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ECONOMIC IMPORTANCE OF REPLACEMENT OF GROUNDNUT CAKE WITH FULL FAT EXTRUDED SOYABEAN MEAL ON BROILER PRODUCTION

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Target Audience: Researchers in animal production, poultry farmers and feedmillers.

ABSTRACT

Effect of replacing groundnut cake (GNC) with full fat extruded soybean meal (FFESBM) on profit margins of broiler production was studied during the early rainy season in Ibadan. One hundred day-old Anak 2000 broiler chicks were raised on five dietary treatments A,B,C,D and E in which FFESBM was used to replace the equivalent crude protein contribution of GNC at 0, 25, 50, 75 and 100%, respectively. Significant ($P< 0.05$) treatment effects were observed with mean body weight gain, average feed intake, dressed weight, net profit and rate of returns on investment. The highest average body weight gain of 2081 g per bird and 4546.60 g feed intake in 8 weeks were recorded on the birds fed with 75% FFESBM plus 25% GNC, while the least were observed on the birds fed with 100% GNC with 1225.01 and 3366 .00 g/ bird, respectively. Dressed percentage (% live weight) was from 60.07 to 72.48%. Feed utilization accounted for 50.78 to 58.75% of the total cost of production, while day-old chick, medication and labour accounted for 23.56 to 28.52, 6.41 to 7.76 and 4.0 to 4.9%, respectively. Inclusion of FFESBM at 50 and 75% gave the least cost feed per kilogramme weight gain (N60.12 to 60.55) unlike 0% and 100% inclusion which were N72.21 and N67.66, respectively. Average net profit of N50.60 per bird was made, while net profit of N3.41 and N83.34/ bird were made on the birds fed with 100% GNC and 25% GNC plus 75% FFESBM, respectively. Rate of return on investment for treatments A, C and D were 1.95, 33.53%, respectively. Use of FFESBM at 75% plus 25% GNC as main sources of plant protein should be encouraged as the broilers fed with it performed best in terms of weight gain and profit margin.

Key Words: Broiler, groundnut cake, full fat extruded soybean meal, profit margin.

DESCRIPTION OF PROBLEM

Larry (1) confirmed that feed management is very important to poultry producers, since income is based on feed utilization which accounts for 60 to 70% of the total production cost. Ogunfowora (2) and Oluyemi (3) indicated that feed cost is over 70%. Major items which constituted greater proportion of production cost according to Olayide and Akinwumi (4) were feed and labour which represented 68 and 22 % respectively. Efficiency of feeds and labour utilization is a very

important means of increasing profits in any broiler enterprise. The economics of new technologies should be assessed to determine how much productivity needs to be increased or what risk needs to be reduced. To fully commercialise the production systems and poultry industry in which traditionally managed stock is about 86% (5, 6), considerable use of economics is needed in terms of feeds, inputs, stocks animal health, resource management and livestock marketing (7). The diets formulated must be directed towards profit maximization which is accomplished by relating nutrient input to some economic measures of broiler performance. Income margins are very narrow in poultry production and income is extremely susceptible to price decreases and to deficient technical input/output ratios (8). Profit margin in broiler production is sensitive to the time of sales (9). Nworgu *et al.* (10) stated that profit level for broiler production in Ibadan ranged from ₦3.15 to ₦51.36/bird. But Ogundipe (11) put the profit level in Zaria at ₦30.80/bird, while Nwajiuba (12) estimated it to be ₦44.60/bird in Owerri. Under Lagos environment Okeowo and Odeyemi (13) put the profit margin in broiler business at ₦2.27 to ₦8.46/bird. Plant protein is not as expensive as protein of animal origin, but its use is limited due to anti-nutritional factors such as tannin, saponin, trypsin inhibitors, mycotoxins, aflatoxin and haemagglutins (14) . Full-fat extruded soybean meal (FFESBM) is a valuable plant protein source that can be used to replace groundnut cake (GNC) as well as reduced the conventional requirement of fish meal in monogastric animals (15). FFESBM with animal protein and amino acid supplementation encouraged better weight gain and profit than GNC which was equally supplemented when fed to broilers (10). GNC is one of the oil meals with highest fibre levels (16). And is high in crude protein content but deficient in lysine and methionine (17). Broilers fed with 75 to 100% GNC as main source of plant protein with animal protein suplementation had lower weight gain, poor feed conversion ratio and lower carcass quality than those fed with 25% GNC with 75% FFESBM (18). Based on the above, we decided to study the economic importance of the replacement of GNC with FFESBM for broiler production.

