

GRAZING STUDIES FOR GRASSLAND SHEEP SYSTEMS AT THE **HILL FARMING RESEARCH ORGANISATION**, U.K.

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Abstract

Studies in the UK on continuously stocked swards dominated by perennial ryegrass show that both net herbage production and lamb output per hectare are maximised when herbage mass is maintained at 1200-1500 kg OM/ha (3-5 cm surface height) during the main season of growth. The use of this information to define sward management objectives is outlined, and the incorporation of these objectives into the spring and summer phases of a grassland sheep enterprise is illustrated.

INTRODUCTION

The links between the plant and animal components of grazing systems are interactive and cyclic, and this often makes it difficult to interpret the results of studies on grazing systems in objective terms. The approach used at the Hill Farming Research Organisation has been to establish separately the scope for manipulating herbage production and animal performance, if necessary in independent trials, and then to examine the compatibility between the management requirements of plants and animals before building the information back into potentially viable systems of animal production for field testing (Hodgson & Maxwell, 1981). In adopting this approach it has been important to relate the results of the component studies to defined sward conditions which can be incorporated into systems studies as management tools.

This paper illustrates the results from recent studies on improved swards and their incorporation into a system of grassland sheep production.

CONDITIONS

The results relate to two HFRO Research Stations in Scotland: Glensaugh, on the edge of the Grampian Hills in the North-East of the country, on a free-draining soil and with a rainfall of about 800 mm; and Hartwood, on the edge of the Southern Uplands, on a very wet soil and with a rainfall of 1000-1100 mm. On both stations the period of active herbage accumulation is limited to about five months (May-September inclusive) and the use of 120-150 kg N/ha in livestock systems results in a ryegrass-dominated sward with a clover content (DM) of 5-10% and annual herbage production of 8-9000 kg DM/ha.

The ewes are Greyfaces (Border Leicester x Scottish Blackface) with a mature weight of 60-70 kg and usually lambing upwards of 150% (live lambs/ewes mated). On these stations lambing normally occurs from early April, and lambs are weaned in late July. Ewes and lambs are continuously stocked for most of the grazing season, suitable areas being shut up for conservation in spring and summer. The requirement for conserved winter forage in a self-contained sheep system amounts to 1.0-1.5% of total annual forage requirements.

COMPONENT RESEARCH

Herbage Production

In swards held at constant herbage mass or surface height by deliberate manipulation of stocking rate, compensating changes in rates of herbage growth and senescence mean that the net rate of herbage production (= growth minus senescence) is insensitive to variations in herbage mass over the range from 1000 kg to 2500 kg OM/ha, or a range in sward surface height from 2 to 8 cm (Bircham & Hodgson, 1983; Grant *et al.*, 1983; Fig. 1). This effect is due in part to compensating changes in tiller size and tiller number, and partly to progressive declines in photosynthetic efficiency and in grazing efficiency (= herbage consumed/herbage grown) with increasing herbage mass (Hodgson *et al.*, 1981; Bircham & Hodgson, 1983; Grant *et al.*, 1983). Herbage growth is seriously depressed at low levels of herbage mass, and grazing efficiency is substantially reduced at high herbage mass because of high senescence losses.

