

NIGHT PENNING AS A MANAGEMENT TECHNIQUE FOR BOTH PASTURE DEVELOPMENT AND PASTURE IMPROVEMENT FOR SMALL HOLDERS IN SOUTHERN CHINA

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ABSTRACT

A series of experiments conducted at Weining, Guizhou Province, China demonstrated night penning to be a successful technique for the improvement of native pastures through enhancement of soil fertility and change in the botanical composition of the sward. The best overall results were achieved with a penning intensity of 7 to 8 sheep nights per m² with pasture establishment most successful from May to September. Ryegrass (*Lolium perenne*), cocksfoot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*) and white clover (*Trifolium repens*) were the most suitable for establishment. A number of strategies to increase the impact of pasture improvement through night penning on small holder farms is discussed. These include the reduction in penning intensity and the integration of night penning into supplement feeding, maintenance fertiliser use and conventional pasture improvement programmes on small holder farms.

KEYWORDS

Night penning, pasture development, pasture improvement, Southern China

INTRODUCTION

The improvement of native pastures is an important part of the expansion of animal production in the provinces of Southern China. Farmers in these areas operate a traditional grazing system with livestock grazed on native pastures during the day and penned indoors at night. This results in low levels of animal production due to the poor quality and limited supply of forage and the continual nutrient transfer from native pastures as manure accumulated in night pens is used on cropping land. Pasture improvement will only be possible through overcoming the low soil nutrient status of the grasslands and maintaining this improvement. To increase the rate of pasture improvement by small-holder farmers, simple low-cost improvement strategies must be identified. A series of experiments were conducted at Weining, Guizhou Province, China since 1990, as part of the United Nations Development Programme (UNDP) Agro-grasslands Development Project, to study night penning as a management strategy for the improvement of pastures, by sheep, on small holders farms (Jiang et al 1995a, 1995b, 1995c, Li et al 1995). Traditional management is for sheep to graze grassland during the day and to be housed at night with the nutrients collected normally returned to the farmers' cropping land. In this series of experiments sheep were penned on small areas of pasture at night to evaluate the impact of stock pressure and nutrient return by the sheep on the rate of pasture improvement. Night penning traditionally allows 2m² per sheep per night. The penning intensity used was defined as the total sheep nights (for all sheep classes) applied per m² for the full duration of the penning period for a given site. Seed is oversown before the last night of penning to allow treading to improve seed contact with the soil. This paper presents the main findings and discusses the most appropriate strategies for small holder implementation of pasture improvement through the use of night penning.

The benefits of night penning

The best overall results were achieved with a penning intensity of 7 to 8 sheep nights per m² (Li et al 1995) with successful pasture establishment from May to September (Jiang et al 1995a) and four species (ryegrass, cocksfoot, Yorkshire fog and white clover) being the most suitable for establishment (Jiang et al 1993, 1995a, Li et al 1995). In these trials it was observed that night penning gave best results when applying a given penning intensity over a shorter time through decreasing the area available per sheep per night. There were low levels of subsequent weed infestation (Jiang et al 1995c) and extensive invasion of volunteer white clover in

night pen treatments not sown with white clover (Jiang et al 1995a), suggesting seed transfer through sheep dung. Night penning also eliminated the need for capital fertiliser applications to establish improved pasture because of the large increases in soil nutrient levels (Figure 1) (Li et al 1995). Initial increases in sward productivity following pasture development through night penning were high (Figure 2) (Jiang et al 1995a), but declined rapidly over time, though there were no marked changes in pasture composition. Soil fertility and pasture production levels under night penning were higher than those measured under conventional establishment through cultivation (Jiang et al 1995c). Surface run-off and soil loss measured on pastures established through night penning were only 45% and 1% of those measured from cropping land (Jiang et al 1995c). This is of ecological significance as soil erosion has increased in recent years due to increased population pressure resulting in the cultivation of the more marginal and steeper soils.

The integration of night penning into small holder farming systems

Pasture development by on-paddock night penning was successful, easy to implement and low cost (only 20% the cost of establishment through cultivation (Jiang et al 1995c)). However, only a small proportion of the total farm area can be night penned at any one time suggesting that the procedure will be more beneficial as a tool for pasture improvement rather than a replacement for maintenance fertiliser applications. Night penning does not add nutrients but transfers nutrients within the system and, if fertiliser is not applied, pasture production on improved areas will continue to decline along with associated sward deterioration. Small holder farming systems will continue to remain nutrient depleting as most night penning will continue to take place indoors with the manure returned to cropping land. The conflict over the return of animal manure to cropping land or to on-paddock night penning needs to be balanced against the increase in herbage yield through improved pasture production increasing carrying capacity and animal production as well as providing increased levels of nutrient returned to the cropping land. The night penning technique needs to be modified to increase the impact on the overall system, and suitable management strategies should be identified for the adoption of penning techniques by small holders.

