FEEDLOT PERFORMANCE AND CARCASS TRAITS OF YANKASA RAMS. I — EFFECT OF VARYING THE CONCENTRATE TO ROUGHAGE RATIO

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SUMMARY

Thirty-five Yankasa rams initially weighing 22.5kg on the average were individually fed one of five diets formulated to differ in the roughage to concentrate ratio: 7:30, 60:40, 50:50, 40:60, 30:70. The diets were isonitrogenous and isocaloric. Average daily gain (ADG) and feed efficiency showed a linear response to increasing levels of dietary concentrate. Feed intake on the other hand did not reveal any significant difference. Both dry matter and nitrogen digestibility tended to increase with increasing dietary concentrate. Dressing percentage, kidney and mesenteric fats also increased with increasing concentrate level. Given the overall performance and current prices of feedstuffs, rams and mutton, it would seem that 50 to 60% dietary concentrate is optimal for fattening.

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INTRODUCTION

About 50% of the total sheep population in Nigeria are managed by nomads. As such, production is by the traditional system of husbandry in which the majority of the sheep depends on the overgrazed ranges for their subsistence. The production system is therefore not efficient enough to meet the present needs nor the increasing demand for mutton which was estimated to rise by 70% by the year 1979/80 (F.A.O. 1966).

It is therefore necessary to study the feedlot performance of sheep in the hope that the intensive/improved system of husbandry would improve the meat production. However, in intensive system of husbandry, feed cost forms a major part of the total production cost, even though fast gains are usually achieved. Nevertheless, fast gains are not necessarily the most economical gains. it may therefore be easier for a farmer with limited resources to feed his flock on a diet with greater proportion of roughage. And since meat sales in Nigeria are not based on quality grades, the farmer will not face financial disadvantage since both premium and less quality meat attract identical price. This study was therefore designed to study the performance of rams on varying concentrate: roughage ratios and certain aspects of the cost of production.

MATERIALS AND METHODS

Fourty Yankasa rams (Adu and Ngere, 1979) about 1½ years old were purchased from the open market and quarantined mostly indoors in a roofed barn with concrete floor and half walls. During this time, they were group-fed native hay (*Andropogon* and *Hyparrhenia* spp. predominating) and supplemented with corn. They were also dewormed with Thiabandazole (Merck, Sharp and Dohme, MSD) and treated for external parasites with Lindane. The deworming and dipping exercises were repeated after three weeks.

Approximately six weeks from the date of purchase, 35 rams with average initial weight of 22.5kg were selected and randomly assigned to the five dietary treatments which were roughage to concentrate ratios of 70:30, 60:40, 50:50, 40:60 and 30:70 for treatments 1 to 5 respectively. *Chloris gayana* hay (approx. 6% CP) was fed as the roughage and the composition of the diets fed is given in

Table 1. The diets were formulated to be isocaloric and isonitrogenous. The rams were individually penned and fed the experimental diets once daily in the morning for the 84 days of the study. The concentrate portion was first fed and the roughage was fed about 2hrs. later. Feed refusals were collected every day before feeding and weighed; and based on this, adjustments were made in an attempt to maintain the desired ratios. Water and feed were made available *ad libitum*. Rams were weighed at the initiation of the study and thereafter biweekly till the end of the study. The weights were taken after fasting (without feed and water) for about 15hrs. The initial and final weights were the average of weights taken on two consecutive days at the beginning and end of the study, respectively.

TABLE 1

Percentage Composition of the Supplements

	Treatments				
	1	2	3	4	5
Roughage: Concentrate	**70:30**	**60:40**	**50:50**	**40:60**	**30:70**
Salt	1.67	1.25	1.00	0.83	0.71
Bonemeal	3.33	1.875	1.50	1.25	0.76
Tracemineral premix	0.83	0.625	0.50	0.42	0.36
Vitamin A+	+	+	+	+	+
Groundnut cake	53.67	41.40	28.16	23.22	16.7
Maize	40.50	54.85	68.84	74.27	81.47
Chemical analysis of diets:					
Gross Energy (MJ/kg DM)	15.95	16.45	16.74	16.75	16.76
Crude protein	14.6	15.20	14.2	14.7	14.1

+Was added to provide 10,000 IU/head/day.

After the final weights were taken, five rams were selected and slaughtered (Adu and Brinckman, 1981) for carcass analysis. Immediately after slaughter, the carcasses were weighed, washed and chilled (5°C) overnight. Each chilled carcass was then re-weighed and split into two along the spinal column before jointing (Umunna and Maisamari, 1981) into wholesale (prime) cuts which were also weighed. The carcass dressing percentage was based on the hot carcass weight while the percentage yield of the various cuts was based on the chilled carcass weight.

