

Chapter 3

METHODOLOGY

3.1 Introduction

The study focused on three provinces, namely the Eastern Cape, KwaZulu Natal and Northern Province. Land degradation data and results, used, however, were taken from all 367 magisterial districts across the nine provinces in South Africa. The three provincial studies included former homelands and independent Bantustans of Ciskei and Transkei, KwaZulu, Gazankulu, Lebowa, and Venda respectively. Different areas, magisterial districts, and towns in these provinces were used to test different scenarios. These are tabulated in the study procedures and methods section below.

3.2 The Terms of Reference

The terms of reference that provided a basis for the design of the data collection and analyses, were:

- (a) to examine concepts and definitions.
- (b) to quantify marginal biophysical characteristics, rural population and rural poor living on these areas, and the government commitment devoted to research on productivity increase (agriculture, environment, forestry and water), post-harvest activities and options for the removal of institutional constraints, all of which are expected to contribute to poverty eradication on "marginal lands" as defined by their biophysical characteristics.
- (c) to make suggestions about future agricultural priorities and strategies for research work on marginal lands, including whether the current level of effort is adequate in relation to that devoted to other land types.

3.3 Study Procedures and Methods

The study created a database for identifying marginal and non-marginal (favoured) lands and their characteristics, including: biophysical environment and climate, land use and land tenure systems, demography, labour and employment and economic production indicators. The purpose or scope of the database was to indicate orders of magnitude of different land types in these provinces, i.e. the extent of favourable and less favourable lands available for agricultural purposes, the extent of forest and woodlands and dry areas, and the number of rural people and rural poor living on them.

3.3.1 Primary Data

Information about the severity of water, soil and vegetation degradation in South Africa was obtained from four main sources. These were:

- a series of workshops (12 in total), which were held in the three Provinces (Eastern Cape, KwaZulu Natal and Northern Province) between March and September 1999, involving 82 participants, most of whom were either agricultural extension officers, development workers and or resource conservation officers. During these workshops informal and unstructured interviews were conducted with participants (see *ANNEX 5 and 6*);
- extensive South African literature on natural resource degradation was reviewed and information about the nation's soil and vegetation degradation was synthesized and prepared for this study;
- several case studies were carried out in 1999 in districts from the three provinces, to verify and add to workshop findings. Selected information derived from these case studies was also used in the study;
- extensive statistical records, that exist for each magisterial district in these Provinces and that cover a wide range of subjects, from agriculture to demography, and from labour to economics, have also been used throughout the study;

- 31 variables (see *Annex 2*) which defined each of the 367 magisterial districts in South Africa in terms of their biophysical environment and climate, land use and land tenure systems, demography, labour and employment and economic production indicators, were used;
- three correlation matrices (soil degradation, veld degradation and a combined, soil plus veld degradation index) which were developed during the workshops, were used;
- the degradation indices and land use variables derived from the workshops were used, and all biophysical and climatic variables, except runoff and erodibility, were calculated from data sets available in the GIS directorates of the Computing Centre for Water Research (CCWR), which are explained in detail in Schulze *et al.*, (1997).
- runoff and erodibility were calculated from the Environmental Potential Atlas (ENPAT, 1996) database (van Riet *et al.*, 1997); and
- the mean values for each of the 367 magisterial districts were calculated using ArcView GIS™.

3.3.2 Socio-Cultural and Economic Data

The data used throughout the study for the purpose of analysing and reporting the socio-cultural and economic analysis were extracted from one of the following tools;

- the population data for the three provinces was collected per magisterial district, based on the 1996 census, as well as from previous studies conducted by the Development Bank of Southern Africa (DBSA). Data from the 1991 census is sometimes used in this study to illustrate the former homeland scenarios.
- the Human Sciences Research Council (HRSC) [Development indicators for Eastern Cape, KwaZulu Natal and the Northern Province, 1997], was used;
- country values on percentage rural population were taken from Development indicator and/or UNDP Human Development Report 1994.
- demography, labour and employment and economic production variables were taken from the nine statistical macro-economic reviews (one from each province) published by the Development Bank (DBSA) in 1995.

- stocking values were taken from the 1995/96 Census of the National Department of Agriculture.

3.4 Workshop protocol

A series of participatory workshops were organised in these provinces during 1999. The main aim of the workshops was to formulate a programme of collaboration between the Republic of South Africa and the Food and Agriculture Organisation of the United Nations (FAO) – Special Programme for Food Security and Development of Rural Information Systems (SPFS). It also had a mandate to develop a consensus map of status of land degradation in these poorest Provinces. Information concerning land use practices and changes in land use area intensity over the last 10 years was also collected. In total, 12 workshops were held each lasting 4 – 6 hours. The location of the workshops were Umtata, Kokstad, Queenstown and East London (Eastern Cape); Cedara, Pieters, Port Shepstone, and Eshowe (KwaZulu Natal); and Giyani, Potgietersrus, Pietersburg and Thohoyandou (Northern Province).

Table 3.1: Itinerary for the 12 Workshops held in Eastern Cape, KwaZulu Natal and Northern Province between March and September 1999. The province, agricultural region and town where each workshop was held, as are the date of the meeting and number of people who attended.