MATERIALS AND METHODS

One hundred day-old Anak 2000 broiler chicks were raised on five experimental starter and finisher diets for four weeks each in the early rainy season. The broiler chicks were randomly allotted to five dietary treatments, A, B, C, D and E, in which FFESBM was used to replace the equivalent crude protein contribution of GNC at 0, 25, 50, 75 and 100% levels, respectively in a completely randomised design. The gross composition of the experimental diets is shown in Table 1. The diets were supplemented with equal amounts of animal protein and amino acids. Feeds and water were provided *ad libitum* while routine vaccinations were administered as and when due while required data were collected. Proximate chemical composition of the experimental and test diets were determined according to AOAC. (19). Data collected were subjected to analysis of variance while Duncan's Multiple Range Test (20) was used in assessing significant differences.

An economic appraisal of the study was carried out to show the efficiency of the rations in terms of cost per unit live weight gain and profit margin. Some data

Table 1: Gross Composition of Experimental Diets

Ingredients (%)	Experimental Diets									
	Starter Phase					Finisher Phase				
	A	B	C	D	E	A	B	C	D	E
Maize	49.85	49.85	52.00	50.00	48.00	54.40	54.75	54.50	54.00	54.00
GNC	26.00	19.50	13.00	6.50	-	24.00	18.00	12.00	6.00	-
FFESBM	-	6.50	13.00	19.50	26.00	-	6.00	12.00	18.00	24.00
Corn Bran	17.40	17.40	15.25	17.25	19.25	15.25	15.00	15.25	15.75	15.75
Fish Meal	4.00	4.00	4.00	4.00	4.00	3.50	3.50	3.50	3.50	3.50
Bone Meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Premix	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Salt	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Calculated Analysis										
Crude Protein (%)	21.32	21.09	20.91	20.73	20.56	20.3	20.1	19.94	19.77	19.59
M.E. Kcal/Kg	2.94	2.95	2.97	2.96	2.93	1.98	2.99	2.99	.299	2.99
Determined Analysis										
Crude Protein (%)	19.96	20.05	20.13	20.15	19.98	18.68	18.97	19.26	19.32	19.36
Crude Fibre (%)	5.27	4.98	6.32	4.76	6.59	4.56	4.76	5.21	6.32	6.46
Metabolizable Energy (Kcal/kg)	2621	26131	2605	2632	2614	2721	2680	2744	2691	2770

were analysed using budgetary and descriptive techniques (21). Total cost of production, net profit and gross margin were determined as shown below:

TCP = TFC - TVC .....(1)

Where

TCP = Total cost of production

TFC = Total fixed cost of using resources whose quantities are fixed during the production period (cost of equipment, land, housing etc) and

TVC = Total variable cost e.g. cost of using resources whose quantities vary during the production period i.e. labour, feeds, day-old chicks e.t.c.

NP = TR - TCP..... (2)

where NP = Net profit

TR = Total revenue

GM = TR - TVC ..... (3)

where GM = Gross margin

NP = NR = NFI = GM - TFC..... (4)

where

NR = Net Return

NRI = Net fixed income.

Profitability ratios were employed to explain the extent to which production were used for profit maximization. These include: BCR, RRI and GR as follows:

BCR (Benefit - Cost Ratio) = TR/TCP .....(5)

RRI (Rate of Returns of Investment) = NP/TCP x 100/1 .....(6)

GR (Gross Ratio) = TCP/TR ..... (7)

RESULTS

Significant ($P<0.05$) treatment effects were observed with mean body weight gain, feed intake, dressed percentage, feed conversion ratio, net profit and rate of returns on investment (Tables 2,3, and 4). The average body weight gain of the birds fed with diet D (75 % FFESBM + 25% GNC) was ₦2.08k in 8 weeks with total feed intake of 4.51kg/bird, while such parameters on the birds fed with diet A (100% GNC) were 1.23 and 3.37kg/bird, respectively. Inclusion of FFESBM at 25, 50 and 100% for most parameters were not significant from each other. Feed cost per kilogramme live weight gain ranged from ₦60.12 to 60.55), unlike 10 and 100% inclusion which amounted to ₦72.21 and ₦67.66, respectively (Table 2). Cost of 1kg of feed at 8 weeks ranged from ₦26.25 to ₦28.31/kg). Mortality of 5% was recorded. Average net profit per bird was ₦50.60, while net profits of ₦3.41, ₦46.86, ₦66.68, ₦83.34 and ₦52.70 were made per bird fed with 0, 25, 50, 75 and 100% FFESBM, respectively (Table 3). Cost of feed, day-old chick, medication and labour accounted for 50.78 to 58.75, 23.24 to 28.52, 6.32 to 7.76 and 4.00 to 4.91% out of the total cost of production, respectively. Rate of return on investment (RRI) was 1.95, 23, 38, 33, 53, 38.73 and 24.83%, while benefit cost ratio (BCR) was 1.02:1, 1.23:1, 1.32:1, 1.39:1 and 1.25:1 for broilers fed with diets A, B, C, D and E, respectively (Table 4). Overall performance and profit margin showed that broilers fed with diet D performed best, followed by diet C and the least was diet A. But dressed percentage was 72.48, 70.60 and 60.07 for birds fed with diets E, D and A, respectively.

Table 2: Performance and cost Analysis of broiler production for 8 weeks

Parameters	Experimental Diets					SEX
	A	B	C	D	E	
Feed Conversion ratio (FCR)	2.75[e]	2.45[b]	2.18[b]	2.17[a]	2.45[b]	0.02
Dressed weight (g)	762.95[a]	1160.20[b]	1296.22[bc]	1501.11[c]	1334.48[bc]	9.74
Dressed Percentage (% live weight)	60.07	65.92	68.55	70.60	72.48	2.75
Breast weight (g)	117.01[a]	220.08[a]	206.00[a]	360.50[c]	299.30[b]	17.88
Mean body weight gain (g/bird)	1225[a]	1715[b]	1846[c]	2081[d]	1841[c]	36.80
Cost of feed (₦/kg)	26.25	26.87	27.54	27.94	28.31	103.89
Total amount of feed consumed (kg/bird)	3.37[a]	4.20[bc]	4.03[b]	4.51[d]	4.40[c]	
Cost of feed per kg live weight gain (₦/kg live weight gain)	72.21	65.80	60.12	60.55	67.66	
Feed utilization out of total cost of production (%)	50.78	56.29	55.63	58.75	58.62	

Mean with different superscripts in the same line differ significantly ($P < 0.05$)

Table 3: Average production costs and returns for intensive broiler management with experimental diets

		Values per Bird (₦) and Percentage of Total Cost of Production of Broiler Chickens fed with Experimental Diets									
		Diet A	%	Diet B	%	Diet C	%	Diet D	%	Diet E	
1.	Revenue										
	Sale of broiler (₦140.0/.kg live wt.)	177.80		246.40		264.74		297.64		264.04	
	Sale of manure (₦0.50/kg)	0.92		0.97		0.82		0.85		0.88	
	Total Revenue (TR) (₦)	178.72		247.37		265.56		298.50		264.92	
2.	Variable Cost of Production										
	Feed:Starter	21.48	12.25	26.85	13.39	29.25	14.71	34.00	15.80	30.54	14.39
	Finisher	67.55	38.53	86.02	42.90	81.39	40.92	92.41	42.95	93.87	44.23
	Total	89.03	50.78	112.87	56.29	110.64	55.63	126.41	58.75	124.41	4158.62
	Day Old Chick	50.00	28.52	50.00	24.94	50.00	25.14	50.00	23.24	50.00	23.56
	Labour	8.60	4.91	8.60	4.29	8.60	4.32	8.60	4.00	8.60	4.05
	Drugs	7.60	4.34	7.60	3.79	7.60	3.82	7.60	3.53	7.60	3.58
	Vaccines	6.00	3.42	6.00	2.99	6.00	3.02	6.00	2.79	6.00	2.83
	Medication	13.60	7.76	13.60	6.78	13.60	6.84	13.60	6.32	13.60	6.41
	Maintenance and Repairs	0.48	0.27	0.48	0.24	0.48	0.24	0.48	0.22	0.48	0.23
	Transport	0.50	0.29	0.50	0.25	0.50	0.25	0.50	0.23	0.50	0.24
	Tax 0.03/One Naira	0.16	0.09	1.51	0.75	2.12	1.07	2.63	1.22	0.69	0.80
	Miscellaneous	0.70	0.40	0.70	0.35	0.70	0.35	0.70	0.33	0.70	0.33
	Total Variables Cost (TVC)	163.07	93.02	188.26	93.89	186.64	93.84	202.92	94.31	199.98	94.24
3.	Fixed Cost of Production										
	Housing (depreciation over 10 yrs)	7.73	4.41	7.73	3.86	7.73	3.89	7.73	3.59	7.73	3.64
	Interest on Loan	2.01	1.15	2.01	1.00	2.01	1.01	2.01	0.94	2.01	0.94
	Equipment (depreciation over 5 yrs)	2.50	1.42	2.50	1.25	2.50	1.26	2.50	1.16	2.50	1.18
Total Fixed Cost (TFC)		12.24	6.98	12.24	6.11	12.24	6.16	12.24	5.69	12.24	5.76
Total Cost of Production (TCP)= (TVC + TFC)		175.31	100.0	200.50	100.0	198.88	100.0	215.16	100.0	212.22	100.0
Net Profit/Loss = (TR - TCP_		3.41		46.87		66.68		83.34		52.7	
Cost of feed per kg live weight gain (₦)/per weight gain)		72.21		65.80		60.12		60.55		67.66	
Average net Profit per bird (₦)					50.60						
Mean body weight for 1 - 8 weeks (kg/bird)		1.27[a]		1.76[b]		1.89[b]		2.13[c]		1.84[b]	

