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Indigenous Chicken Production in Kenya: A Review

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Abstract: Indigenous chickens in Kenya are about 22 million and are kept by 90% of the rural communities in small flocks of up to 30 birds mainly under free range system. The industry is flexible and does not require a lot of space. When people retire or are retrenched they easily start poultry keeping. Distinct indigenous chicken ecotypes have been identified and named. The names are phenotypic descriptions of the birds. The names used to describe the common phenotypes in Kenya are-frizzled feathered, naked neck, barred feathered, feathered shanks, bearded and dwarf sized. The local ecotypes of the chickens vary in body size, conformation, plumage colour and performance. The birds are hardy and thrive under a harsh environment with minimal inputs. They get most of their feed from scavenging and may occasionally benefit from kitchen and other household wastes. Eggs and chicken meat contribute to the protein nutrition of the rural population thus alleviating malnutrition. Sales of eggs and meat earn and diversify incomes for rural households especially among women and children who control benefits accruing from the enterprise. It has also helped those affected and infected by HIV Aids because it does not involve a lot of hard work. Indigenous chicken in Kenya are about 76 % of the total poultry population and produce about 55 and 47% of the total meat and eggs respectively. Productivity is low due to factors which include genotype, poor nutrition, diseases and management. Feed supplementation, provision of housing and disease control was found to improve growth rate and egg production.

Key words: Indigenous chicken, egg production, Kenya

INTRODUCTION

Free range chicken production represents an important system for supplying the fast growing human population with high quality protein and providing additional income to resource-poor small farmers, especially women (Guèye, 2009). Human population pressure, the need for high quality versatile foods especially protein, increasing levels of income and standards of living have created a tremendous demand for poultry products (FAO, 2002). Poultry, particularly chickens are the most widely kept livestock species in the world and also the most numerous (Perry *et al*., 2002; Moreki *et al*., 2010). Indigenous chickens are widely distributed in rural and peri-urban areas where they play the important role of income generation and food production (Thornton *et al*., 2002; Moreki *et al*., 2010). In Africa, indigenous chickens makeup over 70% of the total chicken population (FAO, 1986).

About 90% of the small-scale farmers in Kenya rear indigenous poultry, majority of which are indigenous chicken (Gichohi and Maina, 1992). Eggs and meat from indigenous chicken contribute to the protein nutrition of various household in the country. Sale of poultry products increase and diversify revenue in the livestock sector. Poultry sub-sector creates employment and promotes overall economic development. Culturally indigenous chicken have been used in traditional medicine and for various cultural rites (Dessie, 1996; King'ori, 2004; Moreki *et al*., 2010). Relative to other livestock species, chicken production has the advantages of having quick returns to investment and relatively simple management practices with numerous market outlets for products. Sale of products especially eggs in low value units make chicken products affordable to the lower income brackets (Say, 1987; FAO, 1997). Kenya has an estimated poultry population of 28.5 million. Of these, 22 million (76 %) are free-ranging indigenous chickens (MoLD, 2006). Poultry keeping is especially attractive to poor households as they require low start-up capital and have low maintenance costs. Besides, increasing landlessness occasioned by the high population growth means that poultry production has become the investment of choice due to its low space requirements. The productivity of indigenous poultry is normally low (Table 1) due to genotype, poor feed conversion efficiency and low adoption of modern technologies.

Indigenous chickens are hardy, adapt well to the rural environments, survive on low inputs and adapt to fluctuations in available feed resources (Gichohi and Maina, 1992). They are often left to scavenge for feed around the homestead and in the fields after crop harvests. Consumers' preference for indigenous chicken meat is attributed to the characteristic leanness,

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Table 1: Population and distribution of indigenous chickens

Province	Indigenous
Rift valley	5,622,509
Coast	1,947,061
Western	2,644,148
Nyanza	5,682,742
Central	1,967,180
Eastern	3,864,762
N. Eastern	165,000
Nairobi	141,400
Total	22,034,802

Source: MoLD, 2006

flavour and presumed organic product. Extensive chicken production is a suitable activity for rural women, youth and the landless and marginalized farmers who derive income as well as food from these birds. Chicken production also generates employment for various categories of people including poultry farmers, primary and secondary traders, processors and caterers. Generally, in sub- Saharan Africa indigenous chickens are owned and managed by women and children and often essential part of female-headed households (Dessie, 1996; Ahlers *et al*., 2009). Promotion of indigenous chicken production therefore, economically empowers the rural youth and women (Guèye, 2009).

