Assessment of Indigenous Chicken Production Techniques and Management Practices among Rural Farmers in Semi-Arid Nigeria: A Study of Traditional Poultry-Rearing Systems

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Abstract
Indigenous chickens produce meat that is preferred by majority of Africans, because of its leanness and taste when compared to the exotic one. A study was conducted in semi-arid region of Nigeria, with the objective of characterizing the techniques of production. The management practices employed by indigenous chicken farmers and the relative contributions of house hold members in the production of indigenous chicken, using a multi-stage purposive sampling procedures in which 300 respondents were sampled. The stages were sampling of six states (Kano, Katsina, Jigawa, Sokoto, Zamfara and Kebbi), two Local Government Areas (LGA) from each of the state based on history of massive chicken production in the area, five communities within the LGAs households based on the possession of at least five indigenous chickens. Data collected comprised, of production and management practices, employed in massive chicken rearing in the region. The result showed that respondents flock size ranges from 1 to 5 cocks (75.2%), 1 to 5 hens (57.7%), 1 to 5 cockerels (87.2%), 1 to 5 pullets (84.7%) and 1 to 5 chicks (33.8%) and are mostly owned by the household head. Women dominated local poultry management activities while majority of men provided housing. Indigenous chickens were mostly acquired through direct purchase and raised on free range system for commercial purposes, with the majority of the owners supplementing with cereal grains (58.2%) by broadcasting on ground (56.4%) twice daily (36.7%) and provided water (98%) in mud containers (38.1%) daily. Also, 83 % of the respondents experienced disease outbreak in their flock. It is therefore concluded that there is a sustainable production technique with prospective replacement stock and with women in the management activities. It is thus recommended that, on farm adaptive programmes for indigenous chicken improvement be introduced in households with flock size of 5 each of cockerel and pullets to be offered supplement mornings and evenings in simple clay pots by women.

Keywords*:* Flock; Management practices; Pullets; Cockerels

Introduction

Indigenous chickens are hardy, have the ability to survive under harsh environmental Indigenous chickens are referred to as village or local in Nigeria, Ghana and South Africa (Ajayi, condition (Ajayi, 2010). The hen incubates, hatch, brood her chicks and scavenge for insects, kitchen waste, crop residue and weeds as their food (Odah *et al*., 2019). Weigend *et al*. (2013) however, claimed that uncontrolled crossbreeding is one of the major causes of genetic diversity loss especially among the rural poultry species and breeds. This resulted to genotypes that could not survive under extensive system (Negussie, 2011). In addition, production constraints such as low egg production, low and poor performing breeds, poor weight gain /feed conversion, feed and management problems and lack of capital are associated with this system. In developing countries producers of indigenous chickens are constrained with infectious diseases such as Newcastle disease (ND), Marek's (MD) and infectious bursal disease (IBD, Gumboro) which have no treatment and cause high mortality resulting to enormous loss in productivity under the extensive system (Moussa *et al*., 2019). The products of indigenous chickens (meat and eggs) are nevertheless, preferred by majority of Nigerians because of the leanness when compared to the exotic chickens (Ayorinde, 2002) and the availability of these products in both rural and urban areas as a rich source of protein in their diets (Odah *et al*., 2019). Also, report by Dankoli, Muhammad, Ogah (2021) recommended that local chicken's breast length is a quantitative trait for use as determinant of body size in improvement for selection and breeding programmes of indigenous chickens. The objective of the study was to characterize the techniques of production, the management practices employed by indigenous chicken farmers, and the relative contributions of household members in the production of indigenous chicken in semi-arid region.

Materials and methods

The study was conducted in selected states located in the semi-arid region of Nigeria, situated between latitude 4°14' – 10°15'N and longitude 10°53' – 13°83'E. The study area is characterized by varying climatic conditions, with annual rainfall ranging from 690mm to 950mm and mean annual temperature varying between 24.1°C and 26.3°C. These agro-ecological conditions typify the semi-arid zone of northern Nigeria, which significantly influences indigenous chicken production systems and farmers' management practices in the region.

