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Economics of Production of Broiler Chickens Fed Cassava Peel Leaf Meal (Ratio 9:1) Mix as Replacement for Maize

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Abstract:- This study examined the replacement value of maize using varying levels of cassava peel-leaf meal mixed in the ratio of 9:1 on the economic indicators. Three hundred (300) day old Marshall breed birds replicated5 times in a completely randomized design, 10 birds per replicate were allocated to one of six dietary treatments and maintained for 42 days.Both the growth parameters and the Cost-Return analysis were determined to find out the profitability of the test diets as compared to the control diet. Results show that the Total Costs (TC) decreased from ₦899.18 in the control diet to ₦844.31 in diet 6. The Gross Margin was found to decrease from ₦699.68 in diet 1 to ₦402.55 in diet 6 while the values of ₦0.80 in diet 1 to ₦0.49 in diet 6 was computed as returns per naira invested in the enterprise.

Keywords:- *Economics, Production, Broiler Chickens, Cassava Peel-leaf meal.*

I. INTRODUCTION

Protein – Energy Malnutrition (PEM) continues to be a serious public health issue in many developing nations, and there is a need to boost daily protein consumption, particularly animal protein (Unigwe et al, 2014). In emerging nations, the demand for animal-based diets has been steadily increasing (Thornton, 2010). For several reasons, broiler production has been highlighted as one of the quickest and simplest ways to tackle this issue (Nworgu et al., 2000, Dipeolu et al., 1996; Larry 1993), due to their abundance, high feed conversion ratio, and universal acceptance. Many people in developing world, such as Nigeria, see poultry goods (chicken and eggs) as a luxury. The high cost of poultry meat and eggs is largely due to the high cost of traditional animal feeds. As a consequence of the high cost of conventional feed components including maize, soyabean, millet, wheat, and groundnut cake, poultry researchers are scrambling to find more affordable and easily accessible indigenous feedstuffs. There should be an emphasis on developing diets that are less expensive while yet providing the necessary nutrients without affecting the body's physiological health.Animal-derived foods are also an efficient and compact source of immediately accessible micronutrients, according to Neumann and Harris (1999), who found that the protein and energy they provide are of excellent quality and rapidly digested. Demand for protein and energy-rich feed components will grow as animal protein output rises. In order to meet the energy requirements of poultry, maize is one of the most popular and often utilized elements in poultry diets. However, competition for maize between man and animals has made it to become an expensive component of animal feeds thereby leading a subsequent hike in the price of animal products production and then making them unavailable on the dining table of an average Nigerian (Okorie *et al.,* 2011). Therefore, it is vital to lower the cost of feedstock in order to generate lower-cost goods without compromising profit margins (Adeyemi *et al.,* 2014; Chauynarong*et al.,* 2009).Recent studies have shown that the use of agro-industrial by-products can reduce the cost of producing poultry (Ogunsipe *et al.,* 2015). This study therefore used cassava peels mixed with cassava leaves as a replacement ingredient for maize as an alternativefeed component for broilers.

II. MATERIALS AND METHODS

A. Experimental site

The research was conducted at the Federal University of Technology, Akure's Teaching and Research Farm. The research area is situated Latitude 7^0 15^1north of the equator and Longitude 5^0 15^1 east of Greenwich Meridian. A typical yearly temperature of 22 degrees Celsius is recorded at an elevation of around 370 meters above sea level (Ajibefun, 2011).

B. Experimental diets

Cassava processing cottage industries in Akure, Ondo State, Nigeria's provided the fresh cassava peels which weresun-dried, ground, and stored, while Bamidele Olumilua University of Education, Science, and Technology's Teaching and Research farm provided the cassava leaves which were sundriedfor five days and milled. A 9:1 mixture of milled cassava peel and leaf meal was then created by combining the two. The experiment used 300 Marshall Breed broiler chicks that were one day old. Chicks were given a commercial (CP: 23%; ME: 3200kcal/kg) meal for the first week of the pre-experiment period.

