Low-cost Interventions on Local Chickens' Productivity

Sudik, S. D. ; Dikwahal, S. H.; Yibis, G. G.; Gofwan G. P. and Polycarp, W. D.
[1]Department of Animal Health and Production, Plateau State College of Agriculture, Garkawa, Nigeria
E-mail: davidsudik@yahoo.com phone No: +2348065633541

Abstract
Most local farmers rely on local chickens for animal protein and cash income. However, much is not gotten from the local chickens due to their poor genetic make-up, and poor management system. This study aimed at introducing certain low-income interventions: early separation of chicks, egg incubation using other hens, provision of nest boxes, feed supplements and night housing. The experiment lasted for 8 months. The results showed a total of 231 eggs were laid, 198 chicks were hatched and 168 chicks survived mother less care with corresponding 85.71% hatchability and 84.85% survival rates. Hens returned to lay eggs in 7-10 days after taking care of chicks for an average of 21 days and 3 clutches in 8 months. In conclusion, adoption of these low-cost interventions is suggested to farmers in order to improve their local hen production._
Keywords: local chickens, low-cost interventions, productivity, poor farmers.

Introduction

In most rural areas of developing countries including Nigeria, local chickens constitute the major livestock production (Kamaran *et al.,* 2014) due to low requirements of capital and technical know-how. A farmer that cannot keep pigs, small ruminants and large ruminants can rear a good number of local chickens for provision of animal protein, as a source of income and meeting up some social obligations (Kperegbeyi, 2009, Ajayi, 2010, Haftu, 2016). The ease in raising local chickens has been due to their adaptation to tropical condition, tolerance to poor management, feed shortage and some common diseases (Haftu, 2016).

The performance of the local chickens, however, is below expectation because of a number of factors. Among these factors include poor genetic make-up; feeding is solely by scavenging leading to poor nutrition/poor management which exposes them to environmental hazards, infections and predators. Also, they are completely neglected for any development programmes (Ershad, 2005; Kperegbeyi, 2009, Haftu, 2016). Considering the integral importance of the local chickens in the livelihood of the local farmers who constitute bulk of the population, there is the need to carefully plan its improvement programmes. As some low-cost interventions such as early separation of chicks from the mother hen, using other hens to hatch eggs, construction of simple nest boxes from locally available materials, feed supplementation and night housing of chicks were introduced in this study. These factors were prioritized because they will incur minimal financial stress on the poor farmers. Response criteria were the capability of the hens to continue in productive cycle (breaking local chicken's instinct to long broodiness) and survivability of chicks without the mother hens; thereby increasing productivity and consequent standard of living of poor farmers.

Materials and Methods

This study was approved by the Department of Animal Health and Production of the College of Agriculture Garkawa, Plateau State, Nigeria, as one of the innovations that were designed to uplift the living standard of Village Farmers in the state and beyond.

Study area

Garkawa, is located in the northern guinea savanna zone of Nigeria which lies between latitude 9.2351^{o} N and longitude 9.7233^{o} E. It is 240m above sea level. The atmospheric temperature usually ranges between 28^{0}C and 39^{0}C, mean annual rainfall is usually about 1100mm and relative humidity is usually about 65-80% (Wikipedia, 2016).

Experimental birds and management

Five (5) hens and a cock of different colours and unknown ages were purchased in January, 2016 in one local market located inside Garkawa town. The hens' colour served as identification method. The 5 hens included pure black hen, pure white hen, brown hen, purple hen and mottled hen (designated as PBH, PWH, BH, PH and MH, respectively). They were left to roam freely in the day and also roost freely in some structures constructed with locally available materials in the night. Supplementary feeds which include grains, kitchen wastes, maggots and termites were given to the birds. The maggots were fetched from dumped poultry droppings and animal dungs while the termites were obtained in the nearby bush. Clean drinking water was supplied on daily basis. The bark of mahogany tree and some local herbs were occasionally placed in drinking water as disease preventive measure**.** The management of the birds was designed in a manner that a local farmer can easily adopt. Records of every activity and general observations such as the period of laying eggs, incubation period, age in which chicks were separated from mothers' care, time taken for hen to return to lay eggs and survival rate of the chicks were carefully kept.