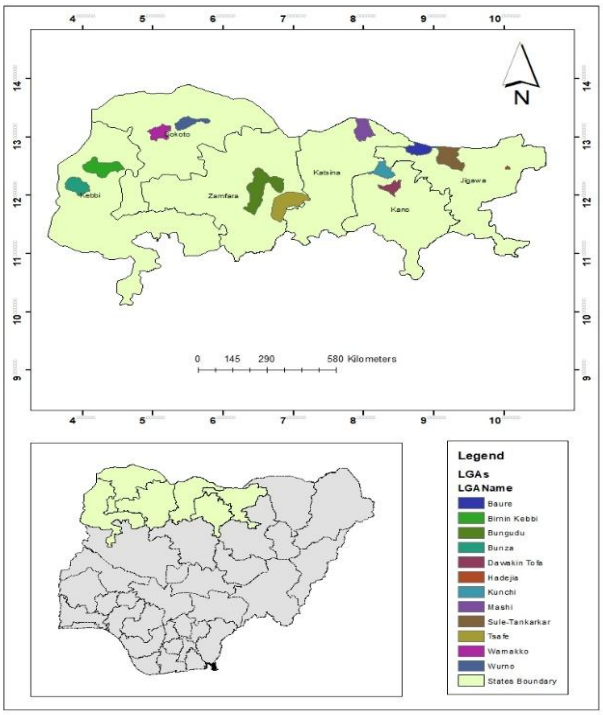

Figure 1: Map of Nigeria showing the study area

Sampling Procedure

A hierarchical design was used for the study. The first stage involved purposive selection of states: Jigawa, Kano, Katsina, Kebbi, Sokoto and Zamfara because of the concentration of indigenous chicken producers and part of the States are considered semi-arid in their geographical location. In the second hierarchy, two local government area (LGA) were purposively selected in each of the selected States. The third rank was random selection of five communities within the radius of 50km each way from the selected LGA based on indigenous chicken production. In the fourth step, five households possessing at least fifteen indigenous chickens and willing to participate, were randomly selected for questionnaire administration.

Data Collection

A total of three hundred (300) structured questionnaires were administered to respondents. The questionnaire comprised demographic information of the respondents, production, selection and breeding parameters were also collected. The data were coded and entered into Microsoft excel until analysis. The data collected were analysed using descriptive statistics (percentages, mean, minimum and maximum). Statistical Package for Social Science (SPSS) version 25.0 was used for the analysis.

Results and Discussion

Table 1 depicts flock structure of indigenous chicken production by farmers in Semi-arid. The result shows that majority of the respondents own 1 – 5 cocks (75%), hens (58%), cockerels (87%), pullets (85%) and chicks (34%) with a mean of 3.7, 7.8, 2.3, 3.1 and 11.6 respectively in their flocks. The result also revealed that 12% of the respondents do not own cock.

Oluyemi and Roberts (2007) defined flock as a group of birds on a farm at a particular time. Knowing their exact numbers enables farmers to have an inventory of the flock. Majority of the respondents keep indigenous chickens in small numbers which was similar to that of Halima (2007) who reported an average flock size of 7 birds per household in Ethiopia. The flock size of interviewed household was medium. This shows that indigenous chickens in the semi-arid is kept by rural poor and hence the profit realised from their production will be low.

Some of the respondents do not have breeding cocks in their flock which is contrary to the findings from Nakkazi *et al*. (2014) in Uganda who discovered an average of two cocks per household but similar to that of Yusuf *et al*. (2014) in South Africa. They added that the respondents depend on neighbour's cocks for mating with ignorance of over stretching the cock and eventual genetic erosion. The domination of hens, pullets and cockerels in the flock is similar to the findings of Justus *et al*. (2013) in Kenya and Conteh and Sesay (2019) in Sierra Leone. They added that it's an indication that hens, pullets, cockerels and chicks are retained for production purposes.