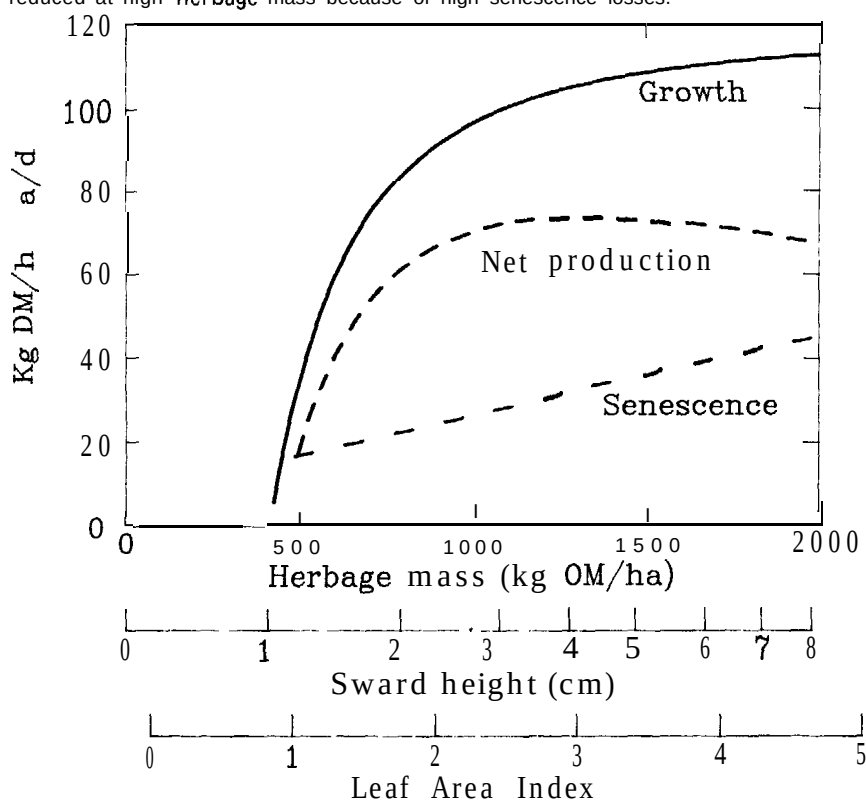


Figure 1: The influence of herbage mass on rate of herbage growth, senescence and net production (kg DM/ha/day) in continuously stocked swards grazed by sheep. Net production is the balance between the rates of growth and senescence. The association between herbage mass (kg OM/ha) sward surface height (cm) and leaf area index in these swards is also shown (from Bircham & Hodgson, 1983).

Herbage Consumption and Animal Performance

During the main grazing season the herbage intake of grazing ewes increases progressively up to levels of herbage mass in excess of 2000 kg OM/ha (Bircham 1981; Fig. 2a). The effect of sward conditions on lamb growth and ewe weight change parallel those on herbage intake, lamb growth rate increasing progressively across the range of sward conditions examined (Fig. 3). However, the stock numbers required to maintain constant sward condition fall progressively with increasing herbage mass or sward height so that, for lactating ewes under continuous stocking management, lamb growth per hectare is maximised at a maintained herbage mass of 1200-1500 kg OM/ha (Fig. 3).

In spring the herbage intake of ewes in early lactation may reach a plateau at a herbage mass of less than 1000 kg OM/ha (Milne *et al.*, 1981; Fig. 2b). This difference in response between early and main season may be primarily a reflection of the lower tiller density and more erect growth of swards at this time than later in the year.

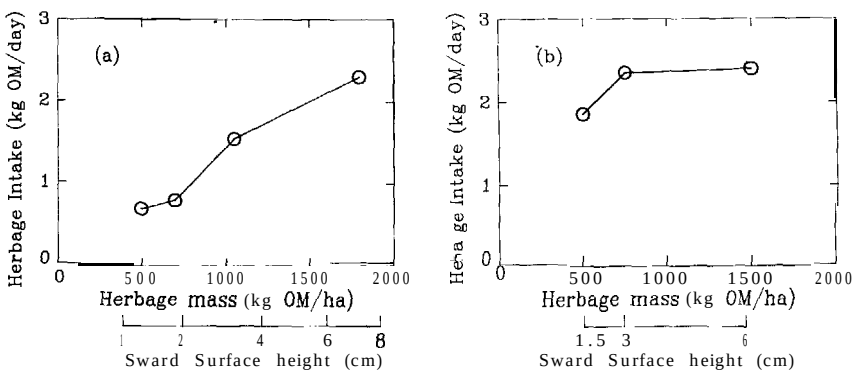


Figure 2: The influence of herbage mass or sward surface height on the herbage intake of ewes under continuous stocking management: (a) Ewes with single lambs in mid lactation in June/July (from Bircham, 1981); (b) ewes with twin lambs in early lactation in May/June (from Milne *et al.*, 1981).

INTEGRATION

The results of the component studies indicate general compatibility between sward and animal interests over the main growing season, both net herbage production per hectare and lamb production per hectare being maximised at a maintained herbage mass of 1200-1500 kg OM/ha or a sward surface height of 3-5 cm (Figs. 1 & 3). Specifications for the management inputs to approximate to these target sward conditions in the main growing season are given in Table 1; finer tuning and adjustment to varying climatic conditions can be achieved by tactical use of fertiliser N and by adjusting the area for conservation.

In the early spring the objective is to encourage herbage accumulation as rapidly as possible towards target levels of 7-800 kg OM/ha or 3 cm sward surface height thus ensuring adequate herbage intake for ewes in early lactation (Fig. 2b). A substantial early application of fertiliser N helps to encourage early growth, but targets are best achieved quickly by limiting grazing pressure on spring swards, either by feeding silage on a "sacrifice" area until swards are ready

for grazing, or by using supplementary concentrates for grazing animals. The reduction in herbage intake when supplements are fed accumulation towards target levels of herbage mass. At this time will have only a small effect up (Milne *et al.*, 1981).

