

Chapter 3: Methodology

3.1 Introduction

The research aim, objectives and justification for the selection of study sites were set out in Chapter one. Chapter two presented the theoretical debates and conceptual framework that inform this research. This chapter discusses the methods used. The chapter is written largely in the ‘ethnographic present’ and the first person ‘I’ because it deals with fieldwork as a lived experience and draws attention to the ways in which *my* interpretations and understandings were influenced by power relationships between translators, respondents and myself.

To reiterate, the aim of this research is to examine the changing livelihood-environment links and opportunities for enhancing livelihoods in the highly degraded and poverty-stricken district of Sekhukhune. The three objectives of the research are:

- 1) To identify and critically evaluate narratives of development and land degradation in South Africa and their links to international directives;
- 2) To examine the dimensions and dynamics of contemporary livelihoods in the study area, with special regard to the contribution of land-based practices to broader livelihood portfolios and to local understandings of land use, land management and environmental change;
- 3) To investigate the justification for and efficacy of interventions grounded in dominant environment-development narratives in enhancing livelihoods and changing environmental processes.

A variety of possible techniques are available for investigating society-environment interactions and dynamics. The effects of soil loss in smallholder agriculture can be explored, for example, at a micro-scale through the analysis of erosion rates and their effects on yield but, as stated in Chapter two, this is a complex and highly time-consuming undertaking. Another popular technique involves assessing the monetary value of erosion to a household and/or the ‘willingness-to-pay’ for soil conservation (e.g. Crookes *et al.*, 2000), but problems with this approach include aggregating survey

data in communities where there is a wide variation in knowledge and practice and, more fundamentally, reducing complex values to monetary units (e.g. Tacconi, 2000). This research adopted an alternative holistic and multi-disciplinary approach, combining use of a range of social and physical scientific methodologies in a mixed methods or hybrid approach (Thomas & Twyman, 2003; Abbot and Guijt, 1998; Batterbury *et al.*, 1997; Brannen, 1992). The approach acknowledges that all understandings are mental constructions and as such are fundamentally imperfect, partial and provisional (Latour, 1993; Simmons, 1993) and must be interpreted in relation to the contexts within, and purposes for which, they were produced (Mosse, 1994; Finnegan, 1992). A value-free, 'true' account of experience is deemed impossible (Quicke, 1994; McDowell, 1992); instead, multiple rationalities are understood to coexist (Chambers, 1994; Thompson *et al.*, 1986). Yet as Batterbury *et al.* (1997:126) argue, biophysical resource fluxes are 'externally real' to human experience. The approach adopted here therefore attends to the social and political construction of different problems by multiple interest groups but simultaneously seeks to provide realist insights for the pragmatic management of environment and development problems (cf. Batterbury *et al.*, 1997).

The hybrid approach was customised to fit the research objectives but still allowed flexibility for iterative methodological adaptation to the specific fieldwork context encountered (Mosse, 1994). Forsyth (1996) suggests using local knowledge as the starting point in research and then using Western scientific methodologies to extend investigations to wider areas. In this research different knowledge repertoires are used for targeting at different spatial scales. 'Official' and scientific perspectives provided perceptions of national-scale differences in 'environmental degradation' that facilitated targeting of a specific district, Sekhukhune. The knowledge of personnel of the Sekhukhune District Department of Agriculture was used to focus on three allegedly highly degraded settlements. Within settlements, a similar approach was utilised to that recommended by Forsyth (1996). Local knowledge was investigated initially in order to direct subsequent scientific investigations to areas of particular interest or value to local people, thus allowing inclusion of issues and areas which are of importance to local people yet which might otherwise have been omitted from more conventional scientific assessments (Thomas & Twyman, 2004).

The approach involved a combination of social surveys, interviews, participatory methods and biophysical techniques. The term participatory is used here to refer to working with the knowledge of ‘ordinary’ people (Park, 1993), rather than to the more radical notion of attempting to empower local people through building community problem-solving capacities (e.g. Chambers, 1997; Stoeker, 1997). While attempts were and are being made to ensure the findings from this study are of more than academic value by distributing research results, expressed in suitable language and format, to networks and contacts established in key South African government ministries and NGOs, the focus of the research was largely on extracting information to meet objectives defined *outside* the local context, as PhD research necessitates.

It is now widely recognised that participatory techniques as ‘public’ social events tend to mask diversity and produce ‘safe’, consensus opinions influenced by group composition, dominant personalities and ‘the noise of power relations’ (e.g. Mapedza *et al.*, 2003; Chambers, 1997; Pottier & Orone, 1995; Mosse, 1994; Simmons, 1993). Awareness of such studies encouraged the more extensive use of individual as opposed to group-based interviews that provide opportunities for a more open dialogue and ‘deep listening’ (de Gabriele, 1999). The principal sources of data were a household survey in each study settlement and semi-structured and repeat interviews with individual representatives of a range of stakeholder groups at settlement, district and provincial scales. These data sources were complemented by observations of, and participation in, local livelihood practices, use of Participatory and Rapid Rural Appraisal (P/RRA) techniques (Chambers, 1992), soil sampling and testing (Anderson & Ingram, 1993) and use of secondary sources including aerial photographs.

The chapter begins by introducing the research strategy and the study sites. It then examines in turn the specific methods used to address each of the three research objectives. Selection of methods and problems experienced in the field are also discussed, including perennial issues of positionality and reflexivity.

3.2 The research strategy

A comprehensive literature review informed the design of the research objectives and choice of methods used. Prior MSc research on livelihood diversity and sustainable land management in a dryland region of Northern India also informed the selection of

methods and theoretical orientation adopted. Two phases of fieldwork in 2002 and 2003 were the foundations on which the overall PhD project was based, as shown in Table 3.1. Research progressed in a flexible, iterative and exploratory manner, with a return visit to the UK between periods of fieldwork providing time for reflection and access to the literature and information technology resources necessary for a preliminary analysis of the data collected.