Province	Agricultural region (s) assessed	Workshop location	Date	Number of people attending
Eastern Cape	Eastern	Umtata	9/6/99	9
	Griqualand	Kokstad	10/6/99	6
	Northern	Queenstown	11/6/99	6
	Central	East London	23/6/99	8
KwaZulu Natal	Northwest	Pieters	16/3/99	9
	Northeast	Eshowe	18/3/99	10
	Southeast	Port Shepstone	23/3/99	9
	Southwest	Cedara	25/3/99	10
Northern Province	Western	Potgietersrus	7/9/99	5
	Central	Pietersburg	9/9/99	9
	Northern	Thohoyandou	14/9/99	6
	Lowveld	Giyani	15/9/99	6

A total of 82 people attended the workshops. The majority of the participants were agricultural officers and or resource conservation technicians. The officials were chosen for a number of reasons, but especially for their expertise. These officials are a significant workforce of the Provincial Departments of Agriculture and National

Department of Agriculture. They have a presence in both marginal and favoured areas and are, for the most part, very knowledgeable about the state of natural, and especially the agricultural resources, of an area. Many have served for many years, if not decades in a single magisterial district or agricultural region and their understanding of the changes that have occurred in an area are unparalleled. It is appreciated, however, that their perspective is strongly influenced by their background and training. This is especially true in terms of their bias towards commercial agricultural production as opposed to their appreciation for the merits of marginal land tenure and land use practices.

However, because agricultural personnel, with a wide experience in both favoured as well as marginal areas, were used, it is believed that the study achieved a realistic and balanced perspective on the problems of land degradation in South Africa. In very subjective assessment of these differences, it is suggested that the officials with a commercial agricultural background tended to over-estimate the problems in favoured districts while those with a history of working in the marginal areas often underestimated the degree and extent of degradation in an area. Overall, however, I support the findings from a survey, which suggest that agricultural extension officers possess reasonably balanced perception of the state of resources of a region. This perception lies between the underestimation generally experienced amongst farmers and the over-estimation of many range scientists

Table 3.2: Differences in the perceptions of veld condition by farmers, agricultural extension officers and range scientists:

Scored	Veld condition %		
	Poorly to very poor	Fair	Good to very good
Farmers	5	21	74
Extension Officers	13	46	41
Range Scientists	40	45	15

Source: Data from Roux (1990) who cites them as being from "a survey carried out by the Extension Research Institute, University of Pretoria (undated).

The same approach in all workshops was adopted. This approach is similar to that used in the Global Map of Human - Induced Soil Degradation (GLASOD) (Oldeman *et al.*, 1991) but the method was modified considerably to suit my own needs and

circumstances. Generally, the procedure is laid out in Liniger and Van Lynden (1998) for the assessment of land use practices and soil degradation only. This methodology has emerged from several iterations of WOCAT Task Force (World Overview of Conservation Approaches and Technologies), and has been shown to be robust enough to be used under a wide range of circumstances. An example of the data sheets used in the workshops is shown in *Annex 5*. The workshop itself was divided into three main components. The first, concerned land use practices in the magisterial district. Although there are many land use classification that have already been applied to South Africa (e.g. Schoeman and Scotney, 1987; Thompson, 1995), the study recognises six, main Land Use Types (LUT). These are croplands, grazing land or veld, commercial plantations, conservation areas and state land, settlement areas and "other".

Workshop participants, with particular knowledge of their magisterial district, were asked to determine:

- the proportion of the magisterial district used for favoured or marginal purposes, expressed as a percentage;
- the area of each LUT within a district, expressed as a percentage of entire district;
- whether the area for each LUT has increased or decreased over the last 10 years and reasons for the change (0=stable over the last 10 years, + 1=slightly increasing, +2=moderately increasing, -1=slightly decreasing, -2=moderately decreasing);
- whether the intensity of land use had increased or decreased over the last 10 years and reasons for the change (0= no change, +1 = moderate increase, +2 =major increase, -1 = moderate decrease, -2 =major decrease);

The second component of the exercise concerned soil degradation in the magisterial district. Soil degradation was divided into erosive forms such as acidification or salinisation. Participants were asked to determine for their magisterial district:

- the two or (rarely) three main types of soil degradation in each LUT.

- the degree of soil degradation in each LUT (1= light, 2+ moderate, 3= strong, 4 = extreme);
- the relative extent of soil degradation in each LUT, expressed as a percentage class;
- the severity class (read from severity class in *Annex 6*);
- the rate of soil degradation that has occurred over the last 10 years (0= no change, +1 = slightly increasing, +2 = moderately increasing, -1 = slightly decreasing, -2 = moderately decreasing).

