Performance of Broilers fed On-Farm versus Commercial Feeds

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Abstract

This study was conducted in the Animal Science Departmental farm to compare the growth performance of broiler chickens reared on three on-farm feeds and three commercial feeds. Broilers were fed the six types of feed during the starter phase between 0-5 weeks of age and during the finisher phase between 5-9 weeks. Results showed that although one of the commercial feeds outperformed all other feeds in terms of weight gain and feed efficiency, the overall growth performance on on-farm feeds were comparable to those on commercial feeds even where one of the on-farm feeds contained sub-optimal levels of energy. However, feed cost / kg weight gain was significantly lower for on-farm feeds. There were significant differences ($P < 0.05$) between the on farm diets (T1-T3) and the commercial diets (T4-T6) in term of feed cost per kg gain. The on farm feeds were relatively cheaper than the commercial feeds. It is concluded from this study that the widespread use of on-farm feeds by poultry farmers can be justified on the basis of cost effectiveness and profitability considerations. However the risks associated with this practice should be a matter of concern to all poultry farmers, research and extension personnel. It is therefore recommended that feed quality regulatory agencies should as a matter of urgency find ways by which some measure of quality control can be applied to on-farm feeds.

Key words: On-farm feed, Commercial feed, Pelleted feed

Introduction

Poultry feeding is a major item of cost in poultry production. In Nigeria, feed cost accounts for about 70% of the total cost of producing broilers and eggs (Adebayo *et al.*, 2002; Kehinde, 2006). Many commercial poultry farms had collapsed while a good number of them experienced slow growth as a result of sudden increases in the cost of poultry feeds (Ogundipe, 2002 and Onimisi,

2004). High cost of poultry feed also results in general increase in the cost of production. Hence, in order to increase profitability in the poultry industry, there is the need to formulate practical rations that will help in reducing the cost of production and still maintain high level of performance in the birds, (Adebayo *et al* 2002).

However, farmers may not have a direct influence on the feed cost when feed is purchased

from the commercial Feed Millers. Therefore, the types of feed used in feeding the birds also play a significant role in the performance of broiler chickens. The effects of feed on the performance of the birds stand out as the most reliable method of assessing the quality of a feed. Many farmers are looking for alternative ways of boosting their profits. Many farmers change from one commercial feed to another in search of a better feed (Ogundipe *et al.* 1986) while a good number have decided to be producing their own feeds. As a matter of fact, feed cost as well as the quality of the feeds are among the factors which dictate farmer's preference for commercial or self-compounded feeds (Adebayo *et al.* 2002; Umeh and Odo 2002). Many farmers also believe that self made feeds are cheaper than the commercial feeds (Adesehinwa *et al.*, 1996, Adebayo *et al.*, 2002). This study was therefore designed to investigate the following objectives: To compare the growth performance of broilers when fed on-farm feeds versus commercial feeds and to evaluate the cost effectiveness of using on farm feed and commercial feed.

Materials and Methods

Location of the Experimental Site

The experiments were conducted in Zaria at the Poultry Unit of Animal Science Department, Ahmadu Bello University, Samaru- Zaria. Zaria is within the Northern Guinea Savannah zone of Nigeria, Latitude 11° 12'N and Longitude 7° 33'E, at an altitude of 610m above sea level (Akpa *et al* 2002).

Experimental Birds

In the first experiment 234 birds were used at the starter phase and 198 birds at the finisher

phase, there were six treatments and each replicated three times with thirteen birds per replicate at the starter phase and eleven birds per replicate at the finisher phase. The starter phase lasted from 0-4 weeks while the finisher phase was from 5-8 weeks. Between 4-5 weeks the birds were pooled and fed a common ration before they were randomly allocated to the six treatments of the finisher phase. In the second experiment, 144 birds were used during the starter and finisher phases. In both cases there were six treatments and each replicated twice, the starter phase was from 2-5 weeks while the finisher was from 6-9 weeks. In the third experiment, 234 birds were used at the starter phase and 216 birds in the finisher phase. Thirteen birds per replicate were used at the starter phase and twelve birds per replicate at the finisher phase. In this experiment, the starter phase was from 0-4 weeks and the finisher phase 5-8 weeks. The birds were housed in a deep litter pens in a completely randomized design.