Table 3.1: Research strategy

Project stage	Time	Purpose and activities
Project planning	Sept 2001- May 2002	Review of literature; research training and fieldwork preparation; establishment of research links
Fieldwork phase one	May-Oct 2002	Address objectives in primary study location: Identification and review of information sources, study sites and stakeholders; selection and training of research assistants/translators; analysis of policy documents relating to rural livelihoods and formal semi-structured interviews with government officials; collection of social and biophysical data on local livelihoods and land use practices
Preliminary data analysis in UK	Oct 2002 – March 2003	Review progress against objectives; refine research methods and consolidate data prior to phase two; soil analysis
Fieldwork phase two	Mar 2003 - July 2003	Complete follow-up work where necessary in primary field site; address objectives in secondary field sites (see phase 1 above); feedback of preliminary findings to land users and collaborating institutions
Write up	July 2003-Sept 2004	Soil analysis; continued refinement, analysis and write up; feedback of findings to collaborating institutions and individuals

3.3 The study settlements

The village of Phahlamanoge, the primary study site for this research, is located in the western foothills of the Leolo Mountains in Sekhukhune District, approximately 150 km south of Polokwane (formerly Pietersburg). Phahlamanoge falls within the administrative boundaries of Fetakgomo Municipality, the local government authority through which development interventions are increasingly coordinated and implemented. The village is located on the mountainous eastern edge of the catchment area of the Lepellane River, a small tributary of the Olifants River, the major river in the region. The potential silt load from the 300 square kilometre Lepellane catchment area is estimated to be 600 tonnes/sq km/annum (Department of Water Affairs, 1991), although the actual sediment yield may be much higher because the area is reported to have been largely denuded of vegetation (Pardeller *et al.*, 1999). Such high silt loads can cause serious problems for downstream users of river water such as irrigation schemes and reticulated drinking water supplies.

Selection of Phahlamanoge as the primary study site was based on interviews with provincial and district level Department of Agriculture staff and NGO personnel. This settlement was of particular interest because the area around Phahlamanoge was widely regarded by provincial government and NGO personnel interviewed as one of the most 'degraded' and eroded areas in the province. This perception is supported by a satellite imagery based study of soil erosion in the former Lebowa conducted in 1993 which identifies the immediate area of Phahlamanoge as having erosion occurring in continuous patches on over 70% of the land surface (Department of Agriculture and Environmental Affairs, 1993). A second reason for selecting Phahlamanoge was the presence of a pilot project of the government's major environment-development programme: Landcare. The activities and impacts of this project on livelihoods and environment are of great relevance to this research. An initial visit to Phahlamanoge also indicated that many local residents had access to land and that land-based livelihoods were widely practiced as part of local household livelihood portfolios. Since 'degradation' processes are likely to be more significant to people where they depend to a greater extent on use of land, perceived needs for conservation are also likely to be greater in such areas. Thus, there appeared to be potential in Phahlamanoge to investigate and contribute practically to a locally recognised need for reducing detrimental environmental change.

Two secondary study sites located within the same watershed, Soupiana and Madibong, were selected for the second phase of fieldwork. Both are located in Makhuduthamaga Municipality adjacent to Fetakgomo. Selection of these sites followed further consultation with Department of Agriculture personnel, NGO staff and an interview with district level Environmental Affairs officers. The latter group identified all three of the selected study sites as being some of the most eroded areas in the district. The aim of working in two further sites was to pursue important issues arising from the primary field site and inter-settlement variation in key livelihood and NR dimensions within the region. By restricting study sites to the same watershed, variation in biophysical variables was minimised. A focus on the Lepellane catchment in particular was further justified because this area was the proposed target of a soil conservation and rural development programme to be implemented by the Japanese International Cooperation Agency (JICA) in partnership with the provincial Department of Agriculture. Discussions with the Limpopo Province Department of Agriculture (LPDA) suggested

that my study might make a useful contribution to this programme, thus broadening the impact of my research beyond the academic sphere.

The village of Soupiana was selected as a secondary study site because it was identified by district-level Department of Agriculture staff as another degraded area that was being considered for a future Landcare project. Like Phahlamanoge, it is also remotely located on the Leolo Mountains, with no all-weather access road, on the eastern edge of the Lepellane catchment. It is situated at higher altitude than Phahlamanoge and consequently receives greater average annual rainfall (cf. Department of Agriculture representative, pers. comm., 2003; Department of Water Affairs, 1991). The influence of this critical variable on livelihood and NR practices was of particular interest. The village was also an attractive research location because it possessed a woodlot project, a potentially useful means for reducing deforestation. Soupiana is a small village and many residents are born in the village or drawn from a sister village in Swaziland, hence kinship ties are strong.

Madibong is at an altitude similar to that of Phahlamanoge and experiences similar levels of rainfall (cf. Department of Agriculture representative, pers. comm., 2003; Department of Water Affairs, 1991). It is located on the western edge of the Lepellane catchment in a highly eroded area where huge erosion gullies exist that had been surveyed previously in preparation for implementation of a LPDA rehabilitation project. This project, however, never came about due to funding constraints. Madibong is distinct from the other two sites in that it is a larger settlement that links with the dense built-up area of Jane Furse, the major transport hub and 'development node' in the district. Residents have easy access to shops, traders, food outlets and transport links, and consequently greater contact with outsiders such as doctors, merchants and politicians. There is also a reticulated water system and electricity, services that are unavailable in Phahlamanoge and Soupiana. However, access to safe drinking water often remains problematic, as it can be in Soupiana and Phahlamanoge. The implications of service and infrastructure availability for livelihood and environmental outcomes were considered in this research. Madibong also experienced much greater immigration from white farms over the last 100 years than did Phahlamanoge and Soupiana, both of which are located in old reserve areas (cf. Delius, 1996). It is important to realise this spatial differentiation of apartheid policy impacts within former

homeland areas. A less settled and cohesive population and reduced land access were therefore predicted in Madibong with potentially significant impacts on land use and coping strategies. For all of the above reasons, Madibong made an interesting case study to contrast to the two smaller and more remote fieldwork sites.

Phahlamanoge, Soupiana and Madibong, like many other rural villages, have various infrastructure and services located in their centres, such as schools, small shops, tribal authority offices and in some cases boreholes and taps. Basic information on settlement characteristics is given in Table 3.2, allowing comparison between settlements.

Table 3.2: Background data on study sites

	Phahlamanoge	Soupiana	Madibong
Total number of households	432	51	1231
Primary schools	2	1	3
Secondary schools	1	1	2
Creches	1	0	5
Shops	5	1	>10
Piped water supply	No	No	Yes
Electricity	No	No	Yes
All weather road	No	No	Yes
Frequent public transport	No	No	Yes
Police station within vicinity	No	No	Yes

Source: Fieldwork

3.4 Research methods

The three research objectives and methods use to address these are summarised in Table 3.3 overleaf.

Table 3.3: Summary of research objectives and respective methods

	Objective	Methods
Objective 1	To identify and critically evaluate narratives of development and land degradation in South Africa and their linkages to international directives	Analysis of relevant policies, legislation, reports and regional level assessments; semi-structured interviews with government and NGO personnel at provincial, district and local levels
Objective 2	To examine the dimensions and dynamics of contemporary livelihoods in the study area, with special regard to the contribution of land-based practices to broader livelihood portfolios and to local understandings of land use, land management and environmental change	Informal discussions, participant observation, household surveys, semi-structured interviews, oral histories, participatory environmental assessments, ranking tasks, diaries, secondary data
Objective 3	To investigate the justification for and efficacy of interventions grounded in dominant environment-development narratives in enhancing livelihoods and changing environmental processes	Interviews with government and NGO personnel at provincial, district and local levels, land user interviews, participatory methods, analysis of aerial photographs, observation and analysis of secondary data

These methods are discussed in detail below.

