FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 8 No. 1, June 2022: Pp.323-328

https://doi.org/10.33003/jaat.2022.0801.100

ECONOMICS ANALYSIS OF FEEDING *BRACHIARIA DECUMBENS* OR *DIGITARIA SMUTSII* HAY TO BALAMI, UDA AND YANKASA RAMS

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ABSTRACT

The study was undertaken to evaluate the effect of breed on the economics of feeding different forages to different breeds of sheep. Ten adult rams aged between 18 and 24 months for Balami, Uda and Yankasa and weighing 24.75, 25.50 and 25.50 kg, respectively procured from local markets were used for the experiment. The rams were fed either hay and fed *B. decumbens* or *D. smutsii* hay *ad libitum* and supplemented with the concentrate at 1 % of their body weight for 90 days. All animals had free access to fresh clean water every day. Differences between the daily feed offered and the remainder were recorded and used to calculate the feed intake. Weight changes were monitored fortnightly and the gain in weight obtained from the difference between the initial and final weights. Cost of feed consumed and income over expenses were determined. Results showed differences in performance of the rams. Total cost incurred showed that it was cheaper to raise Yankasa than Balami and Uda. Selling price was significantly ($P<0.05$) higher for Uda and Balami than Yankasa. The highest ($P<0.05$) income over expenses realised was in Balami (₦9,513.14 followed by Uda with ₦9,386.28) while the least was in Yankasa (₦8,277.99) fed *D. smutsii* hay. It is concluded that feeding *D. smutsii* hay to rams showed positive indices and satisfactory rates of return compared to *B. decumbens*, indicating that the activity covered its feeding costs. Farmers are recommended to feed *D. smutsii* hay as basal diet for greater economic returns.

Key words: Forages, sheep breeds, expenses, economic return

INTRODUCTION

Small ruminant production is highly practiced in rural, semi urban and urban areas representing about 63.7 % of total grazing by domestic animals in Nigeria (Olabisi and Rasheed, 2017). Small ruminants like sheep form a major component of animal production in most rural communities and serves as a resource for poor people. Their economic significance is primarily associated with their small size which involves low investments, less risk of loss and usually preferred over large ruminants for their food and reproductive efficiency (Olabisi and Rasheed, 2017). Furthermore, sheep play a significant role in the food chain and overall livelihoods of Nigerian households (Yusuf *et al.*, 2018). According to Mayberry *et al.* (2018), the potential returns from sheep production are high because of their lower feed requirement. It has been documented that sheep are the principal domesticated small ruminants in terms of total numbers and production of food and fiber products (Akinmoladunet *et al.*, 2019). There are many breeds of sheep, which are found in different regions of the world. In the northern region of Nigeria, there are predominantly three indigenous breeds of sheep (Balami, Uda and Yankasa). Sheep in Nigeria are raised on different forages and supplemented with concentrate and kept primarily for meat however, their milk is consumed in some areas while the skin is known for its high-quality leather which has domestic and export value. The forages used in feeding ruminants differ in their nutritional values hence the objective of this study was to investigate the economics of feeding *Brachiaria decumbens* or *Digitaria smutsii* hay to three breeds of sheep in Nigeria.

MATERIALS AND METHODS

Study site

The study was conducted at the Experimental Unit of the Small Ruminant Research Programme of the National Animal Production Research Institute, Shika – Zaria. Shika is situated in the Northern Guinea Savannah Zone of Nigeria between latitudes 11° 8′ 19.56″N and longitudes of 7° 45′51.22″E at an elevation of 640 meters above sea. The zone is characterized by a rainy season that starts in April or May, stabilizes in June and ends in October. The mean annual rainfall is 1100 mm. Maximum temperature ranges from 27°C - 35.0°C recorded in April while the lowest mean minimum temperature of 11.5°C occurs in December–February and the relative humidity is about 72% (IAR, 2017). The dry season begins with a period of dry cool weather called harmattan that lasts from October to January. The harmattan is followed by a dry hot weather from March to May.

