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Economics of Using Cocoa Bean Shell as Feed Supplement for Rabbits

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Abstract: The study analyzed the economics of using cocoa bean shell (cbs) as feed supplement in rabbit production. Data used for this study was collected from an experimental study of performance of rabbits fed graded levels of various treatments of CBS as feed supplement. Gross margin and dominance analysis were used to analyze the data. The study showed that untreated CBS can be used economically at 100g/kg inclusion in rabbit feed while hot Water treated CBS (WCBS) can be included up to 200 g/kg in rabbit feed. The study recommends the use of hot water treatment of CBS at 200 g/kg inclusion for optimum profitability of rabbit production.

Key words: Cocoa bean shell rabbit, gross margin, dominance analysis

INTRODUCTION

In Nigeria, the high cost and scarcity of conventional food and feed sources for human and livestock has caused men and livestock to compete with each other for some food supply. Hence, livestock for use should be those that are less dependent and are capable of converting crop waste into meat. Lebas *et al.* (1986) found that rabbits with short generational interval fulfils such criteria in utilizing plant materials and crop wastes more efficiently and are very suitable as panacea to protein deficiency and low meat supply in Nigeria (Joseph *et al.*, 1997).

There is therefore, the need to search for by products and crop wastes with a view to finding feed supplements which can maintain physiological balance and enhance live-stock productivity.

Cocoa bean shell, a by-product of the emerging cocoa is the testa immediately surrounding the cocoa nib and constitute about 10% of the cocoa bean. It is estimated that about 10,500 tonnes of cocoa bean shell is produced annually in Nigeria (Aina, 1998), which constitute a disposal problem in the cocoa milling and chocolate industry. The cocoa bean shell has a proximate composition that is comparable to other agro-allied by-products such as maize bran and wheat offal. Hence, it is useful as a supplement to feed animals especially, rabbits. Cocoa bean shell also has an intermediate buffer value between the protein and cereal sources of feed (Carolien, 2001). This suggests that animals consuming cocoa bean shell might not have difficulty in lowering the gastric pH, thus, improving protein digestibility and utilization.

However, the theobromine content of cocoa bean shell limits its use as feedstuff for monogastric animals due to the imbalance caused by theobromine on growth performance of rabbits (Muhammed *et al.*, 2000). Earlier reports (Odunsi and Longe, 1998; Odunsi *et al.*, 1999) advocate the reduction or neutralization of theobromine as a means of improving the food value of the cocoa cake. Adeyina and Ademoroti's (2003) findings indicate some effectiveness of boiling treatment of cocoa bean shell in reducing the theobromine level for improved performance of broiler finisher. This effectiveness may actually be based on the physical measurement; hence, the study is aimed at analyzing the economic of using cocoa bean shell as feed supplement for rabbit. The study specifically analyzes the economical treatment in the use of cocoa bean shell the profitability and the best level of inclusive of cocoa bean shell as feed supplement in rabbit.

MATERIALS AND METHODS

Data used for this study were mainly of the secondary form. The major data was obtained from an experimental study of rabbits fed various treatments of cocoa bean shell. Data were collected on the body weight gain resulting from different level of cocoa bean shell fed. Information were also sourced from journals, annual reports and internal Network information.

Two treatments were used to investigate the effect of cocoa bean shell on growth performance and economic returns to the farmer. Treatment one evaluated untreated Cocoa Bean Shell (CBS) at 0, 50, 100, 150, 200, 250 or 300 g CBS 1kg diet. Treatment two involved hot Water treated Cocoa Bean Shell (WCBS) a 0, 100, 200, 300 and 400 g/kg (WCBS) diet. In treatment 1, forty-two weaner rabbits (mean body weight 0.37 kg) were randomly allocated to the 7 dietary treatment levels. Each rabbit was treated as a replicate thus, there were six replicates per treatment level.

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Treatment two involved the use of 30 weaner rabbit (mean body weight 0.30 kg) randomly allocated to the five dietary treatment levels. Each rabbit was treated as a replicate thus, giving 6 replicates per treatment level.

The feeding trial lasted 70 days, feed and water were given *ad-libitum* and body weight gain was determined on a body basis. Total estimate of cost on labour feed stuffs and value of foundation stocks were compared with total value production to determine the profit or loss to rabbit production.

Gross margin and Dominance analysis were used to analyze in the study. Gross margin analysis determined and compared the cost and return of rabbit production using different levels of cocoa bean shell as feed supplements and is expressed thus:

$$\text{Gross margin (GM)} = \text{TVP} - \text{TVC}$$

where:

TVP = Total value production(ie. Price at which each rabbit was sold

TVC = Total variable cost (sum total of labour, feedstuff cost and value (VFS) of foundation stock)

Dominance Analysis examined the cost and benefit of each treatment and served in eliminating some of the treatment levels from further consideration.

RESULTS AND DISCUSSION

Table 1 shows the result of the gross margin analysis for treatment one. The weight gain compared with the control diet (0 g/kg) was the same (1.2 kg) for rabbits fed up to 100 g/kg inclusion of untreated CBS. However, with further increase in CBS level, weight gain reduced to the least in 300 g/kg inclusion of CBS. This can be attributed to the presence of theobromine (an anti-nutritional factor) which is capable of suppressing appetite thereby reducing feed intake and hence, the reduction in growth performance (Muhammed *et al.*, 2000). Also, the Total Variable Cost (TVC) showed the control diet (0 g/kg) with no CBS inclusion to be highest (969.42 Naira) while, the least TVC (743.28 Naira) was at 300 g/kg inclusion. This confirms the report that the use of non conventional feed ingredient can help in reducing the cost of feeding livestock. Gross margin was shown to increase up to 100 g/kg inclusion level of untreated CBS after which, it started declining. Thus, revealing the superiority of 100 g/kg inclusion level of untreated CBS.

The gross margin analysis of rabbits fed hot Water treated CBS (WCBS) is shown in Table 2. Weight gain up to 200 g/kg inclusion level was the same as the control (1.2 kg). TVC was highest in the control diet (670.58 Naira) and lowest in 400 g/kg WCBS (568.90 Naira). Gross margin however was highest at 200 g/kg inclusion level while, it was lowest at 400 g/kg WCBS inclusion level.

To further ascertain the best economical level of inclusion of the untreated and the hot water treated CBS, the result of the dominance analysis for untreated CBS (Table 3) indicate 100 g/kg inclusion to have the highest return with lower cost. Therefore dominating the other levels of inclusion. In treatment two the dominance analysis (Table 4) showed 200 g/kg inclusion of WCBS to have the highest return with lowest cost compared to other levels of WCBS inclusion.

Table 5 shows the comparison of the dominance analysis of the two treatments. The result showed treatment two with hot water treated CBS dominating treatment one with untreated CBS. This confirms the effectiveness of hot water treatment in reducing the theobromine content of CBS for better performance of livestock (Adeyina and Ademoroti, 2003).

Table 1: Gross margin analysis of rabbits fed graded levels of untreated cocoa bean shell

CBS level (g/kg)	Body weight gain (kg)	VFS (N)	Feed cost (N)	Labour cost (N)	TVC (N)	TVP (N)	GM (N)
0	1.2	600	4.82	364.6	969.42	1000	30.52
50	1.2	550	4.65	364.6	919.25	1000	80.75
100	1.2	500	4.43	364.6	869.03	1000	130.97
150	1.1	450	4.22	364.6	818.82	900	81.18
200	0.9	400	4.02	364.6	768.62	800	31.38
250	0.9	390	3.82	364.6	758.42	800	41.58
300	0.8	380	3.68	364.6	743.38	750	1.72

Table 2: Gross margin analysis of rabbits fed graded levels of hot water treated cocoa bean shell

CBS Level (g/kg)	Body weight gain (kg)	VFS (N)	Feed cost (N)	Labour cost (N)	TVC (N)	TVP (N)	GM (N)
0	1.20	300	5.98	364.6	670.58	1000	329.42
100	1.20	250	5.55	364.6	620.15	1000	379.85
200	1.20	230	5.10	364.6	599.70	1000	400.30
300	1.00	220	4.72	364.6	589.32	850	260.68
400	0.95	200	4.30	364.6	568.90	800	231.10

Table 3: Dominance analysis of rabbits fed untreated cocoa bean shell

CBS level(g/kg)	0	50	100	150	200	250	300
0	-	+50.17	+100.39	+50.60	+0.8	+11	-28.86
50	NA	-	+50.23	+0.43	-4937	-39.17	- 79.03
100	NA	NA	-	-49.79	-99.59	-89.39	-129.25
150	NA	NA	NA	-	-49.80	-39.6	-79.46
200	NA	NA	NA	NA	-	+10.2	-29.66
250	NA	NA	NA	NA	NA	-	-39.86
300	NA	NA	NA	NA	NA	NA	-

Table 4: Dominance analysis of rabbits fed graded level of hot water treated cocoa bean shell

WCBS level (g 1 kg)	0	100	200	300	400
0	-	+50.43	+70.88	-68.75	-98.32
100	NA	-	+20.45	-119.17	-14875
200	NA	NA	-	-139.62	-169.2
300	NA	NA	-	-	-29.58
400	NA	NA	NA	NA	-

NA = Not Applicable, +ve value = Dominant Treatment, -ve value = Non dominant treatment

Table 5: Dominance analysis between of rabbits fed untreated and hot water cocoa bean shell

Treatments	1	2
1	-	+269.33
2	NA	-

Conclusion and recommendation: From the findings of this study, it can be concluded that CBS is economical as a non-conventional feed supplement and can be included in rabbit feed at 100 g/kg inclusion for the untreated CBS and 200 g/kg inclusion for the WCBS in rabbit production for optimum growth performance and highest cost benefit ratio.

It is however recommended that preferably, hot water treated CBS should be used. This treatment has shown to be capable of reducing the theobromine content, reducing feed cost and makes it possible for higher inclusion rate of CBS in rabbit diet.

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