3.4.1 Objective one methods

3.4.1.1 Literature reviews and semi-structured interviews

A combination of secondary data analysis and semi-structured interviews were used to explore narratives of development and land degradation existing within national, provincial and local spheres in South Africa. Relevant national policy documents, legislation, discussion papers, programme and project reports and related international directives – collected via internet, UK libraries or in South Africa - were subject to critical analysis (c.f. Adger *et al.*, 2001; Apthorpe & Gasper, 1996; Hobden, 1996).

Desk-based analysis of macro-scale narratives was complemented and grounded by semi-structured interviews with officials from provincial and local tiers of government responsible for the coordination and implementation of national policy, legislation, programmes and projects – summarised in this thesis under the term *interventions* - relating to rural livelihoods and NR management (Roe, 1998). Representatives of donor organisations such as the German Technical Cooperation (GTZ) and the Ministry of Foreign Affairs of Finland (MFAF) who worked closely with the LPDA to enhance its rural development interventions were also interviewed.

During the second phase of fieldwork in 2002, the Japanese International Cooperation Agency (JICA) arrived in Limpopo Province to begin a four-year study aimed at producing a Rural Development Master Plan for the Lepellane catchment on which this study focuses. The plan will include elements of soil conservation, agricultural development and infrastructure provision. The ultimate aim of the work is, “to help realize economically and socially active rural communities equipped to be responsible for their own development” (JICA, 2003:1). The work of JICA was clearly relevant to this study. Due to their time of arrival and intensive programme, detailed interviews were not possible. However, these would have been inappropriate given the early stage of the JICA project. An introductory meeting was held instead and copies of relevant reports on the programme were acquired. Representatives of personnel from non-governmental organisations (NGOs) active in Sekhukhune were also interviewed in order to both understand their efforts at intervening in environment-development processes and to explore their perceptions of government interventions.

Interviews were held with representatives from the following environment-development agencies, shown in Table 3.4.

Table 3.4: Interviews with representatives of state departments and NGOs

Agencies	Number of interviews
Provincial Department of Agriculture (including embedded donors: GTZ and Finnish Government)	5
Sekhukhune District and sub-district Departments of Agriculture	5
Provincial Chief Directorate: Environmental Affairs	2
Sekhukhune District Department of Environmental Affairs	1
Department of Water Affairs and Forestry	1
Environment Development Agency (EDA) Trust	1
Environmental Justice Network Forum (EJNF)	1
Heifer International	1
Hlatlolanang Health and Nutrition Centre	1
TOTAL	18

Most interviews were conducted with personnel from different hierarchical structures in the Department of Agriculture since this was found to be the dominant implementer of rural development and environmental interventions. The semi-structured interviews involved use of a standardised checklist of predetermined questions, but interviews unfolded in a flexible order and manner to make participants feel more comfortable and allow them to discuss issues they felt were most important (cf. Dunn, 2000). Officials

may have been more open to an interviewer of an older age – many people were surprised to discover I was doing PhD research – but almost without exception they were generous with their time. By emphasising the interests, values and knowledge that I shared with officials and my neutral identity, I sought to nullify visible signifiers of difference, such as my age, and represent myself as a temporary ‘insider’, creating momentary ‘positional spaces’ that engendered a level of trust, respect and cooperation in the interview encounter (Mullings, 1999; Fonow & Cook, 1991).

All official interviews were recorded on tape. Interviews were transcribed relatively soon after occurrence so that discussions could be recalled in detail and recorded more easily (Valentine, 1997). Transcription was aided by noting down technical terms, key issues and hard-to-hear words during or directly after interviews (Longhurst, 2003). Early transcription also allowed reflection on and follow up of emerging issues with informants where necessary.

3.4.2 Objective two methods

A variety of complementary methods and sources were used to examine land uses, environmental understandings and livelihoods in the three study villages in order to enable the triangulation of findings (cf. Valentine, 1997). Having reviewed prior studies of settlements in Sekhukhune, I was familiar with the range of livelihoods I might encounter in the area and thus it was possible to draft preliminary research questions and areas for enquiry. The interviews with officials undertaken to address Objective one enabled construction of hypotheses about the causes and consequences of changes in livelihoods and environmental processes and informed the questions posed to rural residents about their understandings of local changes.

Having previously gained official permission from the local tribal authority to work in the village, this information was used in conjunction with my research objectives to orient myself and begin informal interviews with key informants at the start of my research in Phahlamonge (cf. Burgess, 1984). These informants included the ruling chief, a number of his tribal authority members, teachers at local schools, representatives of local organisations, my two translators - both residents of Phahlamanoge - and numerous other residents met whilst moving around the local area. Through these interviews, exploration of the village and participation in daily household

activities it was possible to quickly construct a broad overview of the situation in Phahlamanoge. This background data, in conjunction with information gleaned from interviews with officials and secondary data sources, guided design of the household survey. In Soupiana and Madibong a similar survey was used to allow comparison of findings between settlements but the design was adapted to local circumstances where piloting deemed it necessary (McLafferty, 2003).

3.4.2.1 Household surveys

Winchester (1999) claims that data from surveys is of limited value when compared to the depth and quality of information that can be captured using depth interviews and participant observation. Yet where geographers require means of combining the collection of qualitative and quantitative data, questionnaire surveys represent a critical tool in innovative, mixed methodology approaches (Sporton, 1999). Questionnaire surveys were used in this research so that quantitative and qualitative data could be collected from a statistically significant number of households in a relatively short time. The questionnaire combined open-ended questions that allowed respondents to express themselves in the fullest possible way and thus potentially provide a better representation of their viewpoints with closed questions that are simpler for respondents to answer and provide data that can be analysed more easily (McLafferty, 2003). Design of the household survey was guided by widely agreed principles (e.g. McLafferty, 2003; Fowler, 2002; Oppenheim, 2000). A draft questionnaire was constructed, reviewed with key informants and then piloted on a few volunteers. Modifications were made to shorten the length of the questionnaire and clarify a number of the questions. Pre-testing also enabled training of my translators and refinement of interviewing skills.

The survey was usually conducted with the head of household, but if he or she was unavailable then another member of the family with detailed knowledge of land use and livelihoods was interviewed. If no such person was available, the household was returned to at a more convenient time or the neighbouring household was interviewed. The majority of interviews were conducted with older women because men were often working, away from the household looking for work, tending livestock or engaged in other activities. This approach could have biased the results from the questionnaire, yet it is widely acknowledged that women tend to undertake the majority of land-based activities in smallholder systems in South Africa (e.g. Rwelmira *et al.*, 2002; Pardeller

et al., 1999; Baber, 1998; Lipton *et al.*, 1996). The possible bias towards women in this research is not therefore considered problematic.