Experimental animals and their management

Ten rams aged between 18 and 24 months each of Yankasa, Balami and Uda indigenous breeds of sheep procured from the local markets at Achida and Giwa in Sokoto and Kaduna states, respectively were used for the experiment. The age of the animals was determined by dentition and the information obtained from the owners at the market. The animals were ear-tagged and isolated in quarantine for 30 days. During the quarantine period, animals were drenched with a broad spectrum anthelminthic (Albendazole®) against

internal parasites and treated with acaricide (Diazzinole®) against external parasites. They were also covered with long-acting antibiotics as prophylactic against possible infection. Following the quarantine period, the initial body weight of all animals was measured. The animals were grouped based on their breed and this served as treatments. All animals were kept in individual pens equipped with a watering bucket and a feeding trough. The feeding trial lasted 90 days following an adjustment period of 14 days.

Feeds and feeding management

Digitaria smutsii and *Brachiaria decumbens* hay harvested from sown pastures and concentrate mixture were used as treatment ration. The concentrate was a mixture of cottonseed cake (39.19 %), maize (37.87 %), maize offal (18.94 %), bone meal (2.50 %) and table salt (1.50 %). The concentrate ingredients (cottonseed cake, maize, maize offal, bone meal and table salt) obtained from the Institute were compounded and stored properly at the experimental site. Animals were fed the concentrate at 1 % of their body weight and the hay fed *ad libitum.* All animals had free access to fresh clean water *ad libitum,* every day.

Experimental design and treatments

There were six treatments in a 2×3 factorial arrangement in a completely randomized design (CRD) with five replications per treatment. One factor was the breed with three breeds of sheep (Balami, Uda and Yankasa) and the second factor was roughage type (*B. decumbens* and *D. smutsii* hay).

Cost benefit analysis

Cost benefit analysis was performed to evaluate the economic advantage of the different treatments by using the procedure of Upton (1979). The partial budget analysis involved the calculation of variable costs and benefits. At the end of the fattening trial, the rams were sold on hoof based on their body weight at N800.00 per Kg liveweight. The difference between the cost price of rams in each treatment before and selling price after the experiment was considered as total return (*TR*) in the analysis. For the calculation of the variable costs, the expenditures incurred on various feedstuffs were taken into consideration. The cost of the feeds was computed by multiplying the actual feed intake for the whole feeding period with the prevailing market price as at the time the study was conducted. The prevailing price of the feeds at the time of feed purchasing including the transportation cost incurred to move them to the experimental site were recorded. Cost benefit analysis method measures profit or loss, which is the difference between gains and expenses for the proposed change and includes calculating net return (NR), i.e., the amount of money left when total major variable costs (TVC) - cost of feeds and animals were subtracted from the total returns (TR): NR = TR-TVC:

Total variable costs included the costs of major inputs that changed due to the change in production. This included the cost of animals and feed consumed. The change in net return (ΔNR) was calculated by finding the difference between the change in total return (ΔTR) and the change in total variable cost (ΔTVC). The selling price of the rams was on weight basis i.e ₦800.00 per kg of live weight as the rams were sold on hoof.

RESULTS

Economics of feeding different forages to different breeds of sheep.

Effect of breed on the economics of feeding *B. decumbens* and *D. smutsii* hay to Balami, Uda and Yankasa rams presented in Table 3 shows that cost of concentrate, hay and total feed consumed were different. Balami recorded higher cost for concentrate, hay and total feed consumed. This was followed by Uda while Yankasa recorded the least values. Total cost incurred was lower for Yankasa than for Balami and Uda. Weight gain was higher for Balami and Uda than for Yankasa but Yankasa had conversely higher value of gain than Uda and Balami. Balami recorded the highest selling price and income over expenses while the lowest values were observed in Yankasa.

Table 4 represents the effect of hay type on the economics of feeding *B. decumbens or D. smutsii* hay to Balami, Uda and Yankasa rams. The result showed that cost of concentrate consumed, hay consumed, total feed consumed and total cost incurred (cost of feed and cost of animals) were lower in rams fed *B. decumbens* than in those fed *D. smutsii* hay. Conversely, rams fed *D. smutsii* hay had better weight gain, selling price and income over expenses than those that were raised on *B. decumbens.* The result of interaction between breeds and hay type presented in Table. 5 depicts that when the rams were fed *B. decumbens,* income generated was lower than when they were fed *D. smutsii* hay. The selling price of ₦33,120.00, ₦26,080.00 and ₦ 24,800.00 for Balami, Uda and Yankasa, respectively raised on *B. decumbens* was lower than ₦38,240.00, ₦33,120.00 and ₦30,080.00 for Balami, Uda and Yankasa, respectively when they were fed *D. smutsii* hay, respectively. Income over expenditure followed the same trend for all the breeds.

