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# Brooding and Rearing of Broiler Chicken on Free Range Using Local Chicken Hens

**[1]Carew, S.N., [1]Yusuf, N.D., [2]Ejembi, E.P and [3]Tuleun, C.D**

*[1]Department of Animal Production, University of Agriculture Makurdi, Benue state, Nigeria.*
*[2]Department of Agric. Extension and Communication, University of Agriculture Makurdi, Benue state, Nigeria.*
*[3]Department of Animal Nutrition, University of Agriculture Makurdi, Benue State, Nigeria.*
**nyusufdanlami@yahoo.com*

***Abstract***

*A study was conducted to compare survivability, meat yield, and haematological profile of intensively reared broiler chicken (treatment 1), broiler chicken brooded and reared by local hens on free range with no health care (treatment 2), free range broiler chickens that were vaccinated (treatment 3), free range broiler chickens that were given medications (treatment 4), free range broiler chickens that were both vaccinated and medicated (treatment 5), and traditional free range local chickens (treatment 6). Each treatment consisted of 4 local hens and a brood, each, of 10 HYBRO® broiler chickens adopted by the hens at day-old. Each hen and her brood served as a replicate. Treatment 1 chickens attained 2.05kg live weight in 9 weeks, with a feed conversion of 2.71 and 2.5% mortality. At 15 weeks of age, live weights and rate of survival for the free ranging broiler chickens were1505g, 42% (treatment 2), 1518g, 70% (treatment 3); 1541, 57% (treatment 4), 1535, 75% (treatment 5). Treatment 6 chicks were 433g at 15weeks, with 45% survival, and 1032g at 25weeks, with a 54% survival rate. Meat yield (dressing %) were 73.4, 67.6, 75.0, 73.6, 74.6 and 51.3 for treatments 1, 2, 3, 4, 5 and 6 respectively. Statistical differences between treatments means was tested at 5% significance level. Meat yield was significantly higher for broiler chickens compared to local chickens, while among broiler chicken, meat yield was significantly lower for those that received neither vaccinations nor medications. Intensively reared broiler chickens at 9 weeks had significantly higher PCV, RBC and WBC values compared to free range broiler chickens and local chickens at 15 and 25 weeks of age. The free range broilers chickens without intervention had least values for PCV, WBC and Hbc values compared to free range broiler chickens vaccinated or medicated. Survival rates were significantly lower for chickens reared on free range, compared to intensive rearing, but vaccination and medication improve this significantly.*

***Key words:*** *Free range, broody hens, broilers, adoption, local chickens*.

## Introduction

Modern hybrid chickens are by far superior to their indigenous counterparts in rate of growth and therefore, meat production, egg production and efficiency of feed conversion. The rural and suburban masses of the third world stand in great need of these abilities because their diet is deficient in animal protein, a critical nutrient which is necessary to be consumed in adequate quantities for the proper growth and development of children, and good health, productivity and life expectancy of adults. Since the purchasing power of these people are very low, the only way for them to benefit from the potential of improved livestock species is for them to produce these animals themselves. The best way to promote production would be to develop production systems for these animals which minimize cost of production

and conflicts with existing livestock management practices and other socio-economic activities.

Attempts have been made to improve the meat production potential of the local chickens by subjecting them to intensive housing and health care system and supplementary feeding, but this has proved uneconomical (FAO, 2004; Do, 2005; Goromela *et al.,* 2008). The superior performance potentials of exotic, hybrid chickens are often not expressed under the nutrient, disease and other stresses typical of the free range environment (Arjona *et al.,* 1988). Other problems associated with the husbandry of exotic chicken include the necessity of artificial brooding and rearing, since the chicks do not come with a mother hen. Artificial brooding and rearing is money, time and energy consuming and incompatible with the reality that the rural poor have very little cash and they have to combine many production activities in their effort to eke out a livelihood.