There is potential for increasing production and productivity of indigenous chicken (Dessie, 1996; Ndegwa *et al*., 1996c; KARI, 2000; Okitoi and Mukisira, 2001; King'ori *et al*., 2007). This can be done by promoting sound management practices such as appropriate housing, disease control, improved nutrition and genetics.

Types of indigenous chicken in Kenya: In most developing countries indigenous chicken populations are the result of uncontrolled cross breeding programmes between various lines of local and exotic breeds (Dare, 1977). Distinct indigenous chicken ecotypes have been identified and named in Cameroon, Egypt, Kenya, Morocco and Sudan. The names are phenotypic descriptions of the birds. The names used to describe the common phenotypes in Kenya are-frizzled feathered, naked neck, barred feathered, feathered shanks, bearded, dwarf sized etc (Nyaga, 2007). The local ecotypes of the chickens vary in body size, conformation, plumage colour and performance (Table 2).

Kenyan indigenous chickens are a heterogeneous population with no standardized characteristics and performance (Table 2). They vary in size, plumage colour, comb type and skin colour (Table 2). Plumage colour varies widely with black, brown or red dominating. Rare colour patterns are light orange, yellow, grey and white laced and mottled (Ndirangu *et al*., 1991). There is also variation in comb type, length and colour of wattles, earlobes and beaks. The head appendages of cockerels are relatively large but those of the hens are small (Williamson and Payne, 1990). Average comb length and height for cocks is 6.36 and 4.88 cm respectively as compared to 3.64 and 1.63 cm for hens (Ndirangu *et al*., 1991). Nearly all combs and wattles irrespective of plumage colour are red. A proportion of birds have wattles mottled red with white and black spots. Majority of indigenous chicken have red earlobes. Other earlobe colours include white and mottled red which occur in small proportions. The most common beak colour is black. Most birds have a cream skin colour although off white, yellow and red skin colours exist. Indigenous chicken feet and toes have a black or cream colour (Ndirangu *et al*., 1991).

Cocks are generally heavier than hens at maturity (Table 2). Live weights of 2.6 kg and 1.8 kg for cocks and hens respectively were reported by Ndirangu *et al*. (1991) while naked-neck ecotypes are heavier than feathered chicken. A flock of indigenous chicken from KARI-Naivasha under a deep litter floor system was classified based on live weight as heavy, medium and light. Cocks had an average live weight of 2.02, 1.77 and 1.33 kg while hens had a live weight of 1.84, 1.54 and 1.21 kg for each class respectively (Chemjor, 1998). At 25 weeks of age indigenous chickens under scavenging conditions and supplemented with 0 or 3.2 g Crude Protein per birds per day (CP/b/d) between 14-25 weeks of age had a live weight of 1.30 and 1.96 kg for hens and cocks, respectively (King'ori, 2004). Hens over 30 weeks of age had a live weight of 1.54 kg (King'ori, 2004). This is similar to Tanzanian indigenous chicken that have a mature live weight of 1.95 kg and 1.35 kg for cocks and hens respectively (Mwalusanya *et al*., 2001).

Production systems

Free range system: Management of the chickens under this system is mainly based on available indigenous technical knowledge (MoALD and Marketing, 2002). The birds are mostly left to scavenge for feeds during the day and confined at night. They scavenge for insects, food waste, green grass, leafy vegetables and any scattered grains (King'ori, 2004). Occasionally the birds are supplemented with household wastes such as maize, canary seeds, cowpea testa, amaranth's seeds, plantain peels, millet, sorghum, ripe pawpaw seeds, cassava meal, cereal bran, oilseed meals, brewers grain, damaged wheat, blood meal and fish meal (Ahmed, 1990; Diambra, 1990; Nwosu, 1990; Moreki *et al*., 2010). Supplements vary based on season and availability. The supplements are either broadcasted on the ground or placed into improvised feeders once or twice a day. Birds of all ages live and scavenge together. Drinking water is irregularly provided in tins or broken clay pot pieces (King'ori, 2004). Indigenous chickens are excellent foragers and tolerate tropical conditions (Barua and Yoshimura, 1997).

