Exploring the link between farmers’ objectives and the phenomenon of pasture degradation in the beef production systems of Central Brazil

F.P. Costa¹, T. Rehman*

Department of Agriculture, The University of Reading, Earley Gate, PO Box 236, Reading RG6 6AT, UK

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Abstract

In Central Brazil, half the area under sown pasture suffers from the phenomenon of pasture degradation; overgrazing is believed to be the main cause. Farmers’ objectives and their links to the practice of overgrazing have been explored to obtain a better understanding of the decisions related to the setting of the stocking rate. A survey of beef cattle farmers was carried out, preceded by an exploratory poll of experts on such production systems. The method of paired comparisons was used for eliciting and analysing farmers’ objectives. ‘Intergenerational transfer’ and ‘cattle ownership’ are the most dominant objectives. Because cattle ownership is implicitly included in the assets involved in intergenerational transfer, possessing cattle assumes an outstanding importance in the hierarchy of farmers’ objectives. These findings elucidate the paradox of overgrazing and provide a basis for treating the perception on the influence of objectives on the degradation phenomenon from being a conjecture to that of an empirically valid hypothesis. They also suggest the need for incorporating the objective ‘maximise the number of cattle owned’ in the analysis and modelling of stocking rate decisions.

Keywords: Pasture degradation; Overgrazing; Beef cattle; Farmers’ objectives

1. Introduction

Relatively limited alternatives for the use of infertile and acidic soils covered originally by savannas, known as “Cerrados”, have made extensive systems of animal production a common feature of Central Brazil. In 1990, this region accounted for more than 100 million hectares of pasture and 80 million heads of cattle, which is nearly 60% of Brazilian totals (Corrêa, 1994). Because of this massive presence of cattle, the region is generally referred to as “Brazil Central Pecuário”; ‘Pecuário’ means devoted to cattle production. It is not an officially defined region, but includes the States of Mato Grosso do Sul, Mato Grosso, Goiás and Tocantins, west of São Paulo and south-west of Minas Gerais, covering some 2.7 million km².

Until the beginning of the 1960s the Cerrados were used to rear beef animals under extensive
systems of production, requiring around 10 hectares per head of cattle. However, from the mid-1960s and the 1970s, most of Cerrados were brought under more intensive farming. Financial assistance including very low interest rates and the ease of implementing low-input (but much more productive) systems based on perennial grasses, such as *Brachiaria decumbens*, imported from Africa promoted a phenomenally rapid growth of sown pastures. The research and technological developments that would have helped to maintain the productivity of grassland and improve the management practices have not kept pace with this rapid growth in beef livestock numbers and the expansion of area with these production systems. Consequently, a normally expected moderate decline of pasture productivity (Cavaye et al., 1989) has turned over time into a situation where the whole system’s sustainability is under threat. It is estimated that in Brazil Central Pecuário half (about 25 million hectares) of the area under sown pasture now suffers from ‘degradation’ (Vieira and Kichel, 1995), a process defined by Macedo and Zimmer (1993, p. 217) as “...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...”.

2. Pasture degradation and the overgrazing paradox

Bad establishment of swards, poor maintenance and inadequate management have been identified as causes of pasture degradation, but overgrazing, which is a consequence of inadequate management, is generally recognised as the major reason. In fact, overstocking of pastures is a widespread practice in Central Brazil, as reported by Meirelles (1993), Nascimento et al. (1994) and Vieira and Kichel (1995), despite the warnings given by grassland researchers and environmentalists.

In reality, overgrazing is an outcome of managing the stocking rate (number of animals per hectare)—a complex phenomenon comprising the interaction of technical and socio-economic factors, the nature of which is not necessarily understood completely by the vast majority of farmers. According to Beranger and Vissac (1993, p. 153), “…livestock farms are very complex systems and farmers generally have only a fragmentary knowledge of their functioning.”

Gilles and Jamtgaard (1981, p. 129) assert further that there is a “…contradiction between the apparent economic interest that herders have in preserving pastures and their tendency to overgraze...”. To understand the phenomenon involving overgrazing and pasture degradation it is important to determine what influences the decisions that have led to the situation, including an exploration of the assumption that farmers as decision makers act rationally usually in pursuit of a clearly defined objective such as profit maximisation.

3. Farmers’ objectives and their influence over cattle production systems

Objectives of cattle producers and how they influence the operation of an agricultural system in Central Brazil have not been studied in any depth so far. However, a recent study (Dalmazo et al., 1997) has examined the relationship between the objectives of small-scale owner-occupiers and the process of technology adoption in the southern region of Brazil; but farmers involved were not beef producers. To explore the link between farmers’ objectives and the widespread phenomenon of pasture degradation in Central Brazil and its relationship with the decisions related to the stocking rate problem, a two-stage investigation was undertaken to elicit and analyse objectives of farmers in Brazil Central Pecuário. First, a questionnaire was sent to experts (mainly agricultural scientists) in December 1995 to provide a basis for formulating an hypothesis on farmers’ objectives and also to provide a backdrop to the research activity itself. Second, a sample of farmers in Central Brazil were asked about their objectives through a survey conducted from May to August 1996. Data from each stage were analysed and, subsequently, the level of agreement or disagreement between the two sets of respondents was assessed, yielding useful insights into the aspects of decision making related to stocking
rates and pasture degradation. This paper presents the results of this pioneering research on the nature of the objectives of Brazilian cattle producers and their influence on the phenomenon of pasture degradation that is prevalent in the agricultural systems of the area.

4. Studying farmers’ objectives

Several studies on farmers’ objectives exist in the literature. Many of these present typological schemes which, despite the different terminology used, generally classify objectives in two groups, economic and non-economic (Pemberton and Craddock, 1979; Harper and Eastman, 1980; Fairweather and Keating, 1994). Perkin and Rehman (1994) have also recently reported a similar outcome for Berkshire, UK, pointing out that personal, family and farm business objectives are inter-dependent and that they need to be considered together. In an earlier study, Gasson (1973) had arranged British farmers’ values into four categories: instrumental, social, expressive and intrinsic. McGregor et al. (1995) highlighted the importance of studying farmer behaviour in order to obtain credible information on the decision-making processes. These authors carried out a survey of Scottish farmers and concluded that they do have multiple objectives, ranking maintenance of the land resource, the environment and their way of life ahead of the traditionally accepted objectives of profit maximisation and risk minimisation. The range of farmers’ objectives is indeed large and diverse, as emphasised by Thompson (1975, p. 315) who asserts that “…managers of business may have up to 200 identifiable objectives, and many of these are in conflict with one another.” Elicitation and exploration of objectives is not an easy undertaking, particularly when dealing with respondents who are a heterogeneous group in terms of their educational attainment levels and willingness to collaborate with researchers. The techniques used to gather information on objectives, therefore, play a crucial role in determining the outcome of a study. Asking open-ended questions about objectives, a simple and straightforward procedure, could then be thought of as the best option. However, in practice this has not proved to be the case as farmers have difficulties in articulating their responses on questions related to objectives (Nielson, 1962, reported by Patrick and Blake, 1980). Alternatively, some techniques involve presenting respondents with predetermined statements on objectives such as ‘paired comparisons’, ‘rating scales’, and ‘magnitude estimation’. Perkin (1992) and Akatugba-Ogisi (1994) have reviewed and compared these techniques in detail. Magnitude estimation is more difficult to implement with the respondents and is, therefore, not used much. Paired comparisons and rating scales have provided similar rank for objectives in both studies, with the former being the easiest to administer, as respondents are only asked which of the two alternatives they prefer.

5. The survey of operators of beef production systems in Brazil Central Pecuário

A random sample of 100 beef cattle producers of “Microrregião Homogênea Pastoril de Campo Grande” (a homogeneous micro-region in the State of Mato Grosso do Sul) provided data on availability of resources and use, stocking rate management and farmers’ characteristics and objectives. It has been estimated by Arruda and Corrêa (1992) that the minimum economically viable area under pastures for such production systems is 700 hectares. This area can be grazed, on average, by 500 cattle and, therefore, only those farms with herds of 500 cattle or more were included in the survey. The main characteristics of all the respondents are shown in Table 1.

A high proportion (about 87%) of farmers were over 40 years of age, with the mode being in the 50–59 years category. The proportion of young farmers below 30 years of age was very low. One third had grown up in the countryside, and only 5% lived on the farm; more than half of the respondents had off-farm sources of income; about 50% held a university degree, with nearly one third who had been agricultural graduates; over 97% of farmers had children, while only one was single. The medians for farm and herd sizes were, respectively, 1585 hectares and 1490 heads.
6. Expert opinions versus farmers’ responses

As pointed out above the technique used to study and analyse information on objectives influences both the way respondents can provide information and the conclusions that can be drawn from the data gathered. Of the various alternatives available, the paired comparisons method was preferred because: (1) the discriminatory process required from respondents is simple; and (2) it is not only possible to order objectives but also to attach scale values to them to reflect their importance. Detailed descriptions of the paired comparisons method can be found in Krenz (1964) and Harman et al. (1972). Examples of its application in rural sector studies are provided by Smith and Capstick (1976), Harper and Eastman (1980), Perkin (1992) and Akatugba-Ogisi (1994).

6.1. Statements presented to farmers

In eliciting farmers’ objectives, a pre-defined list of statements—arranged in pairs—was prepared, drawing upon the literature on similar studies, expert opinions and the first author’s own experience of working with farmers in the study area. For extensive systems of cattle production, few statements on objectives could be found in the literature. MacLeod and Taylor (1994) have studied the issues related to the sustainable use of grazing range lands in Australia. They found profit maximisation as the most frequently mentioned objective, followed by maximisation of beef production (i.e. the number of animals carried over a given parcel of land). The concern for maintaining land resources was not considered important. Similarly, Stuth et al. (1991) have developed a hierarchy of needs for the grazing land manager-owners; however, the results presented are generic and are applicable to a large range of farm types.

In presenting the statements on objectives to respondents, a balance between completeness and practicality was pursued as an excessive number of pairs of statements could undermine the clarity of answers given by farmers. To minimise the chances of any relevant information being missed from farmers’ responses, the four categories of values (i.e. instrumental, social, expressive and intrinsic, as defined by Gasson, 1973) have been represented by at least one of the statements on objectives. In the eventual list of objectives, an explicit statement on profit maximisation was not included, as ‘profit’ is regarded as ‘instrumental’ because it is a ‘means’ to achieve ‘end’ objectives. After several successive screenings, the following seven objectives were retained in the final list:

1. Maintain ownership of land.
2. Work in the countryside, keep and rear animals, be your own boss.
3. Maintain the social status as rancher.
4. Pass on the inheritance and a way of living to the next generation.
5. Be recognised as a progressive farmer.
6. Benefit from the security and liquidity of cattle ownership.
7. Improve the family and personal standard of living.

Objectives 1, 4, 6 and 7 are regarded as ‘instrumental’ as they represent means of obtaining income and security. Objective 3 embodies the ‘social’ value concerned with belonging to the farming community and for gaining recognition and prestige. The ‘expressive’ value of farming
being a means of self-expression or personal fulfilment is reflected in Objective 5. Finally, the 'intrinsic' orientation, i.e. valuing farming as a worthwhile activity in its own right, is given by Objective 2.

6.2. Consistency of farmers' responses

Farmers are regarded as inconsistent if the transitivity relationship of preference is violated significantly in their responses; i.e. if the objective 'a' is preferable to 'b', and 'b' to 'c', then it follows that 'a' is preferred to 'c'. Depending on the frequency of circular triads of statements implying transgressions of the transitivity requirement, a farmer's responses could be considered inconsistent and the corresponding data removed from subsequent analyses. The coefficient of consistency ($\zeta$) as proposed by Kendall (1970) was calculated for each respondent; it is the ratio between observed and maximum number of circular triads, varying from 0 (total inconsistency, the observed number being equal to the maximum possible) to 1 (when no circular triad is observed).

For each of the 100 respondents, a matrix containing the choices for all combinations of objectives was constructed to calculate the number of circular triads and the corresponding coefficient of consistency, and to test the statistical significance of results. For the latter, a $\chi^2$ test was performed to test the null hypothesis that farmers made their choices by chance. As a result, the null hypothesis cannot be rejected for eight of the 100 farmers; hence the remaining 92 cases were used for further analysis.

