Performance and cost of production of fattening Uda sheep fed diets containing different energy levels in a semi-arid environment

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Abstract

An experiment was conducted to determine optimum energy level for fattening Uda sheep in a semi arid environment. Twenty entire male animals with an average weight of 29kg were used in a completely randomized experimental design (CRD). The animals were fed diets containing 2200, 2400, 2600 and 2800 kcals metabolizable energy (ME) / kg of diet. The findings of the study revealed that dry matter (DM) intake and live weight gain (LWG) increased with increasing energy level (P<0.05). Beyond 200 kcals ME / kg, DM intake and LWG tended to decrease (P>0.05). Fattening animals fed diets containing 2600 and 2800 kcal ME / kg were the same (P>0.05) in terms of LWG. Cost of feed / kg LWG was lower for the animals fed diet containing 2600 kcals ME / kg. It was concluded that the optimum energy level found suitable for fattening Uda sheep in semi-arid zone was 2600 kcal ME /kg. The energy value observed from the study could be used by livestock keepers who intend to grow or fatten animals. Studies should be carried out to evaluate the energy requirement of other sheep breeds; so also mineral and vitamin requirements for growth and fattening.

Keywords: Uda sheep, fattening, energy, cost, diet

Introduction

Energy for production represents the amount of energy supplied by a diet which exceeds the requirements for maintenance and which leads to the process of production. The most obvious use of this extra energy is in fattening (Khan and Scott, 2005). The use of metabolizable energy varies between species and between types of production to which animals are put. It also varies between the types of product to which the energy contributes (NRC, 1985; McDonald *et al*., 2002). The metabolizable energy requirement of sheep also varies with age and live weight (Paul *et al*., 2003; Mendel *et al*., 2004; Ledin, 2004). The main aim this experiment was to determine the optimum energy requirement for fattening Uda sheep in the semi-arid region of north western Nigeria.

Methodology

A study was conducted at the Usmanu Danfodiyo University Livestock Teaching and Research Farm. The farm is located within the main campus of the University about 10 km north of Sokoto metropolis in Wamakko Local Government area of Sokoto State. Before the commencement of the experiment, the animals were dewormed with Banmith II® (12.5mg / kg body weight) and sprayed with Triatic® against ecto-parasites. The

animals were also treated against bacterial infections with oxytetracycline HCl (a broad spectrum antibiotic). Feed ingredients used in the preparation of the experimental diets included rice offal, cotton seed cake, groundnut cake, cowpea husk, wheat offal, cowpea hay, maize, bone meal and vitamin and mineral premix. Four experimental diets (designated as diets 1, 2. 3 and 4) were formulated to contain 2200, 2400, 2600 and 2800 (ME)/ kcal / kg. The gross and chemical compositions of the experimental diets are shown in table 1. A completely randomized experimental design (CRD) (Steel and Torrie, 1980) was used in the experiment. Five Uda rams with an average weight of 29 kg were allocated to each dietary treatment. The feeding trial lasted for 90 days during which feed intake, water intake and live weight changes were monitored. Feeding was done once daily. The cowpea hay and the concentrate (i.e. remaining mixture of the diet) were given to the animals separately at the same time. Concentrate, hay and water intakes were calculated by subtracting the left over from the quantities offered the previous day.

Table 1: Gross and chemical compositions of experimental diets fed to fattening Uda sheep

	Treatments (Energy level ME/ kcal /kg)			
Ingredient (%)	**1 (2200)**	**2 (2400)**	**3 (2600)**	**4 (2800)**
Maize	20.46	29.98	38.65	48.57
Cowpea husk	12.55	12.75	15.70	18.48
Cotton seed cake	10.98	12.58	14.70	16.86
Rice bran	12.65	6.44	0.95	0.00
Cowpea hay	39.86	34.75	26.50	12.59
Salt	0.50	0.50	0.50	0.50
Bone meal	2.50	2.50	2.50	2.50
Premix	0.50	0.50	0.50	0.50
Total	**100**	**100**	**100**	**100**
Calculated nutrients contents				
Energy ME/ kcal /kg	2200	2400	2600	2800
Crude protein (%)	12.0	12.0	12.0	12.0
Crude fibre (%) 23.82	21.82	19.80	16.23	

Thoroughly mixed representative samples of the experimental diets and faeces were analyzed for proximate components using the procedures of A.O.A.C. (1990). Data generated from the experiment was subjected to analysis of variance using Statview Statistical Package (SAS, 1998). Least significant difference (LSD) was used to separate the means at 5% level of significance.