Table 2: Characteristics of indigenous chickens

Characteristic	Description	Reference
Plumage colour	Most are black or brown/red. Other colours	Williamson and Payne (1990)
	are white, grey, yellow and light orange.	Ndirangu *et al*. (1991)
		Nwosu *et al*. (1985)
		Tuitoek *et al*. (1998)
Comb and wattles	Most are red	Ndirangu *et al*. (1991)
	Some are red with white and black spots	
Ear lobes	Red and white	Ndirangu *et al*. (1991)
Feathering on neck	Naked neck	Ndirangu *et al*. (1991)
	Full feathered	Barua and Yoshimura (1997)
Beak colour	Black/dark grey	Nwosu *et al*. (1985)
		Ndirangu *et al*. (1991)
Colour of skin	White is the most common	Ndirangu *et al*. (1991)
	Other colours-yellow, red and dark bluish hue	Mohammed (1995)
Feet and toes	Black, cream	Mohammed (1995)
Egg production/year	60-80	Hill and Modebe (1961)
	35-40	Sazzard *et al*. (1990)
	100	Sonaiya and Olori (1990)
	<50	Safalaoh (1992)
		Olwande *et al*. (2009)
	60-70	Rashid *et al*. (1995)
	40-60	Dessie (1996), Moreki *et al*. (2010)
	150	Ndegwa *et al*. (1996a,c)
	80-90	Adedokun and Sonaiya (2001)
	78-99	Okitoi and Mukisira (2001)
	138-160	King'ori (2004)
Parameter	Observation	Reference
Egg weight (g)	33	Nwosu *et al*. (1985)
	35	Akinokun (1990)
	37	Barua and Howlinder (1990)
	43-44	Mohammed (1995); Mwalusanya *et al*. (2001)
	31-38	Kadigi (1996)
	37-39	Adedokun and Sonaiya (2001)
	46-48	Okitoi and Mukisira (2001)
		Olwande *et al*. (2009)
	43-47	King'ori (2004)
Parameter	Observation	Reference
Egg hatchability (%)	75	Barua (1992)
	60	Rashid *et al*. (1995)
	77-89	Mohammed (1995); Moreki *et al*. (2010)
	40-100	Olwande *et al*. (2009)
	41-48	Dessie (1996)
	71-78	Chemjor (1998)
	66-73	Okitoi and Mukisira (2001)
	83-84	King'ori (2004)
Body weight at hatching (Day old)-g/bird	Cockerels = 24-49	Mwalusanya *et al*. (2001)
	Pullets = 23-26	Safalaoh *et al*. (1996)
	Cockerels/pullets = 32-33	Adedokun and Sonaiya (2001)
Body weight at 8 wks-g/bird	Cockerels = 361	King'ori (2004)
	Pullets = 329	Mohammed (1995)
	Cockerels = 255-311	"
Body weight at 20 wks-g/bird	Pullets = 242-262	Adedokun and Sonaiya (2001)
	Cockerels-925-1258	"
	Pullets = 732-1172	Akinokun (1975)
	Cockerels = 1402	"
	Pullets = 1062	Chemjor (1998)
	Cockerels = 954-1096	"
	Pullets = 768-948	Adedokun and Sonaiya (2001)
	Pullets and cockerels = 1171-1684	"
	Adults Cocks = 1950-3150	King'ori (2004)
	Hens 900 = 2250	Mwalusanya *et al*. (2001)
	Adult cocks = 2071-2096	"
	Hens = 1482-1599	Olwande *et al*. (2009)

Table 2 continued

Characteristic	Description	Reference
Age at sexual maturity (days)	148-173	Akinokun (1975)
	225	Barua (1992)
	218-225	Rashid *et al*. (1995)
	154	Kadigi (1996)
	157-165	Adedokun and Sonaiya (2001)
	133-137	Okitoi and Mukisira (2001)
Dry matter intake (g/b/d)	Confinement-71-81	Chemjor (1998)
	Confinement-68-76	King'ori (2004)
	Scavenging-78	Birech (2002)
Growth rate (g/b/d)	Confinement = 14.7-14.9	Chemjor (1998)
	Scavenging (no protein supplemented) = 3-5	King'ori (2004)
	Scavenging plus Protein supplemented = 11-13	King'ori (2004)
Feed conversion ratio (feed/gain)	Confinement = 5.2-5.5	Chemjor (1998)
	Scavenging (no protein supplemented) = 7.6-15.6	King'ori (2004)
	Scavenging plus protein supplemented = 5.8-6.0	King'ori (2004)

Housing under a free ranging production system is not developed and where it exists it's mainly to protect birds from predators and extreme weather. Simple structures such as half drums without air inlets placed under the bed are used to provide shelter to the birds at night. Where shelter is not provided chicken may perch on high places such as trees.

A free ranging production system is characterized by low outputs-egg and meat production per bird (Olwande *et al*., 2009), but has low capital input and hence low economic risks (Gichohi and Maina, 1992). Over 70 % of indigenous chickens in Africa are managed under this system (Sonaiya *et al*., 1999; MoLD, 2008). Replacement stocks originate from hatching own chicks or are purchased from the local market, or from neighbours or given as gift. Breeding stock is rarely replaced and inbreeding is common leading to low flock productivity (Mburu, 1994).

Chickens are an important hedge against unexpected cash needs, such as medical and school fees. One or more chickens are sold to meet such emergency expenses (Moreki *et al*., 2010). Marketing channels for products and live birds are undefined. This maybe attributed to the low and irregular chicken productivity (Mbugua, 1990). As such live birds and eggs are sold at the gate or in the local market. Live chicken are sold during the time of need for cash or when the birds are sick (Nwosu, 1990; Williams, 1990). Eggs are also sold when hatching is not required. Local traders purchase live chicken and eggs from farmers and transport them for sale to urban markets (Andrews, 1990; Nyaga, 2007) while eggs are also sold within households or through the local shop outlets. Live birds are sold when aged six months and over (Olaboro, 1990).

Semi-intensive system: This system of production is practiced in small households where families are more able financially than the rest of the households who practice the free-range system. The chickens reared under this system are mainly crosses between indigenous and exotic. The birds are left to scavenge during the day and are confined in shelters of moderate cost at night. They get supplementation with grains, oil-seed cakes and food waste plus commercial feeds occasionally. Water and Veterinary care is provided though not adequately and mortality is 40-60% in young chicks (Ondwassy *et al*., 1999).

Feeds and feeding: In most cases, birds are let out in the morning to look for feeds (scavenge). They scavenge for insects, food waste, green grass, leafy vegetables and any scattered grains (King'ori, 2004; Nyaga, 2007). They are occasionally offered feed supplements like household waste (left over food), maize grain, millet, sorghum, cassava meal, cereal bran, oil seed meals (Soya bean meal, cotton seed meal, sunflower meal), brewer's grain, damaged wheat and fish meal. The supplement offered depends on whatever is available. The percentage mean Crude Protein (CP) level of the scavenging diets is 11.2. The CP, Metabolizable Energy (ME), Ether Extract (EE), Crude Fibre (CF), Ash, Nitrogen Free Extract (NFE), Starch and Dry Matter (DM) intake is similar for growers and layers in medium high and low potential agricultural areas (Birech, 2002). Comparison of the protein requirements for growers and layers (King'ori *et al*., 2003) with the estimated intake under scavenging conditions (Birech, 2002) indicate that there is a deficit of 2.4 and 0.8 g CP per day respectively. This partly contributes to the low productivity of indigenous chickens under scavenging conditions. Nutrient intake of indigenous chickens under free-range system is enough to meet their maintenance requirements and support minimal growth rate and egg production (King'ori, 2004). The CP requirements for growing indigenous chickens are 20, 16 and 14% and 17, 14 and 12% for the heavy (1.66-2.14 kg) and light birds (1-1.65 kg) respectively, during the 5-8, 8-14 and 14-21 week growth periods (Chemjor, 1998). Energy requirements

during the same growth period are approximately 3000, 2600 and 2400 kcal/kg ME, respectively (Chemjor, 1998).

Indigenous chickens during the 14-21 week growth phase require a CP concentration of approximately 160 g/kg in their diets while laying hens require 120 g/kg (King'ori *et al*., 2003). The energy requirement for maintenance is about 480 kJ/d and more than 953 kJ/d to support maximum laying % (King'ori, 2004). The daily protein requirement for growing indigenous chickens under free range is about 11.9 g while the requirement for those under confinement is about 10.9 g (King'ori, 2004). Growing indigenous chickens in the free-range system require a supplementally CP intake of 3.2 g to optimize growth rate and mature body weight during the 14-25 week period (King'ori, 2004, King'ori *et al*., 2007). Poor nutrition is a factor that contributes to the low growth rate and egg production in free- ranging chickens (Chemjor, 1998; Birech, 2002; King'ori, 2004; King'ori *et al*., 2007, 2009). Poor nutrition has also been reported as a factor contributing to low productivity of Tanzanian indigenous chicken (Mwalusanya *et al*., 2001).

Production performance of indigenous chicken

Egg production: At the traditional farm level, average egg production of indigenous chickens in Kenya and other African countries is about 40-100 per year (Table 2). They are laid in 3-4 clutches, each consisting of 12-20 eggs (Olwande *et al*., 2009). The eggs weigh 25-49 g which is within the range reported for other African countries (Table 2).