It has already been shown (Carew and Ejembi, 2005) that broody local hens can be made to adopt, brood and rear hybrid broiler chicks, thus circumventing the need to spend time and other resources on artificial brooding and rearing. The work of these investigators, however, also showed that survivability was a major bottleneck in the rearing of hybrid broilers on free range, and suggests the need for restriction of the chicks in the first few weeks and some form of healthcare to reduce losses.

This study investigated the effect of vaccination and medication on the survivability, productivity and haemotological profile of free ranging broiler chickens that are brooded and reared by local chicken hens.

## Materials and Methods

The study was carried out in Shabu, which is a village close to Lafia, the capital of Nasarawa State of Nigeria. Shabu is located on latitude 08° 22´ N and longitude 08° 32´ E and at an altitude of 181.33 meters above sea level. The vegetation of the area is Guinea Savannah, characterized by a mean annual rainfall of 1136mm, almost all of which falls in the rainy season which lasts from April to October. Annual mean minimum and maximum temperatures are 22.95 $^0$C and 35.05 $^0$C (NIMET, 2012).

There were 6 treatments. Treatment 1 consisted of 40, HYBRO® broiler chicken, stocked 10 per replicate at day old, and fed a 22% protein broiler starter to 5 weeks of age, followed by 20% protein broiler finisher diet to 9weeks of age. For treatments 2 – 5, four local hens/treatment, that had being incubating their own eggs for 14 – 18 days were each offered 10 day-old HYBRO® broiler chicks for adoption by placing the chicks under the hens at night and removing the yet to be hatched eggs. The hens readily accepted the chicks, and they were then allowed to brood and rear them on free range. Each hen and her adopted brood of 10 chicks served as a replicate. Treatment 6 consisted of 4 local hens and broods of chicks hatched from their own eggs, which varied in number from 8 to 12/hen. Standard broiler husbandry procedures were used to manage treatment 1 birds on deep litter. Treatment 2 and 6 birds received no health care at all. The birds in treatment 3 were

vaccinated against Newcastle disease at 7, 21 and 42 days of age, using lassota vaccine in drinking water. They were also vaccinated against Gumboro disease at 14, 28 and 35 days of age. The birds in treatment 4 were given antibiotics during days 1-7 and days 14-16. They were given a coccidiostat on day 25 and dewormed on day 42 and 70. The birds in treatment 5 were both vaccinated and medicated in the same manner as for treatments 2 and 3 respectively. Housing and general management for all birds in treatments 2, 3, 4, 5 and 6 were the same as for other free ranging chickens belonging to village residents.

Growth rate was measured by weekly weighing of all chicks. Mortality and other forms of losses, meat yield chemical composition of meat carcass cut proportions, production costs and gross margins (sales revenue minus cash expenditure) were also measured. The intensively reared broilers were above 2kg live weight by the $9^{th}$ week of the study, and by the $15^{th}$ and $25^{th}$ week, for free ranging broilers and local chicken respectively, the general opinion of village residents was that the birds had reached table weight, and the study was concluded at these periods for the respective treatments.

Data generated from these measurements were subjected to ANOVA using the General Linear Model (GLM) procedure for SPSS. Differences between treatment means were tested at 5% significance level.

**Results and Discussions**

Results of the effect of management system on growth performance and survival rate are presented in Table 1. The result show that broiler chicken raised intensively had significantly higher weight gain than those on free range, and that on free range broiler chicken had higher weight gains than local chicken.

Similar trend were also observed in the rate of growth. By 5 weeks of age the intensively raised broiler chicken had already attained the live weight that will take 10 weeks and 25 weeks for free range broilers and local chicken, respectively, to achieve. The significantly ($p< 0.05$) higher values for growth rate in intensively reared broiler chicken *vis-à-vis* free range broiler chicken and local chicken are comparable with the earlier findings by Castellini *et al.* (2002) and Carew and Ejembi, (2005).The differences in growth rate between these classes of chicken is to be expected because, the intensively raised broiler chicken had the advantage of unrestricted access to high quality feeds, clean water, whereas the free range broiler chicken and local chickens had to scavenge for feed and water in competition with other poultry and livestock. The local chicken also had to combine this disadvantage with their inherent low genetic potential for growth and feed conversion.

