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INDIGENOUS CHICKEN FLOCKS OF NASARAWA STATE, NIGERIA: THEIR CHARACTERISTICS, HUSBANDRY AND PRODUCTIVITY

[PARVADAS DE AVES INDÍGENAS DE NASARAWA, NIGERIA: CARACTERÍSTICAS, CRIANZA Y PRODUCTIVIDAD]

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SUMMARY

The aim of this study was to assess the flock characteristics, husbandry and productivity of indigenous chickens of Nasarawa State, Nigeria using questionnaire-based survey and on-site investigation. Responses were provided by 117 households cutting across the three agricultural zones of the state. Study agricultural zones did not differ (P>0.05) in the total number of birds owned per household. The mean (±SD) household flock size was 13.9 (9.04) with a cock to hen ratio of 1:3.4. The low gene frequencies of naked neck (0.03) and frizzled (0.02) chickens in the population indicated that these dominant gene carriers are at the brink of extinction. Purchase from market was the main source of foundation stock (78.6%). Approximately 56% of the respondents provided partial enclosure for their birds. About 36% of the households claimed to offer partial feed supplements, such as maize, sorghum, millet, brans, sesame (beniseeds), and this was done in both wet and dry seasons. Women and children were the predominant providers of care for chickens. None of the households controlled the breeding of their flocks. Approximately 74% of respondents named Newcastle disease as the major health issue, and this could have been compounded by their lack of access to veterinary personnel. However, 33% of households claimed to use local herbs for the treatment of their birds. Rats were identified as the commonest predators attacking village chickens. Apart from number of eggs per clutch, cock and hen`s mortality/year that varied significantly (P<0.05) among the three agricultural zones, other variables were similar. Average number of clutches per bird per year was 4.87 (0.92) while the mean number of eggs per clutch was 11.9 (3.27), of which 8.78 (2.71) were hatched. Mean numbers of chick, grower, cock and hen`s mortality per clutch per year were 2.11 (2.26), 1.30 (1.52), 0.30 (0.55) and 1.33 (1.11) respectively. About 62% of the indigenous birds were sold at the adult stage and the priority purpose of keeping chickens was mainly for home consumption (58.1%). The identified constraints of village chicken production were poor health care, poor housing, poor feeding and incidence of predation and theft. Therefore, efforts should be geared towards the improvement in management practices

Key words: Composition; management; native fowls; performance; guinea savanna.

RESUMEN

Se evaluó las características, crianza y productividad de parvadas de aves indígenas de Nasarawa, Nigeria empleando encuestas e investigación *in situ*. Se obtuvieron respuestas de 117 productores provenientes de las tres zonas agrícolas del estado. No se encontró diferencias entre las zonas estudiadas (P>0.05) en el número total de aves por propiedad. Se encontró un total de 13.9 ± 9.04 (±SD) por productor y una relación gallo:gallina de 1:3.4. La baja frecuencia del gen de cuello desnudo (0.03) y pluma rizada (0.02) en la población indica que estos genes dominantes están en peligro de desaparecer. La compra en el mercado fue la fuente principal de animal de cría (78.6%). Aproximadamente 56% de las parvadas contaban con alguna forma de gallineros. Cerca del 36% recibía suplementos alimenticios como el maíz, sorgo, sésamo, etc., tanto en la época seca como lluviosa. Las mujeres y los niños fueron predominantemente los encargados del cuidado de las aves. Se reportó el Newcastle como el principal problema de salud (70%) probablemente por la falta de acceso a servicios veterinarios. Sin embargo 33% de los propietarios declaró emplear plantas locales para el tratamiento de las aves. Las ratas fueron identificadas como el depredador más común de los pollitos. Únicamente se encontró diferencias (P<0.05) el número de huevos por camada y mortalidad anual de gallos y gallinas entre las zonas agrícolas. El número de camadas por año fe de 4.87 (0.92), mientras que el número de huevos por

camada fue 11.9 (3.27), de los cuales 8.78 (2.71) eclosionaron. La mortalidad promedio por camada por año para el número de pollitos, en crecimiento, gallos y gallinas fue de 2.11 (2.26), 1.30 (1.52), 0.30 (0.55) y 1.33 (1.11) respectivamente. Cerca del 62% de las aves fue vendida a la edad adulta y la razón principal de criar aves fue el autoconsumo (58.1%). Las limitantes identificas fueron salud, alojamiento, nutrición, predadores y robo.

