



Original Article

**Weight Gain and Economic Implications of Feeding Uda Rams with Graded Levels of Dietary Mineral Salt (Potash) in Tullun Gwanki Grazing Reserve, Silame Local Government Area, Sokoto State, Nigeria**

M.D. Baba<sup>1,\*</sup>, A.L. Ala<sup>2</sup> and M.A. Maikasuwa<sup>2</sup>

<sup>1</sup> Department of Agricultural Extension and Management, Kebbi State College of Agriculture Zuru, Kebbi State, Nigeria

<sup>2</sup> Department of Agricultural Economics, faculty of Agriculture, UsmanuDanfodiyo University Sokoto, Sokoto State, Nigeria

**ARTICLE INFO**

**Corresponding Author:**

M.D. Baba  
musababs1970@yahoo.com

**How to Cite this Article:**

Baba, M.D., A.L. Ala and M.A. Maikasuwa. 2015. Skin/Leather Quality of Some Sudan Goats under Range Condition. *Global Journal of Animal Scientific Research*. 3(2): 342-349.

**Article History:**

Received: 28 November 2014

Revised: 15 January 2015

Accepted: 22 January 2015

**ABSTRACT**

The study was conducted to examine weight gain and economic implications of feeding Uda rams with graded levels of dietary mineral salt (potash) in TullunGwanki Grazing Reserve, Silame Local Government Area, Sokoto State, Nigeria. TullunGwanki Grazing Reserve was purposively selected because of the predominance of pastoralists in the area. One hundred respondents were randomly selected from a list of four hundred and fifty pastoralists collected. All the sampled respondents were contacted and interviewed using a structured questionnaire. Feeding trial using sixteen growing uda lambs in a randomized complete block design was conducted. A complete diet was formulated and divided into four treatments; treatment A (control) without dietary mineral salt while treatments B, C and D contained potash at 1.25; 2.50 and 3.75kg/100/diet respectively. The animals were fed for the period of nine weeks in which daily records of feed and water intakes and weight gain were kept. Data were analysed using descriptive statistics, farm budgeting and analysis of variance. Duncan's New Multiple Range Test (DMRT) was used to separate the means where significant differences exist. The study showed that majority of the farmers (76%) practiced semi-intensive systems of management and most of them (64%) used common salt in feeding uda rams. The average quantity of dietary mineral salt used by the pastoralists in TullunGwanki grazing reserve was 2.5kg /100kg/ diet. Result of the experiment showed that treatment D gave the highest average daily gain at a feeding level of 3.75kg/100kg diet. Treatment D also gave the best result interms of cost of feed/kg live weight gain (962.83N/kg) as compared to treatments B and C. Similarly, net farm income obtained from the sale of uda under treatment D was highest. Based on the outcome of the study, it was concluded that, farmers in TullunGwanki Grazing Reserve were yet to exploit minerals to the maximum tolerable by uda sheep as they used 2.5kg rather than 3.75kg/100kg diet. Hence, it was recommended that 3.75kg/100kg diet should be used by pastoralists, and animal breeders since it gave the best result in terms of profit and weight gain.

**Keywords:** Weight gain, Economics, Implications, Feeding, Uda Rams, Mineral salt.

## INTRODUCTION

In Nigeria, animal production accounts for about one third of the agricultural contribution to the Gross Domestic Product (GDP) with provision of income, employment, power, organic manure and above all, provision of security in form of food (Nuru, 1986). Meat from sheep and goats accounted for 30% of the total meat consumption in Africa (Reed *et al.*, 1988 and Ajala *et al.*, 2004). Small ruminants (sheep and goats) are increasingly becoming a major source of ruminant protein in Nigeria, contributing over 30% of total meat consumption in the country (Opasina and David-West, 2007). The northern part of Nigeria is home to over 80% of the ruminant population in Nigeria with small ruminants occupying significant percentage especially in the small holder subsistence farmers. The feeding of these animals becomes a serious challenge to the farmers especially during the dry season when feed resources are scarce. During this period the available pasture are dried, lignified and not capable of meeting the nutritional requirement of the animal. Therefore the animal must be supplemented.

