Feedlot Assessment of Four Indigenous Breeds of Cattle in Nigeria

*Madziga I.I, Alawa C.B.I., Lamidi O.S., Goska D.Y., A. A. Adesote[1]

National Animal Production Research Institute, Ahmadu Bello University, Shika-Zaria, Nigeria

[1]Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria

*ishakuemmanuel@yahoo.com

Abstract- An experiment was carried out to compare the feedlot assessment of four indigenous breeds of cattle in Nigeria. Ten bulls each of Bunaji, Rahaji, Sokoto Gudali and Azawak weighing between 200-235 kg, with each breed constituting a treatment in a completely randomized design were used for the study. The bulls were fed with sun dried layer litter in a concentrate mixture for 3 months. Significant (P>0.05) differences were observed in total and average daily weight gain and feed: gain ratio between breeds. Water intake was significantly (P>0.05) different across the breeds. Significant (P<0.05) difference was also observed in body condition score of the breeds. Bunaji recorded the highest value while Azawak had the least for body condition score. Rahaji, Sokoto Gudali and Azawak had significantly (P>0.05) better values of feed consumed than Bunaji. Similarly, income over feed cost and feed cost per gain were significantly (P<0.05) different cross the breeds. Rahaji and Sokoto Gudali had higher values for value of gain. It was concluded that fattening Rahaji, Sokoto Gudali and Azawak are more profitable than fattening Bunaji.

Keywords- Feedlot; assessment; indigenous breeds; cattle; Nigeria

I INTRODUCTION

Beef plays a significant role as a source of animal protein in Nigeria; it accounts for 45% of the total meat supply from domestic animals and its production is almost expensive with low inputs [1].

The reports on pilot institutional fattening trials in the country [2-7] are that the Zebu beef breeds in Nigeria tend to fatten at low weights of about 250kg- 330kg, were mainly on Bunaji and a few on Sokoto Gudali. Such works have not been done on either Azawak or Rahaji neither was the comparison between these breeds themselves and other breeds done but there are speculations that Azawak breed efficiently utilizes feed thereby fattening like the Bunaji.

The aim of this study therefore is to provide baseline information on the fattening ability of Azawak, Rahaji, Bunaji and Sokoto Gudali breeds of cattle fed the same diet in relation to White Fulani (Bunaji).

II MATERIALS AND METHODS

Study site

The study was carried out at the National Animal Production Research Institute, Shika-Zaria. NAPRI is situated in the Northern Guinea Savanna Zone of Nigeria between latitudes 11°N and 12°N and longitudes of 7°E and 8°E at the elevation of 640 meters above sea level.

Animals Management

Ten bulls each of Bunaji, Rahaji, Sokoto Gudali and Azawak breeds of cattle with live weights ranging between 200 and 235 kg divided into four groups in a completely randomized design were used for the study. The bulls were individually housed and fed .They were de-wormed with Albebdazole® against endo-parasites a week to the start of the experiment and dipped in acaricide - Amitix® solution to control ecto-parasites and proper sanitary condition was observed throughout the experimental period.

Experimental diets

The percent and chemical composition of the experimental diet is presented in Table I.

TABLE I INGREDIENTS (%) OF CONCENTRATE DIET

Ingredients	(%)
Maize offals	60
Cottonseed cake	20
Poultry litter	20
	100

Data collection

The bulls were individually pen fed a ration made up of 60% Maize Offal (MO), 20% Cotton Seed Cake (CSC) and 20% Sun dried Layer Litter (SDLL) as the diet. Left-over feed and water were weighed and measured respectively. Feed and water intake were then determined by the difference between offered and weighed back. At the end of the experiment, average daily and total feed intake, average daily and total water intake, weight gain, feed to gain ratio, feed cost per Kg, body condition score, income over feed cost and value of gain were computed.

Chemical analysis

Dry matter content of the feed samples was determined by drying at 60 °C for 48 hours in the laboratory. The samples were ashen by charring in Muffle Furnace at 500°C for about 6 hours [8]. The Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) of the feed samples and the dietary concentrate were analyzed according to the

procedure of [9]. The ether extract and crude fibre of the samples were determined.