Table 4: The effect of the replacement of groundnut cake with full fat extruded soyabean meal on the the rate of returns, cost benefit ratio and gross ratio

Parameters	Experimental Diets				
	A	B	C	D	E
Rate of Return on Investment (RDI) (%)	1.95	23.38	33.53	38.73	24.83
Benefit Cost Ratio (BCR)	1.02:1	1.23:1	1.34:1	1.39:1	1.25:1
Gross Ratio	0.98:1	0.81:1	0.75:1	0.72:1	0.80:1

DISCUSSION

The highest weight gain of 2.08kg/bird in diet D containing 75% FFESBM plus 25% GNC was due to higher biological value of the diet and the fact that the amino acid profile in soybean at that level of inclusion complements in part the amino acids profile of the GNC. The poor performance of diet A containing 100% GNC was likely due to deamination of some amino acids as a result of the imbalance in the amino acid profile (17). Campbell and Lasley (22) reported that when there is lack of proper balance in amino acids, excess amino acids are deaminated and used as an expensive source of energy. Dressed percentages (% live weight) kof 60.07 to 72.48 as obtained were in line with the findings of Hayse and Morrison (23) but less than those of Akpodiete *et al.* (24) who reported dressed percentages of 77.37 to 83.00. Feed conversion ratio at 8 weeks in this study ranged from 2.17 to 2.75 and is higher than the ratio in Europe for broiler production. Low mortality recorded was as a result of efficient management, moderate climatic condition and successful vaccination. Diets C and D in terms of economy of feed conversion gave the least cost per kilogramme live weight gain unlike diet A. However, these values were lower than the findings of Nworgu *et al* (10) and Bamgbose (18). Better performance of diets C and D was further confirmed by the high rate of returns on investment (33.53 to 38.73%) unlike diet A (1.95%) and the profit levels (Table 3). On the average, the net profit per bird was higher in all the treatments (₦3.41 to ₦83.34/bird) (11, 12, 13). The level of net profit was higher in all the treatments (₦3.41 to ₦83.34/bird) than was reported by Nworgu *et al.* (10) due to the fact that the quantity of yellow maize in this work was reduced by 12.46% and replaced by 16.6% corn bran having the same energy value as the maize. This further indicates that energy price or source has some influence compared to the protein on the profit level in broiler production. Feed cost accounted for 50.78 to 58.75% of total production costs and is in agreement with the reports of Larry (1) Renkema (8), and Nworgu *et al* (10), whose figures ranged from 60 60 69.33%. The lower cost of feed in this work is attributed to feed quality, feed utilization, adequate management and market situations.

CONCLUSION AND APPLICATION

Profit in broiler production depends mainly on feed utilization and efficient management of the resources. Since consumers are more interested in the amount of edible meat, dressed weight and qualitative appearance of the products, the inclusion of FFESBM at 75% with 25% GNC as main sources of plant protein appeared more feasible and profitable. Linear relationship between net profit

and progressive increase in the level of FFESBM was noticed up to 75% FFESBM inclusion level.

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