Experimental Feeds

There were twelve experimental diets used for the study. Three of the diets were compounded on-farm composition containing 23% crude protein during the starter phase (T1-T3) and 21% protein for the finisher phase studies (T1a-T3a). The energy levels of the on farm diets were 3000, 2800 and 2600kcal ME/kg for both the starter and finisher phases. Similarly, Commercial feeds were used T4-T6 for starters and T4a-T6a for finishers. Two of the commercial feeds are widely used in many part of Nigeria and are reputed to be of standard quality while the third is from a feed Miller in Zaria. For each of these, the broiler starter

formulations were used during the starter phase while the finisher formulations were used for the finisher phase. One of the standard commercial feeds is in pelleted form. Samples of all feeds were analyzed for proximate chemical composition. The compositions of the feeds are shown on Table 1 for starters and Table 2 for finishers.

Data collection

The Birds were weighed at the beginning of each experiment to determine their average initial

weights before they were then weighed weekly as well as the quantity of feed left over. The weekly feed intake and weight gains were used to compute the feed conversion efficiency, while the feed cost/kg (₦) and feed/gain ratio were used to compute the feed cost /kg gain (₦). Samples of the feeds used during the study were subjected to proximate analysis (AOAC, 1990).

Statistical Analysis At the end of each phase, the cumulative weight gain, feed intake, feed cost/kg gain, mortality and water intake/bird were

Table 1. Composition of Broiler starter diet used for the three experiments

Ingredient	On-Farm			Commercial		
	Feed 1	Feed 2	Feed 3	*Feed 4	Feed 5	Feed 6
Maize	30	6	0			
Soya/FF	36.1	34	33			
Blood meal	3	3	4			
Fishmeal	5	5	5			
Maize offal	17.1	43.2	39			
Rice Offal	0	0	10.2			
KC	5	5	5			
Bone meal	3.1	3.1	3.1			
Salt	0.3	0.3	0.3			
Methionine	0.1	0.1	0.1			
**Premix	0.3	0.3	0.3			
Total	100	100	100			

* This feed is in pelleted form while others are mash.

** Vitamin- mineral premix provide per kg of diet: vit. A, 13,340 i.u; vit D3, 2680 i.u; vit. E, 10 i.u; vit. K, 2.68mg; calcium pantothenate, 10.68 mg; vit. B12, 0.022mg; folic acid, 0.668mg; choline chloride, 400mg; chlortetracycline, 26.68mg; manganese, 133.34mg; iron, 66.68mg; zinc, 53.34mg; copper, 3.2mg; iodine, 1.86mg; cobalt, 0.268mg; selenium, 0.108mg.

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Table 2. Composition of Broiler Finisher diet used for the three experiments

Ingredient	On-Farm			Commercial		
	Feed 1a	Feed 2a	Feed 3a	*Feed 4a	Feed 5a	Feed 6a
Maize	34.00	10.00	0.00			
Soya/FF	32.00	30.00	31.00			
Blood meal	2.00	2.00	2.00			
Fishmeal	0.00	0.00	0.00			
Maize offal	23.10	49.10	49.00			
Rice Offal	0.00	0.00	9.10			
PKC	5.00	5.00	5.00			
Bone meal	3.10	3.10	3.10			
Common Salt	0.30	0.30	0.30			
Methionine	0.20	0.20	0.20			
Premix	0.30	0.30	0.30			
Total	100	100	100			

* This feed is in pelleted form while others are mash

T1a -T3a are on farm formulated feeds. T4a -T6a are Commercial Feeds

** Vitamin- mineral premix provide per kg of diet: vit. A, 13.340 i.u; vit D3, 2680 i.u; vit. E, 10 i.u;

vit. K, 2.68mg; calcium pantothenate, 10.68 mg; vit. B12, 0.022mg; folic acid, 0.668mg;

choline chloride, 400mg; chlortetracycline, 26.68mg; manganese, 133.34mg; iron, 66.68mg; zinc,