Innovations adopted

Three innovations were: Shortening of brooding period: by early removal of chicks from mother hens' care; Hatching of eggs using other hens: by placing up to 20 eggs under a hen to hatch and proper management: feed supplements, good drinking water, providing nest boxes and night housing of chicks.

Data analysis: The data collected were analyzed and discussed using descriptive statistics.

Results and Discussion

Table 1 shows the First reproductive cycle of the local hens. The hens that were purchased in the second week of January, 2016 started laying eggs from 29th January to 28nd February, 2016, with an average of 18 days laying period (clutch length). This was in contrast of 26.2 days reported by Moges *et al.* (2010). The 5 hens laid a total of 75 eggs (mean:15.00±1.22) against 12.8 eggs per hen per clutch (Hagan *et al.,* 2013); 13.7 eggs (Guni *et al.,* 2013) and 11.8 eggs (Mwalusanya *et al.,* 2002). Sixty five (65) chicks were hatched (Mean: 13.00), which was greater than 11.3 chicks reported by Guni *et al.* (2013). Incubation period lasted in 24.20±1.30 days against the well-known 21 days. The number of chicks weaned was 8.40±2.70 against 6.89 reported by Guni *et al.* (2013). One focus of this study was to determine the effect of early weaning on survival rates of chicks. It was observed that survival rate increased as the age of chicks increased from 7 days to 23 days of age. The chicks weaned at 23 showed highest survival rate (91.67%), those at 15 and 16 days had 76.92% each while those separated at 10 and 7 days had the lowest survival rates (42.86% and 38.46%, respectively). This implies that the best weaning age was 23 days (approximately 3 weeks) this was against 6 weeks or more in a typical local chicken

(Ikani and Annate, 2000). The results reflect a mortality rate of 8.33%, 26.08, 57.14 and 61.54% respectively. The higher mortality at 10 and 7 days weaning ages may probably be due to cold as chicks' feathers were not fully developed.

Table 2 shows the second reproductive cycle of the local hens. The hens began laying eggs from 10th to 30th April, 2016 (Mean = 18.40±0.55). The second focus of this study was to determine the effect of early weaning on hen's ability to return to lay eggs. The hens were free of care on 04th April, 2016 and returned to lay eggs after an average of 7.60±1.14 days in contrast to 3 months and above in typical free range system Guni *et al.* (2013). This confirmed that shortening length of broodiness, caused hens' to return to lay eggs early. At this cycle the hens laid 77 eggs (Mean =15.00±0.55). The average egg per hen was higher than values reported by Hagan *et al.*(2013) and Guni *et al.* (2013). The third focus of this study was to determine the ability of local hens to incubate more than 15 eggs. Previous workers (Kperegbeyi *et al,* 2009 reported that a local hen can incubate 15 eggs. To test this PWH laid 16 eggs and was shared among PBH, BH, PH and MH where the first three hens (PBH, BH and PH) received 20 eggs each while MH sat on 17 eggs. The 4 hens hatched 66 chicks (Mean: 16.50). This mean value of chicks hatched per hen was higher than 13.00 recorded in the first reproductive cycle above and was greater than 15 of the maximum number of chicks reported to be incubated by hen (Kperegbeyi *et al,* 2009). This confirmed that local hens can incubate more than 15 eggs. Interestingly, an average of 15.76 ±0.50 chicks were weaned which further confirmed that local hens can incubate more than 15 eggs. Again, in some cases the survival rate was 100%, which also confirmed that a hen can incubate more than 15 eggs.

The PWH whose eggs was shared as described above began another reproductive cycle from 10/May to 29/June/2016 after 10 days of rest. This implies that depriving a hen of her eggs had two advantages: the first advantage was other hens would be trained to hatch eggs and the second advantage was of greater economic return. The PWH laid 17 eggs (in 19 days) and hatched 15 chicks and all survived (Table 3).

Table 4 shows the third reproductive cycle of PBH, BH, PH and MH. The hens started laying eggs from 26th June, 2016 to 15th July, 2016 (Mean: 18.50±0.58 days) following a short period of rest (Mean: 7.25±0.50 days). A total of 62 eggs (Mean: 15.50±0.58 eggs) were laid. From this result it can be argued that local hens not only can sit on more than 15 eggs as reported by (Kperegbeyi *et al,* 2009) but can lay more than 15 eggs; therefore, the postulation than a local hen can sit on 20 eggs was in place. Here also, the eggs laid by BH were shared among PBH, PH and MH such that each sat on 20 eggs while 2 eggs were used for food. This means that wherever more hens are used a family may have eggs on their table. Fifty (50) chicks (Mean: 16.67±0.58 eggs) were hatched. This also confirmed the local hens' ability to lay, incubate and hatch more than 15 eggs.

