

Efficiency of feed conversion during food restriction and realimentation

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Sixty Merino lambs weighing 25 kg were randomly allotted to six different feeding levels as follows: *ad libitum*, 80%, 71%, 65%, 55% and 45% *ad libitum*. Individual intakes and live masses were determined weekly. From 25–33 kg live mass the lambs received restricted feeding except for the control groups on *ad lib* intakes. At 33 kg live mass, half of each group was slaughtered and the remainder received *ad libitum* feed to 45 kg live mass. The 55% and 45% *ad libitum* groups were put on *ad libitum* feed at 31 and 28 kg live mass because the *ad libitum* groups had already reached 45 kg live mass and had been slaughtered.

During the restriction phase, efficiency of feed conversion decreased as restriction increased. For the first week of the realimentation phase, efficiency of feed conversion increased as restriction increased. From the second week of the realimentation phase, efficiency of feed conversion was the same for the *ad libitum*, 80%, 71% and 65% *ad libitum* groups (79,4 MJ DE/kg LWG) while the efficiency of feed conversion for the 55% and 45% *ad libitum* groups decreased to 86,1 and 94,1 MJ DE/kg LWG, respectively.

Sestig Merinolammers van 25 kg elk is ewekansig aan ses verskillende voedingspeile toegeken soos volg: *ad libitum*, 80%, 71%, 65%, 55% and 45% *ad libitum*. Individuele voerinnames en massas is weekliks ingesamel. Vanaf 25–33 kg lewende massa het die lammers beperkte voeding ontvang behalwe die *ad libitum* groep wat die kontrole groep was. Op 33 kg lewende massa is die helfte van elke groep geslag en is die res op *ad*

libitum geplaas tot op 45 kg lewende massa. Die 55% en 45% *ad libitum* groepe is op onderskeidelik 31 en 28 kg lewende massa op *ad libitum* geplaas omdat die *ad libitum* groep 45 kg lewende massa bereik het en geslag is.

Gedurende die beperkingsfase het doeltreffendheid van voeromset afgeneem soos die beperking toegeneem het. Vir die eerste week van die realimentasie fase het doeltreffendheid van voeromset toegeneem soos wat die beperking toegeneem het. Vanaf die tweede week van die realimentasie fase was die doeltreffendheid van voeromset van die *ad libitum*, 80%, 71% en 65% *ad libitum* groepe dieselfde nl. 79,4 MJ VE/kg lewendige massa toename terwyl die doeltreffendheid van voeromset van die 55% en 45% *ad libitum* groepe verswak het na onderskeidelik 86,1 en 94,1 MJ VE/kg lewendige massa toename.

Keywords: Efficiency, feed conversion, restriction, realimentation, sheep

Introduction

Conflicting results concerning efficiency of feed conversion during restriction and realimentation exist in the literature (Graham & Searle, 1975; Meissner, Roux & Hofmeyr, 1979; Meyer & Clawson, 1964). To further elucidate this important subject, this study was planned to examine the effect of different feeding levels on the efficiency of feed conversion during restriction and realimentation in sheep.

Methods

Sixty Merino lambs weighing 25 kg were randomly allotted to six different feeding levels as follows: *ad libitum*, 85% *ad libitum*, 75% *ad libitum*, 65% *ad libitum*, 55% *ad libitum*, and 45% *ad libitum*. Individual intakes and live masses were determined weekly. From 25–33 kg live mass the lambs received restricted feeding except for the control group on *ad lib* intake. At 33 kg live mass half of each group was slaughtered and the remainder received *ad libitum* feed to 45 kg live mass. Since some of the lambs of 85% *ad libitum* and 75% *ad libitum* groups did not consume their allocated amounts during the restriction phase, they were effectively restricted to 80% *ad libitum* and 71% *ad libitum*, respectively. The 55% *ad libitum*, and 45% *ad libitum* groups were put on *ad libitum* feed at 31 kg and 28 kg live mass because the *ad libitum* group had already reached 45 kg live mass and had been slaughtered.

The model of Roux (1976) was used to quantify the data. The parameters were subjected to an analysis of variance procedure and where no significant differences were found, the results were pooled.

Results and Discussion

Feeding level had a marked effect on feed conversion in the restriction, realimentation and total phases. During the restriction phase feed conversion progressively decreased from 67,8 to 266,1 MJ DE/kg live weight gain (LWG) as restriction increased. A remarkable phenomenon was observed during the restriction phase. For the 65%, 55% and 45% *ad libitum* groups, a break occurred in the linear relationship of in body mass against in cumulative energy intake, with the slopes being greater after the break point. From this it was concluded that the maintenance requirements decreased at the break point with a consequent improved efficiency of food conversion, which allowed more energy to be available for growth.

Table 1 Efficiency of feed conversion (MJ DE/kg LWG) in lambs during feed restriction and realimentation at different feeding levels

Treatment during restriction phase	Efficiency of food conversion (MJ DE/kg LWG)		
	Restriction phase 25 – 33 kg	Realimentation phase 33 – 45 kg	Total period 25 – 45 kg
<i>ad libitum</i>	67,8	81,9	75,8
80% <i>ad libitum</i>	87,9	78,6	82,4
71% <i>ad libitum</i>	92,9	74,1	81,8
65% <i>ad libitum</i>	120,8	69,0	89,9
55% <i>ad libitum</i>	160,1	71,3	97,5
45% <i>ad libitum</i>	266,1	79,3	108,5

Significant differences ($P < 0,01$) in feed conversion were found between groups during the restriction phase

During the first week of the realimentation phase the efficiency of feed conversion for the 80%, 71%, 65%, 55% and 45% *ad libitum* groups was 61,8, 39,9, 27,9, 22,8 and 21,9 MJ DE/kg LWG, respectively. It is postulated that alimentary canal fill had a big effect on the efficiencies but the reduced maintenance requirements during the restriction phase also contributed to these improved efficiencies during the beginning of the realimentation phase.

The carry-over effect of the reduced maintenance requirements lasted for only a short time, because from the second week of the realimentation phase no significant differences were found between the *ad libitum*, 80%, 71% and 65% *ad libitum* groups with an efficiency of feed conversion of 79,5 MJ DE/kg LWG. Significant differences ($P < 0,01$) were found between the four mentioned groups and the 55% and 45% *ad libitum* groups with efficiencies of 86,1 and 94,1 MJ DE/kg LWG, respectively.

For the total realimentation phase (Table 1) efficiency of feed conversion improved up to the 65% *ad libitum* group whereafter it declined again. This suggests that up to 65% *ad libitum* no adverse effects are expected but if the restriction becomes greater, the animals will be permanently affected depending on the length of time the animals are subjected to the restriction.

The efficiency of food conversion for the total period shows that as the restriction increases the efficiency of feed conversion decreases and that the *ad libitum* group is still the most efficient group.

These results support the findings of Graham & Searle (1975) and Thomson, Bickel & Schürch (1982) that basal metabolism is depressed during feed restriction and that the carry-over of the depressed metabolic rate lasted for not longer than a week. From the second week of realimentation no significant differences in efficiency of feed conversion were found up to 65% *ad libitum* but if the restriction becomes too severe the animals will be permanently affected.

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