The main reasons for soil degradation in each of the magisterial districts were discussed and a soil degradation index was then calculated for each district as:

$$\Sigma (\text{LUT Degradation Severity Class} + \text{LUT Degradation Rate}) * \% \text{ Area of LUT}$$

The final component of the exercise concerned veld degradation in the magisterial district. The study recognised six main types of veld degradation. These were loss of cover and change in species composition, bush encroachment, alien plant invasions, deforestation and a general category of "other". Participants were asked to determine for their magisterial district:

- the two or (rarely) three important types of veld degradation in the grazing lands only;
- the degree of veld degradation in the grazing lands (1 = light, 2 + moderate, 3 = strong, 4 + extreme);
- the relative extent of veld degradation in the grazing lands, expressed as a percentage class;
- the severity class (read severity class table in *Annex 6*);
- the rate of veld degradation that has occurred over the last 10 years (0= no change, +1 = slightly increasing, +2 = moderately increasing, -1 = slightly decreasing, -2 = moderately decreasing).

The main reasons for veld degradation in each of the magisterial districts were discussed and a veld degradation index was then calculated for each district as:

(Veld Degradation Severity Class + Veld Degradation Rate)* % Area of veld

The soil degradation indices were added together to form a single combined index of land degradation, which incorporated, both soil and vegetation parameters.

Following the formal section of the workshop and completion of the data sheet (*Annex 5 and 6*) a more general discussion followed. Degradation indices were totalled and districts ranked according to their degradation status. The data for each magisterial district was assembled in a Microsoft Excel™ spreadsheet and imported into ArcView GIS™ GIS Version 3.1 for analysis and presentation.

The study has not undertaken a comprehensive analysis of the reliability of the results or potential inaccuracy of the workshop results. However, in some cases there is a significant correlation with other studies (e.g. Versveld *et al.*, (1998) map of the distribution of alien plants; Loxton *et al.*, (1985) assessment of soil erosion in 28 former Transkei districts. This suggests that data in this study might reflect some level of reality that can be corroborated by detailed scientific measurement.

3.5 Case Studies

The 12 degradation workshops, held in the three provinces provided a useful general perspective on land degradation. The workshops pointed to problem areas, and in a very limited time available during meetings, also enabled the study to gain some insight into the probable causes of land degradation in specific districts. Despite the value of this approach it also has a number of weaknesses.

First, local users were generally not represented at the meetings. The opinions of crop and livestock farmers and other land users were not known. For marginal areas this includes those people who use the natural resources of an area for a multitude of purposes such as firewood, construction timber, medicinal plants etc. It was felt that it would be important to consult more widely with the land users of a district to assess whether their perceptions were similar to those of agricultural personnel who

attended workshops. Secondly, there was a need for more detailed accounts of land degradation problems and solutions and the best way was to embark on a series of case studies in key magisterial districts.

Six districts, Herschel and Peddie (Eastern Cape); Nongoma and Weenen (KwaZulu Natal); and Schnoord and Mhala (Northern Province) that comprise both favoured and marginal land tenure systems were used for case studies. Some, such as Herschel and Weenen are perceived to be amongst the worst in the country in terms of their land degradation status:

Three broad areas of investigation were emphasized in each case study.

1. An attempt was made to describe the biophysical resources of the district in more detail and to assess the accuracy of the information obtained in the workshop.
2. An investigation into the environmental history of a district was undertaken largely through asking people about their perceptions of how land degradation status has changed in their lifetime.
3. Local user perceptions and impacts of land degradation in the district were also assessed with the following four theme questions:
 - What are the perceptions, level of awareness and priorities of local land user in terms of their soil and veld resources?
 - What are the perceived reasons for the levels of land degradation in the district or village?
 - How does the extent of land degradation affect local user livelihoods?
 - What approaches have been or should be initiated to reverse or maintain the agricultural status of the district?

With each of these four general themes several additional questions were posed to the land users depending on the composition of the group or on the level of the group or individual. Individual case study investigations lasted from a few days to a week at a time. The information gathered from these case studies is sprinkled throughout the study.

3.6 Magisterial district statistics Chapter 4

Each magisterial district in South Africa has a unique history, which is partly recorded in an extensive set of statistical records. These records define a district and are able to provide insight into the important correlates and predictors of land degradation. Information from several sources was used to assemble a statistical portrait for each magisterial district.

Each chapter outlines the underlying information relevant to natural resource management (NRM) across the study area, and to indicate its utility and possible weaknesses. It is basically a description of what information is available and what it can deliver. As a background to the rest of the study, this chapter provides descriptive natural resources information on three provinces.

4.2 Physical and Biological Environment in South Africa

4.2.1 THE EASTERN CAPE

The Eastern Cape is one of the poorest provinces in South Africa. It is situated in the south east of the country and encompasses what is traditionally known as the Eastern Province, Border and north Eastern Cape areas, as well as the former "homelands" of Transkei and Ciskei. On the northern side, it borders the Kingdom of Lesotho and Free State, while the districts of Middelburg, Graaff-Reinet, Aberdeen, and Willowmore form its western borders. The Eastern Cape is spatially the second largest province, covering 170 616 km², or 13.9 per cent of the total surface area of South Africa.

4.2.1.1 Climate

According to the South African Weather Bureau classification, the Eastern Cape comprises five climatological regions, based on temperature and rainfall variations.

The climatological regions are as follows: