Low input grazing system for dairy production in Northwest Spain

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Abstract

Intensive milk production is increasing the problems of slurry management and under-utilisation of grassland areas. More traditional systems based on the increased use of farm resources may have the potential to minimise the problems. The output and utilisation of a grazed ryegrass/white clover sward was studied during the whole lactation of twenty Friesian cows. The average cow received 1,600 kg of concentrate and produced 6,600 litres of milk. Herd management was the most important tool in maximising the grass intake per cow. The low stocking density that was established to achieve high grass intakes had a negative affect on the quality of the sward. A restricted use of concentrate is recommended to increase grazing pressure, leading to higher grass intakes and improved quality in the grass re-growths. Extending the grazing season in early spring and late autumn increased the milk output from the system.

Keywords: grazing pressure, pasture management, restriction of concentrate

Introduction

Grassland is the main forage in the humid northwest region of Spain, with grazed grass the cheapest source of nutrients for dairy herds. Grazed grass can improve the performance of dairy systems, including reducing the quantity of concentrates required during the winter housing period. Increasing the length of the grazing season can reduce the quantity of slurry produced and provide consumers in Europe with a more acceptable image of dairy farming systems. The management of a grazing system for high-producing animals provides a major challenge. Increasing the quantity of herbage that is available during the early part of the grazing season leads to deterioration in sward quality due to the under-utilisation of pastures. The objective should be to achieve a high level of herbage intake per animal, with maximum exploitation of the potential from grazed grass achieved by studying critical factors affecting intake. These include supplementary feeding, sward characteristics and the requirements of the dairy cow. Recent results show that high producing cows can still achieve satisfactory levels of performances, with high economic returns, from only a moderate concentrate input, although they do not fully exploit their genetic potential (Delaby *et al.* 1999). There is also considerable scope to improve animal performance from diets based on grazed grass following recent improvements in the understanding of factors that influence both grass intake and digestion (Peyraud and González, 2000). In the current trial an evaluation was made on the parameters affecting the performance of a dairy grazing system in the humid region of Spain, including the potential to improve the utilisation of on-farm resources.

Materials and methods

A group of twenty spring calving Friesian cows were maintained in an integrated grazing and cutting system on pastures of perennial ryegrass (*Lolium perenne* L.) and white clover (*Trifolium repens* L.). The average calving date was in early February with each cow fed 6 kg of concentrates per day (180 g kg^{-1} CP) during the first 220 days of lactation. At the end of the summer period the cows were housed for 25 days and fed silage. On turnout to grass in the autumn, 5 kg of concentrate per cow was fed for 40 days, then 1 kg during the next 20 days until lactation ceased. A total of 1,600 kg of concentrate was fed per cow. The management of the cows was based on improving the milk output from grazed grass, by extending the grazing season with earlier spring and later autumn grazing, trying to balance high DM intake requirements with high herbage availability and maintaining good quality

swards. There were no comparative treatments. Two grazing periods were evaluated during the spring. The first (P1) included two grazing rotations from turnout to mid-May, when the grass was in the vegetative stage of growth (i.e. high leaf content). The second period (P2) from mid-May until the dry summer period also included two grazing rotations on swards with a high proportion of stem. When high residual post-grazing sward heights occurred in some paddocks, lower productive cattle grazed the swards to avoid problems of low-quality re-growth. In the last 14 days of the final period in September, cows were offered grass silage in addition to grazed herbage. A third period was evaluated in the autumn (P3), with cows returning to the same paddocks for 70 days (two rotations) from October until December.

Determinations: Daily milk yields per cow were recorded throughout lactation and weekly milk samples analysed for crude protein, butterfat and the milk urea test. Pasture production was measured both pre- and post-grazing using five quadrates (each 0.5m^2). Pre-grazing samples were analysed to determine the botanical composition, with dry matter, crude protein and fibre contents determined by NIRS. The grazing pressure, or number of cow grazing days, was used to determine the potential output from the pastures.