Interviews were usually conducted on weekdays during daylight hours since at other times people were occupied with private family and household tasks and, at weekends, often with funerals or weddings. It was important to be aware that people were giving up their time to answer my questions in return for no direct personal benefit. However, it is hoped that this thesis and reports derived from it will prove useful in an indirect way to the people of Phahlamanoge, Soupiana and Madibong. The questionnaire was designed so that it could usually be completed in less than 45 minutes, reducing the likelihood that respondents would become fatigued (Oppenheim, 2000). Visits to households were, nevertheless, often prolonged by social courtesies such as informal conversation and invitations to share food or drink.

Although the core survey was structured in order to allow comparison between households and settlements and reduction of interviewer effects and biases, sufficient flexibility was maintained to explore interesting emergent issues in a semi-structured manner (Kitchen & Tate, 2000; Miles & Huberman, 1994). Insights gained and trends that emerged as the survey progressed were discussed and reflected upon with my interpreter and key informants (Twyman, 1997), as well as during repeat visits to government and NGO personnel outside the village.

The household was chosen as the basic unity of analysis for this research because in Limpopo Province the household is the primary vehicle through which individuals gain access to crucial livelihood assets such as land, labour and income (e.g. Baber, 1998). 'Household' has many different definitions in the social scientific literature. Chant (1997) defines households as spatial units where members live in the same dwelling and share basic domestic and/or reproductive activities such as cooking and eating. However, Chant (1997) notes that the concept is problematic since the household is unlikely to be universally perceived by all people in all cultural contexts as the primary unit with respect to kinship, economy and residence. Brydon and Chant (1989) also highlight the dynamic nature of the household. The composition of a household will often change over time, both in the short term (between years, seasons and/or days), for example if others assist with food production at peak times, and in the longer term,

according to the household's phase in its lifecycle. It is also important to realise that the concept of household can hide the fact that the division of labour and benefits accrued are often highly differentiated between members within the household unit. While such intra-household relations are an important area for enquiry in research on smallholder agriculture, they are not the focus of this research.

Rural-urban links and migrant remittances are thought to have been fundamental to livelihood strategies and household survival in Sekhukhune over many decades (e.g. Rwelmira *et al.*, 2002; Baber, 1998; Delius, 1996). When considering household demographics it is therefore important to take into account household members who may be absent at the time of interview. The household unit is therefore defined after Baber (1998) as all individuals who have the right, as recognised by other household members, to be based within a particular homestead. The household unit is divided into a 'resident' and a 'non-resident' component (cf. Baber, 1998). This is important because households without a 'non-resident' component are unable to access income sources in the urban wage economy and consequently tend to have substantially reduced income (Carter & May, 1999; Baber, 1998). 'Resident household size' is defined as the number of people considered by the respondent to be living in the homestead at the time of the interview (cf. Baber, 1998). The non-resident component of the household is defined as the number of people who are not considered by the respondent to be living in the homestead at the time of interview, yet who are recognised as household members with the right to be based in the homestead (cf. Baber, 1998).

Quantitative and qualitative data were obtained on a variety of household variables including household demography, land ownership and use, types of crops grown and inputs used, livestock holdings, off-farm livelihoods, remittances and government grants, food security and perceptions of soil erosion and other constraints on NR productivity. A copy of the questionnaire is included in Appendix 2. The survey focused on the previous agricultural season since this allowed data to be gathered on such measures as crop yields and inputs from the same year as information on food security and household composition (Baber, 1998; Richards, 1996). This was necessary because smallholder agriculture tends to be highly dynamic with strategies often changing from year to year in response to changing capacities, opportunities and needs (e.g. Richards, 1985). Pertinent indicators of wealth such as the types of material used in homestead

construction, the size of the homestead and the presence of other assets such as cars or tractors were also recorded during interviews as another means of verification (Twyman, 1997). Where inconsistencies were found, return visits were made to the household in question.

Sensitive questions, such as those about food security and income, were enquired about tactfully, and were addressed only after more basic data on household composition, occupations and land use had been collected and a degree of rapport had been built up with the respondent (Fowler, 2002; Oppenheim, 2000). Many respondents were unable to estimate accurately the size of their landholdings, partly because local people tended to know only the length of their fields, the primary determinant of the cost of hiring a tractor for ploughing. Questions on land area were therefore deleted. Direct measurements of all fields were not possible because households' fields tended to be located at considerable distance from the homestead. However, measurements were made of the fields of a sub-sample of 10 households from the survey, representing the diversity of yields harvested in the prior season.

3.4.2.2 Sampling for the household surveys

Table 3.5 below indicates the number of interviews carried out during the household survey in each settlement along with the total number of households for each settlement, based on local records kept by the respective tribal authorities, to allow comparison.

Table 3.5: Survey sample sizes and settlement populations

	Phahlamanoge	Soupiana	Madibong
Total number of households	432	51	1231 (split into six formal subsections)
Total number of interviews	100	51	100
Percentage of households represented in survey	23%	100%	8%

Source: Fieldwork

Larger sample sizes would have provided more precise estimates of population characteristics, but larger samples would also have required more time and effort spent in interviewing and analysis (McLafferty, 2003). In this research the focus of analysis was on Phahlamanoge so a relatively high percentage of the households (23%) were

surveyed in this settlement. Soupiana and Madibong represented fieldwork sites of secondary importance; hence, in the large settlement of Madibong the percentage of the population surveyed was substantially reduced. Representatives of all households were surveyed in Soupiana because the sample frame was small.

Sampling of the populations of all three villages was constrained by a lack of reliable lists identifying all residents' households (cf. Baber, 1998). Lists of the total number of households present in each village were made available by respective tribal authorities, but these could not be used as sampling frames as they did not allow the identification of individual households. Since an inventory of all households in Phahlamanoge and Madibong was not viable due to the size of the villages, a systematic sampling strategy was adopted (McLafferty, 2003). Settlements were divided up into geographically differentiated clusters or subsections and households were sampled at regular intervals in each, often every third or fourth household, in proportion to the estimated size of the section (Robinson, 1998). The latter was ascertained from official records in Madibong and from a combination of official records and household counts in Phahlamanoge. No systematic bias due to cyclical arrangements of households was foreseen (Kalton, 1983). Ensuring that the sample was not biased to certain geographical areas of a village was important because, especially in the case of Madibong where large numbers of people had immigrated over recent decades, ethnic groups or groups establishing homesteads at different times or arriving from different locations, often resided in distinct areas.

3.4.2.3 Semi-structured interviews

Intensive semi-structured interviews were used with a variety of individuals including adult members of case study households, on land use practices; youth, about aspirations and perceptions of village life; and representatives of local organisations about institutional activities. Interviews were mostly undertaken in the person's home, in the field where they were working or, in the case of youth, on a football pitch where many socialised in their free time. These neutral and informal settings were selected to encourage informants to feel comfortable, ease access and reduce any inconveniences interviews might have caused them (Longhurst, 2003).

As with officials, interviews followed predetermined checklists of open-ended questions but unfolded in a reflexive manner allowing both anticipated and unanticipated themes to be explored (Miles & Huberman, 1994). Interviews in the study settlements were not recorded as respondents found the use of a tape recorder intimidating. Handwritten notes were taken during interviews, emphasising key concepts, phrases and sentences, and these were supplemented after completion of the interview with additional comments to provide context (Kitchen & Tate, 2000).

3.4.2.4 Oral histories

Historical changes in environment and livelihoods captured in surveys and semi-structured interviews were contextualised and complemented by oral histories captured from elderly individuals known to have knowledge of the area and to have lived in the village for most or all of their lives (Slim & Thompson, 1993). Interviews focused on specific changes in the settlement over the respondent's lifetime but allowed open-ended discussion so that interviewees could introduce other material in which they were interested. Encounters rarely took on the form of an entirely unstructured oral history where conversation is directed by the informant rather than by the set questions (Dunn, 2000). Rather, all interactions with local people depended to a greater or lesser extent on prompting and direction from myself, and therefore tended to resemble semi-structured extractive interviews based on a checklist of issues around which discussion was structured (Dunn, 2000), such as changes in human and livestock populations, areas of land cultivated, yields, rainfall and soil loss.

3.4.2.5 Participatory assessment of arable land management

Environmental assessments focused on arable land since this was found to be the most important NR practice for food security. Semi-structured interviews were conducted with members of a sub-sample of 10 of the 100 surveyed households in Phahlamanoge during visits to their fields to gain a more precise understanding of perceptions of environmental change and arable management strategies, priorities and problems (Thomas & Twyman, 2004). Households, and their specific fields (most cultivated only one field), were selected in order to represent the range of dominant local soil types, investigate specific locally recognised problems such as low yields and weed infestation (Thomas & Twyman, 2004), and assess the perceived impacts of interventions such as

contour banks and use of inputs, all factors and processes revealed as significant in the household questionnaire.

These visits included collection of soil samples for the measurement of soil fertility, defined as the capacity of soil to support plant growth. Soil fertility is often classified on the basis of the size of the plant available nutrient fraction, but this is highly dynamic in response to soil, microbial and plant processes (e.g. Smith, 1999; Tiessen *et al.*, 1994; Singh *et al.*, 1989). Levels of plant available nutrients are an unreliable indicator of soil fertility if they are measured more than 48 hours after collection (Allen, 1989). This research therefore focused on the measurement of total nutrient values as laboratory measurement was undertaken after return to the UK. Total levels of Nitrogen (N), Phosphorous (P) and Potassium (K) were focused upon because these are the three limiting nutrients for plant growth (e.g. Scholes & Walker, 1993). Sampling within fields was based on a grid system (e.g. Smith, 1999). As field sizes were small and variations in important variables identified by local people within fields were often limited, sampling of soil was based on a flexible grid arrangement involving four to six points covering the bulk of the field area but including areas identified by local people as manifesting differences in important variables such as crop yield, soil loss and weed prevalence. This enabled objectives to be met using a manageable number of samples.

Soil samples were taken from the topsoil (0-20cm) in line with previous studies of spatial characteristics of soil nutrients (e.g. Schlesinger *et al.*, 1996). A focus on topsoil characteristics is particularly appropriate in dryland environments since in these contexts nutrients are often concentrated in this horizon (Noy-Meir, 1979/80). Samples were stored in zip-lock plastic bags. On return to the UK they were air-dried, assessed for dry weights and stored. Samples were prepared for analysis and analysed using standardised laboratory techniques (Anderson & Ingram, 1993; Allen, 1989), as summarised in the table below.

Table 3.6: Soil preparation and analysis methods

Analysis	Sample preparation	Analysis method
Total N	Sieve at 212 µm; riffle; weigh out 1g of sample material to 2 decimal places accuracy; add kjeldahl catalyst tablets and 12ml anatar conc. sulphuric acid; digestion platform with pear shaped filled with deionised water for 6.5 hours at 395 °C; cool, top up with deionised water to 250ml, invert and filter at 0.45µm; refrigerate	Flow Injection Analysis (FIA): TKN Foss method AN 5221 and AN 5241
Total P	Sieve at 212 µm; riffle; weigh out 1g of sample material to 2 decimal places accuracy; add kjeldahl catalyst tablets and 12ml anatar conc. sulphuric acid; digestion platform with pear shaped filled with deionised water for 6.5 hours at 395 °C; cool, top up with deionised water to 250ml, invert and filter at 0.45µm; refrigerate	Flow Injection Analysis (FIA): TKN Foss method AN 5221 and AN 5241
Total K	Sieve at 212 µm; riffle; weigh out 5g into conical flask; add 100ml ammonium acetate (pH 7) using scales and pipette; shaker for 1 hour in relays so sample does not sit; filter sample using vacuum pump and moist paper GFC 0.45µm filters with tweezers; transfer to tubes and refrigerate	Atomic emission spectroscopy at 766.6 nm with 0.1% Cs buffer solution in range 0-2 mg/l using a Perkin Elmer 1100b Atomic Absorption spectrometer (AAS)

Sources: Anderson & Ingram, 1993; Allen, 1989

To ensure the efficacy of the digestion and analysis methods, the recovery of N, P and K from standard reference materials was used (Allen, 1989). Duplicates and blanks were also run to check for reliability and ensure the background solution was free from contamination (e.g. Smith, 1999; Allen, 1989).

Data from the analysis of soil collected from the first phase of fieldwork, undertaken during the interim period in the UK, provided a basis for further discussions around land use practices during the second fieldwork phase. Participatory mapping of NRs was also attempted to reveal further insights about land user's perceptions of environmental stocks and processes (cf. World Bank, 2002a; Chambers, 1997). However, this technique proved unsuitable as local respondents found the unfamiliar task of drawing maps intimidating. People tended to feel that they could not produce a worthwhile effort themselves and repeatedly referred me to others who might possess the necessary artistic skills. Assuring respondents that I was interested in their own representation of reality rather than an accurate spatial map and offering use of different forms of media (cf. Chambers, 1997) failed to overcome these problems, which may reflect a more fundamental lack of confidence amongst many local people in their own abilities and a dependence on government for technical planning and engineering advice, including mapping (e.g. Bek *et al.*, 2004; Phahlamohlaka, 2000; Cloete, 1985).