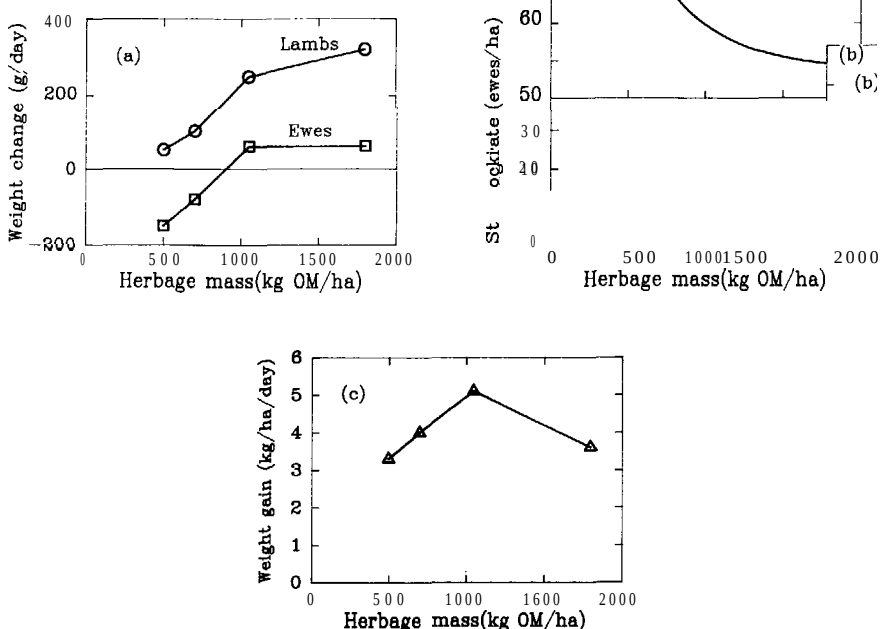


Figure 3: The influence of herbage mass on: (a) Rates of lamb growth (○) and ewe weight change (□); (b) stocking rate; and (c) lamb production per hectare under continuous stocking management (from Bircham, 1981).

There is a rapid transition in May from a feed shortage to conditions where areas must be taken out of grazing, and conserved, to maintain the efficiency of herbage utilisation and the long-term growth potential of the sward. The changes are illustrated in Table 2. The objective is to use conservation to maintain sward targets on main grazing areas, and not *vice versa*. The relatively limited requirement for conserved forage in grassland sheep systems may limit the scope for flexibility in conservation, but there is more flexibility in mixed sheep and cattle systems.

CONCLUSIONS

The principles outlined above now form the basis for grazing management decisions in sheep systems studies at HFRO (Maxwell, 1983), and are being taken up by the advisory services and by farmers. The examples given have been restricted to the spring and summer phases of production. The approach applies equally well later in the year for weaned lambs and dry ewes, though there is still a need to work out the best management strategies to provide suitable sward conditions for breeding ewes in the autumn when herbage production has virtually ceased (Maxwell, 1983).

Table 1: SWARD TARGETS AND MANAGEMENT INPUTS FOR GRAZING SHEEP (MAY-JULY INCLUSIVE)

Sward type: Perennial ryegrass dominant.
Sward target conditions:
Herbage mass: 12-I 500 kg OM/ha. ¹
Sward surface height: 3-5 cm.
Tiller population: 35-40 000/m ² .
Fertiliser N input: 120-150 kg/ha.
Stocking rate: 15-20 ewes/ha, plus lambs.

¹OM X 1.1 ≈ DM

Table 2: INTEGRATION OF REQUIREMENT FOR EARLY SEASON GRAZING, MAIN SEASON GRAZING AND CONSERVATION IN A GRASSLAND SHEEP ENTERPRISE

Early season (April-early May)
Sward target 7-800 kg DM/ha, increasing to 12-I 500 kg DM/ha.
Stocking rate (annual basis) 12-14 ewes/ha.
Main season (mid-May-end July)
Sward target 12-I 500 kg DM/ha.
Stocking rate 15-20 ewes/ha.
Conservation
At 5 t DM/ha for a conservation cut, the area released from grazing provides 75-100 kg DM per ewe. Normal requirement for conserved feed is between 50 and 100 kg DM/ewe, depending upon the amount of winter grazing available.

Grazing managements based on target sward conditions require the use of a sward appraisal procedure which is convenient for general use in the field. Our results suggest that sward surface height may be the best single indicator of herbage production and intake potential within a defined system of management, and height can be easily measured in the field. However, it is difficult to see how this can be safely divorced from some assessment of tiller density and sward morphology, and it is therefore important to have a sharp visual appreciation of target sward conditions. We have found that field demonstration plots and fully integrated systems studies are important in providing an effective basis for discussing the appraisal and use of sward targets in grazing systems with farmers and advisers.

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