6.3. Agreement amongst farmers

To establish the level of variability in the choice of objectives by farmers, the Kendall’s coefficient of agreement ($u$) was used (Edwards, 1957). A value of 0.42 was obtained for this coefficient, indicating a high agreement among farmers, as it can vary from $-1$ to 1. A $\chi^2$ test was also performed, resulting in rejecting the null hypothesis that farmers’ judgements are made at random, thus supporting the observation that farmers did show significant agreement in their choices.

6.4. Scale values for the objectives

After evaluating the consistency of farmers’ responses and the agreement regarding their choice of statements on objectives, the scale values for objectives were calculated under the assumptions which support the so-called “Case V” model. This model is one of the cases defined by Thurstone (1927) in deriving the “law of comparative judgements”. It assumes normal distribution for the discriminial processes, unidimensionality of the psychological continuum and equality for the standard deviations of differences of discriminial dispersions. When an entity identifies, distinguishes, discriminates, or reacts to stimuli, it is going through a psycho-physical action or a discriminial process. Discrimination between stimuli is made over a psychological continuum, where the discriminial processes are considered in the same serial order as the corresponding stimulus series. The discriminial process, however, is not unique for a particular stimulus. When several actors perform a judgement, or alternatively only one does it repeatedly, a distribution of discriminial processes is generated by the occurrence of different comparative judgements. The standard deviation of such distribution is the discriminial dispersion.

From the matrix of proportions, normal deviates and their averages were derived, to obtain scale values. The proportion or P matrix, showing the proportion of respondents preferring each individual goal to six of the rest, is shown in Table 2.

Using the inverse of the standard normal cumulative distribution, the normal deviates corresponding to the elements on the P matrix were calculated (Table 3). The last row of the table gives the scale values after they have been adjusted to render them non-negative.

6.5. The model’s internal consistency

Before interpreting the scale values, the model’s internal consistency has to be established to confirm if the assumptions which support the model (Case V) are tenable. A $\chi^2$ test was applied to examine if observed and theoretical proportions...
were in accord with each other. This test is sensitive to the absence of unidimensionality and, under some restrictions, to lack of equal standard deviations (Mosteller, 1951).

The null hypothesis relevant here was that the assumptions involved in the model were tenable, i.e. there were no differences between observed \( p_{ij} \) and theoretical \( p_{ij}^0 \) proportions. As the distribution of probabilities for the observed proportions was not known, it had to be approximated using an inverse sine transformation:

\[
\hat{\theta}_{ij} = \arcsin \sqrt{p_{ij}} \quad \text{and} \quad \hat{\theta}_{ij}^0 = \arcsin \sqrt{p_{ij}^0}.
\]

To test the null hypothesis, the following statistic was calculated:

\[
\chi^2 = m \sum_{i=2}^{n} \sum_{j=1}^{i-1} (\hat{\theta}_{ij} - \hat{\theta}_{ij}^0)^2 / \lambda,
\]

with \((n-1) \times (n-2)\) degrees of freedom, and \(\lambda\) is a constant equal to 821.

The null hypothesis should be rejected if the calculated \(\chi^2\) exceeded the corresponding tabulated critical value. The calculated \(\chi^2\) (for \(df=15\)) was 20.20, corresponding to a proportion of 0.16 in the \(\chi^2\) distribution. It means that values equal or greater than 20.20 are likely to exist, due to sampling variation, with a probability of 16%. It is considerably distant from the point of rejection of the null hypothesis, even for \(\alpha=0.10\), where the critical value is 22.31; therefore, the null hypothesis was accepted, justifying the assumptions underlying the model.

### 6.6. Interpreting the scale values

The relative position of the seven objectives in relation to each other, given by the scale values, is shown in Fig. 1.

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**Table 2**

Proportion (P) matrix with proportions \((p_{ij})\) in which the column objectives were preferred over the row objectives \(^a\)

