---	--	Bogale (2008)
100	---	---	---	--	--	--	--	Halima (2007)

commonest comb-types of indigenous chicken are rose, pea, walnut/strawberry, single and V-shape. Most of the indigenous chickens have no shank feathers (Halima, 2007; Bogale, 2008; Faruque *et al.*, 2010) and shanks are yellowish in color (Halima, 2007; Bogale, 2008; Dana *et al.*, 2010b). The commonest egg color of indigenous chicken is white (Faruque *et al.*, 2010). The detail morphological characteristics of indigenous chickens are shown in Table 3.

**Production systems:** Majority of indigenous chickens in Ethiopia are reared in the extensive (scavenging) production systems. Different authors (Dana *et al.*, 2010a; Moges, 2009; Mengesha, 2006) who studied about indigenous chicken production at different parts of Ethiopia

reported that the most common production system used was extensive type that was being characterized as small flock sizes, needs no or less inputs and relatively good outputs and a periodic devastation of the flock by disease.

Most of the caretaking practices of local chicken husbandry, including off take decision was being undertaken by women, followed by children of the households in Ethiopia. A shelter used by the majority of the farmers for indigenous chicken productions is sharing the house with the family (penning birds at night with a family). Except some supplementation, there is no planned feeding of chickens and scavenging is almost the only source of diets.

Moreover, there is no planned breeding. Perpetuation of the indigenous chicken species is by natural incubation process. Using this natural phenomenon of broody hen, chicks are hatched and raised all over rural Ethiopia. A broody hen that engaged in hatching, rearing and protecting few chicks, ceases egg laying which needs around 81 days of brooding periods. Most of producers rear their indigenous chickens to generate incomes by selling eggs and marketable chickens.

## **CONCLUSION AND RECOMMENDATIONS**

Population number of indigenous chicken in Ethiopia is declining. On the other hand, chicken is the only species that is expected to be found in every poor household that serves as a source of income and nutrition. Therefore, emphasis should be given from stakeholders (policy makers, research and development bodies) to keep chicken populations.

Ethiopia has diversified agro-ecologies that maybe attributing for the presences of diversified phenotypic appearances of local chickens. Most communities from different parts of a county have been attaching their social believes and life with such morphological characteristics of indigenous chickens. This may create influences on the market values of chickens. Thus, any breeding and improved production program of the local chickens should therefore, incorporate the production objectives and trait preferences of the society. By improving the approaches and traditional managements of indigenous chicken, better performance always been achieved from these birds. Hence, these huge gene pool should be protected from genetic erosion and apply for improvement through traditional selection together along with technologies of genomics.

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