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ScienceDirect
Livestock Science 110 (2007) 251–266
LIVESTOCK SCIENCE
www.elsevier.com/locate/livsci

Effects on animal performance and sward composition of mixed and sequential grazing of permanent pasture by cattle and sheep

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Received 15 September 2005; received in revised form 3 November 2006; accepted 10 November 2006

Abstract

Previous experiments have shown that mixed or conjoint grazing, when two or more animal species are grazed together, can lead to improved performance of one or more of the species and a higher total output per unit area. Sequential grazing systems, when different animal species graze an area in succession, also have the potential to improve productivity. This experiment directly compared these two approaches for integrating the grazing of cattle and sheep when pastured on improved permanent pasture. Four treatments were compared: 1) sheep only from May to October (S/S); 2) cattle only from May to July followed by sheep only from August to October (C/S); 3) cattle and sheep from May to July, sheep only for the rest of the growing season (C+S/S); and 4) cattle and sheep from May to October (C+S/C+S). Each treatment was replicated three times. From May until weaning at the end of July the plots were grazed by steers and ewes and lambs, and from weaning until October by steers and lambs. Sward heights were maintained at 6 cm using a "put and take" stocking system. Animal performance and sward composition data were collected during three growing seasons, 2001–2003. During the pre-weaning period lambs grazing plots which were grazed only by sheep had significantly poorer growth rates than those grazing plots where there was mixed grazing. Lambs grazing the sheep only plots also had lower liveweight gain during the post-weaning period, with the highest growth rates being recorded on the C+S/C+S treatment. Carrying capacity and total liveweight gain per unit area post-weaning were also consistently higher for the C+S/C+S treatment, while carrying capacity pre-weaning was highest for the C/S treatment. Measurements of clover content in the grazed horizon and botanical separation of material from quadrat cuts indicated that even under relatively controlled conditions choice of grazing system can influence sward composition. However, there was no clear link between any single sward change and the growth of the animals, indicating that the improved performance of cattle and sheep under mixed grazing is the result of a combination of factors, rather than a response to a particular sward parameter.

Keywords: Grazing management; Steers; Lambs; Liveweight gain; White clover; Carrying capacity

1. Introduction

The Less Favoured Areas (LFAs) account for 42% of agricultural land in the UK (DEFRA, 2002). The traditional basis of farming in these areas is the keeping

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doi:10.1016/j.livsci.2006.11.006

of breeding sheep and suckler cows, and around 65% of UK beef cows and some 60% of the UK breeding ewe flocks are found in the hills and uplands (DEFRA, 2002). The land resource within LFAs can be divided into two categories: rough grazing (semi natural) and grassland (improved permanent pasture and temporary grass). Although grassland covers only one-third of the land area in the hills and uplands, herbage production from improved pasture can be over five times higher that from indigenous swards (Davies et al., 1984), and consequently these areas are key to the viability of livestock farming in the hills and uplands (Eadie, 1985). In recent years changes in the Common Agricultural Policy (CAP) and other pressures, such as the need to rely more on forage and less on purchased feed in order to satisfy consumer demands for meat that has been produced in a "natural" way, are encouraging farmers to adopt more extensive grazing regimes on improved grassland. At the same time the narrow margins of profit for most cattle and sheep systems in the uplands necessitates the development of grazing management guidelines to achieve the most efficient use of the grassland resource.

There is evidence from studies with wild herbivores and natural grassland ecosystems that different species of animal differ in their grazing habits, leading to niche separation and opportunities for complementary pasture use (Bell, 1970; Jarman and Sinclair, 1979; McNaughton, 1984). Previous experiments with domestic livestock have shown that mixed or conjoint grazing, when two or more animal species are grazed together, can lead to improved performance of one or more of the species involved, and a higher total output per unit area (Nolan and Connolly, 1977; Brelin, 1979; Abaye et al., 1994; Wright et al., 2006), with the most common explanation given for such improvements in animal performance being better utilization of the pasture. This may be due to cattle and sheep having different preferences for plants both as regards to species and plant parts, and/or a reduction in sward rejection due to dung contamination. Sequential grazing systems, when different animal species graze an area in succession, also have the potential to improve productivity (Del Pozo et al., 1996; Wright et al., 2001), apparently as the result of one animal species creating a sward with a composition or canopy structure beneficial to another species. The objective of the current experiment was to directly compare these two approaches for integrating the grazing of cattle and sheep when grazing improved permanent pasture, by evaluating their effects on animal performance, sward composition and output per unit area.

2. Materials and methods

2.1. Site

The experiment was conducted at the Institute of Grassland and Environmental Research's Bronydd Mawr Research Centre, Powys (51 37′ N, 03 38′ W). Details of the centre have been published previously (Munro et al., 1985; Davies, 1998). It was sited at 310 to 360 m above sea level on Devonian sandstone of the Milford series (Rudeforth et al., 1984). The pastures were improved permanent pastures which had been re-seeded at least 10 years previously. The predominant species was perennial ryegrass (*Lolium perenne*) with small proportions of other grass species and white clover (*Trifolium repens*).

2.2. Management

Four treatments were compared: 1) sheep only during the growing season from May to October (S/S); 2) cattle only from May to July followed by sheep only from August to October (C/S); 3) cattle and sheep from May to July, sheep only for the rest of the growing season (C+S/S); and 4) cattle and sheep for the whole grazing season of May to October (C+S/C+S). Individual plot sizes were 2.0, 1.0 and 0.5 ha for treatments 3 and 4, 2 and 1 respectively, and each treatment was replicated three times. It was envisaged that a core stocking rate of 2.4 Livestock Units (LU) per hectare would be maintained throughout the experimental grazing period, with additional animals added to the plots as necessary to retain a pre-determined sward height. From weaning until termination of grazing, lambs only were used as they were considered to be more responsive than ewes to changes in sward composition, especially clover content, and herbage nutritive value. Thus the numbers of "core" animals on the individual plots of the four treatments were expected to be: 1) 8 ewes+11 lambs until end of July; 8 lambs thereafter, 2) 4 steers until end of July; 16 lambs thereafter, 3) 4 steers and 16 ewes+22 lambs until end of July; 32 lambs thereafter, and 4) 4 steers and 16 ewes+22 lambs until end of July; 4 steers and 16 lambs thereafter. Grazing was planned to commence when the sward surface height reached 6 cm in spring. To maintain sward heights at the required 6 cm, a "put and take" stocking system was used, with additional animals kept on similar swards at similar sward heights when they were not on the experimental plots. Grazing ceased when the sward height fell below 5 cm. After that date, all swards were grazed by non-experimental sheep to reduce the height to 4 cm.