<table>
<thead>
<tr>
<th>Objectives</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>2</th>
<th>1</th>
<th>6</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.5000</td>
<td>0.8617</td>
<td>0.8788</td>
<td>0.9034</td>
<td>0.9653</td>
<td>0.9793</td>
<td>0.9696</td>
</tr>
<tr>
<td>5</td>
<td>0.1383</td>
<td>0.5000</td>
<td>0.5280</td>
<td>0.7914</td>
<td>0.7512</td>
<td>0.8637</td>
<td>0.9285</td>
</tr>
<tr>
<td>7</td>
<td>0.1212</td>
<td>0.4720</td>
<td>0.5000</td>
<td>0.6488</td>
<td>0.6310</td>
<td>0.7288</td>
<td>0.7532</td>
</tr>
<tr>
<td>2</td>
<td>0.0966</td>
<td>0.2086</td>
<td>0.3512</td>
<td>0.5000</td>
<td>0.5006</td>
<td>0.7300</td>
<td>0.7138</td>
</tr>
<tr>
<td>1</td>
<td>0.0347</td>
<td>0.2488</td>
<td>0.3690</td>
<td>0.4994</td>
<td>0.5000</td>
<td>0.5894</td>
<td>0.6759</td>
</tr>
<tr>
<td>6</td>
<td>0.0207</td>
<td>0.1363</td>
<td>0.2712</td>
<td>0.5000</td>
<td>0.4106</td>
<td>0.5000</td>
<td>0.6361</td>
</tr>
<tr>
<td>4</td>
<td>0.0304</td>
<td>0.0715</td>
<td>0.2468</td>
<td>0.2862</td>
<td>0.3241</td>
<td>0.3639</td>
<td>0.5000</td>
</tr>
<tr>
<td>Total</td>
<td>0.94</td>
<td>2.50</td>
<td>3.15</td>
<td>3.90</td>
<td>4.08</td>
<td>4.76</td>
<td>5.18</td>
</tr>
<tr>
<td>Rank order</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

\(^a\) Objectives are arranged from the least to the most preferred one.

**Table 3**

Normal deviates \(z_{ij}\) corresponding to the proportion matrix

<table>
<thead>
<tr>
<th>Objectives</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>2</th>
<th>1</th>
<th>6</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.00</td>
<td>1.09</td>
<td>1.17</td>
<td>1.30</td>
<td>1.82</td>
<td>2.04</td>
<td>1.87</td>
</tr>
<tr>
<td>5</td>
<td>-1.09</td>
<td>0.00</td>
<td>0.07</td>
<td>0.81</td>
<td>0.68</td>
<td>1.10</td>
<td>1.46</td>
</tr>
<tr>
<td>7</td>
<td>-1.17</td>
<td>-0.07</td>
<td>0.00</td>
<td>0.38</td>
<td>0.33</td>
<td>0.61</td>
<td>0.68</td>
</tr>
<tr>
<td>2</td>
<td>-1.30</td>
<td>-0.81</td>
<td>-0.38</td>
<td>0.00</td>
<td>0.00</td>
<td>0.61</td>
<td>0.56</td>
</tr>
<tr>
<td>1</td>
<td>-1.82</td>
<td>-0.68</td>
<td>-0.33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.23</td>
<td>0.46</td>
</tr>
<tr>
<td>6</td>
<td>-2.04</td>
<td>-1.10</td>
<td>-0.61</td>
<td>-0.61</td>
<td>-0.23</td>
<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td>4</td>
<td>-1.87</td>
<td>-1.46</td>
<td>-0.68</td>
<td>-0.56</td>
<td>-0.46</td>
<td>-0.35</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>-9.29</td>
<td>-3.03</td>
<td>-0.77</td>
<td>1.32</td>
<td>2.15</td>
<td>4.24</td>
<td>5.39</td>
</tr>
<tr>
<td>Means</td>
<td>-1.3269</td>
<td>-0.4334</td>
<td>-0.1102</td>
<td>0.1880</td>
<td>0.3068</td>
<td>0.6052</td>
<td>0.7704</td>
</tr>
<tr>
<td>Means+1.3269</td>
<td>0.00</td>
<td>0.89</td>
<td>1.22</td>
<td>1.51</td>
<td>1.63</td>
<td>1.93</td>
<td>2.10</td>
</tr>
</tbody>
</table>
Objective 3, “maintain the social status as rancher”, achieved the lowest position on the scale of importance. Besides that its distance to the next objective (“be recognised as a progressive farmer”) was by far the biggest among any pair of consecutive objectives. It is, therefore, possible to observe that farmers do not give much importance to the social status derived from being ranchers or, in doing the opposite in some degree, are not willing to divulge complete information in a survey like this study. “Be recognised as a progressive farmer”, related to social status as well, was also ranked on a low position, reinforcing the findings related to Objective 3.

“Improve the family and personal standard of living” was put a little above the central point on the scale, but not given a high priority. This result is consistent with the farmers’ profile, as most of them (95%) can afford to live in town and have access to a wide range of facilities and consumer goods. The actual standard of living is then considered satisfactory, although any improvement would be logically welcome, if not at the expense of other objectives. In working with low-income farmers, the situation certainly would be different. The implicit values of being a farmer, reflected by the objective of “work in the countryside...” came next, but it was also placed in an intermediate position.

“Maintain ownership of land” was the objective ranked in the fairly significant third position. The feelings in relation to this objective are certainly the most unstable among the seven objectives that have been considered. Land ownership at the moment is a political issue in Brazil, with the landless pressure groups growing steadily in their political influence.

Finally, objectives placed at the first and second position (“pass on the inheritance and a way of living to the next generation” and “benefit from the security and liquidity of cattle ownership”) share the characteristic of being carried out via wealth accumulation. For the systems under study, cattle are possibly the single most valued asset, even more than land, as revealed by the second position of the objective where it is explicitly considered; furthermore, its implied inclusion among the assets considered in the first ranked (“pass on the inheritance...”) objective.

These findings, particularly the last ones, highlight the importance of ownership of cattle in explaining the paradox of overgrazing despite the risk of degradation. It seems that maintaining or increasing cattle assets represented an overwhelming value, with implicit benefits for the farmer that justify the apparently ‘bad’ management practices leading to pasture degradation. This objective, therefore, has to be given its due
importance in analysing and modelling the decision making related to setting the stocking rate.

6.7. Stocking strategy, perceptions on pasture degradation and their relationship with farmers’ objectives

In the survey farmers were asked to state their views on the intensity with which they exploit their pastures: 26% said that they practised overgrazing, 34% reported stocking rate being the same as the carrying capacity and 40% thought that their stocking was below the carrying capacity. The proportion of farmers reporting overgrazing is relatively low considering the general belief that the practice is widespread in the area. Two factors could explain this unexpected result. First, these views as expressed by farmers are ‘declarations’ rather than the actual observed behaviour and, therefore, these responses are farmers’ subjective interpretations of concepts such as carrying capacity, over- and undergrazing. Second, the respondents in answering a question on a ‘non-recommended’ practice such as overgrazing might have felt inhibited in stating the true situation. Additionally, survey respondents were also asked to state their perceptions on the severity of pasture degradation on their farms and in the region as reported in Table 4.

These views confirm the importance of pasture degradation in the region and the information in Table 4 conforms with the estimates that more than half of the sown pasture area in Central Brazil is suffering from degradation.

Knowledge of the relationship between farmers’ objectives and the two variables of stocking strategy and the level of degradation is a basic requirement for developing an understanding of the influence of farmers’ objectives on pasture management. This was explored at the first level by cross-tabulation, where farmers’ objectives are treated as a dichotomous nominal variable. The first category includes preferences for any of the two higher rated objectives (“pass on the inheritance and a way of living to the next generation” and “benefit from the security and liquidity of cattle ownership”). The second category includes preferences for any one of the other objectives, many of which present a very low frequency of preference. Stocking strategy and the level of pasture degradation are ordinal variables with three and six categories, respectively. Using this information, contingency tables were constructed by cross-tabulating preferences for objectives and stocking strategy, and preferences for objectives and the level of pasture degradation. The $\chi^2$ test revealed that results are not statistically significant. This is not surprising as respondent farmers did show a considerable level of agreement on preferences for objectives.