Table 5 depicts the summary of the production performance of 5 local hens. The 5 hens produced 3 clutches each in barely 7-8 months against 3.0, 3.3, 4.0 and 4.6 clutches in a year as reported by Hagan *et al.* (2013), Guni *et al.* (2013), Iqbal and Pampori (2008) and Mengesha *et al.* (2008), respectively. A total of 231 eggs were laid (Mean: 46.2) also against 40.0-45.2 eggs per hen per year (Mwalusanya *et al.,* 2002; Mengesha *et al.,* 2008; Ssewannyana *et al*., 2008; Ajayi, 2010; Moreki, 2010; Guni *et al.,* 2013). The number of eggs per clutch (mean: 15.40) is

higher than 7-12 reported by Kperegbeyi *et al.* (2009). Of the 231 eggs laid 198 (Mean: 39.60) chicks were hatched, representing 85.71% hatchability against 83.2 % reported by Guni *et al.* (2013). The higher hatchability rate in this study depicts the capability of the hens as good performer. Of the 198 chicks hatched, 168 survived life without their mother care, representing 84.85%. This implies that local chicks can be weaned at 21 days of age and it allows hen to return to lay eggs and increase more benefit.

Local chickens reach age of sexual maturity at about 6 months (Ajayi, 2010). By implication chicks hatched early March were expected to go into production around August. Of the 42 survival, if just 20 were females, their productive rate would be four times what was obtained in this study, hence, the business of local chickens would definitely alleviate poverty among rural farmers, create viable employment and would stop the youth from migrating to urban centres in search of formal employment as the only option for survival. On the whole the excellent performance of the hens in this study may be attributed to the better management and feed supplements.

Conclusion

It can be concluded that a local hen can produce 15 eggs within a clutch, incubate up to 20 eggs and successfully hatch 15-17 chicks; it can return to lay after a period of rest of 7 to 10 days. Again, the local chicks can survive without the mother hen's care. The local hen productive capacity would increase when chicks are reared separate from the mother. Further study should involve paying attention to disease management.

References

Ajyi, F. O. (2010). Nigerian indigenous chicken. A viable genetic resources for meat and egg production. *Asian Journal of Poultry Sciences* 2, 218-222.

Ershad, S. M. E. (2005). Performance of hybrid layers and native hens under farmers' management in a selected area of Bangladesh. *International Journal of Poultry Science*. 4, 228-232.

Guni, F. S., Katule, A. M. and Mwakilembe, P. A. A. (2013). Characterization of local chickens in selected districts of the southern highlands of Tanzania. II. Production and morphometric traits. *Livestock Research for Rural Development*, 25 (11).

Haftu, K. S. (2016). Exotic chicken status, production performance and constraint in Ethiopia. A review. *Asian Journal of Poultry Sciences* 10, 30-39.

Hagan, J. K. Bosompem, M. and Adjei, I. A. (2013). The productive performance of local chickens in three ecological zones of Ghana. *ARPN Journal of Agricultural and Biological Science,* 8 (1).

Ikani, E. I. and Annatte, A. I. (2000). Improving the performance of local chickens. *Extension Bulletin,* 92 (6), 1-30.

Iqbal, S., and Pampori, Z. A. (2008). Production potential and quantitative traits of indigenous chickens of Kashmir, Vol. 20 articla #82. Retrieved January 22, 2013 from http://www.Irrd.org/Irrd20/9/kugo20137.htm

Kamaran, A. A., Hani, N. H., Tahir, R. A., Shayma, M. A., Aram, M. and Dastan, A. H. (2014). Comparative productive performance of local hens in Erbil. *Kurdistan Region Journal of Zankoy Sulaimani*, Special Issue, 16.

Kperegbeyi, J. I., Meye, J. A. and Ogboi, E. (2009). Local chicken production: strategy of household poultry development in coastal regions of Niger Delta, Nigeria. *African Journal of General Agriculture*, 5 (1), 17-20.

Mwalusanya, N. A., Katule, A. M., Mutayoba, S. K. and Mtambo, M. M. A. (2002). Productivity of local chickens under village management conditions. *Tropical Animal Health and Production*, 34, 405-416.

Ssewannyana, E., Ssali, A. Kasadha, T., Dhikusooka, M. Kasoma, P. Kalema, J. Kwatotyo, B. A. and Aziku, L. (2008). On-farm characterization of indigenous chicken in Uganda. *Journal of Animal and Plant Sciences,* 1(2), 33-37.

Wikipedia (2016). www.wikipedia.org/wiki/jos

Table 1: First reproductive cycle of the local hens

S/N	Hen	Laying period (days)	Number of eggs laid	Incubation period	Number of chicks hatched	Weaning age (days)	*Number and % of chicks survived in the first reproductive cycle
1	PBH	17	14	23	12	23	11 (91.67%)
2	PWH	18	15	24	13	15	10 (76.92%)
3	BH	18	14	26	13	16	10 (76.92%)
4	PH	19	15	25	14	10	6 (42.86%)
5	MH	18	17	23	13	7	5 (38.46%)
Total	5	-	75	-	65	-	42
Mean	--	18.00	15.00	24.20	13.00	14.20	8.40
SD	-	0.71	1.22	1.30	0.71	6.14	2.70
CV	-	3.93	8.16	5.39	5.44	43.24	32.16

PBH, PWH, BH, PH and MH (pure black hen, pure white hen, brown hen, purple hen and mottled hen, respectively), SD = standard deviation, CV = coefficient of variation.

Table 2: Second reproductive cycle of local chickens

S/N	Hen	Resting period (days)	Laying period (days)	Number of eggs laid	Incubation period	No of eggs incubated	Number of chicks hatched	Weaning age (days)	*Number and % of survived in the first reproductive cycle
1	PBH	8	18	15	25	20	16	21	16 (100.00%)
2	PWH	7	19	16	-	-	-	-	-
3	BH	8	18	15	24	20	17	25	15 (88.24%)
4	PH	6	18	15	24	20	17	26	16 (94.12%)
5	MH	9	19	16	23	17	16	27	16 (100.00%)
Total	5	-	-	77	-	77	66	-	63
Mean	-	7.60	18.40	15.40	24.00	19.25	16.50	24.75	15.75
SD	-	1.14	0.55	0.55	0.82	1.50	0.58	2.63	0.50
CV	-	15.00	2.98	3.56	3.40	7.79	3.50	10.63	3.17

PBH, PWH, BH, PH and MH (pure black hen, pure white hen, brown hen, purple hen and mottled hen, respectively), SD = standard deviation, CV = coefficient of variation.

Table 3: Third reproductive cycle of PWH

S/N	Hen	Resting period (days)	Laying period (days)	Number of egg laid	**Incubation period	Number of eggs incubated	Number chicks hatched	Weaning age (days)	*Number and % of chicks survived in the third reproductive cycle
2	PWH	10	19	17	24	17	15	21	15 (100%)

PWH = pure white hen

Table 4: Third reproductive cycle of PBH, BH, PH & MH

S/N	Hen	Resting period (days)	Laying period (days)	Number of egg laid	Incubation period	Number of eggs incubated	Number chicks hatched	Weaning age (days)	*Number and % of chicks survived in the third reproductive cycle
1	PBH	7	19	16	23	20	17	21	16 (94.12%)
3	BH	7	18	16	-	-	-	-	-
4	PH	8	18	15	24	20	16	22	16 (100%)
5	MH	7	19	15	23	20	17	23	16 (94.12%)
Total	5	-	-	62	-	60	50	-	48
Mean		7.25	18.50	15.50	23.33	20.00	16.67	22.00	16.00
SD		0.50	0.58	0.58	0.58	0.00	0.58	1.00	0.00
CV		6.90	3.12	3.72	2.47	0.00	3.46	4.55	0.00

PBH, PWH, BH, PH and MH (pure black hen, pure white hen, brown hen, purple hen and mottled hen, respectively), SD = standard deviation, CV = coefficient of variation.

Table 5: Summary of production rate

Parameters	Total	Percent
Egg produced	231	-
Chicks hatched	198	85.71% hatchability
Chicks survived	168	84.85% survivability