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Evaluating smallholder brood- and- sale poultry operation using crossbred local chicken genotypes in South East, Nigeria.

Nwachukwu, E.N., Nwankwo, C.U. and Akomah, C.

Department of Animal Breeding and Physiology, College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State.

*Corresponding author: ennwachuk@yahoo.com

Target Audience: Poultry geneticists, Family poultry farmers, Poultry extension workers

Abstract

A total of 92 crossbred pullet chicks of normal feather (44), naked neck (27) and frizzle (21) were used to evaluate early growth performance and monetary returns of a simulated smallholder brood-and-sale poultry production operation. Average day-old (D.O.) weight of chicks were 34.57±0.98g, 35.28±0.59g and 35.38±1.02g for the normal feather, naked neck and frizzle, respectively and these D.O. weights were not significantly (P>0.05) different. However, at 6 weeks of age, the frizzle pullets weighed significantly (P<0.05) heavier (402.10±17.54g) than the naked neck (385.88±5.91g) but the latter were not different from the normal feather pullets (388.45±14.90g). The frizzle pullets consumed significantly more feed and had better feed conversion ratio than the naked neck and normal feather pullets. Cost of day-old chicks was on the average higher for the frizzle and naked neck chicks (₦250.00 and ₦175.00 /chick, respectively) than the normal feather (₦120.00/chick). However, the frizzle and naked neck birds attracted higher revenues (₦1250.00 and ₦850.00, respectively) and higher gross margins (₦580.00 and ₦231.00, respectively) than the normal feather pullets (₦121.00). Thus indicating that raising frizzle and naked neck pullets would be more profitable to a smallholder poultry farmer especially in South Eastern Nigeria where these rare chicken genotypes are considered as premium birds.(*$1 = ₦155.00).*

Keywords*:* Local chicken, crossbreeding, brood-and-sale operation, smallholder poultry

Description of Problem

Growing interest in family poultry farming in recent times has necessitated increased interest in genetic and husbandry improvement of the local chicken populations especially in the less developed and food deficient countries of Asia, South America and Africa. Family poultry farming has been used successfully in some countries in Asia such as India and Bangladesh to alleviate extreme rural and peri-urban poverty (1).

A number of Nigerian local chicken genotypes are known to possess advantageous productive adaptability genes which place them as valued birds among local poultry farmers. Examples include the frizzle and the naked neck

genotypes (2, 3, 4). These genotypes are known to be more heat- tolerant and more feed- efficient than the normal feathered birds especially in hot environments (5, 6). Locally, the frizzle and naked neck birds attract higher and better market prices especially in the States of South East and South-South Nigeria where they are considered as ornamental birds and preferred birds in traditional herbal medicine. Their importance in the socio-cultural life of the people makes them highly sought for and decades of selection against these genotypes has resulted in their becoming extinct and their number falling within the range of endangered poultry species requiring conservation (7, 8).

A way therefore, of increasing the number of these birds, improving their productivity and overall usefulness would be through crossbreeding. Usually, crossbred pullets which retain the productive adaptability characteristics of their parents are better suited for smallholder poultry production. Such hardy crossbreds are considered ideal for 'safety net' flocks which provide poor families with eggs, meat and some cash or 'asset builder' flocks which are basically maintained as a source of acquiring assets as a route out of poverty (1).

The brood-and-sale poultry enterprise which is a growing type of poultry business in the rural and peri-urban areas of Nigeria can benefit from this hardy crossbred chicken concept. To ensure production of good quality and vigorous hybrid chicks, for instance, local chicken cocks with desirable traits can be mated to improved layer strains of chicken. This simple breeding scheme can become a hub driving the smallholder family poultry business into a profitable and sustainable production system. This study, therefore, was designed to evaluate early growth performance and cost-benefit of producing 6 weeks brood- and-sale crossbred normal feather, naked neck and frizzle pullets in South Eastern Nigeria.