Key words: Composición de la parvada; manejo zootécnico; aves indígenas; desempeño.

INTRODUCTION

Livestock form key components of the livelihood strategies of many of the world`s poorest people. Poultry production in tropical countries is based on the traditional scavenging system and chickens are the most important poultry species. Village chickens are generally birds of indigenous breeds living in almost symbiotic relationship with human communities (Spradbrow, 1993). Out of a total of 72,400,856 chickens in Nigeria, 86.17% are free-range (RIM 1992), kept mainly in the rural areas.

Development of village chicken production can be a useful way of helping to meet the nutritional, income, employment and gender needs of the rural population (Kusina and Kusina 1999). According to Sonaiya *et al*. (1999), village poultry production is regaining attention in smallholder agricultural systems, wherever low external production inputs are demanded. The traditional system is advantageous due to free feed resources in the surrounding environment and kitchen leftovers, use of local breeds that are adapted to their environment and preserved ability to incubate and brood naturally (Magwisha *et al.,* 1997; Pedersen *et al.,* 2002). However, poor reproductive performance, poor growth rates, diseases, mortality, predation and low level of literacy among farmers are some of the major constraints in smallholder chicken production (Salum *et al.,* 2002; Conroy *et al.,* 2005).

In Nigeria, the rural poultry offers a wide range of genetic potential, as the local chickens are genetically heterogeneous with diverse phenotypes and genotypes to select from. Indigenous livestock breeds, whose adaptive traits permit survival and reproduction under the harsh climatic, nutritional and management conditions typically associated with resource poor livestock keepers should be prioritized. The improvement of poultry should be in line with the existing rural conditions to avoid the likelihood of maladjusted management.

To date, there are no detailed studies conducted targeting comprehensive description of the flock characteristics and associated performances of smallholder chicken production in Nasarawa State, Nigeria, recently hit by the outbreaks of avian influenza. Therefore, the study aimed at understanding the flock characteristics and some production parameters of village chickens while proffering solutions to the associated constraints.

MATERIAL AND METHODS

Sampling procedure

A cross sectional survey was carried out in the three agricultural zones of Nasarawa State, north central Nigeria namely Nasarawa South, Nasarawa Central and Nasarawa West as delineated by the Nasarawa Agricultural Development Programme (NADP). Nasarawa South comprises five local government areas (LGAs) namely, Lafia, Doma, Obi, Awe and Keana. Nasarawa Eggon, Akwanga, Kokona and Wamba LGAs make up Nasarawa Central while the Western zone is composed of Keffi, Nasarawa, Toto and Karu LGAs respectively.

A double-stage sampling procedure was adopted in selecting the respondents (village chicken producers). Three villages were randomly selected from each local government area making the three agricultural zones. This corresponded to 15, 12 and 12 villages in the Southern, Central and Western zones respectively. Three households were randomly sampled from each of the selected villages making a total of 117 respondents. Sampling was facilitated using the household listing record of the 2006 population census.

Data collection

Data collection was effected through the use of well structured questionnaires (rapid assessment tool) administered on the selected individuals between April and June, 2008. This was in addition to on-site investigation to identify the presence or otherwise of some major genes carriers in native birds. Detailed information was obtained on the flock structure, productivity, management practices, health and sale of stock. Problems prevailing in chicken production of the study areas, and opportunities for improving poultry production were also assessed.

Statistical analysis

Data on flock composition and performance were analysed using the General Linear Model (GLM) procedure of Analysis of Variance (ANOVA) while others were expressed in percentages. The frequencies of certain major genes (naked neck and frizzle genes) were calculated using the Hardy-Weinberg equilibrium as follows:

$q = \sqrt{m/t}$

where,
q = frequency of the recessive gene, na or f
m = observed number of birds with the recessive trait
t = total number of birds sampled.