53.34mg; copper, 3.2mg; iodine, 1.86mg; cobalt, 0.268mg; selenium, 0.108mg.

computed and subjected to Analysis of Variance (ANOVA) SAS/STAT, 1995). Significant levels of differences among means were also determined using Duncan Multiple Range Test (DMRT)

Results

Calculated versus proximate analysis of experimental feeds (Broiler starter)

The results of the calculated and proximate analysis of the feeds used in this study are shown in Table 3. From the results of the proximate

analysis, the Crude Protein was found to be lower when compared with the calculated and proximate analysis of the three on farm feeds. The analyzed CP values were: T1-21.87, T2-21.33, and T3-20.53%, compared to the calculated analysis of 23.0%. Similarly, the analyzed values for the three commercial feeds were; T4-20.75, T5-21.60 and T6-21.45% compared to 21.0, 23.0 and 23.0% respectively for T4, T5 and T6. Among the three on farm feeds, T3 had the highest level of crude fibre both in the calculated and in the proximate analysis. This is because T3 is low in energy

Table 3. Calculated Analysis versus Proximate Analysis of Experimental feeds (Broiler starter)

Parameter	Treatments/Metabolizable energy (Kcals/kg)					
	T1	T2	T3	T4	T5	T6
	3000	2800	2600	2800	2800	2900
Calculated Analysis			Feed Label Analysis			
ME kcals/kg	3010.95	2807.70	2618.10	2800*	2800	2900
Crude Protein (%)	23.26	23.32	23.25	21.00	23.00	23.00
Crude Fibre (%)	5.83	7.51	10.71	5.00	5.00	5.00
Ether Extract (%)	6.32	5.90	5.81	8.50	5.00	6.00
Calcium (%)	1.40	1.47	1.46	1.20	1.00	1.00
Phosphorus (%)	1.09	1.23	1.32	0.45	0.75	NA
Proximate Analysis						
Dry matter (%)	95.14	95.06	94.97	94.67	94.82	95.12
Crude Protein (%)	21.87	21.33	20.53	20.75	21.60	21.45
Crude Fibre (%)	8.38	8.45	9.94	9.19	8.48	9.59
Ether Extract (%)	10.53	11.24	11.11	10.79	11.29	10.53
Ash (%)	13.24	14.04	14.53	11.10	13.66	12.97

Note: * this feed is in pelleted form while others are mash

T1 -T3 are on farm formulated feeds. T4 -T6 are Commercial Feeds

level. The feed label analysis on the three commercial feeds is generally low. While the calculated fat content declined 6.2 to 5.8% from T1-T3 in agreement with the decline in energy levels, this observation was not made in the analyzed ether extract.

Broiler performance when fed on-farm versus commercial feeds

Starter Phase

The performance of broiler starter fed on-farm versus commercial feed during the three seasons is summarized in Table 4. The birds on the commercial feed T4 and those on the on farm

feed T1 had significantly superior body weight, weight gain and feed/gain ratio. There is similarity in the feed intake; T1-1504.72g, T2-1528.4g T4-1551.99g) and T5 1507.98g; while similarity also exists between the low energy diet (T3-1448.42g and the Zaria based commercial feed (T6-1399.86g). Water intake was highest for the birds fed on the commercial feed T4 which is a pelletized feed at 4739.59ml per bird compared to 2853.88ml per bird for commercial feed T6 which had the lowest water intake. The low energy diet T3 had a significantly higher water intake of 3515.47ml among the three on-farm diets. Water/feed ratio was similar for all

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Table 4. Performance of broilers fed On-farm versus commercial feeds during the three experiments– Starter Phase

