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ECONOMIC EVALUATION OF PARTIAL SUBSTITUTION OF CONVENTIONAL BROILER FEED WITH PALM KERNEL CAKE OR BREWER'S SPENT GRAIN AT FINISHER PHASE

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ABSTRACT

This study assessed the economic viability of substituting conventional broiler feeds with palm kernel cake (PKC) or brewer's spent grain (BSG). The experiment was arranged in a completely randomized design with 450 four- week old birds divided into five feed management techniques (treatments) . T_1= 100% conventional broiler feeds , T_2 = 75% conventional broiler feeds and 25% palm kernel cake , T_3 =50% conventional broiler feeds and 50% palm kernel cake , $T_{4=}$ 75% conventional broiler feeds and 25% brewer's spent grain and T_5 = 50% conventional broiler feeds and 50% brewer's spent grain . Broilers in each treatment were separated into three pens .Live weight , weight gain ,feed consumption , feed conversion ratio , feed cost , total cost , cost savings and sales revenue were determined weekly from the 5th to the 12th week . the data collected were analyzed using descriptive statistics, one way analysis of variance and correlation technique. The results showed positive and perfect correlations between live weight , sales revenue , and feed cost , total costs and profit . Treatment 3 had the highest cost savings of N634 but did not differ significantly from treatment 5 with N625 , both demonstrating significant economic benefits. The return on investment(ROI) ranged from 190% to 208%, with Treatment 2 yielding the highest ROI of 208%. The findings suggest that incorporating PKC or BSG into broiler feeds can enhance economic returns, with Treatment 3 and 5 showing the most promising results.

Key words: *Broiler chicken, conventional broiler feed (finisher), palm kernel cake , brewer's spent grain, cost savings.*

1.0 Introduction

Management of feeding in broiler production is crucial in determining the overall profitability and sustainability of the industry. High costs of feed occasioned by lack of feed ingredients

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have driven many poultry farmers out of business, leaving only a few who have adopted innovative management strategies. These strategies include using 75% conventional broiler feed + 25% palm kernel cake (PKC), 50% conventional broiler feed + 50% palm kernel cake, 75% conventional broiler feed + 25% brewery spent grain (BSG), 50% conventional broiler feed + 50% brewery spent grain to manage costs (Adebayo and Adeola, 2020). The cost implications of these management techniques vary significantly, influencing the overall production costs and profitability of broiler farming. For instance, Musa et al. (2018) asserted that compounded feed may reduce costs but might not always meet the nutritional needs of broilers as effectively as more expensive, high-quality feeds.

Substituting feeds with cheaper alternatives can impact growth rates and health, ultimately affecting profitability (Smith et al.2019). Organic feeds for instance can lead to higher market prices for the broilers due to consumer preferences for organic products. Conversely, inorganic feeds, while cheaper, may not provide the same level of health benefits, potentially leading to higher mortality rates (Jones and Jones, 2021). The choice of feed thus has significant implications not only for production costs but also for the market positioning and long-term viability of poultry farming operations. For Williams et al. (2017), balancing these factors is critical for optimizing both profitability and sustainability in broiler production. An informed decision regarding the best feed management technique requires analyzing key metrics such as production costs, profitability, and resource utilization.

Experimental research designs are essential in this context to evaluate the effectiveness of each strategy under controlled conditions (Clark et al.2020). By employing different management strategies, this research aims to identify the most profitable and sustainable method for poultry broiler production. Analyzing the results will provide insights into which feed management technique offers the best balance between cost and performance. This research is vital for farmers to make informed decisions that enhance profitability while ensuring the sustainability of their operations.

2.0 MATERIALS AND METHODS

Experimental Design:

A completely randomized design (CRD) with five treatments and three replications was used.

A total of 4-week 450 broiler chickens were randomly assigned to 15 pens, with 10 birds per pen and three replicates.

Treatments:

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Treatment 1 (T1): Control diet (100% conventional broiler feed)

Treatment 2 (T2): Partial substitution of conventional feed with 25% palm kernel cake (PKC)

Treatment 3 (T3): Partial substitution of conventional feed with 50% palm kernel cake (PKC)

Treatment 4 (T4): Partial substitution of conventional feed with 25% brewer's spent grain (BSG)

Treatment 5 (T5): Partial substitution of conventional feed with 50% brewer's spent grain (BSG)

Data Collection:

Live weight, feed consumption, and feed cost were recorded throughout the finisher phase.

Sales revenue and profit were calculated based on the final live weight and market prices.

Economic Analysis:

Cost-benefit analysis was performed to determine the economic viability of each treatment.

Cost savings and Return on investment (ROI) were calculated for each treatment.

Statistical Analysis:

Correlation coefficients were calculated to determine the relationships between live weight, feed cost, sales revenue, and profit.

Descriptive statistics and analysis of variance (ANOVA) were used to analyze the data.

3.0 RESULTS AND DISCUSSION

FINISHER PHASE

Table 1: Broiler Growth performance ,cost and benefits analysis from week 5 to week 12

	T1	T2	T3	T4	T5	Level of significant
Live weight	3103[a]	3103[a]	2867[a]	3065[a]	2768[a]	.438
Weight gain	383[a]	395[a]	401[a]	367a	370[a]	.821
Feed Consumption	1360[a]	1380[a]	1379[a]	1380[a]	1379[a]	.998

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Feed conversion ratio	2.995[b]	2.995[b]	7.751[a]	3.132[b]	3.043[b]	.000
Feed cost	1494[a]	1185[b]	860[c]	1189[b]	869[c]	.000
Total cost	6428[a]	6119[b]	5794[c]	6123[b]	5803[c]	.000
Cost savings	00000	309	634	305	625	
Sales revenue	18898[a]	18898[a]	17463[a]	18669[a]	16858[a]	.438
Profit	12469	12778	11669	12546	11054	.659
Return on investment (profit x 100 / Total cost)	194%	208%	201%	%	190%	

T1= Treatment 1 , T2= Treatment 2 , T3= Treatment 3 , T4= Treatment 4 and T5= Treatment5. Within a column, numbers followed by the same letters are not significantly different by Duncan New multiple Range Test at 0.05 level . . Table 1 shows the growth performance and cost benefit analysis 205from week 5 to week 12, ranging from treatment 1 to treatment 5. In treatment 1; 100% conventional broiler feeds at finisher phase was given to the broilers. In treatment 2 , 75% conventional broiler feeds and 25% palm kernel cake were used . Treatment 3 is 50% conventional broiler feeds and 50% palm kernel cake . In treatment 4 ,75% conventional broiler feeds and 25% brewer's spent grain were used while in treatment 5 ; 50% conventional broiler feeds and 50% brewer's spent grain were used .From the data analysis made on the variables like; weight gain, live weight, feed consumption, sales revenue and profit; the f-ratios are higher than 0.05 significant level. Other variables like feed conversion ratio, feed cost , total cost , the f-ratios are less than 0.05 .and this shows that there is a significant difference among the treatments that lead to cost saving of ; N634 in treatment 1 , N625 in treatment 5 , N309 in treatment 2 and N305 in treatment 5 .

TABLE 2: weekly average performance table of the variables in partial substitution of conventional Broiler feed with palm kernel cake or brewer's spent grain at finisher phase (week 5 to week 12)

	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12
Live weight	1436	1910	2356	2788	3212	3612	4044	4491
Weight gain	18.00	466	450	429	424	397	435	447

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Feed Consumption	856	1067	1184	1304	1414	1604	1734	1842
Feed conversion ratio	.1511	2.3147	2.6446	3.0409	3.3293	6.6091	6.8298	6.9489
Feed cost	702	866	969	1067	1156	1306	1410	1478
Total cost	5636	5800	5903	6001	6090	6240	6344	6412
Cost savings								
Sales revenue	8750	11633	14348	16981	19564	21998	24629	27352

Table 2 shows the statistical weekly average collections on the live weight , weight gain ,feed consumption , feed conversion ratio , feed cost , total cost , cost savings and sales revenue

TABLE 3 .: Correlation coefficient matrix among feed treatment 1 to feed treatment s

	Profit	Sales revenue	Total cost	Feed Cost	Feed conversion ratio	Feed consumption	Weight Gain	Live weight
Live weight	1.000	1.000	.869	.869	.549	.990	.505	-
Weight gain	.506	.505	.410	.410	.370	.532	-	.505
Feed Consumption	.991	.990	.829	.829	.595	-	.532	.990
feed conversion ratio	.561	.549	.234	.234	-	.5995	.3790	.549
Feed cost	.856	.869	1.000	-	.243	.829	.410	.869
Total cost	.856	.869	-	1.000	.243	.829	.410	.869
Sales revenue	1.000	-	.869	.869	.549	.990	.505	1.000
Profit	-	1.000	.856	.856	.561	.991	.506	1.000

Table 3 shows the strength of the relationships among the variables in this work. Live weight has perfect and positive relationship with the profit and the sales revenue. It also has a very high and positive relationship with the feed cost (p=.869) , feed consumption (p=.990) and the total cost (p=.869) . The relationship between the weight gain and other variables is positive but weak. The correlation between the feed consumption and profit is positive and high while that between the sales revenue and profit is positively perfect. For the purpose of cost savings and profit maximization those variables that have perfect correlation and very high correlation with the profit and cost are of great importance and consideration.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

This study evaluated the economic viability of partial substitution of conventional broiler feeds with palm kernel cake (PKC) or brewer's spent grain (BSG) at the finisher phase. The results showed that Treatment 2, which included a partial substitution of conventional feeds with PKC at 75% conventional broiler feed and 25% palm kernel cake , yielded the best economic returns, followed closely by Treatment 3 which combined 75% conventional broiler feed and 25% brewer's spent grain . These findings suggest that incorporating palm kernel cake or brewer's spent grain into broiler feeds can be a cost-effective strategy for poultry farmers.

4.2 Recommendations

Based on the study's findings, the following recommendations were made:

1. Adoption of Treatment 2 feed formulation: Poultry farmers can consider incorporating partial substitution of conventional feeds with 25% PKC at the finisher phase to improve economic returns.

2. Further research on optimization: Additional studies can be conducted to optimize the inclusion levels of PKC and BSG in broiler feeds to maximize economic benefits while maintaining bird performance.

3. Promotion of alternative feed resources: Policymakers and industry stakeholders can promote the use of alternative feed resources like PKC and BSG to reduce dependence on conventional feed ingredients and enhance the sustainability of poultry production.

By adopting these recommendations, poultry farmers and the industry can benefit from cost savings and improved economic viability.

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