3.4.2.6 Ranking tasks

Simple matrix ranking tasks were used in a small number of semi-structured interviews or with small groups to enable the understanding of local priorities or the relative value of different resources, such as different crop, tree, fruit or soil types for different purposes (cf. Kersten, 1996; Maxwell & Bart, 1995). Rankings were cross-checked between informants and against other data sources.

3.4.2.7 Diaries

A sub-sample of households included in the village survey in Phahlamanoge and representing richer and poorer members of the population and dependence on different forms of livelihood strategies were asked to complete simple tick-box sheets once a day to provide basic information on land use and livelihood activities. Information was gathered on field activities, transformations to livestock holdings, income sources, expenditure, rainfall and food consumption. The aim was to provide supplementary longitudinal data on livelihood practices to corroborate other data sources and to flag up any important shifts in livelihoods, seasonal or otherwise, that might take place during my return visit to the UK, allowing follow up during my second visit. The diary was of a highly structured format in order to remove problems of selectivity, focus participants recall on key issues and ensure that it was quick and easy to complete (Burgess, 1984).

Participants were paid a small stipend to encourage cooperation and to compensate them for the time and effort invested. However, the stipend was sufficiently small both to make it affordable and to ensure it did not create social tensions between those included and those not (cf. Aliber, 2002). The diaries were established two weeks before my return to the UK and with training and trouble-shooting visits most households were producing useful information before departure. One of my translators checked on households every two weeks in order to solve any problems, collect completed sheets, provide new sheets and provide payment. Through this process continuous data covering at least three months was collected on six households, providing an important cross-check on other data and sources. However, respondent fatigue and considerations of ‘optimal ignorance’ (Chambers, 1992) ruled out the extended use of this method.

3.4.2.8 Secondary data

Use of qualitative and quantitative fieldwork methods was complemented by analysis of secondary data (Burgess, 1984), where available, on the dynamics of key livelihood and environmental variables such as demography, employment, rainfall and livestock trends. Secondary data sources were used to provide data that was unavailable in other forms and/or to enable the replication or corroboration of primary data (Kitchen & Tate, 2000). Secondary data sources were used to meet all three research objectives.

3.4.3 Objective three methods

Multiple social and physical scientific methods were also used to investigate the justification for and efficacy of interventions aimed at enhancing livelihoods and changing environmental processes that were grounded in the dominant environment-development narratives investigated under Objective one. Semi-structured interviews with government and NGO personnel were described above. The participant observation, semi-structured interviews and participatory methods used with land users to meet Objective two also informed Objective three, particularly interviews with members of projects about their experiences and their perceptions of the costs and benefits of involvement.

3.4.3.1 Analysis of aerial photographs

Analysis of aerial photographs was used to distinguish changes in cultivation and gully erosion over a 50-year period. The dates of photographs coincided with many participants' lived experience, potentially enabling identification of forces driving contemporary environmental transformations and allowing a further opportunity for triangulation of sources and findings (cf. Batterbury & Bebbington, 1999). The approach reflected that of Mapedza *et al.* (2003) and Elliot & Campbell (2002) who emphasise how use of participatory methods and aerial photographs can complement each other and lead to a more complete understanding of socio-environmental problems. The latter provide information on changes in land cover and erosion extent over past decades, while the former provide data on the changes in land use that led to vegetation change, as well as local perceptions of vegetation change. Land users' understandings may differ from actual vegetation change and may act as an important determinant of NR use (Mapedza *et al.*, 2003).

Pairs of South African government scanned aerial photographs from the 1950s/60s and the year 2000 for each study site were imported into the Arcview geographical information system and geo-referenced to a base map of the region using the ImageWarp extension to apply a bilinear transformation to control points. Polygons were then digitised over these photographs to delineate areas of cultivation. Ground-truthing was unnecessary due to my firsthand knowledge of the study sites. Boundary definition and classification of landcover types is acknowledged to be a subjective process (Whitlow, 1986), but by developing strict rules for classification and undertaking all assessments myself, error was minimised. Woodland was not mapped because tree and bush cover were sparse and dispersed and therefore difficult to positively identify on large-scale photographs. No dense areas of woodland were identifiable in proximity to the study sites. Some systems for the analysis of aerial photographs such as that compiled by the Southern African Regional Commission for the Conservation and Utilisation of the Soil (SARCCUS, 1981) delineate types and degrees of severity of soil loss including sheet and gully erosion, but due to the quality and scale of the images available, this was not possible here.

3.4.3.2 Participatory rangeland assessment

For rangeland areas, field based surveys of vegetation community composition were considered at distances radiating from two or three centres of intense livestock activity identified in each study settlement (Perkins & Thomas, 1993), allowing livestock impacts on biomass and biodiversity to be evaluated and linked to local understandings of change. However, a lack of identifiable points where livestock pressure was highly concentrated acted against the adoption of this method. The occurrence of a drought during my fieldwork also made the reliable identification of a wide diversity of grasses in an intensive veld survey almost impossible.

An alternative approach was therefore adopted. A small sample of livestock herders in each settlement were asked in individual interviews to identify and describe key grasses favoured by their livestock (Bollig & Schulte, 1999). By cross-checking answers within settlements, it was possible to quickly document local perspectives on the grazing resources most prevalent around each settlement. By asking herders to find and collect relatively healthy samples of these grasses and combining these with their descriptions, it was also possible to match favoured grasses to secondary literature and derive a

provisional reading of the state of the veld from the species and varieties of grass identified (van Oudtshoorn, 1999; van der Walt & le Riche, 1999).

3.4.3.3 Soil sampling

Soil samples were collected with the guidance of land users to provide measurements of total stocks of Nitrogen, Phosphorous and Potassium, as described in section 3.4.2.5. These soil samples also provided insights into the impacts of soil erosion on nutrient status relevant to addressing Objective three. Construction of partial nutrient budgets in order to assess the nutrient use efficiency and effectiveness of present cropland management techniques was rejected for the reasons given in Chapter two.

3.5 The research experience and inherent biases

It is impossible to escape the power relations that shape the research process, both during fieldwork and in the process of representing ‘others’ in texts (McDowell, 1992). Attempts must therefore be made to understand and take account of these complexities in practice by examining the positionality of the researcher and subjecting the research process to scrutiny, particularly in developing world research where inequalities are often greatest (e.g. Brockington & Sullivan, 2003; Rose, 1997; Mather, 1996; Okely, 1996; McDowell, 1992). However, an awareness of the ‘arrogance of research’ (Katz, 1994:70) must not be allowed to degenerate into ‘self-indulgent navel-gazing’ (Brockington & Sullivan, 2003:73). Nor should it imply a privileging of developing world knowledge as this approach would be no less problematic, allowing the Western researcher to ignore his/her own responsibilities and introducing problems of ‘gatekeeping’ (Scheyvens & Storey, 2003).