The mineral elements are separate entities from the other essential nutrients like proteins, fats, carbohydrates and vitamins. The mineral elements are known to assist the body in terms of enzymatic functions and maintenance of homeostasis. The deficiency of mineral salts causes animals to scavenge from dump refuse and therefore consumed undegradable materials such as polythene bags, rags and even metals. Adequate consumption of mineral salts enhanced feed utilization efficiency and healthy condition of the animal. This study is carryout to investigate weight gain and economic implication of utilizing graded levels of dietary mineral salt in the feeding of uda sheep in TullunGwanki Grazing Reserve, Silame Local Government Area, Sokoto State, Nigeria

## MATERIALS AND METHODS

The study was conducted in TullunGwanki Grazing Reserve, Silame Local Government Area of Sokoto State. The reserve is situated between latitudes 12° 54' and 13° 02' North and longitudes 4° 52' and 5° 00' East. It is located in the semi-arid Sudano-Sahelian ecological zone, at about 24km away from Sokoto town, along Sokoto/Silame road. The reserve is a public grazing area used on communal basis. It was surveyed in August, 1989 and gazette on the 10<sup>th</sup> day of June, 1991. It has a surface land area of 4,312.54 hectares.

The climate in TullunGwanki grazing reserve consists of a long dry season (October – May) and a short rainy season (June – September) with annual rainy season ranges 400-700mm (SADP, 1995). The rainfall increases both in quantity and intensity, from the Northern to the Southern parts of the state (SABAS, 1996). The dry season include a cold spell usually between November – January, known as the period of Harmattan. This is caused by dusty North –East trade wind originating from the Sahara desert. The temperature varies with wide limits, the mean monthly minimum and maximum temperature are 15<sup>o</sup> C and 40<sup>o</sup> C respectively, the maximum temperature occur in May. The soil is moderately deep and well drained (Adamu *et al.*, 1998).

### Sampling Technique and Sample Size

TullunGwanki Grazing Reserve was purposively selected due to its predominance among pastoralists in the area and also it is the biggest grazing reserve in the state. A list of one hundred and fifty (150) pastoralists were obtained from the village head out of which One hundred (100) livestock farmers were randomly selected. The one hundred and fifty pastoralists were numbered wrapped in paper and one hundred were picked out randomly and used for questionnaire administration.

### **Questionnaire Administration**

Data were obtained through the use of structured questionnaires which were used to collect information on demography, livestock production system, ownership pattern of the animals by the farmers, sources of foundation stock, inclusion of mineral salt in the feeds, type of mineral salt used for feeding sheep, quantity offered and the method of administration. A total of one hundred (100) questionnaires were used for collection of the information with the help of trained enumerators. The quantity of mineral salt given to the animal was monitored by randomly selecting the farmers and measuring the quantity they offered. The quantity was expressed as percentage per kg diet.

### **Experimental Animals and their Management**

Sixteen (16) growing Uda rams of six to seven (6-7) months of age with average weight of 15kg were purchased from markets in Sokoto State for the experiment. The animals were balanced for weight before they were allotted to treatment groups. They were quarantined for a period of two weeks in the Teaching and Research Farm of the University. All the animals were dewormed with Banminth IIR dewormer (12.5g/kg) body weight, sprayed against ectoparasites using triatic and treated with oxytetracycline (a broad spectrum antibiotic) by injection. Experimental animals were fed with cowpea husk and wheat offal before the commencement of the trial.

### **Experimental ingredients**

Feed ingredients which include maize grain, wheat offal, cowpea husk, soya bean meal, cowpea hay, rice milling waste (RMW) and the mineral salts (potash) were used to formulate the experimental diets. Maize were crushed and mixed with other feed ingredients for the preparation of the experimental diets.

### **Formulation of Experimental Diets**

One concentrate experimental diet was formulated for this study and divided into four parts in which part one has no dietary mineral salt which served as control (treatment A). Part two, potash was added at 1.25kg/100kg concentrate diet to serve as treatment B. Part three, potash was added at 2.5kg/100kg of the concentrate to serve as treatment C. Part four, potash was added at 3.75kg/100kg of the diet to serve as treatment D. Experimental diets were fed *ad libitum* for the period of nine weeks.

### **Experimental Design and Feeding Procedure**

A randomized complete block design (RCBD) (Steel and Torrie, 1980) was used for the experiment. Four (4) animals were allocated to each treatment. Each animal represent a replicate. Each group of animal were housed in clean and disinfected pens. Each group of animal were assigned to one of the experimental diets and roughage as basal diet to be fed *ad libitum* for the nine weeks of the experiment. Water intake was also monitored. Cost of purchasing the animals and feeding were determined with also returns and success of the enterprise at the end of the experiment using partial budgeting model.

### **Data Collection**

All animals were weighed prior to the commencement of the experiment and subsequently on the same day every week between 8.00am and 9.00am after overnight fasting to avoid error due to gut fill during the nine weeks of the experiment. Daily record of both feed and water intake were recorded throughout the feeding trial.

**Table1: Gross and Chemical Composition of the Concentrate Diet**

Feed ingredients	Inclusion level kg/100kg diet
Maize grain	10
Soya bean meal	15
Wheat offal	15
Cowpea husk	30
Cowpea hay	15
RMW	15
Total	100
Proximate analysis	
Crude Protein (%)	18.01
Energy (M.E) (Kcal/kg)	2681.37
Dry matter	96.75
crude fibre	23.25
Ether extract (EE)	6.25
ASH	9.75
Nitrogen free extract (NFE)	42.50
Proximate composition of potash	
Sodium (Na) (mg/kg)	127.5
Potassium (K) (mg/kg)	250
Calcium (Ca) (mg/kg)	0.25
Magnesium (Mg) (mg/kg)	1.0
Phosphorus (P) (mg/kg)	5.44

Source: Field Experiment, 2014

### Statistical Analysis

Simple descriptive statistics such as percentages, frequency, means and ranges were used to analyses the data generated from questionnaire administration. The data generated from the experiment were subjected to analysis of variance (ANOVA) using Statistical Package for Social Science (SPSS) Version 16. Duncan's New Multiple Range Test (DMRT) was used to separate the means where significant differences exist (Duncan, 1955).

Net farm income analysis was used to determine the level of profitability of feeding different sources of dietary salt to uda sheep. The net farm income of a farm enterprise is defined as the difference between the total gross income and the total cost of the enterprise (Olukosi and Erhabor, 1988).

$$\text{NFI} = \text{TGI} - \text{TC}$$

Where

NFI	=	Net Farm Income (₦)
TGI	=	Total Gross Income (₦)
TC	=	Total Costs (₦)

## RESULTS AND DISCUSSIONS

Table 2 shows information regarding utilization of dietary mineral salt by the respondents. Majority (64.0%) used common salt as dietary mineral for their flocks. This implies that common salt is preferred more than other forms of dietary mineral salt by the pastoralists. Only 11.0% use potash as dietary mineral indicating that potash is not a common source of dietary mineral in the study area. Denton (1967) noted that all mammals including sheep have the ability to taste salt and there is universal liking for it.

Majority (70%) of the pastoralist reported that they used different mineral salts because they are all financially affordable and hence, obtainable with ease. Information regarding the methods of feeding dietary mineral salts to uda ram indicated that 34% of the pastoralists feed the dietary mineral salt as brine; 21% of them feed the salt together with feed and 37% used it as licks for the animals. The system of management adopted by the majority (76%) of the pastoralists is semi-intensive system. Only 24.0% of the pastoralists use intensive system of

management. Semi-intensive is the prominent system of rearing sheep in the study area because they are transhumant who moved from place to place.

**Table 2: Utilization of Dietary Mineral Salt in Ruminant Feeding in Tullun Gwanki Grazing Reserve**

Variables	Frequency	Percentage
Types of dietary mineral salts used by pastoralists at TullunGwanki Grazing Reserve		
Common salt	64	64
Potash	11	11
Salt lick	4	4
Potash and common salt	6	6
Others	15	15
Total	100	100
Reasons why pastoralists use different salts at TullunGwanki Grazing Reserve		
Affordability	70	70
Accessibility	28	28
Others	2	2
Total	100	100
Methods of feeding dietary mineral salt at TullunGwanki Grazing Reserve		
In water	34	34
In feed	21	21
Licks	37	37
Water and feed	4	4
Water and licks	4	4
Total	100	100
Management system used by pastoralists at TullunGwanki Grazing Reserve		
Intensive	24	24
Semi-intensive	76	76
Total	100	100

Source: Field Survey, 2014

Table 3 shows weight gains of Uda Rams fed graded levels of dietary mineral salt (potash). Mean weight gain obtained in treatment D and C were statistically the same ( $P>0.05$ ) but significantly higher ( $P<0.05$ ) than the other treatment means. However, there was no significant difference between treatments A and B in terms of weight gain. The average daily gain (ADG) indicated that there were no significant difference ( $P>0.05$ ) between treatments C and D whose values were significantly higher ( $P<0.05$ ) than the rest of the other treatments. The result also indicated that treatment A was significantly higher ( $P<0.05$ ) than that of treatment B which gave the lowest value of average daily gain. The average daily gain obtained from the present study ranges from 17.86-75.40g/day with the highest value of 75.40 in the diet containing 3.75kg/100kg diet inclusion level of potash. The highest ADG (75.40g) recorded in this study was lower than that of Muhammad *et al.*, (2008) and Aruwayo (2008) who reported ADG of 109g and 80g/day respectively by uda lambs. Arigbedeet *al.*, (2007) reported ADG of between 41 - 95g/day when they fed hatchery waste meal to West African Dwarf sheep. This study was in agreement with Bibi-Faruk and Osinowo (2006) who reported ADG of 46 and 68g for yankasa sheep fed fresh *Ficusthonningi* leaves. The study was also closely in line with the work of Aruwayoet *al.*, (2007) who reported 80g ADG when they fed fore-stomach digesta and poultry litters waste to growing uda sheep in the same ecological zone. Maigandiet *al.*, (2002) reported average daily gain of 68-94g/day.

The lowest ADG was recorded for treatment B which was due to their low intake of all nutrients. The low ADG obtained in this study could be as a result of the period of the trial as the experiment was conducted during the raining season. Another possible reason was the fact that the animals used in the experiment are weaners who are trying to recover from post weaning effect. Treatment C containing 2.5kg/100kg diet inclusion level of potash is the optimum levels used by farmers which were obtained from the first experiment of this study. The result of the ADG shows that at higher level (3.75kg/100kg diet) better result was obtained therefore this indicate farmer's inadequate supply of mineral salt to their animals.

In terms of feed gain ratio, treatment B had significantly higher ( $P<0.05$ ) value compared with the other treatments. However there were no significant ( $P>0.05$ ) differences between

treatments A, C and D. There were no significant differences in terms of feed efficiency between treatments A and D and also that of treatments B and C. However treatments A and D gave the highest values.

**Table 3: Weight Gains of Uda Rams Fed Graded Levels of Dietary Mineral Salt (Potash)**

Parameter	Treatments				SEM
	A(0)	B (1.25)	C (2.5)	D (3.75)	
Initial weight (kg)	15.00	15.25	15.25	15.00	1.13
Final weight (kg)	17.23	16.38	18.88	19.75	1.72
Weight gain (kg)	2.23 <sup>bc</sup>	1.13 <sup>c</sup>	3.63 <sup>a</sup>	4.75 <sup>a</sup>	0.79
Average daily gain (g/d)	35.32 <sup>b</sup>	17.86 <sup>c</sup>	57.54 <sup>a</sup>	75.40 <sup>a</sup>	12.55
Feed gain ratio	12.33 <sup>b</sup>	23.88 <sup>a</sup>	15.88 <sup>b</sup>	12.11 <sup>b</sup>	2.87
Feed efficiency	0.09 <sup>a</sup>	0.05 <sup>b</sup>	0.07 <sup>b</sup>	0.09 <sup>a</sup>	0.01

a,b,c and d = means in the same row with different super scripts are significantly different (P<0.05)