The naked-neck hens have been reported to lay eggs weighing 52 g (Williamson and Payne, 1990; Stotz, 1983; Ndirangu *et al*., 1991). Under improved housing, disease control and feeding, egg production in indigenous chickens can be increased to about 150 eggs (Ndegwa *et al*., 1996c; King'ori, 2004). Broodiness is the main cause of low egg production and is a feature, which has been eliminated in hybrid birds through selection and breeding (Say, 1987). Broodiness is however, essential for the farmer to increase his flock under the prevailing conditions. Nearly half of the time of a good laying hen is spent sitting on the eggs and brooding her chicks. To increase egg production, broodiness should be suppressed. Suppression of broodiness may be achieved by isolating the hen in a small cage fixed about a metre above the rest of the stock. Feed and water is provided *ad-libitum*. Broodiness normally disappears after 3-4 days. In the traditional system, harsh measures to discourage broodiness have been applied. These include immersion into cold water, hanging the bird upside down, starving the hen or pulling out the vent feathers. These measures may actually stop egg production completely or lead to death. Despite the broodiness problem and the small number of eggs per hen per year, indigenous chicken contributes significantly to the national egg production (MoALD and Marketing, 1994).

Meat production: Indigenous chickens are mainly kept for meat as illustrated by the fact that over 50% of the farmers do not collect the eggs but leave them for hatching (Upton, 2000). Information on meat production potential of indigenous chicken is limited. Most of the birds are sold at between 5-6 months (MoALD and Marketing, 1993). At this stage, individual birds weigh 1.3-1.8 kg (Table 2). The average Cold Dressed Weight (CDWt) of indigenous chickens is estimated to be 72% of the live weight as compared to 80 and 75% for broilers and culled layers respectively (MoALD and Marketing, 1994). However, it is recognized that the indigenous chickens are the major source of poultry meat produced in Kenya. Local poultry farmers are now adding value to their chicken by doing some processing and packaging. It is now possible to find local chicken packaged and labeled in some leading supermarkets in Nairobi. This has improved the prices by about 50% (MoLD, 2006).

Disease incidences and control: Disease risks are high in extensive poultry production systems. They are recognized as a constraint in smallholder poultry production. Expenditure on disease control is minimal and chick mortalities average 40-60% over the first 8 weeks (Ondwassy *et al*., 1999).

Newcastle Disease (NCD) is the most prevalent and fatal in poultry in Kenya (MoALD and Marketing, 1996). A similar situation has been reported for Botswana (Moreki *et al*., 2010). The control of NCD is possible through vaccination and vaccines are available at District and Divisional veterinary offices and from local chemists (Ondwassy *et al*., 1999). Very few smallholder producers of indigenous chickens do vaccinate their poultry but many of them are not aware that NCD can be controlled by vaccination. The vaccine requires being stored under refrigeration and is packaged in doses for 100 chickens. This packing poses a limitation to the use of vaccines for NCD. Other common diseases are fowl pox, fowl typhoid and coccidiosis. Fowl pox is prevented by vaccination. Farmers are advised to form vaccination clusters or groups of farms to share the cost of the vaccine. Fowl typhoid and coccidiosis are prevented by proper hygiene in the chicken house and routine administration of antibiotics. The outbreak of the deadly Avian Influenza in the Asian and Eastern parts of Europe has had negative effects on the poultry industry in the country during the past 3 years. The negative effect has been minimal in the local chicken production sector. Sensitization/training on emergency preparedness has been widely carried out among farmers, officers and all other stake holders in the poultry industry (MoLD, 2006).

Pest (fleas, lice and mites) infestation is high. Sometimes they cause death in chicks. These pests are controlled by maintaining good sanitation in the house and regular dusting with insecticides. Usually the construction of the house does not allow for the maintenance of proper sanitation and there is no regular dusting and giving antibiotics. This leads to high pest infestation and frequent disease outbreaks, leading to high mortalities.

The chickens also require regular deworming and preventive medication against coccidiosis and bacterial infections. Vaccination against NCD increased overall flocks per household, eggs per hen per year, offtake (consumption, sales and gifts), cash flow income from sale of chicken and eggs (KARI, 2000; MoALD and Marketing, 2000; Okitoi *et al*., 2000; King'ori, 2004). It also reduced mortality of flocks within households.

Conclusion:

- The system of production and productivity of indigenous chickens in Kenya is similar to other African countries.
- Indigenous chickens contribute significantly (despite their low productivity) to the national egg and meat (47 and 55 % respectively) production. They are therefore important in the improvement of the protein nutrition of the rural human population.
- The low productivity of indigenous chickens in free-range is mainly due to poor nutrition, housing and lack of proper health care. Growing indigenous chickens in the free- range system require a daily CP supplementation of 3.2 g. This supplementation will increase their growth rate by 2.7 times.
- Vaccination against NCD reduced mortality, increased eggs per hen per year and increased cash flow income from sale of chicken and eggs.
- Indigenous chicken production is a way of increasing rural incomes and also economic empowerment of the rural women and youth.

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