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PROSPECTS AND ECONOMICS OF BROILER PRODUCTION USING TWO PLANT PROTEIN SOURCES

F.C NWORGU+ E.A ADEBOWALE *, O.A. OREDEIN++ AND A. ONI+
+Federal College of Animal Health & Production Technology IAR&T, P.M.B 5029, Ibadan. Nigeria.

*Institute of Agriculture Research and Training, Obafemi Awolowo University.

++ Federal College of Agriculture, IAR&T, Ibadan.

Target Audience: Academics/ reseachers in animal production and farmers.

ABSTRACT

Cost and returns involved in the intensive system of broiler magement were examined using two main plant protein sources to determine the most profitable of the two or their combination. Sixty-six day-old Anak 2000 broiler chicks were raised on experimental starter diets, (A,B,and C) containing 14% soyabean meal (SBM) with 12.1% groundnut cake (GNC) as control, 26% SBM and 25.7% GNC, respectively. At finisher phase, 14% SBM and 11% GNC, 25% SBM and 24% GNC were used for diets A , B and C, respectively. The experimental diets were supplemented with equal amounts of animal protein sources. The duration of the experiment was eight weeks. Significant (P< 0.05) treatment effect was obtained with mean body weight gain but not with average daily feed intake. Average cost of production of 1kg of feed for both starter and finisher diets was ₦27.39k. In analysing the data, descriptive and budgetary techniques were employed. Results indicated that using SBM in intensive broiler management was more profitable than using GNC or combination of the two as was indicated by the net profit, rate of return on investment and benefit-cost ratio. Net profits of ₦51.36 and ₦3.15 per bird were recorded on the birds fed with SBM and GNC plus SBM, respectively, while a loss of minus ₦12.48 was incurred when the birds were fed with only GNC as the main source of plant protein. Rates of return on investment (ROI) were 1.34 , 20.40 and minus 5.66% and benefit-cost ratios (BCR) were 1.01:1, 1.20:1 and 0.94: 1 for broilers fed with SBM plus GNC, SBM and GNC, respectively. Feed utilization accounted for 65.45-69.33% of the total production cost, while day-old chicks, medication and labour accounted for 18.95%-21.76%, 4.42%-5.09% and 2.93% - 3.36% respectively. Cost of feeding a broiler at starter and finisher phases were from ₦40.56 - ₦51.21 and ₦98.43 - ₦124.33, respectively. Cost of feed per kg live weight gain was least on broilers fed with SBM ₦81.27 /kg live weight gain) and highest in broilers fed with SBM plus GNC and GNC (N93.86 /kg live weight gain) indication that it was better to feed the birds with good quality feeds for maximum profit.

Key words: Broilers, soyabean meal, groundnut cake, cost, returns.

DESCRIPTION OF PROBLEM

Full-fat extruded soyabean is a valuable plant protein source that can be used to replace groundnut cake, as well as reduce the conventional requirement of fish meal in monogastric animal feeds (1). There is need to heat soyabean to deactivate trypin inhibitors and also detoxify tannin and lectins which are the antinutritional factors in soyabean meal. Groundnut is high in protein content but deficient in lysine and methionine (2, 3). It should be properly store to reduce mould infection.

According to Tewe and Ologhobo (4), feed consumption and weight gains were similar in broilers fed with groundnut cake-based ration and cooked full-fat soyabean, while feed efficiency ratio was better on the cooked soyabean diet. This work was carried out to determined the profit margin associated with broiler production using groundnut meal and soyabean meal as the main sources of plant protein.

MATERIALS AND METHODS

Sixty-six day-old Anak 2000 broiler chicks were raised on three experimental starter diets. The broiler chicks were randomly alloted to three dietary treatments with three replicates. The diets were formulated as shown in Table 1. Diet A served as control diet and contained 14% soyabean meal (SBM) plus 12.1% groundnut cake (GNC). Diet B contained 25% SBM, while diet C

Table 1: Ration and calculated chemical composition of experimental diets

Ingredients (%)	Experimental Diets					
	Starter Phase			Finisher Phase		
	A	B	C	A	B	C
Maize	60	60	60	61	61	61.4
Soya bean Meal	14	26	-	14	25	-
Groundnut Cake	12	-	25.7	11	-	24
Palm Kernel Cake	6.25	6.25	6.45	6.25	6.25	6.85
Fish Meal	3.00	3.00	3.00	3.00	3.00	3.00
Bone Meal	4.00	4.00	4.10	4.00	4.00	4.00
Vit-Min-Premix*	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
Lysine	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
Calculated Analysis						
Crude Protein (%)	20.50	20.57	20.48	19.93	19.60	19.85
M.E. Kcal/g	3.01	3.01	3.00	3.00	3.02	3.01

* Vitamin Mineral Premix contained (g,kg diet): Thiamine (0.02), Riboflavin (0.034), Pryridoxine (0.10), Cyanocobalamin (0.00003), Niacin (0.10), Calcium pantothenate (0.10), Paminobenzoic acid (0.10), Retinyl acetate (0.04), Ergocalciferol (0.04), Choline HCl (2.00), $CaCO_3$ 915. 258), $CoCl_2.6H_2O$ (1.06), $CuSO_4.5H_2O$ (0.019), FeSO4. H_20 (1.078), $MgSO_4$ (2.292), $MnSO_4.2H_2O$ (0.178), Kl (0.032), K_2PO_4 (15.559).

contained 25.7% GNC for starter phase, but at finisher phase the values were 14% SBM plus 11% GNC, 25% SBM and 24% GNC for diets A, B and C, respectively. Both starter and finisher rations were isonitrogenous.

The broiler chicks were weighed and randomly alloted to the starter diet for another 4 weeks. Feeds and water were provided *ad libitum* and routine vaccinations admistered. Weight gain was recorded weekly and feed consumption was recorded on a daily basis.

Table 2. Determination chemical composition of experimental diets (DM basis)

Parameters (%)	Starter Phase			Finisher Phase		
	A	B	C	A	B	C
Moisture	11.37	9.11	10.69	10.31	9.89	10.48
Dry Matter	89.69	90.89	89.31	89.69	90.11	89.52
Crude Fibre	4.34	4.30	4.10	3.29	3.10	3.35
Ash	9.00	8.10	9.50	8.00	8.00	10.00
Crude Protein	22.75	23.19	21.55	20.63	21.31	20.02
Ether Extract	5.80	5.00	5.85	7.50	9.06	8.60
Nitrogen Free Extract (NFE)	46.74	50.00	48.31	50.28	48.64	4.55
Gross Energy (Kcal/g)	3.10	2.91	2.940	3.193	2.20	3.14
Calcium	0.89	0.92	0.93	0.96	1.02	1.20
Phosphorus	0.63	0.67	0.55	0.71	0.70	0.65
Lysine	0.98	0.99	0.89	0.96	0.91	0.88
Methionine	0.64	0.79	0.670	0.67	0.71	0.66

The proximate chemical composition of SBM, GNC and experimental diets used in this study were determined by AOAC (5) procedure. The energy contents of the diets were determined with a ballistic bomb calorimeter in which benzoic acid was used as a standard. Available lysine was determined by Booth (6) method, while available methionine was determined by Pieniazek *et al.* (7) procedure.

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. Some of the data obtained were subjected to analysis of variance using complete Randomized Design. The Duncan's Multiple Range Test (8) was used to assess significant differences. However, some other data were analysed using descriptive and budgetary techniques (9). They were employed in this study to determine the cost and returns to the factors of production under intensive system of broiler management. Total cost of production can be obtained from Equation 1.

TCP = TFC + TVC .....(1)'
TCP = Total Cost of production
TFC = Total fixed cost of using resources whose quantities were fixed during the production period (cost of equipment, land, housing, etc.).
TVC = Total Variable cost e.g cost of using resourses whose quantities varied during the production period i.e labour, feeds, day-old chicks, etc.
NP = TR -TCP .....(2)
NP = Net Profit
TR = Total revenue
GM = TR -TVC .....(3)
NP = NR = NFI = GM = TFC .....(4)
NFI = Net fixed income
NR = Net Return.
Profitability ratios were therefore employed to explain vividly the extent to which factors of production were used for profit maximation. These include:
Benefit - Cost ration (BCR) = TR/TCP .....(5)
Rate of Returns of Investment (ROI)

$$ROI = \frac{NP \times 100}{TCP \quad 1} \quad \text{.....(6)}$$

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

Table 3: Proximate chemical composition of soybean meal and groundnut cake.

Parameters	Soybean Meal	Groundnut Cake
	% (DM Basis)	
Dry Matter	89.01	91.03
Crude protein	46.06	48.37
Ether Extract	6.42	6.77
Crude Fibre	6.15	7.63
Ash	6.65	5.49
Calcium	0.24	0.20
Phosphorus	0.62	0.54
Nitrogen free Extract (NFE)	34.72	31.74
Gross Energy/KcalME/g	2.45	2.41

RESULTS AND DISCUSSION

Chemical compositions of the experimental diets and test ingredients are presented in Table 2 and 3. Crude protein for the starter and finisher diets ranged from 21.55 - 23.19% and 20.02 - 21.31 %, respectively. The level of lysine in diet B at the starter and finisher phases was greater than that of diet C, but the level of methionine in diet B was greater than in diets A and C. The groundnut cake used contained more crude protein (48.37%) than soyabean meal 46.06%).

Table 5. Average production cost and returns for intensive broiler management

ITEM Values	Per Bird(₦) And Percentage of Total Cost					
	Diets A	%	Diet B	%	Diet C	%
1. Revenue						
Sale of broiler ₦140.00/kg live weight	238.00		302.40		207.20	
Sale of manure ₦0.50/;Kg	0.92		0.70		0.95	
Total Revenue (TR)	238.92		303.10		208.15	
2. Variable Cost of production						
Feed: Starter	48.69	20.65	51.21	20.22	40.56	18.38
Finisher	110.88	47.03	124.33	49.10	103.86	4.07
Total	159.57	67.68	175.54	69.33	144.42	65.45
Day Old Chick	48.00	20.25	48.00	18.95	48.00	21.76
Labour	7.42	3.21	7.42	2.99	7.42	3.36
Drugs	7.58	3.28	7.58	2.89	7.58	3.44
Vaccines	3.63	1.54	3.63	1.43	3.63	1.65
Medication	11.21	4.75	11.21	4.42	11.21	5.09
Maintenance and repairs	0.45	0.19	0.45	0.18	0.45	0.20
Transport	0.45	0.19	0.45	0.18	0.45	0.20
Tax 3k / One Naira	0.09	0.04	1.41	0.56	-	-
Miscellaneous	0.60	0.25	0.60	0.24	0.60	0.27
Total Variale Cost (TVC)	227.7	96.59	243.67	96.79	212.55	96.34
3. Fixed Cost of production						
Housing (depriciation over 10 years)	5.68	2.41	5.68	2.26	5.68	2.57
Interest on Loan	0.50	0.21	0.50	0.20	0.50	0.23
Equipment (depreciation over 5 years)	1.89	0.81	1.89	0.75	1.89	0.86

Table 4. Average production cost and returns for intensive broiler management

Item	Values Per Bird And Percentage of Total Cost					
	Diets A	%	Diet B	%	Diet C	%
Total Fixed Cost (TPC)	8.07	3.41	8.07	3.21	8.07	3.66
Total Cost of Production (TCP) = (TVC + TFC)	235.77	100.00	251.4	100.00	220.63	100.00
Net Profit/Loss (TR-TCP)	31.5		51.36		12.48	
Rate of Return on Investment (ROI) = $\frac{NP}{TCP} \times \frac{100}{1}$	1/34%		20.40%		5.66%	
Benefit Cost Ratio (BCR) = TR/TCP	1.01:1		1.20:1		0.49:1	
Gross Ration = TCP/TR	0.98:1		0.83:1		1.06:1	
Cost of Feed per Kg live weight gain (₦/per live weight gain)	93.86		81.27		93.91	
Mean Body Weight Gain (kg/bird) (1-8 weeks)	1.70[b]		2.15[a]		1.48[c]	
Total feed intake (Kg/bird)			6.00		5.42	

Results in Table 4 showed that significant ($P<0.05$) treatments effects were obtained with mean body weight gain but not with daily feed intake. Birds on diet B which contained 26% SBM gave the best performance with average body weight gain of 2.16kg/bird and total feed intake of 6.0kg/bird. These parameters were least in the birds fed with GNC (1.48 and 5.42kg/bird). Average cost of producing 1kg of feed for either starter or finisher diet was ₦27.38. Average cost of feed per bird at starter and finisher phases were ₦46.82 and ₦111.21, respectively. These parameters were ₦51.21 and ₦152.85 for starter and finisher diet, respectively for diet B.

Net profits of ₦51.36 and ₦3.15 per bird were recorded on the birds fed with SBM and GNC plus SBM, respectively, but a loss of ₦12.48 was recorded in treatment C. Cost of feeds accounted for 65.45 - 69.33% of the total cost of production. Day-old chick, medication and labour accounted for 18.95 - 21.76% 4.42-5.09% and 2.93 - 3.36%, respectively. Rate of return on investment (ROI) was 1.34, 20.40 and 5.66% for diets A, B and C respectively. There was no mortality.

The increase in weight gain for diet B could be attributed to the nature of SBM and proper balance of amino acids (2). The economic appraisal in terms of efficiency of feed utilization and net profit showed that the feed cost per kilogram live weight gain was least on broilers fed with SBM but higher in mixture of GNC plus SBM and GNC alone. This indicates that inspite of higher cost of feed in diet B, weight gain compensated for increase in cost and it was therefore better to feed the birds with feeds of better quality for maximum profit attainment. This was further confirmed by the figures obtained for the benefit-cost ration and gross ratio values. Diet A was better utilised than diet C due to the higher biological value of its plant protein sources. Two different protein sources might have low biological values when fed separately, but when fed together they may act synerigistically and have a much higher biological value. This might explain the observation in diet B; of the diet was due to the fact that the amino acid in soyabean complemented at least in part, the amino acid of the groundnut cake.

Net profit of ₦51.36 per bird in treatment B is an indication of better feed utilization and higher weight gain of the birds fed with SBM. This shows that diet B was of higher quality and more palatable with proper balance of amino acids. As could be seen in Table 5, the cost of feed ranged from 65.45 - 69.3% of the total cost of production.

CONCLUSION AND APPLICATIONS

1. This study indicated that SBM at 26% inclusion level the broiler ration gave profit of ₦51.36 per bird.
2. Inclusion of 24.85% GNC with animal protein supplementation in broiler ration could not support adequate weight gain, hence a loss of ₦12.48

per bird was recorded. Farmers should be discouraged from using such a high inclusion level of GNC in broiler diet.

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