Table 1: Flock Structure of Indigenous Chicken Production by Farmers in Semi-arid Nigeria

Flock structure	Frequency	Percentage
Cocks		
0	33	12
1 – 5	206	75
6 – 10	31	14
Total	**274**	**100**
Min = 0	Max=10	Mean ± STD= 3.7 ±6.86
Hens		
1 – 5	173	58
6 – 10	71	24
11 – 15	24	8
16 – 20	32	11
Total	**300**	**100**
Min = 1	Max=20	Mean ± STD= 7.8 ±9.53
Cockerels		
1 – 5	253	87
6 – 10	37	13
Total	**290**	**100**
Min = 1	Max=10	Mean ± STD= 2.3 ±3.78
Pullets		
1 – 5	254	85
6 – 10	46	15
Total	**300**	**100**
Min = 1	Max=10	Mean ± STD= 3.1±5.54
Chicks		
1 – 5	98	34
6 – 10	84	29
11 – 15	40	14
16 – 20	31	11
21 – 25	10	3
26 – 30	27	9
Total	**290**	**100**
Min = 1	Max=30	Mean ± STD= 11.6±13.95

Table 2 shows flock ownership and management decisions among household members. The result revealed that 43% of the chickens are owned by the household head while 22 and 35% were owned by the spouse and children respectively. The findings also indicated that decision making about chickens was taken by household head (91%). Majority of the respondents (78%) do not employ labour for the indigenous chicken production. Gender analysis is used as a tool to understand the vital role men, women and children contributes in various responsibilities, use of resources, access and control of resources, participation in decision making and contribution to household income and food security (Kusina *et al*., 2001). Tadelle and Ogle, (2001) pointed out that involvement of men and women in different types of agricultural activities depend mostly on social, cultural, local customs and religious influence in their communities. Majority of flock in the study area were owned by the household head, this doesn't concur with the findings of Mapiye and Sibanda (2005) in Zimbabwe and Patbandha *et al*. (2016) in India who all reported that women own majority of flock in rural communities. Gueye (2005) also reported that women own more than 70% of indigenous chickens in sub-Saharan Africa. He added that ownership has reduced with the intensification of chicken production. A study by Okitoi *et al*. (2007) in Kenya also revealed that women and children lead in ownership of flock in rural communities, this was similar to what was obtained in the study area. Mapiye and Sibanda (2005) added that this is done to develop children's responsibilities and interest in poultry production.

According the findings of this study management decisions such are selling, consumption, disposal and gifts are mostly taken by the head of the household in the study area. This differs with the findings of Patbandha *et al*. (2016) who reported domination of women in management decisions for indigenous chickens. Family members in rural communities partake in management practices of indigenous chickens. The study reveals that majority of the respondents use family labour for indigenous chicken production, this agrees with the view of Larbi *et al*. (2013) who reported that households mostly use family labour and occasionally use commercial and locally available feed resources. This study report that chicken production management is divided along gender line in most households, in the study area revealed that women were mostly engaged in cleaning, feeding and watering of the indigenous chickens. This agrees with the report by Gueye (2002) who reported that women in rural Africa are engaged in wide range of activities and tasks in agriculture and animal husbandry as well as household. The men are mostly responsible for building of the houses which is in line with the report of Ali, (2012) who reported that house construction and treatment of birds were predominantly done by men, while women and to a lesser extent child were involved in major management activities.

Table 2: Flock Ownership and Management decisions

*Flock Ownership	Frequency	Percentage
Household Head	216	43
Spouse	111	22
Children	179	35
Decision Making		
Household Head	272	91
Spouse	10	3
Children	17	6
Total	**300**	**100**
Labour		
Yes	66	22
No	234	78
Total	**300**	**100**

**Multiple response*

Pattern of Chicken Management by Gender of Households in Nigerian Semi-Arid Zone is presented in Table 3. The result shows that adult males (51%) and adult females (46%) were engaged in housing and cleaning respectively for the chickens, feeding (46%), watering (49%), other management activities (24%) were carried out by adult females only in the household. Biosecurity is a set of management practices designed to reduce the introduction and spread of disease-causing organisms (Conan, Sorn and Vong, 2012). They added that diseases in poultry are spread through the beak while eating, drinking, cleaning of feathers or during breathing. When such measures are taken, disease incidences are reduced. In the current study majority of the indigenous chicken farmers were engaged in cleaning of the housing on weekly basis so as to reduce the spread of diseases. This is contrary to the findings of Yusuf *et al*. (2014), who reported that most farmers kept their chicken under poor hygienic conditions and inadequate housing to protect the birds from harsh weather conditions. Women were mostly

engaged in cleaning, feeding and watering of the indigenous chickens in the present study. This agrees with the report by Gueye (2002) who reported that women in rural Africa are engaged in wide range of activities and tasks in Agriculture and animal husbandry as well as household. The men are mostly responsible for building of the houses which is in line with the report of Ali (2012) who reported that house construction and treatment of birds were predominantly done by men while women and children were involved in major management activities.

Table 3: Chicken Management divided along Gender Line in the Household

*Management	Young male	Adult male	Young Female	Adult Female
Housing	76 (25%)	152(51%)	15(5%)	89(30%)
Cleaning	75 (25%)	72(24%)	61(20%)	137(46%
Feeding	67(22.3%)	88(30%)	49(16%)	139(46%)
Watering	71(24%)	55(18%)	52(18%)	146(49%)
Others	27(9%)	34(11%)	13(4%)	72(24%)

**Multiple response*

Table 4 shows the management system of indigenous chickens. It revealed that majority (53%) of the respondents allow their indigenous chickens on free range while 40% of the respondents practise semi-intensive system of production. Findings from the current study revealed that majority of the respondents practiced free range production system which is similar to that of Natukunda *et al*. (2011) in Uganda who reported that 92% of indigenous chicken farmers practiced free range with only seasonal or conditional feed supplementation. Mahoro *et al*. (2017) added that 10.2 % of indigenous farmers in Rwanda practice semi-intensive which is similar to the current findings. On the type of housing provided the result shows that 52% of the respondents provide mud houses and 29 % hand woven baskets for the housing of indigenous chickens. About 93% of the respondents clean the poultry house on weekly (47%) basis. Majority of the respondents provide some form of housing for their indigenous chickens in the study area. This finding is similar to results obtained in some Africa countries (Moges *et al*., 2010 in Ethiopia; Kingori *et al*., 2010 in Kenya and Mahoro *et al*., 2017 in Uganda). Malatji *et al*. (2016) pointed out that 94.9% indigenous chicken housing in Limpopo provinces of South Africa are from locally available materials such as paper boxes, scrap wood from discarded furniture and wooden poles which is similar to the current findings were farmers mostly use locally available resources such as hand-woven baskets, mud houses and Bamboo cages for the housing.

The purpose of keeping indigenous chickens is presented in Table 5. The finding shows that 41% and 39 % of the respondents keep poultry for commercial and subsistence purposes while 14% and 6 % keep poultry for festivities and other reasons respectively. Agriculture particularly livestock subsector is the principal source of livelihood in Nigeria. The sector provides approximately 23% of the household income in Northern Nigeria (FAO, 2019). As indicated by Justus *et al*. (2013) local chickens are mostly for commercial and subsistence reasons but the products such as eggs and live chickens are sold to supplement family income while others are given out as gifts to friends and relatives. They added that some of the birds are kept for celebrations, emergencies, funerals, church contributions. This is also in line with the current study where majority of the farmers produce for both commercial and subsistence reasons. Although, contrary to the report of Conteh and Sesay (2019) who reported that indigenous chickens are mainly kept for production of high-quality manure in Sierra Leone for production of vegetables. The procurement of breeding stock showed that majority (67 %) of the respondents acquire the breeding stock through direct purchase, while 20% and 13 % of the respondents acquired their initial stock through gifts and inheritance respectively. Assefa *et al*. (2019) reported that most indigenous chicken producers in south western Ethiopia acquire their stock through direct purchase and gift from friends which is similar to recent findings. They added that buying from markets for starting or as replacement stock could reduce inbreeding and increase heterogeneity in the population.

Feeding and watering of indigenous chicken production is depicted in Table 6. The result shows that 94 % of the respondents provide feed supplement to their indigenous chickens. Out of which 58 % fed their chickens with cereal grains while 22 % and 20 % supplement with cereal by-products and kitchen waste respectively. Most of the respondents supplement the indigenous chickens by broadcasting (56 %) and in containers (39 %). The number of times they fed them ranges from once (22 %), twice (37 %) and thrice (35) daily. The result further revealed that majority (98%) of the respondents provide water for their flock and mostly in in mud containers (39 %), plastic containers (32 %) and bowls (21 %). The respondents wash the containers on daily (42 %), bi-weekly (30 %) and weekly (20%) basis.

Table 4: Management system of indigenous chickens

Variable	Frequency	Percentage
Free range	160	53
Semi-intensive	119	40
Intensive	21	7
Total	**300**	**100**
Do you provide housing for your chickens		
Yes	268	89
No	32	11
Total	300	100
***Materials used for the housing**		
Hand woven basket	78	29
Bamboo cages	35	13
Mud houses	142	52
Others	16	6
Do you clean your poultry house materials?		
Yes	278	93
No	22	7
Total	**300**	**100**
***How often do you clean these materials**		
Daily	75	27
Weekly	125	47
Fortnightly	29	11
Monthly	36	13
Quarterly	4	1
Others	10	4
Total	**280**	**100**
Where do they rest at night		
On tree tops	55	18
Roof tops	53	18
Kitchens	23	8
Inside rooms	141	47
Others	28	9
Total	**300**	**100**

Table 5: Purpose of keeping and mode of Indigenous Chickens Acquisition in the Study Areas

Variable	Frequency	Percentage
Commercial	123	41
Subsistence	116	39
Festivities	42	14
Others	19	6
Total	**300**	**100**
Direct purchase	200	67
Inheritance	40	13
Gifts	60	20
Total	**300**	**100**

Supplementary feeding in poultry production is encouraged so as to improve the weight gain and the eggs. This is in line with the report of Yusuf *et al*. (2014) and Assefa *et al*. (2019) who reported that most farmers provide supplements to their stock periodically. Other researchers such as Mekonen (2007); Natukunda *et al*. (2011); and Dessalew *et al*. (2013) indicated that households in rural communities offer supplementation only on seasonal occasions. They reported cereal grains, kitchen waste and by-products were the common feed supplements used in rural areas of Africa. They added that supplementary feeding is provided due to poorly fed birds develop low immunity to diseases and productivity. Nakkazi *et al*. (2014) reported that supplementation is mostly by throwing on the ground by majority of the farmers twice daily while others provide on feeding troughs which is similar to the current findings. Water is provided for the indigenous chickens mostly in plastics or mud containers in the current findings which is similar to the report by Moges *et al*. (2010) who reported that most chicken owners had trough made from clay material, wooden trough and plastic containers. They added that 50 % of the chicken owners clean the troughs when they remember while 23.9 % clean the troughs daily, 24.3% do not clean their troughs which differs with current findings.

Table 6: Feeding and Watering of Indigenous Chicken Production

Variables	Frequency	Percentage
Provision of feed supplement		
Yes	283	94
No	17	6
Total	**300**	**100**
Types of feed supplement		
Kitchen waste	81	20
Cereal grains	239	58
By-products	90	22
***Total**	**410**	**100**
How do you feed the birds		
In containers	142	39
Throw on ground	206	56
Others	17	5
***Total**	**365**	**100**
How often do you feed them		
Once	67	22
Twice	110	37
Thrice	105	35
Others	18	6
Total	**300**	**100**
Do you give water to your birds?		
Yes	294	98
No	6	2
Total	300	100
What type of containers do you use?		
Plastic containers	95	32
Mud containers	112	39
Tins	24	8
Bowls	62	21
Total	**294**	**100**
How frequent do you wash the containers?		
Daily	121	42
Weekly	59	20
Biweekly	89	30
Fortnightly	13	4
Others	12	4
Total	**294**	**100**

**Multiple Response*

The results of disease outbreak and its management among indigenous chickens in semi-arid zone is presented in Table 7. The findings revealed that 83 % of the respondents experienced outbreak in their flock. The ubiquitous disease in the study area was Newcastle disease and accounted 76%. Seventy- two (72) percent of the interviewed households indicated that disease outbreak affects all stages of growth. They mostly use conventional (53 %) and traditional treatment (42%) during the outbreak of diseases. Majority (83%) of the respondents also cull their indigenous chickens for sale (27 %), consumption (22 %), and disease outbreak (18 %) and during festive celebrations (11%). Disease outbreak in indigenous chickens is a common occurrence in most rural African communities. Reports by Natukunda *et al*. (2011) in Uganda, Malatji *et al*. (2016) in South Africa, Assefa *et al*. (2019) in Ethiopia, Conteh and Sesay (2019) in Sierra Leone and Moussa *et al*. (2019) in Niger Republic all affirm outbreaks of diseases which is similar to the current findings. Assefa *et al*. (2019) added that Coccidiosis and fowl pox are also important causes of mortality while predators are additional threats. Current findings revealed the aforementioned diseases affects all stages of growth irrespective of age and sex, and could occur at any time of the year (Nigussie *et al*., 2010). Culling of birds in the study area was mainly for sale, consumption during festive periods and/or diseases outbreak. However, Moges (2014) and Bogale (2008) reported that most households cull their birds due to old age and poor productivity while Mekonen (2007) added that cock fight is also an additional reason for culling.

Table 7: Disease Outbreak and its Management among Indigenous Chicken in Semi-Arid Zone

Variables	Frequency	Percentage
Experience of disease outbreak		
Experienced	250	83
No experience	50	17
Total	**300**	**100**
Common disease outbreak		
Newcastle disease	189	76
Fowl pox	10	4
Coccidiosis	26	10
Infestation (lice & Ticks)	13	5
Chronic Respiratory Disease	12	5
Total	**250**	**100**
Stage of growth the disease affects		
Chicks	21	8
Growers	11	4
Adults	39	16
All stages	179	72
Total	**250**	**100**
Disease management		
Call Animal health personnel	133	53
Traditional treatment	105	42
Others	12	5
Total	**250**	**100**
Culling		
Culled	249	83
Not culled	51	17
Total	**300**	**100**
***Reasons for culling**		
Consumption	98	22
Sale	122	27
Old age	30	7
Poor productivity	37	9
Celebrations / Festivities	50	11
Cock fight	12	3
Injury	13	3
Diseases	78	18
Total	**440**	**100**

**Multiple Response*

Conclusion

The study concludes that indigenous chicken production in the semi-arid regions of Nigeria demonstrates sustainable production techniques with viable prospects for replacement stock maintenance. Women play a pivotal role in the day-to-day management activities of indigenous chicken flocks, indicating their central position in household poultry production systems. Based on these findings, it is recommended that on-farm adaptive improvement programmes for indigenous chicken be introduced at the household level. Specifically, starter flocks comprising five cockerels and five pullets should be distributed to participating households, with supplementary feeding protocols implemented twice daily (morning and evening) using locally available and affordable resources such as simple clay pots. Women should be targeted as primary beneficiaries and managers of these intervention programmes, given their existing involvement and expertise in poultry management. Furthermore, extension services and capacity-building initiatives should focus on enhancing women's knowledge of improved breeding practices, disease management, and nutrition supplementation to optimize productivity while maintaining the genetic integrity and adaptive characteristics of indigenous chicken breeds. This approach would not only improve household food security and income generation but also preserve valuable indigenous poultry genetic resources adapted to the harsh semi-arid environmental conditions.

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