Materials and Methods

Location of study

The study was conducted at the Poultry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike. This area falls within the South-East agro-ecological zone of Nigeria and has two distinct seasons namely, a long rainy season stretching from April to November and a short dry season lasting from December to March. The temperature during the rainy season ranges from $23^{o} – 28^{o}$C with average relative humidity of 75%. The dry season temperature is between $25^{o} – 36^{o}$C with average relative humidity of 55%, while precipitation ranges from 1700 – 2200mm per annum. Most of the rural and peri-urban dwellers are farmers that keep mainly poultry, small number of sheep and/or goats.

Management of base population

Local chicken cocks numbering three per genotype and aged between 9 – 12 months of the normal feather, naked neck and frizzle genotypes were mated to 10 mature females each of the Nera brown layer strains. The birds were housed in

conventional open-sided chicken house netted with wire mesh. These breeding stocks were fed chicken layer mash containing 16% CP and 2930 kcal/ME. Water was provided free choice with prophylactic antibiotics provided only occasionally.

Mating system

The mating ratio of the breeding flock was 3 males: 10 females for the three genotypes and due to obvious weight differences between local cooks and exotic layer strains , artificial insemination technique as outlined by Lake (9) was also employed to optimize fertility. Hatching eggs were collected daily and identified appropriately using ink markers and set in the incubator weekly.

Management of Hybrid F_1 chicks

A total of 123 mixed sexed chicks were generated in three hatches for the study. The chicks were raised sex combined until four weeks when 31 male chicks were culled. The remaining 92 pullet chicks were raised in batches and according to their genetic groups. Routine poultry husbandry practices as outlined by the University Teaching and Research Farm were strictly adhered to.

Data collection

Body weights of the chicks were taken at day-old using electronic weighing scale. Subsequent body weights were taken weekly until 6 weeks. Daily feed intake was recorded for the various genotypes while feed conversion ratio was computed as a ratio of total feed consumed over body-weight attained at 6 weeks.

The cost of day-old chicks (D.O.C.) was assessed and estimated at 20% of the market price of their respective adult chicken genotypes. Total cost of production per bird at 6 weeks was calculated as sum of cost of D.O.C., feed consumed, medication and contingencies (kerosene, wood shavings and transport). Revenue accruable from the pullets of each genotype was ascertained by comparing the price of contemporary pullets of similar genotypes in local markets around the study area. Gross margin per bird was obtained as difference between revenue and total cost of production.

Experimental design and data analysis

The experiment was a completely randomized design with genotype as major factor of interest. The growth performance and cost benefit analysis data were subjected to one-way analysis of variance procedure using the SPSS (10) statistical package. Significant means were separated using Duncan Multiple Range Test of SPSS (10).

Results and Discussion

The growth performance of crossbred normal feather, naked neck and frizzle pullet chicks (Table 1) showed that day-old weights of these birds were not significantly ($P>0.05$) different. However, the 6 weeks body weights were significantly ($P<0.05$) different with the frizzle pullets having the highest body weight of 402.10±17.54g, while the normal feather and naked neck had

388.45±490g and 385.88±5.91g, respectively. The heavier body weight achieved by the frizzle pullets is in line with previous reports (4, 11) while the lower body weight of the naked neck genotype is consistent with reports of (3, 12).

Average daily feed intake was significantly higher for the frizzle pullets (36.25±2.45g/d) compared with the normal feather individuals (34.70±2.76g/d). However, this parameter was not statistically different for the frizzle and the naked neck pullets (35.15±3.72g/d). This observation could mean that the natural heat tolerance attributes of these two genotypes due to the presence of plumage reducing genes which in-turn encourages increased feed intake is operative at 6 weeks of life. Total feed consumption at 6 weeks was significantly highest for the frizzle pullets (1,518±15.08g) while the value for the normal feather individuals was the least (1,450±17.98g).

Table 1: Performance of crossbred normal feather, naked neck and frizzle pullet chicks

Parameter	Normal feather	Naked Neck	Frizzle
Average D.O.C. wt. (g)	34.57±0.98	35.38±1.02	35.28±0.59
Average BWT. @ 6wks (g)	388.45±14.90^{ab}	385.85±5.91^{b}	402.10±17.54^{a}
Avrage Daily Feed intake (g)	34.70±2.76^{b}	35.15±2.72^{ab}	36.25±2.45^{a}
Total Feed consumed (g)	1450±17.78^{b}	1490±18.72^{ab}	1518±15.08^{a}
Feed conversion ratio(FCR)	3.74±0.29	3.87±0.84	3.78±0.46
Mortality (%)	0	2.05	0

$^{a-b}$ Means in the same row bearing different superscripts are significantly different (P<0.05). D.O.C. –Day old chick, BWT= Body weight

Table 2: Cost-benefit analysis of crossbred normal feather, naked neck and frizzle pullets at 6 weeks

Parameter	Normal feather N = 44	Naked Neck N = 27	Frizzle N = 21	SEM
*Cost of D.O.C. (₦)	120.00^{c}	175.00^{b}	250.00^{a}	18.85
Average Cost of Feed per bird (₦)	339.00^{b}	340.00^{b}	355.00^{a}	2.65
Average Cost of medicament per bird (₦)	45.00^{b}	65.00^{a}	40.00^{b}	3.80
Average Cost of woodshavings, kerosene and transport per bird (₦)	25.00^{b}	30.00^{a}	25.00^{b}	1.01
Av. Total cost of prod. per bird(₦)	520.00^{c}	610.00^{b}	670.00^{a}	21.80
Revenue per bird (₦)	750.00^{c}	850.00^{b}	1250.00^{a}	76.38
Gross margin per bird (₦)	121.00^{c}	231.00^{b}	580.00^{a}	69.18

$^{a-c}$ Means in the same row bearing different superscripts are significantly different (P<0.05). *$1 = ₦155.00 D.O.C. –Day old chick,

However, there were no differences in total feed consumed by the frizzle and naked neck pullets at 6 weeks. This indicates that these varieties of chicken may have similar genetic background and could be different from the normal feathered local chicken (13, 14). The feed conversion ratios of these hybrid pullets also showed no statistical difference at 6 weeks of age.

Table 2 shows cost-benefit analysis of raising these crossbred pullets. It was evident that the normal feather chicks cost least at day-old (₦120.00) which was twice cheaper than the frizzle D.O.C. (₦250.00). The naked neck chicks also cost significantly higher (₦175.00) than the normal feather chicks in their production environment. Prices of D.O.C.s were estimated from the market value of their adult parents. It was a common knowledge that the rarer the genotype, the higher its market value. The cost of medication ranged from ₦40.00 - ₦65.00 per bird with the naked neck pullets attracting the highest cost of medication. This observation is understandable; this genotype had the highest mortality of 2.05% while the frizzle and normal feather pullets recorded no mortality. Post-hatch mortality in naked neck chicks has been reported by (12,15). Cost of wood-shavings and kerosene were fairly the same for the various genotypes except for the naked neck individuals which attracted more brooding cost (₦30.00/bird) due to more heating and change of litter materials arising from observed morbidity and mortality in that genotype.

The frizzle pullets had the highest cost of production (₦670.00) due to higher cost of D.O.C. and increased feed intake and consequently increased cost of feed per bird. The naked neck pullets ranked next to the frizzle birds and attracted more cost of production than the normal feather pullets. Revenue at 6 weeks was highest (₦1250.00) for the frizzles because they were in high demand in local markets and much valued in the study area. This was followed by the naked neck pullets (₦850.00/bird) and the normal feather birds (₦750.00/bird). The higher revenue achieved by the frizzle and naked neck pullets resulted in higher gross margin for these genotypes such that within 6 weeks, the frizzle and naked neck attracted a gross margin of ₦580.00/bird and ₦231.00/bird, respectively. The normal feather pullets, on the other hand, had the lowest gross margin of ₦171:00/bird for the period, indicating that in a smallholder brood-and-sale poultry operation, the frizzle and naked neck pullets would net in higher profits than the normal feather birds especially in South Eastern Nigeria where these genotypes are highly valued.

Conclusion and Application

The results of this study showed that

1. The frizzle pullets achieved the heaviest body weight at 6 weeks followed by the normal feather birds while the naked neck pullets were lighter.
2. The frizzle pullets were indeed premium birds and attracted the highest cost at day-old, highest

revenue and gross margin at 6 weeks.

3. It would be more profitable for smallholder poultry keepers especially in South Eastern Nigeria to raise fizzle chicken genotypes then the local chichen of other types.

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