Results and Discussion

Proximate composition of the experimental diets

Dry matter, NFE and lipid contents of the experimental diets increased with increasing energy levels, while ash content decreased. The crude protein content of the diets slightly increased from treatment 1 to treatment 4 (table 2).

Table 2: Proximate composition of the experimental diets fed to fattening Uda sheep

Parameter (%)	Treatments (Energy level)			
	1 (2200)	**2 (2400)**	**3 (2600)**	**4 (2800)**
Dry matter (DM)	94.93	95.81	96.17	96.24
Crude Protein (CP)	11.88	11.97	12.26	12.31
Crude Fibre (CF)	25.03	23.67	21.60	19.31
Ether Extract (EE)	5.57	6.30	8.40	9.20
Nitrogen free Extract	41.18	43.84	44.44	46.72
Ash	11.27	10.03	9.47	8.70

DM and energy intake, live weight gain, FCR and DM intake as % body weight Total DM intake was higher (1.3 kg / day) for treatment 3 compared to the other treatments ($P<0.05$). Energy intake increased from 2609 kcals / day for treatment 1 to 3468 kcals / day for treatment 3 ($P<0.05$), and then slightly declined to 3388 kcals / day for treatment 4 ($P>0.05$) (table 3). Final live weight of the experimental animals increased from 34 kg for treatment 1 to 44 kg for treatment 3 ($P<0.05$) and then declined to 43 kg for treatment 4 ($P>0.05$). ADG (g / d) increased from 58 for treatment 1 to 180 for treatment 3 and then declined to 163 for treatment 4 ($P>0.05$). Inversely, DM intake as % body weight decreased from 3.5 for treatment 1 to 2.9 for treatment 4 ($P<0.05$). Feed conversion ratio decreased from 20.3 for animals on 2200 ME kcal /kg to 15.39 for those on 2400 ME kcals /kg and 7.6 for those on 2600 and 2800 ME kcal /kg ($P<0.05$) (table 3).

Table 3: Live weight gain, FCR and DM intake as % body weight of fattening sheep fed diets containing different energy levels.

Parameter	Treatments (Energy level)				
	1 (2200)	**2 (2400)**	**3(2600)**	**4(2800)**	**SEM**
Initial weight (kg)	29.20	29.20	29.1	29.2	1.96
Feed intake (kg/day)	1.19^{c}	1.25^{b}	1.36^{a}	1.21^{bc}	0.018
Dry matter intake (kg/day)	1.14^{c}	1.16^{b}	1.30^{a}	1.20^{bc}	0.017
Energy intake (Kcal/day)	2608.52^{c}	2988.29^{b}	3467.91^{a}	3387.88^{a}	48.02
Final weight (Kg)	34.10 ^{b}	36.0 ^{b}	44.2 ^{a}	42.9 ^{a}	1.99
Live weight gain (kg)	4.90 ^{c}	6.80 ^{b}	15.10^{a}	13.70^{a}	0.56
Average daily gain (g/d)	58.33^{c}	80.95^{b}	179.76^{a}	163.09^{a}	6.66
Daily dry matter intake as % body weight	3.51^{a}	3.48^{a}	3.08^{b}	2.85^{b}	0.13
Feed conversion ratio	20.34 ^{a}	15.39 ^{b}	7.60 ^{c}	7.60 ^{c}	0.38

a, b, c Means in the same row with different superscripts are significantly different (P< 0.05)

Feed cost

Cost of feed increased from ₦52 / kg for treatment 1 to ₦65 / kg for treatment 4 (table 19). Cost of feed consumed increased from ₦5167 for treatment 1 to ₦6975 for treatment 3 and then declined to ₦6588 for treatment 4 (P<0.05). Cost of feed / kg live weight gain was lowest for treatments 3 (₦462.9) and 4 (₦489.0) compared to treatment 2 (₦869.3), which was in turn lower than the ₦1055.7 observed for treatment 1 (P<0.05)(table 4).

Table 4: Feed cost of fattening sheep fed diets containing different energy levels

Parameter	Treatments (ME (kcal/ kg)				
	1 (2200)	**2 (2400)**	**3 (2600)**	**4 (2800)**	**SEM**
Cost of feed (₦ / kg)	51.88	56.46	61.16	64.82	
Total feed intake (kg)	99.60^{b}	104.59^{b}	114.04 ^{a}	101.64^{b}	1.70
Cost of feed consumed (₦)	5167.14^{d}	5906.20^{c}	6974.81^{a}	6588.05^{b}	98.41
Cost of feed / kg live weight gain (₦/kg)	1055.70^{a}	869.28^{b}	464.89^{c}	489.06^{c}	23.59

a, b, c Means in the same row with different superscripts are significantly different (P< 0.05)

The DM content of the experimental diets was similar to the values reported for a number of tropical feed stuffs (Aduku, 1993; Payne and Wilson, 1999; Maigandi and Nasiru, 2006). The decrease in CF contents with increasing energy levels could be due to decrease in the contents of high fibre ingredients (such as hay) and increase in low fibre ingredients such as maize. High fibre ingredients are characterized by high content of silica which contributes to ash content (Oyenuga, 1968; Ademosun, 1985). This could explain the decrease in the ash contents of the diets with increasing energy levels. The increase in the lipid content as energy density increased might be attributed to the increase in the quantity of cotton seed cake in the diets with increasing energy levels. The fibre levels of the experimental diets were within the range recommended for sheep (NRC, 1985). The crude protein contents of the diets were similar. They are close to the recommended value for sheep (ARC, 1990). It was observed that DM intake increased when energy density of the diets increased from 2200 kcals / kg of ME to 2600 kcals/ kg of ME. Above 2600 kcals / kg, DM intake slightly dropped. This is because ruminants generally consume feed to satisfy their energy requirements, beyond which the animal could suspend intake (Paul *et. al.,* 2003; Mendel *et al.,* 2004). The significantly lower weight gain experienced by animals on treatment 1 might be due to their lower feed and nutrient intakes. The non significant difference in LWG and ADG observed between the animals fed 2600 and 2800 kcals / kg could be due to the non significant difference in their energy intake. The energy value of the feed fed to the animals with the best performance (2600 and 2800 Kcals/ Kg) was below the recommended value of 3272 kcal / kg by NRC (1991) and 3400 kcal / kg by Taylor and Field (2004) for fattening sheep. The higher feed conversion ratio obtained for animals on treatment 1 (2200 kcals / kg) was due to their lower feed intake and LWG. Total Cost of feed consumed was higher for treatment 3 partly because animals in this treatment had the highest feed intake and partly due to the increase in the cost of feed with increasing energy level. However cost of feed per kg live weight gain decreased with increasing energy level. Treatment 1 had the highest cost of feed per kg live weight gain due to the fact that animals on that treatment had the lowest LWG. The non significant difference observed between treatments 3 and 4 in cost of feed per kg live weight gain indicates that these two treatments are the most economical for fattening sheep in this ecological zone.

Conclusion

DM and nutrients intake and LWG were higher for animals fed 2600 and 2800 ME kcals / kg of diet. Cost of feed per kg live weight gain was lower for animals fed diets containing 2600 ME/ kcals kg although not significantly different from those fed 2800 kcals ME/ kg. It was concluded that 2600 ME/ kg is the optimum energy level for fattening sheep in a semi-arid environment.

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