Digestion Study:

Two digestion trials were undertaken using 10 and 15 rams respectively. The rams were fitted with faecal collection harnesses and then placed in metabolism cages. They were fed to appetite with the assigned diets once daily throughout the 15 day preliminary and 10 day total faecal collection periods.

The feeds, orts and faeces were handled by standard procedure and proximate components were determined according to A.O.A.C. (1970). The data were analysed statistically and treatment means compared by Duncan's Multiple Range test as outlined by Steel and Torrie (1960).

RESULTS

Average daily gain (ADG) (Table 2) showed a linear response to level of

dietary concentrate. The ADG of rams on treatment 1 (the high roughage diet) was significantly ($P < 0.05$) lower then those on treatments 3, 4 and 5 (the high concentrate diets). The ADG of rams on treatment 2 was also significantly ($P < 0.05$) lower than for those on treatments 4 and 5. There was however no significant difference between the ADG of rams on treatments 1 and 2, treatments 2 and 3 or treatments 4 and 5.

TABLE 2
Results of the Fattening and Digestibility studies

	Treatments				
	1	2	3	4	5
Number of animals	7	7	7	7	7
Mean initial weight (kg)	22.6	22.3	22.4	22.5	22.5
Mean final weight (kg)	27.8	28.8	30.4	31.4	32.9
Mean daily gain (g/day)	61.9^{a}	77.4^{ab}	95.2^{bc}	106.0^{c}	123.8^{c}
Feed: gain ratio	14.5^{c}	12.3^{bc}	9.7^{ab}	8.7^{a}	7.2^{a}
Mean daily DM intake (g/day)	899.8	949.2	921.1	890.4	± 10.24
DM intake expressed as % of body weight	3.57	3.72	3.49	3.41	3.21
Dry matter digestibility (%)	65.4^{a}	72.7^{ab}	66.7^{a}	72.8^{ab}	77.3^{a}
Nitrogen digestibility (%)	68.5^{a}	73.7^{ab}	69.7^{a}	71.9^{ab}	75.2^{b}

^{a,b,c}Means in the same row bearing different superscripts are significantly different (P 0.05).

Whereas ADG was significantly affected by dietary concentrate levels, feed intake on the other hand was not, but there was a tendency towards reduced intake as the concentrate level increased.

Feed efficiency increased linearly from treatments 1 to 5. Rams on treatments 3, 4 and 5 had significantly ($P <$ 0.05) better feed efficiency than those on treatments 1 and 2. There was however no significant ($P >$ 0.05) differences in feed efficiency between rams on treatments 1 and 2.

Both dry matter and nitrogen digestibility tended to increase with the addition of concentrate in the diet; this became significant ($P <$ 0.05) at the highest level of dietary concentrate (treatment 5).

The carcass data are shown in Table 3. Though carcass dressing percentage tended to increase with increasing levels of dietary concentrate, only the value for rams on the high roughage diet (treatment 1) was significantly ($P < 0.05$) lower than those of the other treatments. The yield of wholesale cuts was not significantly affected by the treatments. Kidney and mesenteric fat showed a linear response to level of dietary concentrate. The total offal fat (kidney + mesenteric) increased from 0.181 to 1.05kg for treatments 1 to 5

TABLE 3
Carcass traits

	Treatments				
	1	2	3	4	5
Mean dressing %	39.1^{a}	42.6^{ab}	43.5^{ab}	44.0^{b}	43.4^{ab}
Mean % yield of wholesale cuts	92.2	94.2	92.7	94.2	91.7
Mean kidney fat (kg)	0.08^{a}	0.14^{a}	0.22^{ab}	0.30^{b}	0.50^{a}
Mean mesenteric fat (kg)	0.10^{a}	0.20^{ab}	0.46^{ac}	0.56^{c}	0.55^{c}

$^{+}$Included the long leg.

^{a,b,c}Means in the same row bearing different superscripts are significantly different (P 0.05).

DISCUSSION

The significant increase in daily liveweight gain with increasing levels of dietary concentrate is in agreement with what some previous workers had reported both with sheep and cattle (Adu and Brinckman, 1981; Adeleye and Ikhatua, 1977; Levy *et al.* 1975). However, this increase in daily liveweight gain cannot be attributed to differences in daily dry matter intake since this did not significantly differ among treatments. Rather it could be related to the better utilization of the low roughage diets by the rams. The rams on treatments 4 and 5 were approximately 41% more efficient in converting energy into liveweight than those on high roughage (treatments 1 and 2) diets. Levy *et al.* (1975) had made a similar observation. They had shown that animals fed *ad libitum* on low roughage diet will increase daily gain and improve feed conversion more than those on high roughage because of the higher efficiency with which the energy of concentrate feed was utilized in the fattening process.