The frequencies of the dominant allele (Na and F) where calculated using the formula:

$P = 1-q$

where,
P =frequency of the dominant allele

The observed frequencies were tested against the expected Mendelian ratio of 3:1 corresponding to values of 0.75 for the dominant allele and 0.25 for the recessive allele using Pearson's chi- square test. SPSS (2001) statistical software program, was employed.

RESULTS AND DISCUSSION

The mean flock composition per household in the three agricultural zones is shown in Table 1.There was no significant difference (P>0.05) in the chicken flock size per household across the study zones. The average flock size (±SD) of chickens in the study areas was 13.9 (9.04) birds and varied between 4 and 48 birds respectively. The mean flock size obtained in this study is lower than the value of 28.7 recorded for free range village chickens by Aboe *et al*. (2006) but higher than 9 and 5.6 chickens per holding reported for Tswana and Jamma chickens respectively (Aganga *et al.,* 2000; Mammo *et al.,* 2008). It also falls within the range of 5 to20 birds which, according to Sonaiya and Swan (2004), seems to be the limit that can be kept by a family without special inputs in terms of feeding, housing and labour. While the mean numbers of chicks and growers were similar, those of cocks and hens were significantly (P<0.05) different among the different zones. Nasarawa Central and Nasarawa South agricultural zones recorded higher means for cocks and hens. This could be attributed to the heavy presence of smallholder farmers in these areas; who tend to retain a good number of their breeding stock for procreation and as a means of survival. The cock: hen ratio of 1:3.4 is relatively high compared to 1:2.5 recorded for Ethiopian chickens (Tadelle *et al.,* 2003). The proportion of mature hens in a flock is used to estimate egg and chicken production.

Phenotypic variation in the appearance of indigenous chickens is shown in Table 2. The frequency of the naked neck (Na) and frizzle (F) genes were 5.51 and 4.09% while those of the recessive gene carriers (na and f) were 94.5 and 95.9% respectively. The gene frequency of feather restriction gene (Na) was 0.03 while that of feather morphology gene (F) was 0.02. The chi-square analysis showed that the phenotypic ratios for both feather restriction (naked neck versus normal) and feather morphology (frizzled versus normal) deviated significantly (P<0.55) from the theoretical expectation for a Mendelian population.

The diverse morphological traits observed in the current study are consistent with those of McAinsh *et al.* (2000) who stated that the variation in phenotypes is exactly what characterizes local chickens. They further stated that this is probably an expression of high variability at genotype level. Naked neck and frizzle traits have been found to be relevant for the tropics because of their association with heat tolerance and production. According to Horst (1984), Naked neck gene results in 40% less feather coverage overall, with the lower neck appearing almost ''naked''. This considerably reduces the need for dietary nutrition to supply protein input for feather production, and protein is a limiting factor in many scavenger feed resource bases. Thus, protein is shifted to meat and egg production than to feather synthesis. Naked neck and frizzled birds are noted for good egg traits (Marthur and Horst, 1990; Yakubu *et al.,* 2008). The Nigerian Hausa keep some unique types and colours of naked neck chickens because these birds are associated with spirits in local rituals. However, the low frequencies for these dominant genes carriers in the recent study suggest that they are at the brink of extinction. Some of the reasons adduced for this are that naked neck and frizzled birds are ugly, irritating and attract lower price when sold as live animals for meat purposes.

Table 1. Flock composition (mean ± SD) of indigenous chickens by Nasarawa agricultural zones.