In order to achieve the NRC (1994) minimum need for each phase, six experimental diets were developed, both for the starter and for the finisher. It was established that diets 2, 3, 4, 5 and 6 had maize substituted with cassava peel-leaf-meal (9:1) mix at 10, 20, 30, 40, and 50 %, whereas diet 1 was the control. During the finisher phase, the same formulation process was used. The diets were all carefully mixed together. Table 1 shows the starter diet's gross composition, whereas Table 2 shows the finisher diet's gross composition.

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	Level of maize replaced by cassava peel – leaf meal mix (9:1)					
Ingredient	0	10	230	40	50	
Maize	51.19	46.07	40.95	35.83	30.71	25.60
CPLM	0. 00	5.12	10.24	15.36	20.48	25.60
SBM	30. 00	30. 00	29. 00	29. 00	28.50	28.50
GNC	9. 00	9. 00	9. 00	9. 00	9. 00	9. 00
FM	4. 00	4. 00	4. 00	4. 00	4. 00	4. 00
B/meal	2. 00	2. 00	2. 00	2. 00	2. 00	2. 00
Oyster shell	0.50	0.50	0.50	0.50	0.50	0.50
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.13	0.13	0.13	0.13	0.13	0.13
Methionine,	0.13	0.13	0.13	0.13	0.13	0.13
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Vegetable oil	2.50	2.50	3.50	3.50	4.00	4.00
Calculated analysis						
Crude protein	23.23	23.39	23.49	23.60	23.76	23.85
ME(kcal/kg)	3092.8	3044.2	3004.9	2980.3	2887.3	2839.02
Calcium%	1.54	1.44	1.36	1.34	1.24	1.23
Av.Phosphorus %	0.61	0.6	0.59	0.59	0.58	0.58

Table 1: Gross Composition of Experimental Diet (g/100g) for broiler –starters fed diets in which maize was replaced with CPLM (9:1) mix

*Composition of vitamin premix: "Vitamin A (10,000 iu) D (2,000,000 iu), E (35, 000 iu); K (1,900mg); B12 (19mg); Riboflavin (7,000mg). Nicotinic acid (45,000mg)' Folic acid (1,400mg); Pyridoxine (3800mg); Thiamine (2,200mg); Pantothenic acid (11,000mg); Biotin (113mg) and trace element such as Cu (8,00omg), Mn (64,000mg); Zn(40,000mg), Fe(32,000mg), Se(160mg), I(800mg); and other items as Ca (400mg); Chlorine (475,000mg) Methionine (50, 000mg); BHT (5,000mg) and Spiramycin (5,000mg) in 2.5kg of premix. Embavit No1 by May and Baker Nig. Plc":

CPLM =Cassava peel leaf meal, SBM =Soybean Meal, GNC = Groundnut Cake, FM =Fishmeal, B/meal = Bone meal ME= Metabolizable energy.

**ME: metabolizable= (37x%CP) + (81.8x%FAT) + (35.5x%NFE) (Pauzenga, 1985).

Ingredient	**Level of maize replaced by cassava peel /leaf meal mixture (9:1)**					
	0	**10**	**20**	**30**	**40**	**50**
Maize	58.23	52.41	46.58	40.76	34.94	29.12
CPLM	0.00	5.82	11.65	17.47	23.29	29.12
SBM	24.00	24.00	24.00	24.00	24.00	24.00
GNC	9.00	9.00	9.00	9.00	9.00	9.00
FM	3.50	3.50	3.50	3.50	3.50	3.50
B/Meal	2.00	2. 00	2. 00	2. 00	2. 00	2. 00
Oyster shell	0.50	0.50	0.50	0.50	0.50	0.50
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.11	0.11	0.11	0.11	0.11	0.11
Methionine	0.11	0.11	0.11	0.11	0.11	0.11
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Vegetable Oil	2.00	2.00	2.00	2.00	2.00	2.00
Total %	**100**	**100**	**100**	**100**	**100**	**100**

Table 2: Gross Composition of Experimental Diet (g/100g) for Broiler-Finisher fed diets in which maize was replaced with CPLM (9:1) mix