Results and Discussion

Figure 1 shows the milk yield curve for a cow yielding 6,600 kg during the lactation period. The milk quality values are also shown, including the low levels of milk protein and butterfat recorded during the summer. Concentrate used was 240 g kg^{-1} of milk, compared with c. 350 g kg^{-1} for cows on intensive farms yielding 7,000 kg. In the last 15 years during which intensification has increased in Galicia, the proportion of milk produced from forage has declined from 60 % to 20%. Forage has been used inefficiently and there has been a lack of confidence in the value of grazed pastures (Barbeyto, 1999). The pasture DM production, average grass intake and the crude protein and fibre contents are shown in Figure 2. The total herbage DM on offer was 17.3 t ha^{-1} with the clover content less than 10% in spring and increasing to 15 to 20% in the autumn. At the end of spring period the dry matter (DM) content of the grass was high (> 200 g kg^{-1}).
A stocking density of 3.4 cows ha^{-1} was supported by the sward in the spring-summer period. Herbage allowance is one of the primary factors influencing herbage intake. High herbage allowance is required to achieve the maximum intake and milk yield per cow. However, increased herbage allowance in early season also increases residual sward height. This may result in a deterioration of sward quality in mid and late season, including reducing herbage digestibility. Intake was low (10 t ha^{-1}), with only 57% of the available grass utilised due to a high pre-grazing herbage allowance and residues after the third and fourth rotations.
Alternative strategies are required to improve utilisation of the residual herbage and ensure high quality swards are sustained throughout the grazing season. Options include mechanical topping or grazing with low-producing animals in a leader-follower system (Mayne *et al.*, 1986). In this trial extra cattle were used as followers for grazing the residues. An alternative approach would be to adopt a more restricted grazing regime and feed supplementary concentrates more efficiently. Another research challenge would be to develop a strategy for sward structures that ensures high intakes are maintained under the limitations of a low residual sward height. On tall swards the available grazing area can be reduced to maintain the quantity of herbage that is available, with the animals forced to graze to a lower sward height where the herbage density is greater. Although bite weight increases with height in the first stage of the defoliation of a sward, daily intake is not always positively related to the pre-grazing sward height. With high-density swards, bite weight is greater than in open swards irrespective of sward height.