7. Expert opinions versus farmers’ responses

Experienced agricultural researchers are expected to be, and mostly are, aware of the realities of farming their farmer client has to deal with. Only two studies could be found where an explicit attempt has been made to compare farmers’ perceptions and the opinions of experts on any reality of farming. MacLeod and Taylor (1994) compared the perceptions of research scientists and responses

<table>
<thead>
<tr>
<th>Scale of importance</th>
<th>Scale values</th>
<th>Frequency of scale values for the severity of pasture degradation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In the region</td>
<td>On the farm</td>
</tr>
<tr>
<td>Not important at all</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Not very important</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Little important</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Important</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>Very important</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>Extremely important</td>
<td>6</td>
<td>40</td>
</tr>
</tbody>
</table>
of beef cattle producers about sustainable grazing management issues in Australia. Important similarities and differences were highlighted; the differences were related mainly to the perceived objectives of producers. More recently, Dalmazo et al. (1997) have contrasted farmers' responses and extensionists' perceptions on farmers' objectives and problems for small farmers in Southern Brazil. The evidence on misperceptions by extensionists is clear. These differences and similarities of the two sets of perceptions and opinions provide a useful backdrop to examine issues pertaining to agricultural sustainability. But the evidence available on the matter, such as it exists, is meagre.

7.1. Opinions of experts

Prior to the design and construction of the questionnaire for farmers, a small but representative group of 16 experts on the beef cattle systems in the study area were asked about their perceptions of farmers' objectives, management of the stocking rate and other factors associated with the problem of pasture degradation. Agricultural researchers who work in the region are believed to have a sound understanding of farming conditions and farmer behaviour in the area. It was believed that their views would provide a useful backdrop for formulating hypotheses on farmers' objectives. Most of these expert respondents have been working for long periods at CNPGC/EMBRAPA (National Beef Cattle Research Centre—Brazilian Organisation for Agricultural Research, located at Campo Grande, State of Mato Grosso do Sul), a research centre dealing exclusively with beef cattle production in the region. Their long standing experience as researchers and advisers—as they are regularly asked to provide consultancy and other services, their perception of farmers' real situation is not likely to be wide off the mark—should confer both reliability and validity to the data collected.

Nevertheless, the outcome from the analysis of this expert opinion survey has to be treated with some caution because: (1) farmers and experts were questioned using different procedures, through pre-defined statements and open-ended questions, respectively; as a consequence, some objectives presented to farmers could not be included in the list originating from experts; (2) data from farmers may not reflect the objective reality accurately, as they did not come from observation, but from questioning; and (3) data from experts are not from a random and unbiased sample.

To facilitate the task of the experts, the farmers were treated as being of three types, 'traditional', 'with off-farm income' and 'crop grower'. Such classification is supported by an increasing significance of the two last categories, resulting from new off-farm jobs and business opportunities, as well as the expansion of area under crops in the region. Experts were then asked to state what they thought were the most important objectives for each of the three types of farmers. These statements on farmers' objectives were ranked according to the frequencies of mention.

7.2. Farmers versus experts

As farmers had been asked about objectives using the paired comparisons method, it was necessary to use another indicator for direct comparison of farmers' statements and expert opinions. The procedure consisted of: (1) compute the percentage (involving all farmers in the subgroup) for all possible number of times (0, 1, 2, 3, 4, 5 or 6) the objective could be selected by one farmer; and (2) calculate a weighted (by percentage) average for that possible number of times of selection, giving the desired indicator. Table 5 shows the results of this comparison.

Clearly some objectives were not mentioned by experts for all types of farmers. The possible explanations for this are:

1. “maintain ownership of land” was not mentioned at all, perhaps because of its political connotation given the special circumstances prevailing in the Brazilian society, with experts considering it irrelevant given their mission as agricultural researchers; nevertheless, this problem does affect decisions at the farm level and, therefore, has to be part of our enquiry.

2. “maintain the social status as rancher” is absent for the ‘crop grower’, probably due to
of someone who possesses better managerial skills and keeps cattle as a means of diversifying the production system, rather than for social status reasons.

3. “be recognised as a progressive farmer” was not linked to the ‘traditional’ farmer, a logical consequence of the conservative profile associated with this category of farmers; and

4. “improve the family and personal standard of living” was only considered relevant for the ‘traditional’ farmer.

Having allowed for the above differences in expert opinions on farmers’ objectives, some further incongruities still exist between expert views and farmers’ responses. These incongruities and congruencies for each farm type are:

1. **Traditional farmer.** Farmers and experts showed a substantial conformity, placing Objective 3 as the lowest in the hierarchy and giving a high position to Objectives 4 and 6. The main difference was the reversed position for these most preferable objectives, with experts putting Objective 2 in the highest position, above 4 and 6, and farmers doing the opposite.

2. **Off-farm income farmer.** Objective 6 was considered as the most important one by both farmers and experts. On the other hand, Objective 3, placed by farmers at the lowest position in the hierarchy, was put at a considerably high position by experts. The other point of no coincidence was the position of Objective 4, very low for experts and the second highest for farmers. The degree of conformity for this case was smaller than for the traditional, despite the important common answer for the highest ranked Objective 6.

3. **Crop grower farmer.** The results for this type were similar to those for off-farm income farmers: Objective 6 was placed as the second highest by farmers and in the first position by experts while Objective 4 was ranked low by experts and as the highest one by farmers.

8. **Concluding remarks on the link between pasture degradation and farmers’ objectives**

The purposes of research have been served well by the use of the paired comparisons technique as it produces a scale for farmers’ objectives from a sample which is very heterogeneous in attributes like educational attainment levels and age. The scalar values, rather than a simple ordering of objectives, were the most relevant outputs from analysis, since a very similar hierarchy was obtained by the informal procedures used when farmer responses and expert views were compared. Most of the farmers (92%) and the model used in analysing their answers were

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* Objectives: 1, Maintain ownership of land; 2, Work in the countryside, keep and rear animals, be your own boss; 3, Maintain the social status as rancher; 4, Pass on the inheritance and a way of living to the next generation; 5, Be recognised as a progressive farmer; 6, Benefit from the security and liquidity of cattle ownership; 7, Improve the family and personal standard of living. Blanks mean that experts did not mention that objective.
considered statistically consistent. Farmers also presented a high degree of agreement, with no compelling reason for splitting them in clusters.

The scale values of 2.10 and 1.93 placed, respectively, on “pass on the inheritance and a way of living to the next generation” and “benefit from the security and liquidity of cattle ownership” as the more important objectives are close. This closeness, combined with the presence of cattle as one of the assets included in the inheritance referred in the ‘number one’ objective and the explicit consideration of cattle ownership in the objective rated second, reinforces the significance of the objective of possessing cattle itself. It is worth mentioning that similar observations have been made by MacLeod and Taylor (1994) in Australia, where “maximise animals carried” was also regarded as a very important objective by beef cattle farmers.

“Ownership of land” came next on the scale. “Work in the countryside…” on other hand is placed halfway on the scale implying that farmers are not putting too much value on the intrinsic benefits of farming.

“Improve the family and personal standard of living” is also located on an intermediary position, indicating that farmers are generally satisfied with their actual level of consumption. This result is consistent with the preference for capital accumulation (Objectives 4 and 6), since this target would normally be pursued after the fulfilment of a minimal level of consumption.

“Concern with social status” has been placed at the bottom of the scale. The hesitation by farmers in declaring such preference could lead to some bias in the results generated, indicating that social status should be explored via indirect statements in future research.

Farmers and experts showed a substantial degree of conformity on the hierarchy of objectives, despite some incongruities. It suggests that researchers are aware of the importance that farmers give to various objectives, which in a way lends credibility to the research programmes that researchers pursue themselves. Another important observation that has emerged from the comparison of farmers’ responses and expert opinions, is the foremost importance that both groups attach to the objective of possessing cattle.

The analysis presented in this paper provides an understanding of the overgrazing paradox due to two main reasons. First, possessing cattle as an end is indeed a strong objective for the farmers; the feeling of uncertainty about the future, enforced by long periods of high inflation and weak social and economic institutions in Brazil, may have contributed to make it a fundamental value, resulting in high discount rates to be used when evaluating any decision with long-term consequences. Second, long-term losses due to pasture degradation are presumably reduced significantly when expressed in terms of present value (due to the high discount rates). Additionally, it seems that farmers have not been aware of overgrazing and its consequences, even though it seems hard to believe. Despite the recent emphasis on the problem of pasture degradation, farmers’ perceptions have been marred by a general lack of knowledge on this issue until recently.

This research provides a basis for treating the perception on the influence of objectives on the degradation phenomenon from being a conjecture to that of an empirically valid hypothesis. In terms of modelling the process of decision making related to the stocking rate, the present findings, apart from highlighting the importance of considering multiple objectives, point out the need to integrate the objective “maximise the number of owned cattle” with gross margin or profit optimisation, as a definite determinant of the current state of the agricultural system in existence.

References


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