Survival rate was significantly different in all the treatments except treatment 4 and 6 which were similar. The highest survival rate was for intensive broilers (98 %), followed by free range broilers that were both vaccinated and medicated (75 %), while the lowest was for free range broilers that were neither vaccinated nor medicated (42 %). The difference in survival rate between the two rearing system

would be because the intensively reared broiler chicken were in a more controlled and protected environment and were vaccinated and medicated, at appropriate times, against diseases and parasites, had unrestricted access to high quality feed, whereas the free range broilers and local chicken had no protection against the vagaries of the weather and against thieves, predators, and in some cases, diseases.

**Carcass Characteristics**

Results obtained from carcass analysis are presented in Table 2. The results show that intensively reared broiler chicken had significantly ($P< 0.05$) higher live weight, plucked weight and dressing% even when their data is at 9 weeks of age is compared to free range broiler chickens and local chickens at 15 and 25 weeks of age, respectively.

Among the birds that were reared on free range, those that received vaccinations/ medications had higher meat yields, expressed as dressing %, than those that received only vaccinations or no medical attention at all.

With regards to distribution of meat among carcass cuts, there were significant differences between treatments for the proportions of the neck, wing, shank, breast and back. The carcasses of intensively reared broiler chicken had a higher proportion of these parts than the carcasses of free range broilers, which, in turn, had higher proportions than the carcasses of local chicken.

**Haematological and serum biochemical indices**

The results from estimates of haematological and serum biochemical indices of intensively raised broilers chicken, free range broiler chicken and local chicken are presented in Table 3. The result shows that there was a significant difference only in haemoglobin and Creatinine. In both cases, the local chicken had higher values than broilers.

The haemotological indices, Packed cell volume (PCV %), White blood cells (WBC %), and Haemoglobin concentrations (Hbc) of free range broiler chickens, intensive broiler chickens and local chickens has the values that are within the normal physiological range reported for broiler chickens by Kaufman and Murray (2008).

The intensively reared broiler chickens at 9 weeks had significantly higher PCV, RBC and WBC values compared to free range broiler chickens and local chickens at 15 and 25 weeks of age. However, the free range broilers chickens without intervention had least values for PCV, WBC and Hbc values compared to free range broiler chickens vaccinated or medicated. This therefore implies that vaccination and medication had significant ($P < 0.05$) effect on the relative quality of blood cells.

A reduction in PCV, RBC, WBC and Hbc component in blood is an indication that the oxygen carrying capacity of the animal blood would be reduced and a reduction in haemoglobin may be accompanied by a fall in the red blood cell (RBC) count and packed cell volume (PCV).

The higher values of WBC, RBC and haemoglobin concentration indices among the scavenging broiler chickens in this study, may offer better explanation of the defense mechanism of broiler chickens in free range production system.

The mean values for cholesterol and createnine in free range broiler chicken were significantly (P>0.05) influenced by vaccination/medication and rearing systems. However, free ranging broiler chicken had higher total protein content compared to the intensively raised broiler chickens and local chickens. Serum proteins are important in osmotic regulation, immunity and transport of several substances in the body system. Similarly the serum cholesterol levels differed significantly between the two rearing systems. Significantly higher cholesterol content of the serum indices of intensively raised broiler chicken compared to free range broiler chicken and local chicken may be due to nutrition. The reduction in cholesterol levels is a positive development in view of the current emphasis on reduction in the consumption of cholesterol.

The significantly higher serum createnine in free range broiler chickens compared to intensively reared broiler chickens is an indication of the ability of the free range broilers chickens to cope with the free range rearing condition. Serum createnine helps in evaluating the liver function and diseases (Sieldel *et al*. (2006).

## Conclusions

The results obtained from this study confirm that local broody hens can brood and rear broiler chicks and that vaccination/medication improve the survivability as well as the performance of free range broilers. The study has also shown that the genetic superiority of the hybrid broiler chicken is expressible even under the inclement conditions of the free range. Further studies in other areas of intervention, such as feed supplementation, is needed to further improve on the productivity and survival rate of free range broilers.