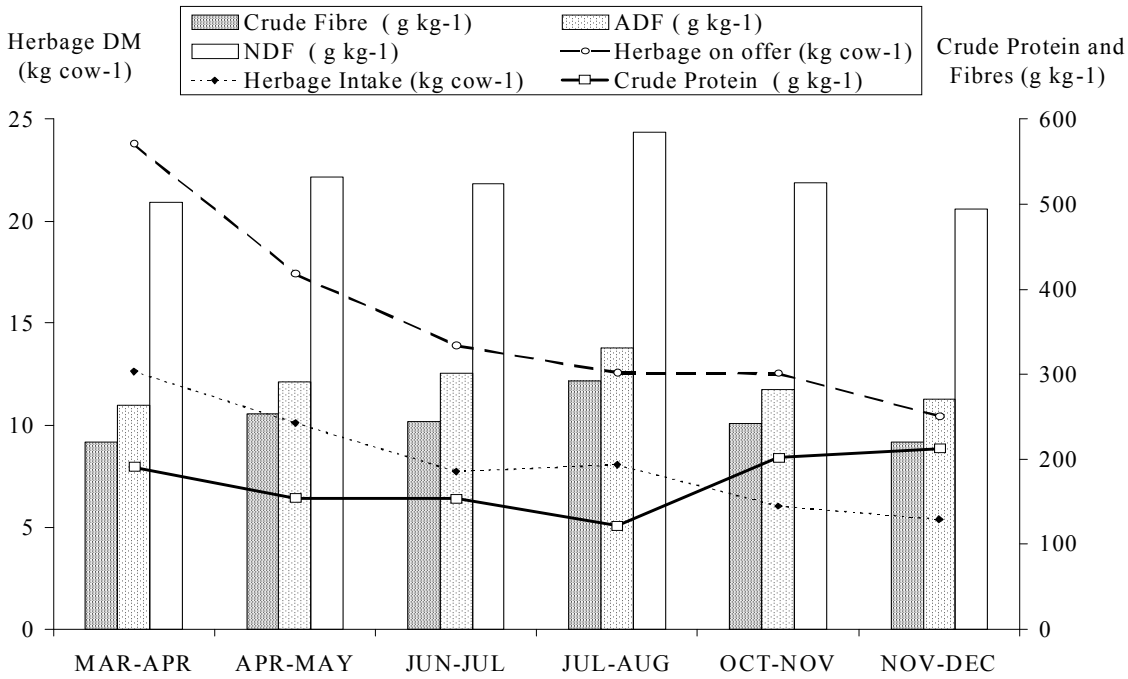

Figure 1. Herbage quality and utilisation under a dairy grazing system

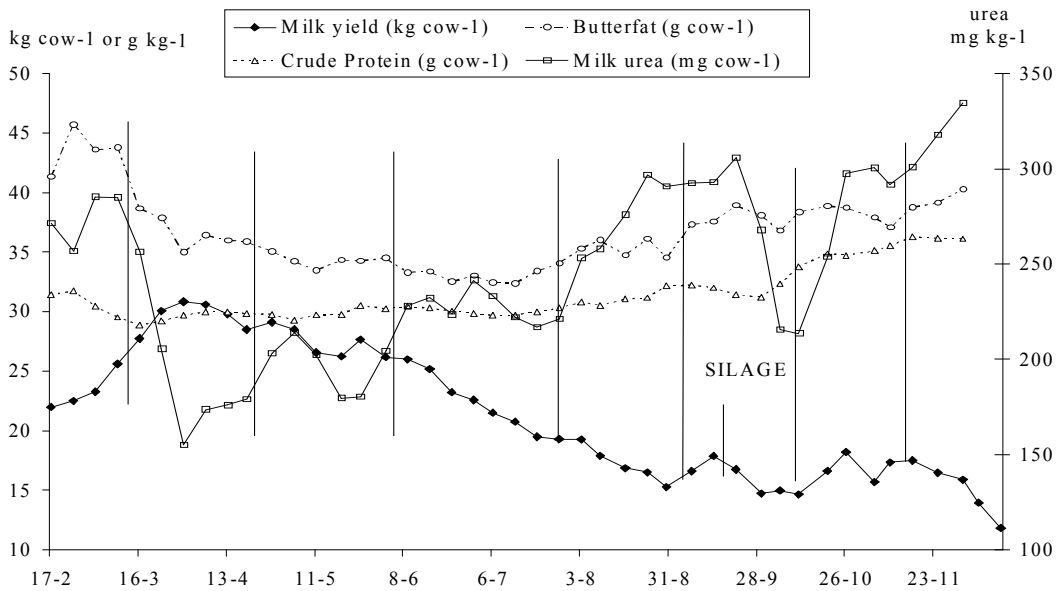

Figure 2. Milk yield, quality, and urea test under a dairy grazing system

The mean milk urea content of all cows during the lactation is shown in Figure 1. During the first grazing rotation when the protein content of the herbage was high and cows reached a peak yield of 31 kg per day, there was a sharp fall in the urea values to 150 mg kg^{-1}. The inability of the high-yielding grazing cow to meet its nutritional requirements through herbage intake has been found to lead to a decrease in milk yield and quality (Peyraud and González, 2000). An increase in milk urea was recorded during the fourth rotation, due to the stemmy pastures leading to a smaller energy deficit in the energy to protein ratio. During grazing the urea values were satisfactory at 150 to 350 mg kg^{-1}. In some experiments a peak of 560 mg kg^{-1} has been recorded during mid-September, showing an excess of protein and an energy deficit in the diet (González *et al*, 2001). The production of grass during mild weather in the October and March period could be exploited by dairy farms in the coastal area of Galicia. Daily milk yield in the autumn was 16 kg per cow, with 24 % of the total annual production produced during this period. In Northern Ireland access to autumn grass for 3-4 hours per day has been found to increase milk yield by 2 kg and reduce grass silage intake by 4.2 kg (Mayne, 1995). The option of extending the grazing season beyond the normal period, in both late autumn and early spring, would be beneficial as the cost of grazed grass is lower than the cost of conserved forages. In addition less concentrates may be required.

Conclusions

A system of milk production based on improving the utilisation of grazed perennial ryegrass/white clover swards led to improved results under Galician conditions and may also improve the performance of intensive systems that feed high levels of concentrates. The urea test proved useful for determining the energy to protein status of the diet during the grazing season. Herd management was used as a tool to maximise the grass intake per cow. The combination of a high herbage allowance and low stocking density had a negative effect on the quality of the sward. Therefore, an increase in the stocking density is recommended, using less productive livestock to graze residues and improve the utilisation of the pastures.
Reducing concentrate inputs would also have a similar effect, by increasing the grazing pressure and improving both the quality and intake of the grass. Sward characteristics, due to an increase in stocking density or the feeding of less concentrate, should be regarded as of equal importance to the pre- and post-grazing sward heights. Extending the grazing season in early spring and late autumn improves the milk output from the system.

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