Statistical analysis

All data generated from the study were subjected to analysis of variance (ANOVA) procedure of [10] in a completely randomized design. Duncan Multiple Range Test of the SAS package was used to compare treatment means that were significant. The model used was: $Y_{ij} = \mu + B_i + e_{ij}$

Where Y_{ij} = observation on the breed; μ= Overall mean; B_i = Effect of i_{th} Breed: 1, 2, 3, and 4;

e_{ij} = Random error. All statistical tests were done at 5% probability level.

III RESULTS

Chemical composition of experimental diet

Table II presents the chemical composition of the experimental diet. The diet used in this study had 92.37% DM, 19.63% CP, 27.40% CF, and 10.01% EE, 80.82% OM, 35.95% ADF, 51.27% NDF and 11.55% Ash. The ME (MJ/kg DM) is 10.52.

TABLE II CHEMICAL COMPOSITION (%) OF CONCENTRATE DIET

Chemical composition	(%)
Dry matter	92.37
Crude protein	19.63
Ether extracts	10.01
Organic matter	80.82
Acid detergent fibre	35.95
Neutral detergent fibre	51.27
Crude fibre	27.40
Ash	11.55
ME (MJ/kg DM)	10.52

The ME value of the experimental diet was calculated as per Alderman (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

Performance

The concentrate and hay intake (kg/day) of the bulls are shown in Table III. The concentrate intakes of 411.48kg, 408.22kg, 402.17kg and 403.80kg were recorded while the hay intakes of 403.86kg, 400.14kg, 407.17kg and 404.5kg were recorded for Bunaji Rahaji, Sokoto Gudali and Azawak respectively. There were significant (P<0.05) differences observed in both the concentrate and hay intakes between all the breeds. Total feed intake ranged between 808.00kg for Azawak and 815.00kg for Bunaji and there was no significant (P>0.05) difference noticed between the breeds. Similarly, daily feed intake which ranged between 8.98kg for Azawak and 9.06kg for Bunaji was not significantly (P>0.05) different between the breeds.

TABLE III PERFORMANCE OF FOUR INDIGENOUS BREEDS OF CATTLE FED CONCENTRATE MIXTURE AND DIGITARIA SMUTSII HAY

Parameters	Breeds				SEM	LOS
	Bunaji	Rahaji	S/Gudali	Azawak		
Conc. Intake (Kg)	411.48^a	408.22^a	402.17^b	403.80^b	4.53	*
Hay Intake (Kg)	403.86^b	403.86^b	407.17^a	404.57^b	3.03	*
Total Feed Intake (Kg)	815.00	809.00	809.00	808.00	6.45	NS
Daily feed intake (Kg)	9.06	8.99	8.99	8.98	0.07	NS
Initial weight (Kg)	210.00	209.00	210.00	210.00	1.04	NS
Final weight (Kg)	296.00^b	300.00^a	300.00^a	299.00^{ab}	1.99	*
Weight gain (Kg)	86.00^b	91.00^a	90.00^a	89.00^a	1.99	*
Average Daily Gain (Kg)	0.96^b	1.00^a	1.00^a	0.99^a	0.02	*
Feed: Gain Ratio (Kg)	9.48^c	8.89^a	8.98^a	9.08^b	0.17	*
Water Intake (l)	1743.00^b	1666.00^c	1786.00^{ab}	1835.00^a	30.98	*
Average Daily Water Intake (l)	19.00^b	18.50^c	20.00^{ab}	20.00^a	0.34	*
Intake as (%) body weight	3.06^a	2.98^b	3.00^b	3.00^b	0.02	*
Body Condition score						*
Initial	3.66^a	3.15^b	3.13^c	3.40^c	0.06	*
Final	8.20^a	8.02^b	7.58^c	7.84^d	0.09	*

^{a,b,c} = Means bearing different superscripts differ significantly(P<0.05), SEM = Standard Error of Means ; * = P<0.05, Kg = Kilogramme, l = litre; % = percent; NS= Not significant.

Values for total water intake were 1743.00l, 1666.00l, 1786.00l and 1835.00l for Bunaji, Rahaji, Sokoto Gudali and Azawak respectively. Daily water intake ranged between 18l for Rahaji and 20l for Sokoto Gudali and Azawak. Both the total and daily water intakes were significantly (P<0.05) different between the breeds with Azawak and Sokoto Gudali having the highest intake of 20L/day followed by Bunaji with 19L/day. Rahaji had the least (18 L/day) water intake which was statistically (P< 0.05) lower than other breeds.

The values of total body weight gain were 86.00, 91.00, 90.00 and 89.00 while the values of average daily weigh gain were 0.96, 1.00, 1.00 and 0.99 for Bunaji, Rahaji Sokoto Gudali and Azawak respectively. The results showed that there were significant (P>0.05) differences in total weight gain and average daily weight gain between the breeds. Rahaji, Sokoto Gudali and Azawak were significantly (P<0.05) similar and significantly (P<0.05) higher than Bunaji in both cases. The result showed the range of feed to gain ratio of 9.04 for Rahaji to 9.55 for Bunaji. The value of feed to gain ratio was significantly (P<0.05) higher for Bunaji while Azawak and Sokoto Gudali had similar values. Rahaji had the least value for feed to gain ratio and was therefore more efficient.

Economic evaluation

The result of economic evaluation of fattening the four breeds is presented in Table IV. It showed that there was significant (P<0.05) difference in the total cost of feed consumed among the breeds. Bunaji, Sokoto Gudali and Rahaji had N27, 913.00; N27,594.00 and N27,428.00 respectively and were significantly (P>0.05) similar but different from Azawak which had N27,263.00 which was

the least and better. Feed cost per kilogram live weight gain was significantly (P<0.05) higher in Bunaji with N327.00 while the other breeds had significantly (P >0.05) lower values of N308.00, N310.00 and N308.00 for Rahaji, Sokoto Gudali and Azawak respectively. Value of liveweight gain (N350/ kg liveweight) were also significant among the breeds. The values of liveweight gain were N36,247.00, N36,148.00 and N35,735.00 for Rahaji, Sokoto Gudali and Azawak that had significantly (P>0.05) similar values above Bunaji which had N34,470.00 and was the least. Similarly,   the values N8, 818.00, N8, 554.00 and N8, 472.00 for Rahaji, Sokoto Gudali and Azawk and N6, 556.00 for Bunaji were presented in Table 3 for for income over feed cost. The result showed that Rahaji, Sokoto Gudali and Azawak were significantly (P<0.05) similar and had better income over feed cost above Bunaji.

TABLE IV ECONOMIC EVALUATION OF FOUR INDIGENOUS BREEDS OF CATTLE FATTENED ON CONCENTRATE MIXTURE AND DIGITARIA SMUTSII HAY

Parameters	Breeds					
	Bunaji	Rahaji	S/Gudali	Azawak	SEM	LOS
Cost of feed cons. (N)	27,913.00[b]	27,428.00[a]	27,594.00[a]	27,263.00[a]	293.00	*
Income over feed cost (N)	6,556.00[b]	8,818.00[a]	8,554.00[a]	8,472.00[a]	664.00	*
Feed cost/gain (N)	327.00[b]	308.00[a]	310.00[a]	308.00[a]	5.00	*
Value of gain (N)	34,470.00[c]	36,247.00[a]	36,148.00[a]	35,735.00[b]	96.00	*`

a,b,c = Means bearing different superscripts differ significantly(P<0.05), SEM = Standard Error of Means ; * = P<0.05, Kg = Kilogramme, l = litre; % = percent; NS= Not significant, N= Naira

IV DISCUSSIONS

Chemical composition of the diet

The ME of the diet was 10.52 MJ/kg DM and it was within the range of 10 – 11.6MJ/kg DM recommended for bulls [10]. The CP of the diet was 19.63%. It was higher than 13% and 13% - 15% CP requirement of beef cattle stated by Rutherglen [11] and Aduku [12] respectively. The CF of the diet has exceeded the minimum level of 17% required by beef cattle [13]. The EE of the diet had exceeded the maximum recommended level of 6% for matured cattle [14]. This increase in the value of EE must have been due to the presence of cotton seed cake in the diet. The differences noticed in the chemical composition of the diet in the present study could be associated to the fact that some of the individual feed ingredients used in compounding the diet had high nutrients in them over the ones used by the earlier authors as the year of production, where they are produced in relation to the availability of nutrient in the soil on which they were produced and method of processing may be different.

