RESPONSES OF LAMBS TO DIFFERING PASTURE CONDITIONS

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I. INTRODUCTION

Fundamental knowledge of the relationships between the diet and productivity of grazing animals and pasture conditions (yield, botanical composition, density and leaf lengths of components) is meagre. Such knowledge is essential for the development of management practices calculated to maximise animal production either per head or per unit area.

Willoughby (1958, 1959) was one of the first to describe a quantitative relationship between animal performance and pasture yield. This was for rate of body weight gain in Merino weaner wethers and the yield of green dry matter per unit area at any season of the year (Arnold 1962) did not obtain such a precise relationship as Willoughby, on similar pasture with Merino wethers. Wheeler, Rerdon and Lambourne (1963) were unable to obtain a relationship between food intake and yield of green dry matter per unit area.

In the spring of 1963 an experiment was carried out at the Ginninderra Experiment Station, Canberra, to determine the pasture conditions required for optimum herbage intake and rate of gain in body weight of fattening lambs grazed on pasture of Phalaris and subterranean clover (Trifolium subterraneum).

II. MATERIALS AND METHODS

Herbage intakes and rates of gain in body weight of grazing lambs were measured at four different levels of pasture yield. Details are set out below.

(a) Sheep

Lambs from a flock of Border Leicester x Merino ewes mated to Dorset Horn rams were weaned on August 20th, 1963. On September 7th, lambs with a mean live weight of 40 lb (18 kg) were allocated at random to eight groups; there were four groups each of ten lambs and four each of six lambs. The groups of ten lambs were used to study rate of gain in body weight and the groups of six lambs to study intake.

(b) Pastures

Twenty plots each of 0.25 acre were established on a four year old pasture of Phalaris and subterranean clover. Four levels of herbage yield were each represented by five plots randomly selected. The desired levels were 250, 500, 1250 and 2000 lb/ac (280, 570, 1410 and 226 kg/ha) of green dry matter. Approximations to these levels were achieved by prior grazing by wethers. Three plots at each level were used for measuring rate of gain in body weight and two for intake.

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The four groups of ten lambs were each allocated to a level of pasture yield. They grazed at the allocated level from September 6th until November 18th. To eliminate the effects of selective grazing on ‘availability’ of pasture, lambs were moved approximately weekly to a fresh set of plots. Lambs were weighed weekly and pasture samples were taken three days after grazing commenced on any plot.

Yield of the various components of the pasture was estimated from oven dry weights of herbage which had been cut to ground level from six quadrats on each plot. Fifty grass leaves and fifty clover petioles were measured in each sample.

The lambs for intake studies grazed together from August 20th until September 23rd when they were put onto plots for intake measurements. Intake was estimated from faecal output using faecal nitrogen regression equations (Arnold and Dudzinski 1963). Lambs were harnessed for faecal collection; total faecal output over three days was measured. There were two intake periods separated by seven days; groups of lambs were allocated at random to pasture levels for each period.

Plots not being grazed were stocked with wethers to maintain the desired levels of pasture yield.

III. RESULTS

(a) Gain in body weight and pasture conditions

Figure 1 shows the relationship between rate of gain in body weight and green dry matter per unit area. Whilst the rate of gain in body weight changed during spring, a curvilinear relationship with an asymptote between 1000 and 1400 lb per ac (1130 to 1580 kg/ha) dry matter was established for the whole period.

There was also a relationship between rate of gain in body weight and herbage length (Figure 2). As lambs were observed to eat little clover until early November there was also a relationship between length of grass and rate of gain in body weight; maximum rate of gain was recorded at grass length of 3 in. (80 mm).

(b) Intake and pasture conditions

The mean liveweight of lambs when used to measure intake was similar (50 lb, 23 kg) to that of lambs used to measure body weight gain at the two highest levels of pasture yield.

There was a difference of about 100 g/day in level of intake between the two periods, possibly due to lambs becoming used to the harness. In both periods, intake increased to a maximum around 1200 lb/ac (1360 kg/ha) dry matter and declined at higher levels. This decline may be due to inability of the lambs to graze properly on long herbage. Figure 1 shows the relationship between mean intake for the two periods and pasture yield.

The relationship between intake and herbage length is shown in Figure 2. Maximum intake was recorded when the mean grass leaf length was 2·4 in. (60 mm).

IV. DISCUSSION

Arnold (1962) suggested that it would be surprising if the rate of body weight gain of sheep could be related precisely, at all seasons of the year, to one component of pasture yield. This experiment shows that the relationship can be demonstrated fairly precisely, but that there are seasonal effects.
means are represented by vertical lines. Gain in body weight and in digestible organic matter intake. Standard errors of

Fig. 1—Amount of green dry matter per unit area of pasture related to rate of

GREEN DRY MATTER (kg/acre)

DIGESTIBLE ORGANIC MATTER INTAKE (g/day)

DAILY GAIN (g)

SEP'T 9 - OCT 2
SEP'T 9 - NOV 18
OCT 2 - NOV 18
PERIOD
Fig. 2.—Herbage length related to rate of gain in body weight and to digestible organic matter intake. Standard errors as in Figure 1.

There are several factors influencing the relationship but the principal problem in elucidating this and similar relationships is the measurement of “availability” of pasture. Under all but the shortest of pasture conditions, the animal samples only certain fractions of the total herbage. Much of the pasture is thus
effectively “unavailable” and the amount of pasture effectively “available” can never be precisely known. In any case, it will vary from one animal to another.

This will apply also to the study of relationships between pasture yield and intake.

These relationships will be modified by the digestibility of the diet and by the structure of the pasture. Although the asymptote for intake and rate of body weight gain was around 1200 lb/ac (1350 kg/ha) in this experiment it is unlikely to be so on all other pastures. An amount of 1200 lb/ac (1350 kg/ha) can be presented to the animal in various ways with marked differences in height and density. It is unlikely that intake and body weight gain will be the same under all conditions. Comparative data for various pasture conditions need pastures to be described in more precise terms than yield.

The clear indication that the intakes and rates of body weight gain of lambs decrease when these pastures yield more than 1500 lb/ac (1690 kg/ha) or are more than 3 in. (80 mm) long, need further study.

Although basic relationships between diet and productivity and pasture conditions undoubtedly exist there are many more variables involved than can be controlled experimentally. Thus, these relationships may be obscured (Wheeler, Reardon and Lambourne 1963). It is concluded that the level of animal production that can be expected from a pasture is indicated only broadly by the pasture conditions.

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VI. REFERENCES