Parameters	Treatments/Metabolisable Energy (Kcal/kg)						SEM	Diff
	T1	T2	T3	T4	T5	T6		
	3000	2800	2600	2800	2800	2900		
Initial weight (g)	125.43	125.60	128.29	125.43	126.99	125.51	1.18	
Final weight (g)	897.10 ^b	799.47 ^{cd}	833.01 ^c	968.86 ^a	772.87 ^{de}	742.52 ^c	13.42	*
Weight gained(g)	760.56 ^b	673.87 ^{cd}	704.72 ^c	843.21 ^a	645.88 ^{de}	617.01 ^e	12.37	*
Feed Intake (g)	1504.72 ^{ab}	1528.40 ^a	1448.42 ^{bc}	1551.99 ^a	1507.98 ^{ab}	1399.86 ^c	24.86	*
Feed/Gain	1.90 ^{ab}	2.21 ^d	2.04 ^{bc}	1.77 ^a	2.32 ^e	2.11 ^{cd}	0.05	*
Water Intake (ml)	3374.62 ^c	3309.34 ^c	3515.47 ^b	4739.59 ^a	3288.16 ^c	2853.88 ^b	47.38	*
Water/Feed	2.42 ^b	2.40 ^b	2.75 ^b	3.76 ^a	2.49 ^b	2.04 ^c	0.12	*
Feed Cost/kg (₦)	40.53	36.84	34.11	55.69	54.27	50.00	0.02	*
Feed Cost/kg gain(₦)	74.20 ^{de}	80.21 ^d	69.09 ^c	98.21 ^c	126.11 ^a	106.65 ^b	2.59	*
Mortality	0	0	0	0	0	0		*

a, b, c, d on the same row means with different superscript differ significantly ($P < 0.05$)

T1 -T3 are on-farm formulated feeds. T4 -T6 are Commercial Feeds

the treatments except for T4 that was higher and T6 that was lower than the others. The poor performance of birds fed on commercial diet T6 confirms the fears of many farmers that some commercial feeds are of poor quality. Feed cost per kg was lower for the three on-farm feeds: ₦40.5 for T1, ₦36.8 for T2 and ₦34.1 for T3 when compared to the three commercial feed ₦55 for T4, ₦54.3 for T5 and ₦50 for T6. Feed cost per kg gain (₦) was least on the on-farm feed. There was significant difference ($P < 0.05$) in feed cost / kg gain in all the six diet. No mortality was recorded in all the six treatment during the three experiments.

Calculated versus proximate Analysis of the experimental feeds (Broiler finisher)

The results of the proximate and the calculated analysis of the feed samples used in this study are shown on Table 5. The following observations were made; the calculated crude protein values were similar to the proximate values both for the on-farm and the commercial feeds. The values for the proximate analyzed crude proteins are: 20.54% for T1, 20.13% for T2, 19.60% for T3, 19.69% for T4, 19.73% for T5 and 20.37% for T6. Among the three on farm feeds, T3 had the highest level of crude fibre both in the calculated and in the proximate analysis. This is because

Table 5. Calculated Analysis versus Proximate Analysis of Experimental feeds (Broiler finisher)

Parameter	Treatments/Metabolizable energy (Kcals/kg)					
	T1a	T2a	T3a	*T4a	T5a	T6a
	3000	2800	2600	2800	2800	2900
	Calculated Analysis			Feed Label Analysis		
ME kcals/kg	3003.75	2802.48	2605.80	2900*	2800	2800
Crude Protein (%)	20.26	20.34	20.30	19.00	20.00	20.00
Crude Fibre (%)	5.83	7.94	11.09	5.40	5.00	5.00
Ether Extract (%)	5.57	5.15	5.19	8.60	5.00	5.00
Calcium (%)	1.25	1.32	1.33	1.20	1.00	1.00
Phosphorus (%)	0.97	1.12	1.23	0.41	0.5	NA
	Proximate Analysis					
Dry matter (%)	93.32	93.29	93.77	96.02	93.19	93.71
Crude Protein (%)	20.54	20.13	19.60	19.69	19.73	20.37
Crude Fibre (%)	6.27	6.34	6.64	6.58	6.49	6.78
Ether Extract (%)	6.70	6.75	7.23	7.31	7.01	6.88
Ash (%)	8.11	8.72	9.73	7.96	9.58	9.76

Note: * this feed is in pelleted form while others are mash

NA: Not Available

T1 -T3 are on farm formulated feeds. T4 -T6 are Commercial Feeds

T3 is low in energy level. In other word the crude fibre declines with increase in the feed energy level.

Broiler performance when fed on-farm versus commercial feeds Finisher phase

The performance of broiler finisher fed on-farm versus commercial feed during the three seasons was summarized in Table 6. There was no significant difference ($P>0.05$) in the body weight, weight gain, and water/feed ratio in the birds fed on T1, T2, T3, T5 and T6. Feed intake was similar for all the treatments. Water/feed ratio was similar for the birds fed on farm feeds (3.6 for T1, 3.57 for T2, 3.45 for T3) and two of the commercial feeds (3.53 for T5 and 3.35 for T6). The birds on T4 had higher water/feed ratio of 4.06. there was significant difference ($P<0.05$) in the feed cost/kg in all the six treatments during

the three experiments, the on farm feeds had the lower cost of ₦36.7 for T1, ₦33.1 for T2, ₦30.3 for T3 compared to ₦56 for T4, ₦52 for T5 and ₦51 for T6. There were significant differences ($P<0.05$) between the on farm diets T1-T3 and the commercial diets T4 -T6. Similarly, the on farm diets had the lower feed cost/ kg gain of ₦76.72 for T1, ₦86.7- for T2, ₦90.9 for T3 compared to ₦127.7 for T4, ₦132.97 for T5 and ₦134.94 for T6. No mortality was recorded during the three experiments.

Discussion

Calculated versus proximate analysis of experimental feeds – Broiler starter

The low crude protein values observed in the three on farm feeds (T1, T2, T3) as calculated versus commercial feeds T4 - T6 for the proximate analysis contradicts the report given by Tegui

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and Beynen (2004) in a survey carried out in Douala, Cameroon who reported that the protein values of the calculated analysis were lower than the proximate values. Among the three on farm feeds the crude fiber declined with increase in energy levels as expected. Surprisingly, the crude protein was similar in all the six treatments.

Broiler performance (starter phase)

There was a significant ($P < 0.05$) difference in the growth performance of the birds across the six treatments. The birds on the on farm feed T1

(3000 kcals ME/kg) and those on the commercial feed T4 performed better. The superior performance observed in term of body weight, weight gain and feed/ gain ratio of the on farm feed T1 (3000 kcals ME/kg) and the commercial feed T4 may be due to the high energy level or bioavailability of the nutrients in these diets. This is similar to the report of Leland (2002) who reported that feed quality affect the growth performance of chickens. This observation also agreed with Summer (2000), who reported that birds eat less of high density feed but perform

Table 6. Performance of broilers fed On-farm versus commercial feeds during the three experiments – Finisher Phase

Parameters	Treatments/Metabolisable Energy (Kcal/kg)						SEM	Diff
	T1 3000	T2 2800	T3 2600	T4 2800	T5 2800	T6 2900		
Initial weight (g)	1250	1253	1213	2200	1251	1261	0.39	
Final weight (g)	2532 ^b	2514 ^b	2469 ^b	2691 ^a	2562 ^b	2562 ^b	0.03	*
Weight gained(g)	1282 ^b	1261 ^b	1223 ^b	1441 ^a	1311 ^b	1242 ^b	0.03	*
Feed Intake (g)	3932 ^b	3933 ^b	4298 ^a	4057 ^{ab}	4019 ^{ab}	4039 ^{ab}	0.11	*
Feed/Gain	3.20 ^{ab}	3.19 ^{bc}	3.65 ^c	2.88 ^a	3.14 ^{ab}	3.42 ^{bc}	0.15	*
Water Intake (ml)	7.98 ^d	8.55 ^c	8.81 ^{bc}	9.67 ^a	9.10 ^b	7.88 ^d	0.17	*
Water/Feed	3.60 ^b	3.57 ^b	3.45 ^b	4.06 ^a	3.53 ^b	3.35 ^b	0.13	*
Feed Cost/kg (₦)	36.73	33.14	30.26	56.00	52.33	51.11	0.18	*
Feed Cost/kg gain(₦)	76.72 ^b	86.70 ^b	90.73 ^b	127.73 ^a	132.97 ^a	134.94 ^a	8.81	*
Mortality	0	0	0	0	0	0		*

a, b, c, d on the same row means with different superscript differ significantly ($P < 0.05$)
T1 -T3 are on farm formulated feeds. T4 -T6 are Commercial Feeds

better. The significantly higher water/ feed ratio observed on the birds fed on the commercial feed T4 may be as a result of the high water intake since feed consumption is directly proportional to water intake. It may also be because of the pelletized nature of the feed; from personal observation the birds on the pelletized feed consumed more water during the period of the experiments. The high water intake observed in T3 may be due to the bulkiness of the diet. The low feed cost/kg and feed cost /kg gain observed in the On-farm feeds T1-T3 during the three experiments agreed with the report obtained by Adebayo *et al* (2002) and Adesehinwa *et al* (1998) who reported that On-farm feeds are cheaper than the commercial feeds.

Calculated versus proximate analysis of experimental feeds –finisher phase

Among the three on-farm feeds the crude fiber declined with increase in energy levels as expected. Surprisingly, the crude protein was similar in all the six treatments. The crude protein values observed in the proximate analysis are similar in all the six treatments and were close to the calculated values. This may be the reason for the similarity in feed intake observed among the birds in all the treatments. This is contrary to the report of Tegui and Beynen (2004) in a survey carried out in Douala, Cameroon who reported that the protein values of the calculated analysis were lower than the proximate values

Broiler Performance (finisher phase)

The similarity of performance in body weight, weight gain and water/ feed ratio observed in the three on farm feeds T1a-T3a and the commercial feeds T5a and T6a during the finishing phase is

a reflection of the fact that older birds tend to perform well on feeds that do not have very wide variation in nutrient content or energy levels. This agrees with Steve (2000), who observed that a range of energy levels can be used for broilers without affecting growth rate. In other words broiler finisher can perform well on different diets. Also, the birds on commercial feed T4 (Pelletized) consumed more water. This is similar to the observation made during the starter phase of the study. This may be the reason for the watery stool excreted by these birds. This observation is in agreement with the report of David (1996) who observed that birds on pelleted feed void moisture-laden faeces. However, the poor feed /gain observed in the low energy diet T3 also agrees with Steve (2000) who reported that low energy diets lead to poorer feed efficiency. There was a significant ($P < 0.05$) difference between the on- farm and the commercial feeds, the three on farm feeds are cheaper in term of feed cost / kg and feed cost/ kg gain compared to the three commercial feeds. This is of great advantage because feed cost /kg gain is the determinant of how much profit accrues to the farmer after harvest and sales.

Also, the growth performance of the birds fed on the on-farm formulated feeds was comparable to those fed on commercial diets despite the none inclusion of maize in one of the on-farm feeds T3 as shown on tables 1 and 2. The reason could be that the on-farm feed is more fresh than the commercial diets. It is expected therefore to have unaltered nutrients particularly vitamins and amino-acids as against commercial feeds whose nutrients (vitamins and amino-acids) must have diminished or altered through oxidation/reduction reactions because of long

period of storage before reaching the end users i.e. the poultry farmers.

Conclusion and Recommendations

There was a significant difference ($P < 0.05$) between on- farm and commercial feeds in term of cost effectiveness. The on- farm feeds was cheaper when compared with the commercial feeds and the birds fed on- farm feeds had better feed cost/ kg gain. Farmers are therefore advised to consult expertise in feed formulation so as to benefit from these advantages owing to the fact that the total cost of production and the final returns after sales are the two major concerns of poultry farmers.

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