The following modifications to the basic procedure should increase the impact and rate of adoption:

1. Penning intensity should be reduced.

The optimum penning intensity recommended by Li et al (1995) is derived from the response per unit area night penned and not from a whole farm perspective. Reducing the rate by 50% (to 4 sheep nights/m²) still produces pasture production levels similar to those expected through cultivation and fertiliser application (Jiang et al 1995c) while at the same time markedly increasing the area developed.

2. Incorporate supplement feeding with night penning.

During periods of feed shortage, short term grazing on pasture before or after feeding supplements within the on-paddock penned areas during the day could be used with sheep housed indoors at night. The timing of this day penning (winter) would only return nutrients and would be appropriate for use in the maintenance and improvement of pastures with improved species already present or for the initial breakdown of native pastures. This strategy would also reduce overgrazing of winter pasture by limiting the time the sheep graze each day.

3. Combine night penning and standard pasture establishment techniques to increase the area treated.

Larger shrub weeds could be cut and removed by hand and the sheep then used to remove and open-up dense native swards. Hoof action

could be used more than grazing by encouraging the sheep to move around the penned area both after penning in the evening and before release in the mornings. The use of hand rakes could also significantly reduce the night penning intensity required. On the other hand it could mean the use of limited applications of fertiliser either at establishment or by starting a fertiliser maintenance programme earlier. If capital fertiliser was applied, the combination of grazing, treading and raking effects could be carried out without on-paddock night penning. In this case, to maximise the grazing effect, sheep could be contained in a fenced day pen area immediately after release from housing in the mornings. This strategy is supported by Jiang et al (1995c) who identified cultivation and land preparation as the major cost associated with pasture establishment.

Although night penning was shown to successfully develop improved pastures, gains were only localised and short term (Figure 1 and Figure 2), unless maintenance fertiliser was applied to the improved pasture. The need to return farm manure to the cropping land is likely to limit the amount of on-paddock night penning that will be carried out by small holders each year, and night penning as a method to develop pasture will therefore need to be well targeted as part of an integrated management system that recognises the small holders' cropping requirements.

REFERENCES

Jiang, W.L., Chu, A.C.P. and J.Z. Ren 1993. Botanical composition dynamics and herbage mass in pasture mixtures in the mountainous regions of Guizhou Province, China. Proc. XVII Int. Grassland Congress 735-736.

Jiang, W.L., Wa, Q.R. and X.Y. Liou 1995a. Studies of integrated effects on native pasture improvement by night penning in Guizhou karst region. (I) Effects of different timing and intensity of sheep night penning, and pasture species mixtures. Acta Agrestia Sinica 3: Sect 10 (1-12).

Jiang, W.L., Wa, Q.R. and M.Z. Zhang 1995b. Studies of integrated effects on native pasture improvement by night penning in Guizhou karst region. (II) The research of persistence on primary productivity of improved pasture. Acta Agrestia Sinica : Sect 11 (1-7).

Jiang, W.L. Wa, Q.R. and M.Q. Wu 1995c. Studies of integrated effects on native pasture improvement by night penning in Guizhou karst region. (III) Research on the benefits of the technique; ecology and economy of pasture improved by sheep night penning. Acta Agrestia Sinica 3: Sect 12 (1-8).

Li X.L. and W.L. Jiang 1995. A study on establishment of improved pastures through sheep camping. Acta Agrestia Sinica 3: Sect 13 (1-6).

Figure 1

Changes in pasture yield after night penning (kg DM/ha/year).

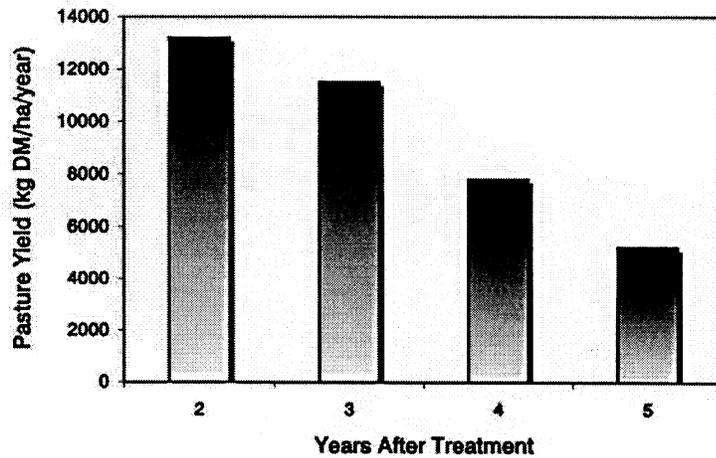


Figure 2

The effect of penning intensity on soil nutrient levels.