ISSN No:-2456-2165

Calculated Analysis						
Crude protein %	20.21	20.40	20.59	20.77	20.96	21.15
M.E (kcal/kg)	3109.2	3053.9	2968.49	2943.2	2887.9	2832.86
Calcium %	1.44	1.40	1.38	1.32	1.24	1.22
Av.Phosphorus %	0.57	0.56	0.56	0.55	0.55	0.54

*Composition of vitamin premix: "Vitamin A (10,000 iu) D (2,000,000 iu), E (35, 000 iu); K (1,900mg); B12 (19mg); Riboflavin (7,000mg). Nicotinic acid (45,000mg)' Folic acid (1,400mg); Pyridoxine (3800mg); Thiamine (2,200mg); Pantothenic acid (11,000mg); Biotin (113mg) and trace element such as Cu (8,00omg), Mn (64,000mg); Zn(40,000mg), Fe(32,000mg), Se(160mg), I(800mg); and other items as Ca (400mg); Chlorine (475,000mg) Methionine (50, 000mg); BHT (5,000mg) and Spiramycin (5,000mg) in 2.5kg of premix. Embavit No1 by May and Baker Nig. Plc"

C. Experimental Layout and Bird's Management

Pre-experimental chicks were weighed before distributing them in a completely randomized Design (CRD) among the six food options. This was done five times with each replication including 10 chicks. There was an average weight difference of 4.2g across groups for each diet. Feeding was ad libitum for the chicks from days 8 to 21 (starter feed) and days 22 to 42 (Finisher feed). Every seven days, weight changes in the groups were recorded and daily meal records were gathered. Water was also made available to the animals.

D. Statistical Analysis

Data obtained were subjected to analysis of variance (ANOVA) using SPSS (2012) version 21, while the difference between treatments means were examined by Duncan multiple range test of the same package.

III. RESULTS

Table 3 shows the performance of the birds from age 7 to 42 days. There were significant (P<0.05) differences in the final body weight, average weight gain and feed conversion ratio among the birds on the different dietary treatments. The final body weight (kg) of the birds fed the control diets was the highest (1.97kg) and was significantly (P<0.05) higher than those fed the test diets. There was significant (P<0.05) differences in the FBW of the birds on diet 2(10%) and those on diets 3 to diet 6 (50%) also there was significant (P<0.05) differences in FBW of birds fed diet 3 to diet 5 and those fed diet 6. There were no significant (p>0.05) differences in average feed consumption (AFC) of the birds across the dietary treatments. However, feed consumption increased with increase in replacement of maize with CPLM (9:1) mix in the diet. The feed conversion ratio of the birds fed the control diets, though not significantly (P>0.005) different from bird fed diets 2 (10% CPLM) was significantly (P<0.005) different from those birds on diets 3 to 6 (20-50%).

Table 4 however showed that the cost of feed decreased with increased level of inclusion of the CPLM (9:1) mix. The cost of feed varied from ₦335.01 in control diet to ₦280.14 in diet 6. Accordingly, it showed that the average Total Variable Costs (TVC) ranged from ₦821.45 from birds on diet 6 (50%) to ₦876.32 for birds fed the control diet while the Total Fixed Cost (TFC) was estimated to be #22.86 for all the dietary treatments. The Total Costs (TC) (which is the Total Variable Cost (TVC) + Total Fixed Cost (TFC)) decreased from ₦899.18 in the control diet to ₦844.31 in diet 6. The Gross income or average total revenue within the period estimated to range from ₦1,576 in diet 1 to ₦1,224 in diet 6 was mainly generated from the sales of broiler birds. It was calculated by multiplying the current cost of a kilo of chicken (₦800) with the final body weight of the birds per diet. The Gross Margin was found to decrease from ₦699.68 in diet 1 to ₦402.55 in diet 6 while the values of ₦0.80 in diet 1 to ₦0.49 in diet 6 was computed as returns per naira invested in the enterprise.