3.5.1 Positionality and reflexivity

Interviews, like any form of social interaction, involve reflexive relationships that are mutually structured by all participants. How respondents viewed me could have influenced my interactions with them and hence the entire research process (Batterbury, 1994). During fieldwork it was therefore important to be mindful of the image I was projecting of myself, especially being a white, well-educated, British outsider conducting face-to-face transactions in a rural South African environment populated largely by black, poorly-educated individuals, many of whom were women.

People in Phahlamanoge were initially very suspicious about the presence of a white foreign ‘other’ in their village asking questions about their activities and projects. As a result it is possible that some individuals may have withheld information from me. In a small number of cases it was obvious that respondents were highly suspicious and did not want to give me too much information. Yet while many people were sceptical about my presence at first, in the vast majority of cases, no doubt partly due to my association with a local assistant and my attempts to make myself seen and known around the village, people became welcoming. Although I remained an ‘outsider’, the relationship between myself and those I researched had changed substantially, and was also highly variable between individuals, implying the simple but popular outsider/insider dichotomy may lack subtlety and flexibility (cf. Mullings, 1999; Mather, 1996).

Non-response bias is unlikely to have exerted a significant impact on the research findings as few problems were experienced with finding willing participants once initial suspicions were overcome (Fowler, 2002). On the other hand, it is possible that a positive bias exists in the information collected due to a potential desire on the part of respondents to provide answers that they thought might ‘please’ me (Mosse, 1994), what Gill (1993) refers to as a ‘conspiracy of courtesy’ (Gill, 1993). A positive bias might also have resulted because, despite explanations to the contrary, people thought their responses might lead to direct assistance from myself or the government. Repeat visits and cross-checking between sources and methods were used to make transparent any such problems.

3.5.2 Positionality and translation

Interviews with government and NGO personnel were conducted in English with no translator present, but all interviews and group discussions with villagers required the assistance of a translator due to the different local languages used, hence it is important to consider their positionality as well as my own (Twyman *et al.*, 1999). Efforts were made to learn and communicate basic phrases in the languages used in the study villages, Swazi and Northern Sotho, and although far from perfect, these attempts were important in breaking down psycho-social barriers; villagers seemed to value these efforts as a sign of my genuine interest in and respect for their culture and community (cf. Smith, 2003). Although reliance on the interpretive abilities of my translators could be considered to lead to a loss of precision and reliability of the data collected due to

misunderstandings or simplifications inherent in the translation process, the use of multiple translators, both male and female, in all villages and multiple methods and sources sought to reduce any such errors by allowing cross-checking for aberrations and the triangulation of findings (Valentine, 1997). Discreet efforts were also made to talk to those who spoke English, such as ward councillors, teachers and well-educated youth, without any translator present as a further means of ensuring I did not receive a representation of reality that had been sanitised or distorted, consciously or otherwise, by my translators (Valentine, 1997).

There is considerable debate in the literature about how a researcher may gain access to more balanced viewpoints (e.g. Archibald & Crnkovich, 1995; Fonow & Cook, 1991; Hill-Collins, 1990; Abu-Lughod, 1988). Some researchers contend that ‘insiders’ have an advantage because they are able to use their knowledge of a group to gain more intimate knowledge of its mental and physical activities (e.g. Hill-Collins, 1990; Abu-Lughod, 1988). However, Fonow & Cook (1991) argue that ‘outsiders’ will tend to be better able to take an objective viewpoint and observe behaviours without distorting their meanings. In this research, employing research assistants who lived in the villages where fieldwork was undertaken could be seen as a disadvantage because people being interviewed might have felt reluctant to reveal information that they might have shared with an independent and neutral outsider. However, this disadvantage was arguably more than out-weighed by the benefits of working with a local resident. These included personal recognition between translator and interviewee that facilitated access to respondents and in many cases contributed to reduced suspicions and a more relaxed, open and informal atmosphere than would otherwise have been possible, and greatly enhanced efficiency in understanding village layouts and activities and in locating key informants and hidden households.

An outsider working with an insider in the manner in which I worked with local translators is arguably a hybrid solution that captures both the insider advantage of intimate local knowledge (Hill-Collins, 1990; Abu-Lughod, 1988) and the outsider advantage of a more distanced and objective viewpoint (Fonow & Cook, 1991). By employing local residents and frequenting local shops I was also aware that in some small way my research was injecting ‘outside’ income into the local economy.

Attempts were made to investigate the backgrounds of potential assistants before employing them to ensure that they were as politically neutral as practicable and that they possessed appropriate language skills, time, personality and local knowledge. All assistants were trained in interviews skills and the understanding and translation of key terms was explored to ensure that the ideas and meanings of my English questions could be communicated as precisely and reliably as was practicable to respondents and *vice versa*. While literal translation in the interview was not possible (cf. Twyman *et al.*, 1999), it was essential that the translator summarised as accurately as possible what respondents said. Research assistants employed in Madibong had previous training in and experience of conducting survey work, substantially reducing the time required to refine interviewing skills.

Relations with translators were generally very positive and professional, although in Phahlamanoge during initial stages of fieldwork I quickly became aware that I needed my translator - who had invaluable local knowledge and a social standing which greatly facilitated access to a wide range of respondents - as much as, if not more than, he needed me (for income). Moreover, he was also aware of this delicate balance of power and his gatekeeping role (cf. Mullings, 1999). Thus when I was unsatisfied with his performance in an interview situation, considerable diplomacy and sensitive negotiation was often required to bring about desired changes in behaviour. Nevertheless, over time we built an excellent working relationship and the research benefited hugely from his local expertise, negotiation skills and patience.

3.5.3 Positionality and ethics

The research was conducted in an ethical manner, seeking appropriate permissions, respecting respondents' rights, local customs and land access issues. Before beginning all interviews, my translator would explain who I was, my background and my reasons for wanting to interview them (Burgess, 1984). My independence from government, NGOs and other local organisations was emphasised and local participants were also assured that information supplied would remain confidential and that they would remain anonymous. All names of local respondents provided in this thesis are fictional. Respondents were always given the opportunity to withdraw at any time, with assurances that this would not be a problem (Fowler, 2002). During all interactions I attempted to maintain an open, non-judgemental approach to encourage the respondent

to express him or herself fully and to respect their rights to express their own opinions (Burgess, 1984). Preliminary findings from the research were fed back to key informants in the study settlements and a report derived from this thesis has already been supplied to LPDA. Reports for other government ministries in South Africa including further reports for LPDA will be prepared in due course. Findings will also be posted on a website and links provided to collaborators. Yet as I stressed to respondents, as a supposedly neutral and objective academic researcher I was and remain powerless to ensure that my findings are read by government agents or acted upon in any way.