**Table 1: Growth performance of broiler chicks brooded and reared by local hens**

| | TREATMENTs | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Age (Weeks)** | **T1** | **T2** | **T3** | **T4** | **T5** | **T6** | **SEM** | **P.Value** |
| 5 | 1.03$^{a}$ | 0.25$^{c}$ | 0.50$^{b}$ | 0.33$^{b}$ | 0.33$^{b}$ | 0.10$^{d}$ | 0.003 | 0.001 |
| 9 | 2.23$^{a}$ | 0.98$^{b}$ | 0.92$^{b}$ | 0.71$^{b}$ | 0.87$^{b}$ | 0.15$^{c}$ | 0.007 | 0.018 |
| 15 | - | 1.51$^{a}$ | 1.52$^{a}$ | 1.51$^{a}$ | 1.64$^{a}$ | 0.46$^{b}$ | 0.014 | 0.024 |
| Wt gain (kg) | 2.18$^{a}$ | 1.46$^{b}$ | 1.47$^{b}$ | 1.46$^{b}$ | 1.49$^{b}$ | 0.99$^{c}$ | 0.02 | 0.000 |
| Survival (%) | 98$^{a}$ | 43$^{e}$ | 70$^{c}$ | 57$^{d}$ | 75$^{b}$ | 54$^{d}$ | 4.1 | 0.000 |

abcd = means in the same row with different superscripts are significantly different ($p < 0.05$); T1 = Intensive broiler chicks; T2 = Free range broiler without intervention; T3= Free range broiler chicks vaccinated; T4= Free range broiler chicks medicated; T5 = Free range broiler chicks vaccinated and medicated; Wt = Weight.

**TABLE 2: Carcass characteristics of broiler chickens reared by local broody hen**

| | TREATMENT | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameters** | **T1** | **T2** | **T3** | **T4** | **T5** | **T6** | **SEM** | **P.Value** |
| Live weight (g) | 2212.50$^{a}$ | 1502.5$^{b}$ | 1511.3$^{b}$ | 1511.3$^{b}$ | 1517.5$^{b}$ | 1111.3$^{c}$ | 60.90 | 0.000 |
| Plucked weight (g) | 1935.0$^{a}$ | 1332.5$^{b}$ | 1381.3$^{b}$ | 1338.8$^{b}$ | 1410.0$^{b}$ | 703.8$^{c}$ | 75.00 | 0.000 |
| Dressed weight (g) | 1625$^{a}$ | 1016.3$^{b}$ | 1065.0$^{b}$ | 1112.5$^{b}$ | 1133.0$^{b}$ | 570.0$^{c}$ | 102.10 | 0.000 |
| Dressing (%) | 73.4$^{a}$ | 67.6$^{c}$ | 70.5$^{b}$ | 73.6$^{a}$ | 74.6$^{a}$ | 51.3$^{d}$ | 0.055 | 0.000 |
| | **% of dressed weight** | | | | | | | |
| Breast | 26.38$^{a}$ | 19.49$^{b}$ | 19.51$^{b}$ | 19.84$^{b}$ | 19.93$^{b}$ | 14.47$^{c}$ | 1.66 | 0.000 |
| Back | 13.66$^{a}$ | 10.28$^{b}$ | 10.35$^{b}$ | 11.45$^{b}$ | 11.66$^{b}$ | 8.95$^{c}$ | 0.95 | 0.000 |
| Thigh | 7.20 | 7.25 | 7.30 | 7.49 | 7.86 | 6.54 | 0.65 | 0.000 |
| Shank | 2.22$^{ab}$ | 2.94$^{a}$ | 3.62$^{a}$ | 3.22$^{a}$ | 3.47$^{a}$ | 1.49$^{b}$ | 0.35 | 0.000 |

$^{abcd}$ = means in the same row with different superscripts are significantly different ($p < 0.05$); T1 = Intensive broiler chicks; T2 = Free range broiler without intervention; T3= Free range broiler chicks vaccinated; T4= Free range broiler chicks medicated; T5 = Free range broiler chicks vaccinated and medicated; Wt = Weight.

**Table 3: Haematology and serum biochemistry of broiler chickens reared by local hens**

| | TREATMENT | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETERS** | **T1** | **T2** | **T3** | **T4** | **T5** | **T6** | **SEM** | **P.VALUE** |
| PCV (%) | 38.75 | 34.88 | 35.38 | 36.13 | 35.75 | 35.00 | 1.37 | 0.008 |
| R B C (x 106 m*l*) | 2.51 | 2.80 | 2.93 | 2.99 | 3.06 | 2.91 | 5.91 | 0.403 |
| WBC (X 103/ m*l*) | 237.13 | 211.25 | 225.75 | 228.75 | 215.13 | 210.13 | 0.88 | 0.876 |
| Haemogbobin | 10.93$^{b}$ | 10.14$^{b}$ | 10.3$^{cb}$ | 10.48 | 10.3 | 12.44$^{a}$ | 0.29 | 0.000 |
| Cholosteral(mg/d*l*) | 61.09 | 50.23 | 51.28 | 53.23 | 53. 24 | 52 | 3.43 | 0.000 |
| Creatimine (gm/m*l*) | 46.8$^{b}$ | 47.23$^{b}$ | 48.28$^{b}$ | 48.24$^{b}$ | 48.34$^{b}$ | 56.70$^{a}$ | 2.29 | 0.000 |

$^{a,b,c,\,d}$ *Means in the same row with different super script differ significantly (P<0.05); PCV = Packed Cell Volume; WBC = White Blood Cell; Int = Intensive; Ni = No intervention; Vac = Vaccinated; Med = Medicated; LCNI = Local chicken no intervention; P.Value = Probability value*.

## References

Arjona, A.A, Denbow, D.M, and Weaver, W.D. Jr (1988). Effect of heat stress early in life on mortality in broilers exposed to high-environmental temperatures just prior to marketing. Poultry science. 67: 226-231.

Carew, S.N and Ejembi, E.P (2005) Hybrid Chick Adoption by Local Broody Hens. Indian Journal of Animal Sciences 75(7): 776-778.

Castellini, C. Mugnai, C. and Dal Bosco, A. (2002). Effect of Organic Production System on Broilers and Meat Quality. ***Meat Science Journal,*** 60: 219 – 225.

Do, D.V. (2005). Effect of Supplementation, Breed, Season and Location on Feed Intake and Performance of Scavenging Local Chickens in Vietnam. PhD Thesis Submitted to Swedish University of Agricultural Science, Uppsala, Sweden.

FAO (2004). Small – Scale Poultry Production. Food and Agriculture Organisation Corporate Document Repository. http//www.fao.org/documents/advanced – s- result.asp.

Goromela, E.H., Kwakkel, R.P., Verstegen, M.W.A ., Katule, A.M (2008). Effect of Season and Farming System on the Quality and Nutritional Quality of Scavengeable Feed Resources and Performance of Village Poultry in Central Tanzania. Cell Anim. Biol., 2:63 – 71.

Kaufman, G. and Murray, M. (2008). Avian Diagnostic and Therapeutic Techniques.2nd Edition, Macmillan Publishers. 157PP.

NIMET. (2012). Nigeria Metrological Agency, Weather Report, Lafia, Nasarawa State.

Nwosu, C.C. (1990). The state of smallholder rural poultry production in Nigeria. In: "Smallholder Poultry Production". Proceedings of CTA Seminar. Thessaloniki, Greece. 9-13th October. pp 183-192.

Siedel, J. Schlumberger, H. Klose, S. Ziegenhorn, J. and Wahlefeld, A.W. (2006). Improved reagent for enzymatic determination of serum cholesterol, *Biochemistry,* 19: 838 – 839.