Table 4 shows Cost of feed/kg live weight gain of Feeding Graded levels of Dietary Mineral Salts to Uda rams. The highest cost of feed was recorded in treatment D whose value did not differ significantly with that of treatment C. Though treatment A and B are significantly similar (P>0.05), treatment B recorded the lowest cost of feed per kg. Cost of feed/kg live weight gain was highest in treatment B (N1847.31) containing Potash at 1.25kg/100kg diet. This is probably attributed to high cost of feed and very low ADG obtained in the treatment. This indicated that it is more economical to produce growing sheep at 3.75kg/100kg mineral salt (potash) inclusion level in the diet.

**Table 4: Cost of Feed/kg Live Weight Gain of Feeding Graded levels of Dietary Mineral Salts to UdaRams**

Parameter	Treatments				SEM
	A(0)	B (1.25)	C (2.5)	D (3.75)	
Cost of feed consumed (N/day)	32.55 <sup>b</sup>	27.27 <sup>b</sup>	61.96 <sup>a</sup>	66.91 <sup>a</sup>	8.74
Cost of feed/kg live weight gain	939.97 <sup>b</sup>	1847.31 <sup>a</sup>	1243.18 <sup>a</sup>	962.83 <sup>b</sup>	222.86

a,b,c and d = means in the same row with different super scripts are significantly different (P<0.05)

Table 5 shows average cost and returns of feeding graded levels of dietary mineral salts to Uda ram for 9 weeks. The average total revenue generated from rams fed treatment A was ₦23357 and for treatment B it was N22208.50. The amount of revenue generated from feeding rams with treatment C was ₦25587.50 and for treatment D it was ₦26763. The average total cost for treatments A, B, C and D were N10761.59, ₦10707.70, N12645.67 and N12982.99, respectively. Net farm income for treatment A was ₦12595.41, for treatment B it was ₦11500.80, for treatment C it was ₦12941.83 and for treatment D it was ₦13780.01.

**Table 5: Average Cost and Returns of Feeding Graded levels of Dietary Mineral Salts to Uda Ram for 9 weeks**

Parameters	Treatments			
	A (0)	B (1.25)	C (2.5)	D (3.75)
<b>Cost (₦)</b>				
Cost of animals (₦)	7500.00	7500.00	7500.00	7500.00
Medicals ₦	187.5	187.5	187.5	187.5
Labour ₦	550.00	550.00	550.00	550.00
Feeders and drinkers(₦)	380.00	380.00	380.00	380.00
Cost of feed consumed (₦)	2050.34	1997.70	3903.17	4215.49
Cost of water consumed (₦)	93.75	92.50	125.00	150.00
Total cost (₦)	10761.59	10707.70	12645.67	12982.99
<b>Revenue</b>				
Manure sales(₦)	70.00	70.00	70.00	70.00
Sales of rams ₦	23287.00	22138.50	25517.50	26693.00
Total revenue (₦)	23357.00	22208.50	25587.50	26763.00
Net farm income (₦)	12595.41	11500.80	12941.83	13780.01

Source: Field Survey, 2014

The result indicated that animals in treatment D consumed more feed. This could be because treatment D contained higher level of dietary mineral salt and hence acceptability was

high. In the case of water consumed by the experimental animals, the table showed that animals in treatment D and C consumed more water than treatment A and B because the dietary mineral salt in treatment D and C were higher than in treatments B and A had no dietary mineral salt. This corresponds with the report of Church (1976); Devendra and Mcleroy (1982); Okorie (1983) and Chesworth (2006) who observed water intake of sheep to increase as salt content increases in the diet. Sales of rams from the table indicated that treatment D was sold higher this was because they gained more weight than the other treatments. From the results rams fed graded level of potash in treatment D gave the highest net margin and hence more profitable.

## CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, it was concluded that, semi-intensive management system prevailed and common salt was predominant in raising uda ram in the study area. Farmers in Tullun Gwanki Grazing Reserve were yet to exploit minerals to the maximum tolerable by uda sheep as they used 2.5kg/100kg diet rather than 3.75kg/100kg diet. Hence, it was recommended that 3.75kg/100kg diet should be used by pastoralists, and animal breeders since it gave the best result in terms of profit and weight gain.

## REFERENCE

- Adamu, A.Y., M.G. Lawal, and U.A. Birnin – Yauri. 1998. Analysis of irrigation water in fadama areas of Sokoto State. Fadama Users Association Reports, Sokoto Agricultural Development Project (SADP) (NFDP) Sokoto State, 29p.
- Ajala, M.K., J.O.Gefu, and A.K. Mohammed. 2004. Constraints associated with small ruminant production in Giwa Local Government Area of Kaduna State, Nigeria. *Tropical Journal of Animal Science*. 7(2):21-27.
- Arigbede, O.M., B.O.Odigwua, O.A. Oni and O.A. Isah. 2007. Effect of graded levels of hatchery waste meal inclusion on nutrient intake, digestibility and performance of West African Dwarf rams. *Tropical Journal Animal Science*. 10(1-2): 423 – 428.
- Aruwayo, A., S.A.Maigandi, B.S.Malami and A.I. Daneji 2007. Performance of lambs fed fore-stomach digesta and poultry litter waste. *Nig .J. Basic Appl. Sci*. 15(1-2): 86-93.
- Chesworth, J. 1992. The Tropical Agriculturalists (Ruminant Nutrition). Technical Centre for Agriculture and Rural Cooperation. CTA Wageningen, Netherlands. Macmillian Publishers. Oxford. 148p.
- Church, D. C. 1978. Livestock feeds and feeding. Oxford Press, Portland, Oregon.
- Devendra, C., and G.B. Mcleroy. 1982. Goats and Sheep production in the tropics. Longman, U.K, pp:165-177.
- Duncan, D.B. 1955. Multiple Range and Multiple F-tests. *Biomet*. 11: 1-42.
- Maigandi, S.A., H.M. Tukur and A.I. Daneji. 2002. Fore-stomach digesta in the diet of growing sheep 1. Performance and economics of production *Sokoto Journal of Veterinary Science*. 4(2): 16-21.
- Muhammad, N., S.A. Maigandi, W.A. Hassan and A.I. Daneji2008. Growth performance and economics of sheep production fed varying levels of rice milling waste. *Sokoto Journal Veterinary Science*. 7(1): 59-64.
- Nuru, S. 1986. Animal Agricultural Research and its contribution to food production, Proceedings of the 22<sup>ND</sup> Annual Conference of Agricultural society of Nigeria. 1<sup>st</sup> – 3<sup>rd</sup> Sept., 1986. Ahmadu Bello University, Zaria, p:1.
- Okorie, J. 1983. A guide to Livestock Production in Nigeria. Macmillian Education Ltd., London. 187p.
- Olukosi, J.O., and P.O. Erhabor. 1988. Introduction to Farm Management Economics; Principles and Application. Agitab Publishers Ltd. Zaria.
- Opasina, B.A., and K.B. David-West. 2007. Position paper on Sheep and Goats production in Nigeria. Sheep and Goat meat production in the humid of West Africa. FAO Corporate Document Repository. <http://www.fao.org/dorep/004/s8374s8374b20.htm>.
- Reed, J., C.Ebong, J. Tanner, G.Geburu, and W.N. Akale. 1988. The nutritive value and uses of feeds for fattening small ruminants in African highlands. A perspective of ILCA research. *Small Ruminants Research Network Newsletter* 12:10-27.
- SABAS. 1996. Detailed soil survey report of Fadama Agricultural Lands Sokoto Agricultural Development Project, Sokoto Nigeria. Approtech Project Limited Toronto, Ontario, CANADA, SABAS, Conculancy Services India.

- SADP. 1995. Sokoto Agricultural Development Project. Soil fertility Report of central zone Sokoto State, Technical Services Division (NATSP). 36p.
- Steel, R.G.D., and J.H. Torrie. 1980. Principles and Procedures of Statistics, McGraw Hill Book Co. Inc. N.Y.