DISCUSSION

Economics of feeding different forages to different breeds of sheep

The goal of farmers is normally to maximize profits from fattening enterprises by aiming at raising animals that will grow fast and produce desired carcasses at the least possible cost. Feed cost and cost of animals were considered as the indices for calculating the income in this study and these constituted more than 80 % of the total cost of fattening the rams. In this study, the total cost of feed consumed was highest in Balami compared to Uda and Yankasa. In spite of the highest total cost incurred on Balami which probably might be due to its feed requirement compared to the other two breeds, it had the best return which was occasioned by its selling price resulting into higher income over expenses. This result agrees with the one reported by (Sule, Kolawole and James, 2019), who in their study on performance and carcass characteristics of four breeds of rams Nigeria under fattening condition, reported that Balami breed had the best potential for performance and carcass characteristics.

It was cheaper to feed the rams on *B. decumbens* than *D. smutsii* hay but the performance was higher for rams raised on *D. smutsii* than for those raised on *B. decumbens* hay. The explanation that could be given for this is that *D. smutsii* hay is softer and more palatable than *B. decumbens* hence it was relished more by the animals. The slightly higher CP content of *D. smutsii* hay compared to *B. decumbens* may have also led to the higher weight gain reported for those rams that were raised on it than those raised on *B. decumbens*. The higher weight gains for rams fed *D. smutsii* hay made it more economical as selling price and income realized over expenditure was higher than what was realized from the sales of those reared on *B. decumbens.* This result disagrees with that of (Ahmed., *et al* 2019) who in their study reported that rams feed with 60:40 ratio *B. ruziziensis* to concentrate mixture in a total mixed ratio improved utilization, and gave the highest weight gain (5.5kg) and revenue (₦4887.7)

The interaction between breed and hay type indicates that the return obtained for each of the three breeds raised on *D. smutsii* hay was higher than those for their respective counterparts raised on *B. decumbens.* This could be attributed to the fact that *D. smutsii* hay had higher CP and ME than *B. decumbens* hay. Regardless of whichever hay was fed, Balami rams followed by Uda performed better t han Yankasa rams.

CONCLUSION

It was evident from this study that feeding different hay to rams positively altered the cost of production. It was concluded that feeding *D. smutsii* hay to rams supplemented with concentrate mixture improved income over expenses than when they were fed B. *decumbens.* Similarlly, Balami rams fed *D. smutsii* outperformed the other breeds. It was therefore recommended that farmers should match their selection of rams with a better forage for optimum profit realization in sheep production.

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Table 1: Chemical composition (%) and cost of *B. decumbens, D. smutsii* hay, Maize, maize offal, cottonseed cake

	Ingredients				
Nutrients (%)	*B. Decumbens*	*D. Smutsii*	Maize	Maize offal	Cotton seedcake
Dry Matter	91.21	94.63	91.18	91.95	91.83
Organic Matter	81.26	83.90	86.76	81.87	89.01
Crude Protein	4.56	5.76	8.31	11.69	28.58
Ether Extract	3.85	4.05	8.03	11.03	11.05
Crude Fibre	64.08	68.89	45.21	53.92	50.21
Neutral Detergent Fibre	44.09	42.21	48.01	45.21	47.23
Acid Detergent Fibre	45.35	43.12	43.27	34.99	42.35
Ash	8.76	8.92	11.02	10.05	4.98
ME (MJ/kg DM)	10.81	11.03	10.69	10.88	11.51
Cost (₦ per kg)	33.79	33.79	75.00	28.00	35.56

The ME values of the experimental feed ingredients were calculated as per Alderman and Contril (1985) as follows: ME= (MJ/kg DM) 11.78+0.00654CP+ (0.000665EE) ^{2} – CF (0.00414EE) - 0.0118A Where DM=Dry Matter, CP = Crude Protein, EE = Ether extract, CF = Crude Fibre, A= Ash, Naira =100 Kobo (₦)

Table 2: Ingredient, chemical composition and cost per kg of concentrate diet

Ingredients	(%)	Cost (₦per kg)
Maize	37.87	26.13
Maize offal	18.94	13.07
Cottonseed cake	39.19	27.04
Bone meal	2,50	1.72
Table Salt	1.50	1.03
Total	100	68.99
Chemical composition		
Dry matter	92.78	
Organic matter	81.23	
Crude protein	13.63	
Ether Extract	17.15	
Crude fibre	27.40	
Acid detergent fibre	45.95	
Neutral detergent fibre	56.27	
Ash	11.55	
ME (MJ/kg DM)	10.52	

The ME values of the experimental feed ingredients were calculated as per Alderman and Contril (1985) as follows: ME= (MJ/kg DM) 11.78+0.00654CP+ (0.000665EE) ^{2} – CF (0.00414EE) -0.0118A Where DM=Dry Matter, CP = Crude Protein, EE = Ether extract, CF = Crude Fibre, A= Ash

Table 3: Effect of breed on the economics of feeding *B. decumbens* or *D. smutsii hay* to Balami, Uda and Yankasa rams

Parameter	Breed		
	Balami	Uda	Yankasa
Cost of Concentrate Consumed (₦)	2,707.86	2,486.40	2,377.40
Cost of Hay Consumed (₦)	1,884.47	1,793.57	1,497.91
Cost of Total Feed Consumed (₦)	4,592.33	4,279.97	3,875.31
Total Cost Incurred (₦)	22,086.86	22,133.72	20,882.01
Final weight (Kg)	39.50	39.40	36.45
Weight Gain (Kg)	14.70	14.00	11.70
Selling Price (₦)	31,600.00	31,520.00	29,160.00
Income over Expenses (NR = TR-TVC) (₦)	9,513.14	9,386.28	8,277.99

Naira (= ₦), Kilogramme (Kg), Total cost incurred (cost of animals, cost of concentrate and cost of hay) Selling price (₦ 800.00/Kg live weight), Net return (NR), Total return (TR), Total variable cost (TVC), Income over expenses divide by Weight gain (IOE/WtG)

Table 4: Effect of hay type on the economics of feeding *B. decumbens* or *D. smutsii hay* to Balami, Uda and Yankasa rams

Parameter	Hay type	
	B. decumbens	*D. smutsii*
Cost of concentrate consumed (₦)	2,422.93	2,625.07
Cost of hay consumed (₦)	1,647.26	1,803.03
Cost of Total Feed consumed (₦)	4,070.19	4,428.10
Total cost incurred (₦)	21,521.86	21,879.76
Final body weight (Kg)	37.57	39.33
Weight gain (Kg)	12.57	14.37
Selling price (₦)	30,056.00	31,464.00
Income over Expenses (NR = TR-TVC) (₦)	8,534.14	9,584.24

Naira (₦), Kilogramme (Kg), Total cost incurred (cost of animals, cost of concentrate and cost of hay), Selling price (₦800.00/Kg live weight), Net return (NR), Total return (TR), Total variable cost (TVC), Income over expenses divide by Weight gain (IOE/WtG)

Table 5: Interaction effect of breed and hay type on the economics of feeding *B. decumbens* or *D. smutsii hay* to Balami, Uda and Yankasa rams

	Hay Type					
	B. decumbens			*D. smutsii*		
	Breed					
Parameter	Balami	Uda	Yankasa	Balami	Uda	Yankasa
Cost of Concentrate Consumed (₦)	2,496.06	2,493.30	2,279.43	2,922.42	2,476.74	2,475.36
Cost of Hay Consumed (₦)	1,783.77	1,703.69	1,454.66	2,065.24	1,803.03	1,525.96
Cost of Total Feed Consumed (₦)	4,279.83	4,196.99	3,734.09	5,437.82	4,542.74	4,542.74
Total Cost Incurred	22,985.86	21,088.78	20,013.18	24,187.66	22,734.78	21,176.97
Final Weight (Kg)	41.40	32.60	31.00	47.80	41.40	37.60
Weight Gain (Kg)	13.80	12.20	7.20	15.30	13.10	9.80
Selling Price (₦)	33,120.00	26,080.00	24,800.00	38,240.00	33,120.00	30,080.00
Income over Expenses (NR = TR-TVC) (₦)	10,134.14	4,991.22	4,786.82	14,052.34	10,385.22	8,903.03

Naira (₦), Kilogramme (Kg), Total cost incurred (cost of animals, cost of concentrate and cost of hay), Selling price (₦ 800.00/Kg live weight), Net return (NR), Total return (TR), Total variable cost (TVC), Income over expenses divide by Weight gain (IOE/WtG)