Performance

There were differences in the hay and concentrate consumption across the four breeds of cattle even though some of them ate more of hay and others more of concentrate but this did not lead to any difference in the total feed intake among all the breeds. This may be because the

bulls have balanced for hay in the case of those that took less of concentrate while those that took less of hay balanced for concentrate. Daily feed intakes (8.94 – 9.06kg/day) were higher than (7.82 – 9.14kg/day) and (6.26 – 6.45kg/day) reported by [15] and [5] for Bunaji bulls in fattening trials.

The intakes of all the breeds expressed as percent of their body weight ranged from 2.98% – 3.06%. This finding agrees with the value of 3.00% observed by [16]. The intake as percent body weight of the animals is in line with their total feed intake as there was no difference in the take –off weight of all the bulls and they were all the between the ages of one and two. This implies that they all ate the same amount of feed. It also means that breed difference did not affect the feed consumption of all the breeds as they were all within the same range of weight at the start of the experiment.

Total and daily water intakes were different among the breeds. The values 18.52L/day – 20.39L/day were within the range of 15.1 – 71.9litres for growing and finishing cattle [17]. The low water intake by all the breeds could have been as a result of environmental temperature (21 – 27°C) since water intake by animals is highly influenced by environmental temperature and season [18]. Although the water intake was low, it had no effect the feed intake as well as the weight gains and the general performance of all the breeds. The reason for Rahaji breed taking less amount of water could be that this breed is found in far north the drier part of the country where it is used to taking little water. The clear reason why Azawak, S/Gudali and Bunaji took more water than the Rahaji breed is not unconnected to the fact that its total nitrogen output was higher which led to lower nitrogen retention than those of the other three breeds that had lower values for total nitrogen output that led to higher nitrogen retention thereby requiring a lot of water to neutralise the high concentration of ammonia that has resulted from the breakdown of nitrogen in the blood. This is in conformity with the finding of [19] who noticed increase in water intake and urine excretion when a diet containing a high level of non protein nitrogen. It also agrees with the report by [20] that bulls fed 50% of the protein in their diet as non protein nitrogen took more water than those bulls that had less non protein nitrogen in their diet. Another reason that could be advanced for the higher water intake by Azawak, Sokoto Gudali and Bunaji above Rahaji could be breed difference as it is also one of the factors that affect the water intake of animals.

There were significant (P<0.05) differences that existed in the weight gain of all the breeds as presented in Table III. The average daily weight gain obtained in this study is higher than the findings of [20] who reported 0.87kg but compares with the values   of 1.07kg/day reported by [5]. Rahaji, Sokoto Gudali and Azawak had similar values for feed to gain ratio and were lower than that of Bunaji. This indicates that these three breeds utilized their feed better than the Bunaji as smaller value of feed to gain ratio shows the efficient utilization of feed by an animal. The higher values of weight gain and lower values of feed to gain ratio obtained in this study for Rahaji, Sokoto Gudali and Azawak suggest that it is better for farmers to fatten these three

breeds than fattening Bunaji since their total intake were at par but out-performed Bunaji in terms of the traits aforementioned.

There was significant difference in the body condition score among the breeds. It was best for Bunaji at both the initial and final stages followed by Sokoto Gudali. The improvement observed at the final stage of the feeding trial in the body condition scores of the bulls showed that the feed was properly utilized by the animals. Bunaji was best in body condition score at both the initial and final stages probably because it has a better developed hump that is often lopsided and its rump is more rounded and well developed over those of the other breeds. This could also be because this breed is used to this environment than the others. It also agrees with the school of thought that animals with smaller frames tend to have better body condition scores than those with bigger frames as they tend to have more body reserve. Similarly, it also agrees with the report of University of Missouri Extension (2230) that two animals of similar live weight may differ considerably in BCS or an animal with a slightly lower body weight may have better BCS than the one with higher weight.

Economic analysis

From the result of the economic analysis, feed cost per gain was higher in Bunaji than the other breeds. Income over feed cost was similar and better in Rahaji, Sokoto Gudali and Azawak than Bunaji. In the same vein, value of gain appeared similar in Rahaji (N36,247.00), Sokoto Gudali (N36,148.00) and Azawak (N35,735.00) but better than Bunaji (N34,470.00). The implication of these is that fattening any of these three breeds will yield more money to a farmer since he will spend less on them to get one kilogramme of weight gain than fattening Bunaji although they all have the potentials for beef which was evidenced from their performances.