Replacement of maize by CPLM (9:1) mix

Parameters	Diet 1	Diet 2	Diet3	Diet 4	Diet 5	Diet 6	±SEM
	0%	10%	20%	30%	40%	50%	
Final body weight (kg/bird)	1.97^{a}	1.78^{b}	1.67^{c}	1.63^{c}	1.59^{cd}	1.53^{d}	0.30
Total feed intake (kg/bird)	3.18	3.20	3.21	3.22	3.22	3.22	0.04
Feed conversion ratio	1.74^{a}	1.95^{ab}	2.09^{bc}	2.15^{bc}	2.21^{c}	2.31^{c}	0.05

Table 3: Mean value of performance characteristics of broiler chickens fed diets in which maize was replaced by cassava peel -leaf meal (7-42 days of age)

a,b,c d: Mean within rows having different superscripts are significantly different (P<0.05)

ISSN No:-2456-2165

	Diet 1 0%	Diet 2 10%	Diet 3 20%	Diet 4 30%	Diet 5 40%	Diet 6 50%
A. Variable Cost (₦)						
Cost of Stock	190	190	190	190	190	190
Veterinary Cost	28.58	28.58	28.58	28.58	28.58	28.58
Cost of Feed	335.01	324.10	315.25	303.13	289.97	280.14
Labour Cost	285.58	285.58	285.58	285.58	285.58	285.58
Utilities	37.15	37.15	37.15	37.15	37.15	37.15
Total Variable Cost (₦)	876.32	865.41	856.56	844.44	831.30	821.45
B. Fixed Cost (₦)						
Depreciation Cost	22.86	22.86	22.86	22.86	22.86	22.86
Total Fixed Cost	22.86	22.86	22.86	22.86	22.86	22.86
Total Production Cost (₦)	899.18	888.27	879.42	867.30	854.16	844.31
C. Weight (kg)	1.97	1.78	1.67	1.63	1.59	1.53
D. Gross Income (₦)	1,576	1424	1336	1304	1272	1224
E. Net Profit (₦)	676.82	535.73	456.58	436.70	417.84	379.69
F. Profit per Naira invested ₦)	0.75	0.60	0.52	0.50	0.49	0.45
G. Gross Margin (₦)	699.68	558.59	479.44	459.56	440.70	402.55
H. Gross Margin per Naira invested (₦)	0.80	0.65	0.56	0.54	0.53	0.49

Table 4 : Cost and Return Analysis in Broiler Production per Bird fed varying levels of CPLM (9:1) mix as a replacement for maize

IV. DISCUSSION

Analyzing the structure of cost-returns in poultry production may help investors better understand the expenses involved in the business so that they can enjoy the greatest possible financial rewards from their investments (Sanni and Ogundipe, 2005). Sanni and Ogundipe (2005) also noted that the cost of pullets and feed must be the focus of any management intervention aimed at reducing production costs in any poultry operation.

Tables 4 presents the result of cost and return analysis in broiler production per bird fed varying levels of CPLM (9:1) mix as a replacement for maize. It can be observed from the table that with increase of the cassava mix in the diet, the cost of feed reduced. Thus, feed cost/bird was lower in the cassava mix based diets than the control. This agreed with findings of Ubalua (2007), Ukachukwu (2008); and Akinfala et al. (2011). The result also shows that all the profitability indicators (Net profit, Profit /Naira invested, Gross margin and Gross margin/ Naira invested) decreased across dietary treatments up to diets 6. The result implies that it is profitable to produce at all the test dietary treatment. It is however instructive to note that optimal profit was recorded at test diets 2. Though all the test diets are profitable, further addition of cassava peel will reduce the size of the bird hence the decline in the revenue from its sale. It should be noted that production cost only does not determine revenue, body weight is also crucial. Comparing the test dietary treatments with the control experiment in terms of profitability, it was observed that the control diet is more profitable than the test diets (diets 2 to 6). In light of this observation, it appears that substituting maize for cassava peel mix is less lucrative. This is in line with the findings of Kana et al. (2014), who found that as the substitution level of maize with cassava fiber grew, all production and economic indicators decreased dramatically.

V. CONCLUSION AND RECOMMENDATION

Feed costs dropped when maize was replaced in the broiler chicken diet with a 9:1 mixture of cassava peel-leaf meal, however there was a reduction in all the profitability indicators with increase of Cassava Peel Meal in the diet. A 10% replacement however can be recommended.

