



Unravelling the rationale of ‘overgrazing’ and stocking rates in the beef production systems of Central Brazil using a bi-criteria compromise programming model

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Abstract

In Central Brazil, the long-term sustainability of beef cattle systems is under threat over vast tracts of farming areas, as more than half of the 50 million hectares of sown pastures are suffering from degradation. Overgrazing practised to maintain high stocking rates is regarded as one of the main causes. High stocking rates are deliberate and crucial decisions taken by the farmers, which appear paradoxical, even irrational given the state of knowledge regarding the consequences of overgrazing. The phenomenon however appears inextricably linked with the objectives that farmers hold. In this research those objectives were elicited first and from their ranking two, ‘asset value of cattle (representing cattle ownership)’ and ‘present value of economic returns’, were chosen to develop an original bi-criteria Compromise Programming model to test various hypotheses postulated to explain the overgrazing behaviour. As part of the model a pasture productivity index is derived to estimate the pasture recovery cost. Different scenarios based on farmers’ attitudes towards overgrazing, pasture costs and capital availability were analysed. The results of the model runs show that benefits from holding more cattle can outweigh the increased pasture recovery and maintenance costs. This result undermines the hypothesis that farmers practise overgrazing because they are unaware or uncaring about overgrazing costs. An appropriate approach to the problem of pasture degradation requires information on the economics, and its interplay with farmers’ objectives, for a wide range of pasture recovery and maintenance methods. Seen within the context of farmers’

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objectives, some level of overgrazing appears rational. Advocacy of the simple ‘no overgrazing’ rule is an insufficient strategy to maintain the long-term sustainability of the beef production systems in Central Brazil.

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1. Introduction

Brazil has the second largest cattle population in the world, after India, with over 160 million cattle and 180 million ha of pastures (FUNDAÇÃO IBGE, 1997). Most of these cattle are in Central Brazil; vast pastures have been established there since the early 1970s, aided by subsidised agricultural credit and the extraordinary adaptation of the ‘zebu’ (*Bos indicus*) cattle and some new perennial grasses (notably *Bra-chiaria decumbens* from Africa).

In a recent study on the link between beef producers’ objectives and pasture degradation (Costa and Rehman, 1999), a survey in Central Brazil provides a general profile of farmers and farms in the area. Typically, beef farmers and their families live mostly in towns; they have a wide range of educational background and more than a half of them have an off-farm source of income. The average farm area is 1539 ha, 91% of which is under pastures. Eighty six percent of pastures are sown species. Supplementary feeding of animals is not a common practice, except for some mineral supplementation. On average 1453 cattle are kept on 1400 ha of pasture, a stocking rate of around 1 head/ha. The Nelore breed is the most common cattle, reared on 92% of the farms. The cow–calf enterprise is followed, on its own or in combination with other activities, on 83% of the farms. The average calving rate is 80%, considerably higher than the national average of 60% (Zimmer et al., 1998). The slaughtering age is around three years.

Despite the “vibrancy” of the beef sector in the agricultural industry of the Central Brazil, the sustainability of the production systems there has been under threat in recent years. More than a half (ranging from 50% to 80%) of the 50 million ha of sown pastures suffer from some form of degradation (Vieira and Kichel, 1995; Macedo, 2000), that is, “the loss of vigour, productivity and natural capacity for recovery, in order to sustain production and quality of grass required by animals, and to overcome the detrimental effects of insects, diseases and weeds” (Macedo and Zimmer, 1993). Declining levels of soil nitrogen are regarded as the primary cause of degradation, but other factors also accelerate the process. Among the factors that flow from farmers’ decisions, overgrazing is probably the most important, with direct effects on the pasture prompting the question: if overgrazing is deleterious, why do farmers continue with such stocking rates? The hypotheses that may explain this paradox are:

- (a) Farmers are unable to foresee the consequences of their decisions completely, due to the complexity of the system and the lack of information and managerial resources.

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