3.6 Other biases and potential biases

3.6.1 Seasonality

Findings could have been biased by seasonality and by the characteristics of the specific year in which research was undertaken and oriented. For example, the sustained period of dry weather that was being immediately experienced during both field visits, and that was subsequently officially recognised by government as a drought that demanded provision of assistance to rural people, may have had a substantial impact on people's perceptions of rainfall change (cf. Dahlberg, 1996). The previous year had experienced more rainfall but was also perceived by many local people to have been drier than many past seasons. Indeed, there was a widespread perception amongst respondents in Phahlamanoge and in Madibong that rainfall in the region had decreased over recent decades leading to a decline in yields. Respondents' perceptions of broader changes in rainfall, and other variables, and the impacts of these on their livelihoods, were used in conjunction with secondary data sources to contextualise the relatively tight temporal gaze provided by fieldwork.

The dryness of the specific year of fieldwork also impacted on biophysical research. For example, completion of a survey of rangeland grasses was not possible because, as noted above, the drought made reliable identification of local grasses problematic.

3.6.2 Location

The three study villages selected for fieldwork represented a variety of sizes of settlement, locations and altitudes, differing degrees of market, infrastructure and service access. However, the sample was purposely biased towards villages perceived by agricultural extension workers familiar with the region to suffer from particularly

high levels of soil erosion. This study does not therefore claim to be representative for all villages in Sekhukhune District; rather, it presents intensive case studies of livelihoods and interventions in a small number of settlements reported to be particularly 'degraded' (Richards, 1996; Harvey, 1969). These case studies may not provide a basis for making wide-ranging inferences about the general population, but they stand to be substantiated, and the detailed data gathered may enable an enhanced understanding of the processes that underlie empirical observations and reveal patterns that can be used to generate or modify models or hypotheses (Rice, 2003; Richards, 1996; Miles & Huberman, 1994; Harvey, 1969). Moreover, by linking local level case studies to broader structural processes, broader scale relevance is also retained (Twyman, 1997; Murdoch & Marsden, 1995). The focus of the case studies on poor, highly degraded villages and on Phahlamanoge as the site of a Landcare project is also significant in that it can generate insights into particular situations in order to improve them (Drenth, 1996). Thus the aim of this research is to generate knowledge that is accurate and contributes to theory and that is also potentially useful to improving the quality of life of respondents (Drenth, 1996).

3.6.3 Topic

Respondents appeared comfortable to talk about relevant livelihood and environmental issues. Income was rarely discussed directly since key informants suggested it was a highly sensitive subject. Natural causation, problems of jealousy and perhaps also local perceptions that generating income is a 'zero-sum game' (Orr, 2001), where gains for one actor imply losses for others, meant that households were unlikely to acknowledge that they were getting wealthier while others remain poor. However, the value of government grants, often the main source of household income, was known, as were the ranges of salaries generated from different forms of informal and formal employment. In addition, respondents were often willing to estimate the regularity of income flows and their relative contributions to livelihoods. Such subjective measures could be cross-checked to some extent against observations of household structure and construction and ownership of other assets such as tractors, stoves or generators. Even if individuals had been comfortable to discuss their income and expenditure in detail, a complete and rigorous economic analysis of monetary flows would have taken a considerable amount of time (cf. Baber, 1998). Ultimately, such analyses were not deemed necessary to meet the objectives of this study.

During my initial meeting to seek permission to work in Phahlamanoge, the tribal authority sought clarification that I was interested only in asking residents about land use and livelihood practices and that I was not going to involve myself in political issues. Key informants also warned me off talking about the highly sensitive subject of the political factions and power struggles in the community. However, it was possible to tactfully explore such contextual aspects with key informants once I had built up a certain level of rapport with them, or implicitly via discussion of apparently apolitical issues of land use or livelihoods in some instances.

3.7 Data analysis

Findings from multiple sources were gathered and integrated through an inductive, 'grounded' cycle of examination, analysis and cross-checking in order to uncover the reasons for and implications of different emergent understandings and to address the research objectives (Miles & Huberman, 1994). The livelihoods framework provided guidance to this process and assisted organisation of data. Keeping a fieldwork diary also aided management of my thoughts and emotions during fieldwork and assisted later recall and reflection (cf. Burgess, 1984).

Quantitative data was manipulated on return to the UK in Excel spreadsheets and SPSS. Selection of statistical tests to apply to the data was driven by the objectives of the research (Kitchen & Tate, 2000). As the sample sizes were often small and broke the normality assumptions of parametric tests, only non-parametric tests were used. Mann-Whitney U test was used for comparison of two independent samples, using a significance level of 0.05, but in most cases simple descriptive statistics were sufficient to describe the collected data. Levels of total Nitrogen, Phosphorous and Potassium in the collected soil samples were extracted and quantified in the laboratory using standardised methods, as described in section 3.4.2.5.

Qualitative data such as interview transcripts was coded and analysed based on widely used methods outlined in Corbin and Strauss (1998), Slim and Thompson (1994) and Finnegan (1992). Identification of themes and connections in interview transcripts was facilitated by the underlying structure to the questions asked (Kitchen & Tate, 2000). During coding there was a tension between organising segments of texts into thematically coded groups and maintaining links to the context within which each

element had originally been expressed (cf. Mason, 1994). However, by maintaining the original transcripts whilst simultaneously cutting and pasting coded sections, marked with signatures stating their origin, between different data files it was possible to move backwards and forwards between different arrangements of the data, facilitating a flexible and dialectical exploration of findings. Repeated readings of data sources, repeat interviews and discussions with key informants to pursue emerging themes in the field, intermittent reflection and consideration of neglected aspects, and spontaneous memories, thoughts and intuitions (cf. Okely, 1994) all represented additional influences on the process of coding that increased its complexity but ultimately produced a holistic and grounded analysis (Cope, 2003; Kitchen & Tate, 2000).

3.8 Summary

This research adopted a hybrid mixed methods approach to address the three research objectives. Use of household surveys and semi-structured interviews was complemented by experimentation with a variety of P/RRA techniques, oral histories, soil sampling and testing and use of secondary sources including aerial photographs. The theoretical approaches and debates discussed in Chapter two guided adoption and use of this methodology and the focus of fieldwork on a variety of social and environmental factors. The findings generated through use of this methodology constitute the remainder of the thesis. The next chapter analyses national scale developmental and environmental narratives that frame livelihood dynamics and interventions in the three study settlements; the latter are investigated in subsequent chapters.