REFERENCES

[1.] Adeyemi O.A, Eruvbetine D, Oguntina T, Dupeolu N and Agunbiade J.A (2008). Feeding broiler chickens with diets containing whole cassava root meal fermented with rumen filtrate. Archive Zoo technical.57(218):247-258.

[2.] Akinfala, E.O., Matanmi, O. and Tinuala, J.A. (2011). Nutrient characterization of cassava plant meal and its utilization by broiler chickens in the tropics. Livestock Research for Rural Development. 23: (11) 2011. *http://www.irrd.org/Irrd23/11akin23229.htm*

[3.] Ajibefun I (2011) Akure City Profile. www. En. Wikipedia.org/Wiki/Akure.

[4.] Chauynarong .N, A.V Elanagovan and P.A. IJI (2009). The potential in Cassava products in diets for poultry. World's Poultry Science Journal Vol. 65:23 – 35.

[5.] Dipeolu, M.A, O.Eruvbetine and T.J.Williams (1996). Indigenous chicken rearing under village condition. International Journal of Animal Science 11:63-67.

[6.] Kana J.R, Tadjong RN, kiuietche HM, Terfack Y, Zambou H and E.T. Tequia A (2014) Valorisation des residus de manioc en substitution du mais dan la ration alimentaire du poulet de chair. Livestock Research for Rural Development Vol.26, Article #48 Retrieved February 26(2014) from http:/www.Irrd.org/Irrd26/3/kana26048.htm

[7.] Larry, E.N. (1993). Broiler Feeding and Management Poultry. Int.32:70-72.

[8.] Neumann, C and HarrisD.M. (1999) Contribution of animal source foods in improving diets quality for children in the developing world. The World Bank,

Washington D.C., USA *http://:ilri.O7fyy*u/Infoserv/webpub/fulldocs/Investing in Diary/Dox/World%&20Bank%20report%20%20contributionofAnimalSourceFood.pdf.

[9.] Nworgu, F.C, G.N Egbunike and F.I. Ogundola (2000). Performance and nitrogen utilization of broiler chicks fed full fat extended soya bean meal and full fat soya bean. Tropical Animal Production Investment 3:47-54.

[10.] Ogunsipe, M.H, Adejumo, J.O, Agbede, J.O, and Asaniyan, E.K, (2015) Effect of roxazyme G2G Supplementation on cassava plant meal fed`to broiler chickens. Livestock research for Rural Development 27 (12):http://www.org//rrd 27/12/ogun 27240.

[11.] Okorie, K.C, Nkwocha, G.A and Ndubuisi, E.C. (2011). Implications of feeding varying Dietary level of Cassava Leaf Meal on Finisher Broiler: Performance, carcass, Hematological and Serological profiles. Global Research Journal of Science 1:58-66.

[12.] Pauzenga U (1985). Feeding Parent Stock. ZooTechnical International. Pp. 22-24.

[13.] Sanni, S. A. and Ogundipe, S. O. (2005). Economics of some modules of poultry production in Kaduna State, Nigeria. Nigerian Journal of Animal Production, 32(1): 102 – 107.

[14.] SPSS (2012). IBM Corp. Released 2012. IBM SPSS Statistics for windows, version 21.0. Armonk, NY: IBM Corp.

[15.] Thornton, P.K. (2010). Livestock production: Recent trends, Future prospect. Philosophical transaction of the Royal Society of London. Series B, Biological Science 365: 2853-2867.

[16.] Ubalua, A.O. (2007). Cassava wastes: treatment option and value addition alternatives. African Journal of Biotechnology. Vol. 6(18): 2065-2073

[17.] Ukachukwu S.N (2008). Effect of composite cassava meal with or without palm oil and or methionine supplementation on broiler performance. Livestock Research for Rural Development.Vol.20,Article H53. Retrieved February 5(2014) from *http://www.Irrd.org/irrd2014/ukac:20053.htm*

[18.] UnigweC.R,(2011). The impact of replacement of maize with graded cassava root meal on the haematology and growth performance of starter broiler. Continental Journal of Animal and Veterinary Research. 3: 1-6.