The higher mean daily liveweight gain observed on the 50 to 70% concentrate levels was similar to the results of Marsh (1975) who reported greater gains by calves offered 50 to 70% concentrates. In general however, the gains are fairly low when compared with the gain of temperate sheep and some tropical breeds (Appleman, 1970; Ramadan and Robinson, 1972). Nevertheless, the gains compared well with those of other sheep fed diets with comparagle energy levels (Umunna and Maisamari, 1981).

Feed intake tended to decrease with increasing dietary concentrate. For example, the average intake expressed as percentage of body weight for rams on the high roughage diets (treatments 1 and 2) was 3.65% compared to 3.31% for those on the high concentrate diets (treatments 4 and 5). It has been shown that ruminants would consume more of a diet high in roughage especially when it constitutes up to half of the diet than a diet low in roughage (Levy *et al.* 1975).

The continued improvement in efficiency of feed utilization up to the highest level of concentrate (70%) was contrary to the findings of Gilliepie and McLaughlin (1977) and Adu and Brinckman (1981), who reported that efficiency of feed utilization declined after 50% oat inclusion and 47% dietary concentrate level, respectively.

Both dry matter and nitrogen digestibility tended to increase with increasing level of concentrate in the diets. This is in agreement with the previous report of Adeleye and Ikhatua (1977). However, on the 50% concentrate diet, digestibility was depressed. The reason is not immediately understood. It is however known that the faster digestion of the concentrate portion of the diet is capable of altering the ruminal pH in such a way that it could reduce the cellulolytic microbial population or cause a decline in their activity. Either action would cause a reduction in the digestibility of the roughage portion (50% in this diet) with a consequent total reduction in apparent digestibility (Head, 1953 and El Shazly *et al.* 1961). However, since the diets with the higher levels of concentrate inclusion did not show similar declines in digestibility one wonders if the pH effect could be implicated.

The dressing percentage obtained in this study though lower than those reported by Umunna and Maisamari (1981) were within the range reported for the breed (Adu and Ngere, 1979). Whereas the percentage yield of prime cust did not significantly differ across treatments, kidney and mesenteric fat yields significantly increased. These paralleled the pattern of dietary concentrate level. They also agreed with the reports of Adu and Brinckman (1981.

TABLE 4

Relative cost of Production

	Treatments				
	1	2	3	4	5
Total feed consumed per animal (kg) ..	75.6	79.7	76.6	77.1	74.8
Total weight gained per animal (kg) ..	5.20	6.50	8.04	8.90	10.40
Feed cost per ton dry matter (₦)	153.30	182.06	213.19	243.06	275.67
Cost of feed consumed per ram (₦)	11.59	14.51	16.33	18.84	20.62
Gross revenue per ram (₦)	11.70	14.63	18.09	20.03	23.40
Gross income per ram (₦)	0.11	0.12	1.76	1.29	2.78

In calculating the relative cost of production (Table 4), cost of labour was excluded because the experimental conditions demanded high level of labour which cannot be justified under farm conditions; and it was a constant factor for all treatments. The cost of production increased from ₦11.59 for the high roughage diet to ₦20.62 for the highest concentrate diet. When the cost of production is taken together with total liveweight gain, the production cost of a kilogram of liveweight decreased with increasing concentrate level. Whereas it cost ₦2.21 to produce a kg gain with high roughage diet, it cost ₦1.98 to produce the same gain with the 70% concentrate diet. The lower cost of production with the highest concentrate diet (70%) was due to the higher liveweight gain it effected. Brokken *et al.*, (1976) associated this with grain being much cheaper per unit of net energy, and as such less energy is required to produce a given gain from concentrate diets, whereas roughage diets require more days of animal maintenance to give the same amount of growth. The faster rate of growth would also reduce the cost of labour and cost of maintenance of equipment; but in view of the fact that cereals, especially maize and guineacorn, are still the staple food of the population, their use in animal feed, especially for ruminants, has to be restricted or alternatives sought. Given the ADG, carcass characteristics and cost considerations, it would seem that the 50% to 60% concentrate diets are adequate for fattening. At current market prices for rams, mutton, feed ingredients and labour there is need to study in greater detail the economics of ram fattening operations in Nigeria.

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