Flock structure	South	Central	West	Overall
Flock size	14.3±8.44[a]	15.5±11.12[a]	11.7±7.06[a]	13.9±9.04
Chicks	4.78±3.09[a]	6.22±4.30[a]	4.67±2.92[a]	5.19± 3.50
Growers	4.62±3.37[a]	4.72±4.08[a]	3.58±3.16[a]	4.33± 3.55
Cocks	1.20±1.06[ab]	1.39±1.25[a]	0.86±0.79[b]	1.15± 1.06
Hens	4.18±2.08[a]	4.67±2.74[a]	2.69±1.33[b]	3.87± 2.26
Cock: Hen	1:3.8	1:3.4	1:3.4	1:3.4

[ab] *Means in the same row for each parameter with different superscripts are significantly different (P<0.05).*

Table 2. Proportion of major gene carriers and their gene frequency in indigenous chickens.

Genetic group	Allele	Observed	Expected*	Proportion (%)	Calculated gene frequency	Expected gene frequency
Naked neck	Na	31	422	5.51	0.03	0.75
Normal	na	532	141	94.5	0.97	0.25
Frizzled	F	23	377	4.09	0.02	0.67
Normal	f	540	186	95.9	0.98	0.33

**A total of 563 birds were sampled (on-site investigation).*
Expected gene frequency for frizzled chickens was calculated on the assumption that an individual did not survive to maturity.

Most of the farmers (78.6%) acquired their initial breeding stock through purchase from markets (Table 3). About 72% of the households provided overnight housing for their birds while about 28% roosted under shrubs, perched in trees or roof tops. The overnight accommodation was either a complete or partial enclosure. In the former, birds were provided with permanent structures with mud walls and thatched roofs or wooden and wire cages with old corrugated iron sheets. The use of disused huts and palm fronds or raffia baskets characterized the partial enclosure. However, the two enclosures were not littered. The present findings are at variance with that of Khalafalla *et al.* (2008) who reported that nearly half (48.7%) of the households provided overnight housing. Kugonza *et al*. (2008) however, reported that 77% of the respondents in Eastern Uganda provided complete enclosure for their chickens. The provision of good housing as a prerequisite for any viable and sustainable chicken project has been stressed (Smith, 1992). Proper housing does not only provide an environment that moderates environmental impact but also provides adequate ventilation for the birds to lay eggs in next boxes, as well as to feed and sleep in comfort and for security purposes. Most of the farmers (63.3%) offered partial feed supplementation to their birds while about 3 and 34% of them provided full and zero supplementation respectively. Maize, sorghum, millet (or brans called dusa), sesame (beniseeds) and kitchen leftovers were offered to the birds in the morning before they were released to scavenge. The regularity and quantities provided depended greatly on available resources. Smallholder farmers with larger flock size usually purchased commercial feed as a means of supplying balanced diet, but the amount offered fell far below expectation. The scavengable feed resource base does not meet the nutrient requirements of indigenous birds. There is need therefore, to improve the nutrition so as to increase the productivity of the birds. Feed supplementation was done (75.3%) in both seasons (wet and dry) of the year. It was mainly the responsibility of mother and children (52.1%) to feed and offer water to village chickens while a lesser role (4.27%) was played by the father. This is consistent with the findings of Aboe *et al*. (2006). The mating system of indigenous chicken flocks was indiscriminate. This is a characteristic feature of village chickens where the farmer had virtually no control on the breeding system as a result of the scavenging nature of the birds.

Information on disease prevalence was extracted in the course of the rapid assessment when the farmers were asked to give in local language and in order of importance, the names and symptoms of the diseases prevalent in their areas as well as the season(s) of occurrence. Their responses were confirmed from the charts showing some common fowl diseases in Nigeria. Each disease was subsequently coded, and the coded data was eventually used for analysis. There was no laboratory diagnosis of any of the diseases. The result indicated that 74.4% of the households

claimed that Newcastle disease (ND) was the most important and prevalent disease in the study area (Table 4). This was followed by Coccidiosis (13.7%), Helminthosis (8.55%), Gumboro (7.69%) and fowl cholera (4.27%). The present finding conforms to that of Swai *et al*. (2007) where ND was reported as the predominant disease in Tanga, Tanzania. All the smallholder farmers had no access to any regular organised health input. They normally resorted to self medication using indiscriminately drugs such as tetracycline and aspirin to treat virtually all ailments. However, the households located within the villages where outbreaks of avian influenza occurred (Yakubu *et al.,* 2006; Yakubu and Musa, 2008) claimed that they came in contact for the first time with veterinary personnel during the mopping-up exercise. Local herbs were employed by 33.3% of the farmers. Such herbs included, Mahogany for Newcastle disease, Madachi (neem tree leaves) for treating Coccidiosis and Mahogany and Onions (Albasa) for treating Helminths. However, the potency of these herbs is a subject for future investigation. Rats (Jaba), Snakes (Machiji) and Cats (Muskule) accounted for 65.0, 16.2 and 10.3% of the common predators of birds in the surveyed agricultural zones.

The performance characteristics of the native birds are presented in Table 5. The number of clutches/bird/year, number of eggs hatched/clutch, and chick and grower's mortality/year were not significantly different ($P>0.05$) among the study zones. However, the zones differed significantly ($P<0.05$) in number of eggs/clutch and cock and hen's mortality/year. The overall mean of clutches and number of eggs hatched/clutch were 4.87(0.92) and 8.78(2.71) respectively. These values which are quite low could be improved upon by mating with superior genes and controlling the brooding practices. Higher clutch number per year could be found by breaking broodiness as it shortens the period to switch the clutch to every 27days. In another study, the average egg production reached 177 eggs per year when indigenous chickens were housed in cages under relatively improved management (Suleiman, 1996). This system is already being practised in Ethiopia in which a relatively high egg production (143 eggs per hen/year) was reported (Rushton, 1996).Cock mortality was higher in Nasarawa Central compared to Nasarawa West (0.44±0.65 versus 0.17±1.33). Lowest mean hen's mortality/year (0.89±0.78) was also recorded for Nasarawa West.

Birds were sold mainly as adults (62.4%) (Table 6). This was attributed to consumers' preference, easy marketability and the higher price they attract. 58.1% of the farmers decided to dispose off their birds for home consumption while 27.4% sold their chickens to meet financial obligations. The proportions for festival/sacrifice and gift were 9.40 and 3.42% respectively. Very few of the farmers (1.71%) gave out birds in exchange of labour, farm produce and as a form of security. This study was concurrent with the report of Aganga *et al*. (2000) that farmers kept chickens mainly for home consumption and occasional sales.

Table 3: Management of local chicken.

Parameter	Number/(%)
a. **Source of foundation stock**	
i. Inherited	8 (6.84)
ii. Purchase from market	92 (78.6)
iii. Purchase from neighbour	6 (5.13)
iv. Gift	3 (2.56)
v. Borrowed	5 (4.27)
vi. Others	3 (2.56)
b. **Types of housing**	
i. Partial enclosure	65 (55.7)
ii. Complete enclosure	19 (16.2)
iii. Perch in trees	11 (9.40)
iv. Perch on roof tops	9 (7.69)
v. Roost under shrubs	13 (11.1)
c. **Feed supplementation**	
i. Zero supplementation	40 (34.2)
ii. Partial supplementation	74 (63.3)
iii. Full supplementation	3 (2.56)
d. **Season of feed supplementation**	
i. Wet only	15 (19.5)
ii. Dry only	4 (5.19)
iii. Wet and dry	58 (75.3)
e. **Members of household responsible for feeding and offering water to birds**	
i. Father only	5 (4.27)
ii. Mother only	12 (10.3)
iii. Children only	23 (19.7)
iv. Father and children only	16 (13.7)
v. Mother and children only	61 (52.1)
f. **Breeding control**	
i. Yes	0 (0)
ii. No	117 (100)

Health constituted the major constraint of village chicken production (39.3%) followed by housing (20.5%), feeding (19.7%), predation (12.0%) and theft (8.55%) (Table7). The solutions for these constraints are however, outside of the low genetic potential of free range village chickens. The problem of diseases in village chickens is compounded by the interactions of different causal factors that are of significant importance to disease epidemiology. At the village

level, contacts between flocks of different households, the exchange of birds as gift or entrusting, sales and purchases are the main sources of infection transmission. Similarly, other domestic and wild birds formed another source of infection because the chickens roam freely in the localities. The higher helminth burden in village chicken flocks has been attributed to the scavenging diet that includes some of the hosts such as worms and snails (Pandey *et al.*, 1993).

In order to boost village chicken production in Nigeria, it is recommended that: i) There should be periodic veterinary and extension services to the farmers towards improved productivity and preservation of local birds. Some of the farmers submitted that should the veterinary services they received in areas where avian influenza outbreaks were reported be sustained, this will certainly boost village chicken production. ii) There is need for a comprehensive study of the potency of the local herbs used by the households for the treatment of certain diseases of native fowl; as these herbs could serve as a veritable complement to the orthodox medicine. Iii) Efforts should be intensified by farmers towards the provision of complete housing using cheap locally available resources such as mud blocks, planks, thatched roofs and wood shavings (litter materials).

Table 4. Health care of native fowls.

Parameter	Number/(%)
a. **Common diseases of flock**	
i. Newcastle	87 (74.4)
ii. Gumboro	9 (7.69)
iii. Coccidiosis	16 (13.7)
iv. Fowl cholera	5 (4.27)
v. Helminthosis	9 (8.55)
b. **Access to veterinary personnel**	
i. Yes	0 (0)
ii. No	117 (100)
c. **Application of local herbs**	
i. Yes	39 (33.3)
ii. No	78 (66.7)
d. **Common predators of birds**	
i. Rats	76 (65.0)
ii. Snakes	19 (16.2)
iii. Cats	12(10.3)
iv. Hawks	7 (5.98)
v. Others	3 (2.56)

Table 5. Performance indices (mean ± SD) of local birds by Nasarawa agricultural zone.

Variable	South	Central	West	Overall
No of clutches/bird/year	4.78 ± 0.93^{a}	4.89 ± 0.92^{a}	4.97 ± 0.94^{a}	4.87± 0.92
No of eggs/clutch	11.3 ± 3.22^{b}	11.7 ± 3.58^{ab}	12.8 ± 2.90^{a}	11.9± 3.27
No of eggs hatched/clutch	8.51 ± 2.79^{a}	8.47 ± 2.93^{a}	9.42 ± 2.32^{a}	8.78± 2.71
Chick mortality/clutch/year	1.87 ± 1.89^{a}	2.56 ± 2.89^{a}	1.97 ± 1.94^{a}	2.11 ± 2.26
Grower's mortality/clutch/year	1.51 ± 1.47^{a}	1.25 ± 1.66^{a}	1.08 ± 1.42^{a}	1.30 ± 1.52
Cock mortality/clutch/year	0.29 ± 0.55^{ab}	0.44 ± 0.65^{a}	0.17 ± 1.33^{b}	0.30± 0.55
Hen's mortality/clutch/year	1.51 ± 1.10^{a}	1.56 ± 1.29^{a}	0.89 ± 0.78^{b}	1.33± 1.11

^{ab} *Means in the same row for each parameter with different superscripts are significantly different (P<0.05).*

CONCLUSION

The results of this study showed that village chicken production is primarily the endeavour of smallholders and the subsector is extremely livelihood intensive. The mean flock size was low while the major genes carriers were at the brink of extinction. Women and children were the main providers of care for birds. Although productivity was low, the indigenous birds are more adapted to unfavourable climatic conditions, particularly the extreme tropical heat.

Table 6. Disposal/sale of stock.

Variable	Number / (%)
a. **Age of disposal of birds**	
i. Chicks	6 (5.13)
ii. Growers	38 (32.5)
iii. Adults	73 (62.4)
b. **Reasons for disposal**	
i. Cash need	32 (27.4)
ii. Gift	4 (3.42)
iii. Home consumption	68 (58.1)
iv. Festival/Sacrifice	11 (9.40)
v. Others	2 (1.71)

Table 7. Constraints of village chicken production.

Variable	Number / (%)
i. Health	46 (39.3)
ii. Feeding	23 (19.7)
iii. Housing	24 (20.5)
iv. Theft	10 (8.55)
v. Predation	14 (12.0)

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