V CONCLUSION

On the basis of the findings of this study, it was generally observed that Rahaji, S/Gudali and Azawak breeds did better in most of the parameters measured. It was therefore concluded that they can fatten better than Bunaji.

VI ACKNOWLEDGEMENT

REFERENCES

[1] Olayiwole, M.B. (1982). Cattle feedlot operation in Nigeria. In Beef production inNigeria. Proceedings of National Conference on Beef production. pp. 310-337.

[2] Olayiwole, M.B., Ahmed, M.B. and Bell, T.D. (1975). Feedlot performance and carcass characteristics of steers fed high protein and high energy ratio. Nigerian Journal of Animal Production.2 (2):270-276.

[3] Olayiwole, M.B. and Fulani, I.J. (1980). Economics of Commercial Beef Production under feedlot system of management. In: ILCA, Addis Ababa (Ethiopia); Tropics of West Africa, Kaduna, Nigeria, 23rd -30th 1979.

[4] Olayiwole, M.B., Buvanendran, V., Fulani, I.J. and Ikhatua, J.O. (1981) Intensive fattening of indigenous breeds of cattle in Nigeria. World Review of Animal Production, Vol. XVII, No. 22. pp. 71-77.

[5] Ikhatua, U.J. and Olayiwole, M.B. (1982). Seasonal effect on performance of feedlot bulls. Journal of Animal Production Research 2(2): 99-111

[6] Lamidi, O.S., Adamu, A.M., Ehoche, O.W. and Alawa J.P. (2007). Replacement value of Sun-dried broiler litter for cotton seed cake in the fattening diets for Bunaji bulls. Journal of Animal Production Research 20(1&2): 99-112.

[7] Lamidi, O.S., Adeyinka, I.A., Alawa, C.B.I., Balogun, A. R., and Barje, P.P. (2008). Survey of Dry season feed Resources for smallholder fattening schemes in Northern Nigeria. Asian Journal of Animal and Veterinary Advances 3(2): 92-97.

[8] AOAC, (2000). Official Methods of Analysis. Volume 1. 17th ed. Association of Official Analytical Chemists, Washington, DC, USA.

[9] Van Soest, P. J., Robertson, J. B. and Lewis, B. (1991). Methods for Fibre and non Starch Polysaccharides in relation to animal nutrition. Journal of Dairy Science. 74: 3587-3597.

[10] SAS, (2002). Statistical Analysis System. Guide for personal Computers. Version 9. SAS Institute, Inc. Carry, N.C. USA.

[11] Rutherglen, D.C. (1995). Energy and Protien Requirements of Beef cattle. Victoria State Government Agricultural Notes. AG0374 ISSN 1329-8062.

[12] Aduku, A.O. (2005). Tropical Feeding stuff Analysis Table. Department of Animal Science, Ahmadu Bello University, Zaria-Nigeria.

[13] NRC (2000). Nutrient Requirements of Beef Cattle. 7th Revised Edition. National Academic, Press, Washington, DC, USA. Retrieved on 25th August, 2009 from http://www.nap.edu/books/0309069343/html

[14] Parish J.A. and Rhinehart, J.D. (2008). Energy in Beef Cattle Diets.Mississipi Agricultural and Forestry Experiment Station. Retrieved on 12th September, 2010 from wwwthecattlsite.com/articles/1653/energy in beef cattle diets

[15] Idowu, O.O. (2011). Comparative Evaluation of some Cereal by- products as Energy sources for fattening Beef cattle. M.Sc. Thesis. Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria.

[16] NRC (1996). Nutrient Requirements of Beef Cattle. National Academy of Science, USA.

[17] Gadberry, S. (2002). Water for beef cattle. Agriculture and Natural Resources. University of Arkansas Cooperative Extension Services. FSA 3021-PD-1-10RV.

[18] Arias, R.A. and Mader, T.L. (2008). Modeling daily water intake in cattle finished in feedlots. Nebraska Beef Cattle Reports. University of Nebraska, Lincoln.

[19] Wohlt, J.E., Sniffens, C.J. and Hoover, W.H. (1973). Measurement of protein solubility in common feedstuffs. Journal of Dairy Science. 56: 1052-1058.

[20] Lamidi, O.S. (2005). The use of some conventional non protein sources for fattening cattle. Ph.D. Thesis. Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria.