RURAL LIVELIHOODS IN SOUTH-EASTERN ZIMBABWE: THE IMPACT OF HIV/AIDS ON THE USE AND MANAGEMENT OF NON-TIMBER FORESTRY PRODUCTS

by

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DECLARATION

I, Munyaradzi Junia Mutenje declare that:

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ABSTRACT

Non-timber forest products (NTFPs) constitute an important source of livelihood for most poor rural households and communities in Zimbabwe. NTFPs also serve as a vital livelihood safety net in times of hardship. An important feature of this dependence is that almost all NTFPs are deemed to have 'public good' characteristics, with no exclusive property rights. Consequently, extraction is often intense and exhaustive because of lack of alternative income sources, unreliable productivity and weak enforcement of institutional arrangements governing NTFPs use. In recent years, with HIV/AIDS rampant in Zimbabwe, there are indications of a rapid increase in the extraction of NTFPs, mostly from common property resources. Appropriate natural resources policies need to be based on comprehensive research, yet to date scant attention has been paid to understanding the role of NTFPs in mitigating the predicaments of HIV/AIDS-affected households in Zimbabwe. The main objective of this study was to determine the types of and need for natural resource management interventions to help ensure the sustainability of local responses to HIV/AIDS.

The research focused on five communities of Sengwe Communal in the Chiredzi district, Zimbabwe. Multistage cluster sampling was used to select ten villages and households for the survey. Two villages from each community, representing the most and the least affected by epidemic were selected for each community using stratified random sampling. A cluster analysis was used to improve understanding of the challenges of rural livelihoods and how households diversify their livelihood strategies to cope with the various constraints. Five dominant groups based on their livelihood diversification patterns were identified : (1) smallholders/unskilled workers; (2) subsistence smallholder/non-timber forestry products harvesters; (3) crop production and non-timber forestry products extraction integrators; (4) commercial smallholders with regular off-farm employment; and (5) specialised commercial livestock producers. Multinomial logit model results showed that the level of education of the household head, the value of physical assets, cattle numbers and income, remittances, NTFPs income

and economic shocks were the main determinants of these livelihood choices. Empirical evidence also revealed that households that were statistically significantly affected by HIV/AIDS economic shocks practised 'distress-push' diversification by extracting NTFPs. These results suggest that policy makers need to advise rural households on how to improve their risk management capacities and move from geographically untargeted investments in livelihood assets to a more integrated approach adapted to the asset base of individual households.

Using panel data from 200 households in 2008 and 2009, regression models revealed that NTFPs extraction is an important *ex-post* coping mechanism for many HIV/AIDS-afflicted households. The results also revealed that the main determinants of livelihood strategy choices were differences in asset endowment, especially education, land and livestock and the impact of the shock. Asset constraints compelled diversification into lower-return activities such as NTFPs extraction. Findings from a comparative analysis of HIV/AIDS-afflicted and non-afflicted households showed that HIV/AIDS-afflicted households were relatively young, with relatively few physical and livestock assets. A fixed-effect Tobit model indicated a positive significant relationship between HIV staging and quantity of NTFPs extracted. The relatively young, poorly educated households with low household coping capacity in terms of livestock value relied more on the natural insurance of forests in buffering HIV/AIDS economic shocks. These results have important policy implications for development planners, conservationists and non-governmental organisations working in the region. There is a need for programmes that reduce pressure on forest resources, and improved access to education and health care, thus helping the poor to cope with the HIV/AIDS economic crisis.

This study also examined the extent to which forest degradation is driven by existing common property management regimes, resource and user characteristics, ecological knowledge and marketing structure. A Principal Component Analysis indicated that the existence of agreed-upon rules governing usage (including costs of usage), enforcement of these rules, sanctions for rule violations that are

proportional to the severity of rule violation, social homogeneity, and strong beliefs in ancestral spirits were the most important attributes determining effectiveness of local institutions in the management of Common Pool Resources (CPRs). Empirical results from an ordinary least regression analysis showed that resource scarcity, market integration index, and infrastructural development lead to greater forest resource degradation, while livestock income, high ecological knowledge, older households, and effective local institutional management of the commons reduce forest resource degradation. The results suggest that there is a need for adaptive local management systems that enhance ecological knowledge of users and regulates market structure to favour long-term livelihood securities of these forest-fringe communities.

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DEDICATION

This study is dedicated to the loving memory of my parents Elizabeth Ester and
Leonard Benaya Mutenje. I will always remember you.

ACKNOWLEDGEMENTS

LIST OF ABBREVIATIONS AND ACRONYMS

ABCG........................Africa Biodiversity Collaborative Group

AIDS.........................Acquired Immune Deficiency Syndrome

CPRs.........................Common Pool Resources

CIFOR ....Centre for International Forestry Research

DBH ....Diameter at Breast Height

FAO...........................Food and Agriculture Organisation of the United Nations

GLTP........................Great Limpopo Transfrontier Park

GLTFCA ....Great Limpopo Transfrontier Conservation Area

GNP..........................Gonarezhou National Park

GPS...........................Global Positioning System

HIV ....Human Immunodeficiency Virus

IUCN ....International Union for Conservation of Nature

MNL ....Multinomial Logit Model

MOHCW ....Ministry of Health and Child Welfare

NGOs........................Nongovernmental organisations

NTFPs.......................Non-Timber Forest Products

PCA ....Principal Component Analysis

SADC FANR VAC ...Southern African Development Community Food
Agriculture and Natural Resources Vulnerability
Assessment Committee

SSA...........................Sub-Saharan Africa

STDs.........................Sexually Transmitted Diseases

TFCA........................Transfrontier Conservation Area

UNAIDS...................United Nations Programme on HIV/AIDS

UNDP ....United Nations Development Programme

VIF ....Variance Inflation Factor

WHO ....World Health Organisation

INTRODUCTION

Non-timber forestry products (NTFPs) originate from natural (not cultivated) forest and other tree systems. In sub-Saharan Africa (SSA), NTFPs serve as a safety-net for rural households and communities in times of economic crisis, illness or agricultural output shortfalls. Wide arrays of NTFPs meet numerous needs of rural households. Among these are food items such as fruits, vegetables and juices; wood carved or woven into pieces of art or utilitarian objects; and roots, leaves and bark processed into food and traditional medicines. The majority of these resources are characterised as common pool resources (CPRs) in SSA.

The livelihood strategies and well-being of many rural households in SSA have been affected by short-term shocks and long duration stresses due to the HIV/AIDS epidemic. Empirical evidence shows that HIV/AIDS has significant adverse effects on household composition, labour supply and income generation (Harvey 2003). It affects not only household food production, cropping patterns, livestock production, labour-time allocation, and access to productive assets, but also children's education and access to consumption of goods and services essential for household maintenance and well-being.

The diversity of rural livelihoods is one of the key variables to measuring the impact of a crisis and the ability of households to cope (Ellis 1998; Bryceson 2002). Livelihoods are more adaptable if it is possible to substitute between livelihood activities and a diverse portfolio of activities that improve the long-range resilience of a household's livelihood in the face of adverse trends or sudden shocks (Ellis 1998). Rural households diversify into a number of livelihood activities such as agricultural crop production, livestock production, wage work, cottage industry, and forest product collection as a risk management strategy. The mix of activities depends on a household's ability to access different livelihood opportunities (Ellis 1998; Bryceson 2002). A livelihood is sustainable when it can cope with and recover from stresses and economic shocks, maintain or enhance its capabilities, assets and entitlements, while not undermining the natural resource base (Chambers & Conway 1992). Livelihood strategies are the product of the

interaction between choice and constraint (Ellis 2000). Though it can be deduced from the literature why many households diversify their livelihood strategies, it is difficult to generalise the effects and implications of such diversification across empirical case study data (Hussein & Nelson 1998).

This study argues that livelihood diversification plays a crucial role in determining the coping strategies available to rural households in Zimbabwe facing economic shocks, particularly for those households coping with the effects of HIV/AIDS. The ability to diversify livelihoods is conditioned by asset portfolios and shocks to which a household is exposed. Thus, an empirical analysis of coping strategies used by households in Zimbabwe will help researchers and policymakers to better understand the current dynamics of household-level investment in the context of HIV/AIDS. Identification of either effective means of targeting transfers to the poor or the food insecure, or impediments to the functioning of factor markets in labour, land and capital that condition households' on- and off-farm investment may assist government and non-government organisations in reducing poverty vulnerability in Zimbabwe.

Though there has been little research explicitly exploring the relationship between the socioeconomic-agro-ecological impacts associated with HIV/AIDS and smallholder reliance on NTFPs in Zimbabwe, there are conceptual linkages in support of such a relationship (Mutangadura *et al*. 1999). At the household level, HIV/AIDS morbidity and mortality increase the amount of time and money allocated to health care, while reducing labour and productivity. Household responses to these impacts include reduction in the area of land cultivated, reduction of farm inputs, and sale of assets such as livestock (Baier 1997; UNAIDS 1999; Engh *et al*. 2000). Such responses ultimately lead to food and nutritional insecurity and deeper poverty (Egal & Valstar 1999; Topouzis & Hemrich 1996). For people with HIV/AIDS, adequate nutrition is necessary to maintain body weight and energy, enhance the immune system, slow the progression of HIV infection to the development of AIDS, improve the effectiveness of antiretroviral therapy, and reduce vertical transmission of HIV

(Beisel 2002; FAO 2002). However, patients and caregivers find it difficult to promote, provide, and obtain conventional foods, which are often not readily available and accessible to many HIV/AIDS-afflicted households (Nnko *et al*. 2000). Wild supplies of food make up much more of HIV/AIDS-afflicted households' dietary value than is often realised (Hoskins 1990). Though empirical investigation has yet to yield conclusive evidence, anecdotal evidence supports the hypothesis that the socio-economic impacts of HIV/AIDS lead to greater household dependence on NTFPs for food and nutritional security. A number of studies in South Africa have indicated that HIV/AIDS-afflicted households depend on wild supplies for food and nutritional security (Booysen *et al.* 2002; Africa Biodiversity Collaborative Group (ABCG) 2004). These natural resources remain accessible to the public and are vulnerable to degradation, since they are common property resources (ABCG 2004). Because the long-term viability of natural resource-based household/community responses to HIV/AIDS ultimately depends on the carrying capacity of the resource base, there is a need to develop a comprehensive body of knowledge on how to sustainably manage forest resources for NTFPs.

There is evidence that rural households particularly the poor draw on natural insurance (Campbell *et al*. 2002; Loibooki *et al*. 2002; Pattanayak & Sills 2001). Extraction of common pool resources is one of the main coping strategies, also called 'the subsidy from nature' (Hecht *et al*. 1988). This natural insurance is particularly important in rural areas of SSA characterised by agricultural, epidemiological, and market uncertainties, where the remoteness of rural communities results in scarceness of insurance alternatives such as formal credit or insurance programs. HIV/AIDS-affected households have been observed to substitute purchased food with wild vegetables, and HIV/AIDS widows in Zimbabwe rely on the production of baskets with fibres collected from local woodlands as their main source of income (Mutangadura *et al*. 1999). A household's degree of vulnerability to HIV/AIDS-related shocks and the extent to which forest products are used as a safety net are determined by the nature, probability and intensity of the shock and the household's ability to cope with

such shocks in terms of safety nets, alternative income sources and insurance mechanisms (Angelsen & Wunder 2003; McSweeney 2004). Moreover, the generation gap resulting from adult deaths negatively affects the passing on of knowledge concerning traditional local NTFPs harvesting practices to the younger generation.

According to the World Health Organisation (WHO 2003), 80% of the population in Africa use NTFPs for primary health care and Ndoye *et al*. (1999) estimated that 70% of local communities use several forest products for health purposes. The reasons include growing poverty due to HIV/ AIDS and lack of employment opportunities in rural areas, which prevent rural dwellers from affording the higher costs of pharmaceutical products (UNAIDS 2002). However, where demand for medicinal plants exceeds local supply, over-harvesting can lead to extinction of important species. This evidence also suggests that HIV/AIDS-afflicted households in rural Zimbabwe increase their dependence on such natural resources as a temporary coping strategy and/or as a more permanent livelihood strategy. This is because environmental assets may be the only assets that these poor rural households have at their disposal to combine with their labour, particularly in rural areas where wage labour opportunities are limited. Despite increasing HIV/AIDS prevalence and the importance of NTFPs as safety nets in rural livelihoods of SSA, this environmental dimension of the African HIV/AIDS epidemic has received little attention (Hunter & Twine 2006). Exploratory analysis of rural households' natural resource dependence will determine the types of and need for natural resource management interventions necessary to ensure the sustainability of local responses to HIV/AIDS.

Research is also needed into the ability of this rural safety net to deal with idiosyncratic health shocks and whether there are situations where they fail to insure households. Where forests adequately insure households, they need to be considered at higher levels of policy debate. Knowing how households respond to shocks is of critical importance since it reveals what the rural households can do to help themselves in these circumstances. There has been only limited research into

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these responses in Zimbabwe (Mutangadura *et al.* 1999). Understanding people's coping strategies can guide the formulation of interventions aimed at helping rural households. The contribution that NTFPs as safety nets make to rural livelihoods needs to be investigated so that governments do not discount it in their poverty alleviation policies or their assessments on the value of communal areas, natural forests, and woodlands. There is, however, a gap in the literature with respect to the real value and strength of the safety-net function of NTFPs in the context of HIV/AIDS at local level. Moreover, very little research explicitly examines the role of natural insurance (or coping extraction) among rural households affected by HIV/AIDS in tropical forests. As a result, there is little systematic analysis to help guide conservation and development promoters in their efforts to understand how rural households deal with this negative shock. The overall objective of this study is to examine the capacity of forests in conditioning household vulnerability and responses to idiosyncratic health shocks in south-eastern Zimbabwe.

The specific research objectives of this study are:

- To determine if NTFPs dependence of rural households afflicted by HIV/AIDS is different from that of non-afflicted households;

- To evaluate, using panel data from 2005 to 2009, the influence of HIV/AIDS on the utilisation of NTFPs is a function of HIV/AIDS staging, the household's coping capacity, access to natural resources, and market access;

- To explore ecological costs and changes in natural resources used in local communities in response to HIV/AIDS; and

- To provide recommendations on community-based forestry management initiatives that can reduce ecological costs whilst maintaining or enhancing existing livelihoods.

The remainder of this thesis is organised as follows: Chapter 1 reviews literature on the economics of rural livelihood diversity and outlines a conceptual framework for this study the so called asset-based approach to household livelihoods analysis. Chapter 2 presents the conceptual framework and reviews pertinent literature on factors determining households' and communities' participation in NTFPs exploitation and the current HIV/AIDS status in

Zimbabwe. In Chapter 3, the literature and debates concerning ecological consequences of NTFPs exploitation, as well as their role in rural livelihoods, are detailed. Descriptions of the study area and of the data collection methods employed are provided in Chapter 4.This chapter also develops in full detail the analytical approaches and empirical methods used in conducting the analyses. Results on the dominant livelihood diversity patterns and the main determinants of these choices of livelihood strategies are provided in Chapter 5. Chapter 6 presents the results of empirical analyses using the panel data regression model on the dynamics of HIV/AIDS and NTFPs extraction. Results on the dimensions of local institutional management of CPRs and the determinants of forest degradation in the study area are discussed in Chapter 7. Chapter 8 summarises the key findings and presents the policy recommendations.

CHAPTER 1

RURAL LIVELIHOOD DIVERSITY TO MANAGE ECONOMIC SHOCKS

This chapter begins by exploring the working definition of the term 'livelihood strategy'. This is followed by a brief overview of the two main motives that compel rural households to diversify their livelihoods. The importance of rural livelihood diversity as response to HIV/AIDS as an economic shock is also discussed. Migration as a livelihood strategy and its linkage with HIV/AIDS are highlighted in this chapter. The chapter ends with the conceptual framework used to analyse the rationale of rural livelihoods diversity.

1.1 Defining Livelihood strategy

The definition of 'livelihood strategy' has been extensively discussed among academics and development practitioners (Chambers & Conway 1992; Carney 1998; Ellis 1998; Batterbury 2001; Francis 2002). According to Ellis (1998), a livelihood strategy encompasses not only activities that generate income but many other kinds of choices, including cultural and social choices, that come together to make up the primary occupation of a household. The term 'livelihood' attempts to capture not just what people do in order to make a living, but the resources that provide them with the capability to build a satisfactory living, the risk factors that they must consider in managing their resources, and the institutional and policy context that either helps or hinders them in their pursuit of a viable or improved living standard. Thus, the concept of livelihood is about individuals, households or communities making a living, attempting to meet their various consumption and economic necessities, coping with uncertainties and responding to new opportunities (de Haan and Zoomers 2005).

1.2 Rural livelihood diversity

Multiple motives prompt rural households and individuals to diversify assets, incomes and activities (de Haan & Zoomers 2005). There are two sets of motives. The first set consists of 'push factors', including risk reduction, response to

diminishing factor returns in any given use, reaction to crises or liquidity constraints, and high transaction costs. The second set of motives comprises 'pull factors', namely, the realisation of strategic complementarities between activities, and specialisation according to comparative advantage given by superior technologies, skills or endowments. This distinction between diversification types that do or do not lead to either growth or poverty reduction differentiates between two alternative livelihood strategies, such as 'demand-pull' and 'distress-push' ('accumulation' and coping') diversification (Reardon *et al.* 1998; Haggblade *et al.* 2002).

The objective of distress-push diversification is to stabilise income flows and consumption in the face of adversity. It thus implies engaging in economic activities that are often less productive than agricultural production could be on a full employment basis. It is an outcome of constraint-related motives, and is therefore related to 'necessity' or 'limited risk-bearing capacity'. It typically occurs in an environment of risk, of market imperfections (for example, incomplete or weak financial systems) and of hidden agricultural unemployment. Less-endowed and lower-income households typically resort to distress-push diversification (Ellis 2000; Barrett *et al.* 2001; Bezemer *et al.* 2005). Conversely, demand-pull diversification follows from the desire to capture new opportunities. For example, households may adopt new market or technological opportunities which could increase total labour productivity, household incomes, and financial and asset wealth. It is driven by choice rather than by necessity (Bezemer *et al.* 2005; Barrett *et al.* 2001; Ellis 2000).

The paradox faced by poor households is that while they would most need livelihood diversification, they are less able to engage in higher remunerated livelihood strategies due to entry barriers and difficulty of financing lumpy investments (Ruben & Pender 2004). Consequently, much of the livelihood diversification in rural areas is characterised as '*desperation-led*' and limited to unskilled wage labour (Barrett *et al.* 2001). Analysis of households' revealed preferences among a set of feasible livelihood strategies provides insights into

their diversification behaviour and, therefore, into what sort of interventions might be effective in reducing poverty vulnerability. This assists the identification of (a) effective means of targeting transfers to the poor or the food insecure, and (b) impediments to the smooth functioning of factor markets in labour, land and capital that condition households' on- and off-farm investment (Barrett *et al*. 2001).

Diversity among rural households is primarily based on differences in resource endowments (land, labour, capital and natural resources like forests) and access to markets and institutions (Ellis 2000; Barrett *et al*. 2001; Ruben & Pender 2004). The means through which households derive income from a particular combination of on-farm and off-farm activities, however, can be a more relevant criterion to understanding current household level investment dynamics and resource use (Barrett *et al*. 2001). Opportunities to diversity vary amongst households. Asset portfolios not only mediate the opportunity to diversify but can also determine whether the effects of diversification are positive or negative. A household's ability to adopt more profitable diversification strategies is also determined by its having the skills, location, capital, credit and social connections to pursue other activities (Hussein & Nelson 1998). Households with similar endowments and opportunities for market exchange do not always select the same portfolio of activities. Different relative preferences for income and consumption, wealth and status, and efforts and risk, as well as subjective elements such as enterprise styles are broadly responsible for the diversity amongst seemingly homogenous household types. Resource use intensity also appears to be related to a broad range of additional factors (including life cycle criteria, social hierarchy and tradition) that together shape the farm household objective function (Ruben & Pender 2004).

1.2.1 Migration as livelihood diversification strategy

Migration is another livelihood strategy increasingly pursued by rural households. It also has a special role in the analysis of rural livelihood diversification under crisis as it makes the important link between macro and micro levels of the

economy (Geran 2000). Migration may be seasonal, circular, rural–urban, or international, and is heavily mediated by capital endowment of migrants and their households (de Haan 1999). Literature has emphasised the significance of remittances in international financial flows to developing countries and the complex social and economic ties that bind migrants to the livelihood circumstances of those they leave behind (de Haan 1999). Migration is often ignored and sometimes blocked by policy and institutions; yet it is a very important factor in diverse rural livelihoods that can lead to improved rural livelihoods, and improve rather than degrade natural resources (de Haan 1999).

According to Crush *et al* (2006), migration and remittances from it have both benefits and costs on the welfare of rural households and communities. The impacts also change over time. In the beginning, migration may deprive the household and rural economy of labour but in the longer term, remittances may be invested back into improving productivity and creating assets and household incomes (Crush *et al.* 2006). Empirical evidence has shown that historically land and asset poor households have undertaken much of the migration (UNAIDS 1998; Crush et al. 2006). Some of the migrants have managed to enter high-return economic streams where they get much higher remuneration than they would have earned at home. Nevertheless, for many others, migration has remained a low-return coping activity because of discrimination against them and their lack of special skills required to penetrate high remuneration migratory work (Crush *et al.* 2006).

Cross-border migration has a strong relationship to poverty and socioeconomic exclusion (UNAIDS 1998; Crush *et al.* 2006). In Sengwe Communal in Zimbabwe, cross-border migration for employment is an important component of livelihood strategies, because of recurring droughts (Dzingirai 2004). Data on the remittance behaviour of cross-border migrants and receiving households is limited. Similarly, little information is available on linkage between migration and HIV transmission in rural areas. Despite the lack of reliable data, it is apparent that remittances to home areas do contribute significantly to household livelihoods and food security in semi arid areas (UNAIDS 1998; de Haan 1999; Crush *et al.*

2006). Remittances may be in cash or goods. They can play a key role in the livelihoods of migrant households allowing for human capital investment in education, health and housing and food. Remittances may also be used as capital to invest in income earning household inputs as well as to capitalise entrepreneurial activities. Exploratory analysis on how migrations promote or inhibit diversification, both of the on-farm and the non-farm type, given the vulnerability of rural households is required.

The link between migration and HIV is complex and not well understood (UNAIDS 1998; Crush *et al.* 2006.) Migration is widely recognised as one of the main facilitating conditions of HIV transmission. Improved understanding of the linkages between migration and HIV risk factors is crucial to control further spread of AIDS. According to UNAIDS (1998), HIV is often greatest when people find themselves living and working in conditions of poverty, powerlessness and social instability, conditions which apply to many migrants. Migration *per se* does not necessarily favour the spread of HIV, but often creates a context (prolonged separation from family, isolation, distress) in which migrant person may engage in risky sexual practices (Bailey 2008). According to Crush *et al.* (2006), migration also makes people more difficult to reach through interventions, whether for preventive education and HIV testing, or post-infection treatment and care. Temporary labour migration results in people having to leave behind families and their social groups and redefine their identities (UNAIDS 1998). In addition, younger migrants returning with more disposable income may seem more attractive to women and have more sexual partners (Bailey 2008). Several studies have found that HIV prevalence or risky sexual practices are higher among migrants compared with non-migrants (UNAIDS 1998; Lurie *et al*. 2003; Crush *et al.* 2006). A study in India, for instance, found that female partners of male migrants may be at higher risk of HIV infection as a result of risky local sexual behaviour while partners are away (Halli *et al.* 2007). Empirical evidence has shown that migration is an important coping strategy for poor rural households, hence understanding the link between migration and HIV/AIDS is important for targeted and informed interventions.

1.3 Conceptual framework

The conceptual framework used in this study adopts the 'asset-based approach' where the *assets* of a household include the productive, social and locational assets. Assets, together with the environment, determine the opportunity set of options for livelihood strategies (Ellis 2000). Household and community decisions regarding asset use determine outcomes such as household well-being, environmental conservation and community prosperity (Hussein & Nelson 1998; Barrett *et al*. 2005). The welfare-generating potential of assets depends on the asset-context frontier. Policy reforms and building of assets need to be considered in sequence. The asset-based approach is well suited for understanding and analysing the Sengwe rural economy because of the unequal distribution of assets, high exposure to natural, economic and social shocks, and continuing economic, political and institutional reforms (Hussein & Nelson 1998; Dzingirai, 2004; Barrett *et al*. 2005), all of which pertains to this study. This framework (Figure1.1) includes the following components: assets, the context (policies and shocks), household livelihood strategies, and outcomes (measures of household well-being). The asset-based approach underlies the livelihoods approach. A household's asset portfolio consists of the stock of productive, social, and locational resources used to generate well-being (Moser 1998; Winters *et al*. 2002). Figure 1.1 shows how each asset (or capital type) is defined, given the available information in the household data set and supplementary secondary data sources.

Assets........
determine opportunities

... Within a given context

Productive	Social	Locational
Human capital Natural capital Physical capital Saving & stocks	Social Networks Political Networks	Infrastructure & services Distance to town Agro-ecological zone

Policy/ institutional situation	Existence of Risk
Economic policies Other policies and institutions Property Rights & contracts National & local government social protection & safety nets	Prices & markets Droughts & floods Natural disasters Diseases & Pest Physical Insecurity Wildlife attacks

options

Well being outcomes ....

For Livelihood Strategies

Income & consumption Savings Food security Health and nutritional status	Environmental sustainability Hope towards the future Empowerment Self esteem Leisure and recreation

On farm activities, off-farm agricultural activities
Off farm non-agricultural activities
Migration/receipt of remittances
Participation in social assistance & safety nets

Figure 1.1: Asset-based approach. Source: Chambers & Conway (1992)

Tangible assets (natural, productive, physical, livestock and other forms of stock), intangible assets (social capital and non-market institutions allowing access to or control of assets or resources), and capabilities (human and cultural capital, and life cycle characteristics) shape livelihood strategies (Chambers & Conway 1992; Valdivia *et al*. 2001). Livelihood strategies are expressed in the set of activities that a household pursues. A diversity of economic activities is characteristic of a setting where production and consumption decisions are joint (Ellis 1998), capital types are substitutable (Winters *et al.* 2002), and many factor and product markets are incomplete, or households are partially integrated with markets. In this setting, individuals in the household pursue many objectives – those maximising income and consumption, managing risk, and activities of a social reproductive nature (Ellis 1998). Many assets and strategies contribute to the capacity to withstand shocks in fragile environments like the Chiredzi district rural area in Zimbabwe.

Asset composition is important in determining investments in the various activities. Assets are resources in production and at the same time can be invested or divested, accumulated or depleted, from one year to the next. Livelihood strategies vary (Ellis 1998; Valdivia *et al.* 2001), influenced by linkages inside and outside agriculture, and family life cycle characteristics such as age, education, and dependence ratio (Bebbington 1999). The extent of diversification of the household portfolio of activities is determined by these characteristics and by the household's and individual's objectives, such as risk management practices,

preferences, and/or strategies available to cope with shocks (Valdivia *et al.* 2001). The choices of the household are constrained by the combination of assets that can be accessed (Chambers & Conway 1992; Winters *et al*. 2002). Certain assets are only effective if combined with others, thus asset complementarity matters (Barrett *et al.* 2001).

Other important determinants of asset productivity include regulatory and legal systems, which determine the security and transferability of assets and the existence of means of exclusion (Winters *et al*. 2002). These factors are known as the context. Domestic and international policies, institutions and markets, and forces of nature shape the context. In response, households allocate their assets and select livelihood strategies to try and manage shocks associated with the prevailing context (Adato & Meinzen-Dick 2002). The context in which households operate helps determine the welfare-generating potential of assets and prospects for improved well-being. The political, legal and regulatory contexts affect how households' assets are managed (Barrett *et al.* 2005). Exposure to shocks is also part of the context. Shocks create fluctuations in income, consumption and lower household well-being. Communities around Gonarezhou National Park in Zimbabwe regularly experience several shocks, such as crop loss due to drought and/or wildlife destruction, livestock loss and theft, illness, death of a household member due to chronic illness (e.g., HIV/AIDS), and loss of employment. These shocks are examined in this study, along with estimates of monetary loss in terms of actual damage occurred or lost employment income. Household responses to these shocks are also examined, but only illness/death of a family member and livestock theft were considered as household specific economic shocks.

The 'opportunity set' for households to achieve different levels of well-being depends on the interface between assets and the prevailing context. Strategic management of a household's asset portfolio defines its behaviour or livelihood strategy (Ellis 1998; Adato & Meinzen-Dick 2002). Livelihood strategies thus refer to the choices that people employ regarding the use of their asset portfolio in

pursuing income, security, well-being and other productive and reproductive goals. These choices translate into economic activities such as land and labour use decisions, reproductive choices, investments in education, migration and participation in social capital building. Choices thus depend to an important extent on asset holdings that determine the ability to undertake a given enterprise and the productivity of resources allocated to that enterprise, while the potential returns depend also on the context. Livelihood strategies include a wide range of on- and off-farm agricultural and non-agricultural activities (Corral & Reardon 2001). In the asset-based approach, asset accumulation and changes in livelihood strategies are important drivers of sustained improvements in well-being.

Finally, selected livelihood strategies determine outcomes that reflect household well-being and prospects for growth over time. The asset-based conceptual framework provides a variety of measures of household well-being. In addition to income and consumption, poor rural households are concerned about food security, health status, vulnerability in general, empowerment and self-esteem, participation in community affairs, environmental quality, and hopefulness towards the future (Moser 1998). Barrett *et al*. (2001) argue that assets and income all have limitations as indicators and, therefore, should be used in combination. This approach is adopted in this study.

1.4 Summary

The main objective of this chapter was to offer a theoretical overview of issues relating to rural livelihood diversity and provide a conceptual framework for analysing livelihood strategies in the context of HIV/AIDS. The chapter began by defining the term livelihood strategy. Two main motives that drive rural households to diversify their portfolios were identified as 'demand-pull' and 'distress-push' diversification. According to the available empirical evidence, 'demand-pull' diversification is an outcome of choice and desire to capture new opportunities, whereas 'distress-push' results from constraint-related factors that are motivated by necessity. Livelihood diversification in rural areas is commonly regarded as distress-push. It is driven by necessity not choice. Analysis of the

motives of rural livelihood diversification will provide insights of diversification behaviour and help identify factors that hinder and condition households' on and off farm investments. Resource endowments not only determine the prospects of diversifying livelihood strategies but also the effects of diversification. A household's ability to adopt more profitable diversification strategies is determined by its asset portfolio and how it perceives risks. Migration was also identified as important livelihood strategy in risky environments. Empirical evidence has shown that much of the migration is desperation-led and commonly undertaken by asset-poor households and communities. Though migration is an important component of rural livelihood diversification, little information is available about how migration promotes or inhibits diversification in semi-arid areas, particularly with the HIV/AIDS dynamics. This chapter concludes with an overview of the asset-based approach that was used to analyse rural livelihood diversity.

CHAPTER 2

THE SAFETY-NET ROLE OF NTFPS IN HOUSEHOLDS AND COMMUNITIES AFFLICTED BY HIV/AIDS

This chapter provides an overview of the impact of HIV/AIDS on rural livelihoods in Southern Africa with a particular focus on Zimbabwe. Debates on the use of the term coping strategy in the context of HIV/AIDS are also highlighted. The final part features a discussion of the role of NTFPs in rural livelihoods and how HIV/AIDS affects the extraction of these natural safety nets.

2.1 HIV/AIDS as a unique shock

The HIV/AIDS epidemic is transforming the landscape upon which development must take place in much of the developing world (Gillespie *et al.* 2001). Like other infectious diseases that become epidemic, HIV starts out as an idiosyncratic shock that turns into a cumulative shock. HIV/AIDS is different from most other diseases and shocks. It is incurable and fatal, killing the most productive members of society while the private nature and cultural attitudes towards sex lead to silence, denial, stigma and discrimination (UNAIDS 2002). This makes effective prevention and mitigation difficult to implement. The long incubation period between infection and full-blown symptoms leaves many infected people unaware of their status, forming a reservoir for further spread of the HIV virus. Individuals who are unaware of their HIV status and their families cannot begin to alter livelihood strategies in response to the coming shocks. Although life-prolonging treatment is available, for most people in developing countries it remains too expensive (Gillespie *et al.* 2001). HIV/AIDS, thus, adds a new dimension to livelihoods innovation.

2.2 Household coping strategies in the face of HIV/AIDS

The impact of HIV/AIDS and the coping strategies pursued by households are inextricably linked. It is important to note that communities are not homogeneous and not all households have the same access to assets. Households within the same

community may have different options and perceptions of risk and may, therefore, turn to a different strategy or combination of strategies to cope with the impact of shocks (Mutangadura & Webb 1999). A comprehensive analysis of the dynamic nature and impact of coping strategies in the context of HIV/AIDS is fundamental to policymakers and research scientists.

According to Ellis (2000), coping strategies are short-term responses to an unplanned crisis and are a form of *ex-post* diversification. The coping strategies of communities and households can be seen as the best response actions available given their constrained socioeconomic and physical environment (Campbell *et al.* 1989). Household coping strategies today are, however, different to those in the past because of the effect of socio-economic relations between households, impact of HIV/AIDS and wider macroeconomic forces (Ellis 2000).

Several arguments have been put forth concerning the concept of coping strategies. The term coping in the context of HIV/AIDS may entail that people manage their difficult situation and the shock is transitory that does not alter their livelihoods permanently (De Waal *et al.* 2005). HIV/AIDS, by its complex nature, often involves permanent transformation of these livelihood strategies, particularly when entwined with the range of other compounding factors. Rugalema (1999) challenged the usefulness of the concept of coping strategies, focusing more on the negative effect of HIV/AIDS-induced illness and death on household socio-economic well-being. He argues that the concept analyses the success rather than failure of such response strategies, implying that the household is managing or persevering. Secondly, he emphasises that households do not act in accordance with a previously formulated plan or strategy but respond to the immediate need by disposing assets when faced with these socio-economic constraints. Decisions are increasingly based on immediate needs and not on the importance and usefulness of the assets. For example, land has been abandoned and sold formally and informally to meet medical costs (Mutangadura & Webb 1999), a situation that has long-term implications for household food security.

Finally, Rugalema (1999) argues that since coping strategies tend to be described as short-term responses to entitlement failure, they give a notion that this negative change in livelihood options involves marginal costs, obscuring the true cost. For example, while taking children out of school is a coping strategy it will also have long-term implications on human capital development (Rugalema 1999). According to this study, the use of the concept of coping strategies is most feasible in circumstances of drought or famine but not for the impact of HIV/AIDS, which not only changes communities and livelihood patterns but also agro-ecological landscapes with long-term implications for recovery.

On the contrary, De Waal *et al.* (2005) argue that there are indications that traditional rural African coping strategies can mitigate the worst effects of HIV/AIDS where households are not subject to additional multiple stresses and when viewed over a short reference period of, for example, a couple of years. According to this study, the various factors that determine the success of these strategies include:

- Gender, age and position in the household of the ill/deceased person;
- Household socio-economic status;
- Type and degree of labour demand in the production system;
- Availability of labour support to affected households;
- Other livelihood opportunities;
- Available natural resources;
- Availability of formal and informal sources of support, including credit and inter-household transfers;
- Length of time that the epidemic has been impacting the rural economy; and
- Existence of concurrent shocks such as drought or a commodity price collapse.

UNAIDS suggests that individuals and households undergo processes of experimentation and adaptation when adult illness and death impacts whilst an attempt is made to cope with immediate and long-term livelihood change (SADC, 2003). The coping strategies that are pursued not only depend on but also have a cumulative impact on the assets upon which a household can draw, and hence influence a household's future vulnerability. It can be argued that the staging and

timing of the shock and its relative impact are important factors to be considered in any HIV/AIDS and livelihood analysis. As supported by a number of authors, (World Bank 1997; De Waal *et al.* 2005; UNAIDS 2002), certain strategies may be followed after the death of one household member and these may become less viable on the death of a second prime age adult, in which case damaging strategies may be pursued out of necessity.

The possibility that some households actually cope effectively should not be ignored. A focus on the shock and assumed crisis caused by HIV/AIDS may disregard the fact that some households do, in fact, cope. The World Bank, for example, noted that AIDS-affected households appear to be resilient. In Côte d'Ivoire, although total consumption dropped when an individual died from AIDS, basic needs dropped less and almost fully recovered within 10 months (World Bank 1997). Exploring the factors behind effective coping, in relation to the options and resources available, and the strategies selected is perhaps one of the most instructive ways forward for policymakers and researchers.

2.3 HIV/AIDS and the regional livelihood crisis

The claim that the current southern African livelihood crisis is inextricably linked to the widespread HIV/AIDS epidemic, which has deepened the crisis, is supported in much of the food security literature and current thinking (Harvey 2003). The region has the highest HIV/AIDS prevalence rate in the world, as illustrated by the latest AIDS epidemic update from UNAIDS: Lesotho 27%, Malawi 20%, Mozambique 16%, Swaziland 43%, Zambia 20% and Zimbabwe 21%. These figures indicate a steadily worsening epidemic in all listed countries over the past four years, apart from Zimbabwe, which has a decreasing prevalence (UNAIDS 2005). As shown in Table 2.1, these rates are embedded amongst some of the highest rates of poverty and malnutrition in the world.

Table 2.1: Linkage between HIV/AIDS, poverty and food and nutritional insecurity, 2002

	% Adults living with HIV	% Poverty[a]	% Children underweight[b] (year of survey)	% (numbers) of population in need of food aid
Botswana	37.3	47	13 (2000)	-
Malawi	14.2	85	25.4 (2000)	29 (3.2 million)
Zambia	16.5	87	25.0 (1999)	26 (2.9 million)
Zimbabwe	24.6	64	13.0 (1999)	49 (6.7 million)
Lesotho	28.9	66	17.9 (2000)	30 (0.65 million)
Swaziland	38.3	67	10.3 (2000)	24 (0.26 million)

[a] Living on less than $2 per day; [b] Weight-for-age <-2 Z-score.

Sources: HIV: UNAIDS, (2002)

According to Harvey (2003), the HIV/AIDS epidemic has contributed to the crisis in three ways. It firstly reduces farm production and incomes, as labour is lost due to sickness, caring and death, which in turn erodes the capital base of affected households and forces them to plant smaller areas under less-intensive techniques. Secondly, it further erodes households' resilience and ability to cope with other shocks, particularly as the asset base is eroded and livelihood options are reduced. Thirdly, the epidemic undermines the ability of institutions to respond, particularly as professional staff are affected, and the combined impacts erode the overall economic performance of the economy.

Recently it has been recognised that household food insecurity in rural and urban southern Africa cannot be properly understood if HIV/AIDS is not factored into the analysis. Baylies (2002) noted that HIV/AIDS can, on one hand, be treated in its own right as a shock to household food security, but on the other, it has such distinct effects that it is a shock like none other. Livelihoods based analysis of linkages between food security and HIV/AIDS show that the impact is systemic, affecting all aspects of rural livelihoods (Haddad & Gillespie 2001). However, there are still large gaps in understanding how and why the interaction of forces destroy some households while others survive and, at the same time, create

opportunities for others to adapt livelihoods to their benefit (Jayne *et al.* 2004). Understanding and distinguishing the effects of HIV/AIDS within the complex set of forces affecting the southern African region is a key problem for scientists and policy-makers. Without that knowledge, it will be impossible to understand the dynamics and nuances of vulnerability and, hence, to revise interventions as necessary (SADC 2003).

However, as the FAO has argued, despite the fact that the epidemic is now in its third decade in Africa, available analysis to date provides an unclear picture as to how HIV/AIDS is affecting household food and nutritional security (Jayne *et al.* 2004). Much of the current 'knowledge' on HIV/AIDS and food security is based upon a few empirical studies and a range of material that embodies 'anecdotal recycling' (Haddad & Gillespie 2001). Given the dearth of longitudinal household data over a long period and methodological limitations, the longer-term effects of AIDS, and particularly the community-level effects, have yet to be rigorously measured. A greater number of empirical datasets and quantitative impact studies are necessary to have a clearer and more accurate understanding of what is going on in different communities and societies. It is with these caveats in mind that the available empirical studies on the effects of HIV/AIDS on the rural economy should be viewed.

In addition, AIDS differs from other kinds of diseases such as malaria, as it appreciably raises the likelihood of subsequent death in the family after one-member contracts the disease (Chapoto & Jayne 2005). These results hold many important implications for poverty reductions strategies in areas hard hit by AIDS, such as most of southern African rural communities.

2.4 HIV/AIDS in Zimbabwe

Zimbabwe is among the sub-Saharan countries with the highest HIV/AIDS prevalence rate in the world. The HIV prevalence rates calculated through testing pregnant women who attend antenatal clinics rose significantly in the late 1980s and early 1990s. Since the late 1990s, the prevalence rates among adults aged 15–

49 years seems to have levelled off, reaching 24.6% in 2003 (MOHCW 2004) and 21% in 2004 (UNAIDS 2005). According to government figures, the adult prevalence was 20.1% in 2005 (MOHCW 2005) and fell to 15.6% in 2007 (*The Herald*, 1 November 2007). The Ministry of Health and Child Welfare believes that this downward trend does not imply that the epidemic has been brought under control, as HIV prevalence continues to be high (MOHCW 2005). To emphasise this point, despite the downward trend, Zimbabwe is still among the countries with the highest rates in the world and in the region, ranked fourth after Swaziland (43%), Botswana (37.3%) and Lesotho (27%). One in every five adults in Zimbabwe is infected with HIV/AIDS (UNAIDS 2004). An estimated population (children and adults) of 1.8 million and 1.6 million adults aged 15–49 is living with HIV in Zimbabwe (MOHCW 2004). Prevalence levels of the population aged 15–49 years in Zimbabwe show similar trends between urban and rural areas, with 28% and 21% prevalence rates, respectively (MOHCW 2004).

A recent review, carried out between November 2004 and June 2005, which was commissioned by UNAIDS and other international partners, confirms the indications of declining trends in HIV prevalence in Zimbabwe (UNAIDS 2006). The report suggests declining trends in the past five years, in particular from 24.6% to 21.3% between 2002 and 2004. Several factors are thought to be contributing to this, including the reduction in the number of sexual partners and changes in sexual behaviour partly reflecting an increase in condom use in non-regular partnerships. The decline may also be driven by mortality rates that seem to be levelling off in some parts of the country (UNAIDS 2005). It should, however, be recognised that with over one in five pregnant women still testing HIV-positive, infection levels remain among the highest in the world, underscoring the need to bolster prevention activities. Of special concern is the possibility that factors such as population mobility, spousal separations and livelihood insecurity following the forced displacement of several hundred thousand Zimbabweans in 2005 could reverse these recent trends (UNAIDS 2006).

2.5 NTFPs and their role in rural livelihoods

Non-timber forest products (NTFPs) provide a range of products which, when incorporated into the livelihood strategies of rural people, aid in reducing their vulnerability to risks (Neumann & Hirsch 2000). These products are used to meet basic needs; are sold in local, regional, and national markets to generate cash; and have an important gap filling or safety-net function (Khare *et al.* 2000; Shackleton *et al.* 2002; Angelsen & Wunder 2003).

There is a range of risks, shocks and trends to which rural households are vulnerable. A variety of self- and mutual-insurance mechanisms among poor farmers have been explored in theoretical and empirical studies, examining their interlinkage with asset holdings at both household and community levels under imperfect markets. It is commonly argued that the poor with limited resources and opportunities tend to rely more on natural resource extraction not only for income and sustenance but also for insurance (Jodha 1986). This is because environmental assets may be the only assets the poor hold or have at their disposal to combine with their labour, especially in locations where wage labour opportunities are limited. As such, this poverty-environment link seems to limit the prospects for win-win outcomes of conservation-development initiatives proposed by policy makers and NGOs, especially when coupled with other negative shocks of various sorts (Barrett & Arcese 1998). Yet, the current understanding of this link between asset poverty and natural resource extraction is based on limited empirical studies, ones that typically relate only extraction volume, income, with total income or asset holdings (Cavendish 2000; Coomes *et al.* 2001). Moreover, very little research to date explicitly examines the role of natural insurance (or coping extraction) among rural households in tropical forests (Pattanayak & Sills 2001). As a result, there is little systematic analysis to help guide conservation and development promoters in their efforts to understand how the poor (and others) deal with negative shocks. This study examines the role of forests in conditioning household vulnerability and responses to covariate risk and idiosyncratic health 'shocks'.

There has been debate regarding the poverty-forest link and the potential for forests to contribute towards poverty alleviation. There is a disparity between the expected role of NTFPs in economic development and poverty reduction strategies, and what is happening in practice. According to Wunder (2001), although natural forests serve a function as safety nets, there are challenges in raising producer benefits sufficiently for forests to make a significant contribution to poverty alleviation. Angelsen and Wunder (2003) draw attention to the argument that forests and poverty are linked in a downward spiral whereby poverty causes forest loss and forest loss causes poverty. Wunder (2001) states that there are few win–win synergies between natural forests and poverty reduction on a national scale. Neumann and Hirsch (2000) argue that the safety-net function of NTFPs is important, particularly for the rural poor.

While a number of studies have documented the role of NTFPs in livelihoods (Hegde *et al*. 1996; Peres *et al*. 2003), few have critically analyzed the conflict between livelihood gains and ecological costs and how the long-term livelihoods could be safeguarded. It is often assumed that there is little, or no, ecological impact of NTFP harvest (Shaanker *et al.* 2004), although there is evidence to the contrary (Godoy & Bawa 1993). The present research will focus on the balance between securing long-term livelihoods and the associated ecological costs of non-timber forest product use. Based on this study, interventions that could help lower the ecological cost and maintain or enhance existing livelihoods will be proposed. High dependence, low or no ecological knowledge and an exploitative market are likely to impose high ecological costs. When dependence on forest products is low, independent of ecological status of the people as well as market structure, the ecological cost is bound to be low (Shaanker *et al.* 2004). However, when dependence is high, as is the case in most developing countries such as Zimbabwe, the ecological cost will primarily be determined by the status of knowledge among the people, institutions that govern use and harvest of the forest products, and the marketing system. In general, it can be hypothesised that high dependence coupled with low knowledge status and high degree of institutional failure leads to high ecological cost. Alternatively, high dependence, if associated with good ecological

knowledge status, good institutions with secure property rights, and a non-exploitative marketing structure, is likely to lead to a milder ecological cost. The relative strength of these linkages might be important in determining the final payoffs into benefits and costs. Additional factors such as the proximity to the market and market demand conditions are also important determinants. This study aims to explore these possibilities.

2.6 Effects of HIV/AIDS on NTFPs extraction

HIV/AIDS-afflicted rural households undertake many unique and nuanced changes with regard to NTFPs use and collection strategies following an adult mortality experience (ABCG 2004). The myriad possible changes in a household can be presented as a typology of four interrelated dimensions of household strategies involving the selection, use, collection, and level of consumption of NTFPs.

Natural resource selection strategies include those household decisions involving what natural resource is to be used for a given purpose. For instance, mortality-induced changes in natural resource selection have been observed as afflicted households turn to natural resources (e.g., wildfoods) as alternatives to purchased items (Barany *et al.* 2001). More generally, mortality effects on resource selection strategies can be seen as more desirable products are replaced with those most readily available as households struggle to cope with diminished labour capacity and the resultant reallocation of money and time (Dwasi 2002). Closely related to selection strategies, *natural resource use strategies* are decisions regarding the purpose of the selected natural resources. Also, use strategies may entail the sale of natural resources otherwise used for household consumption in an effort to raise much needed income (Cooke 1998).

Natural resource collection strategies represent other important arena of potential change. More specifically, natural resource collection strategies involve those decisions regarding *where* natural resources are to be collected (including formal and informal markets), *who* (in terms of household position) will do the collecting,

and the associated *costs* of collection in terms of time, money and/or bartered assets (Dwasi 2002). Questions of *who* in the household collects resources unavoidably raise the issue of opportunity costs. A summary of research from sub-Saharan Africa notes that time otherwise spent in school or studying represents significant opportunity costs associated with the use of children as natural resource collectors (Cooke 1998). As related to mortality experience, ABCG, (2004) reports that throughout SSA changes in the natural resource collection strategies frequently involve unsustainable collection practices and the de-emphasising of stewardship in general (Dwasi 2002). Unfortunately, the death of a prime-aged adult also often represents the loss of a skilled and knowledgeable natural resource collector. In contrast, children and inexperienced natural resource collectors are more likely to employ unsustainable collection practices due to lack of traditional knowledge (Dwasi 2002).

2.7 Conceptual framework for NTFPS as coping strategies for rural households and communities afflicted by HIV/AIDS

The conceptual framework guiding the empirical implementation is the household economic theory developed by Becker (1965). The model recognises that households act as a unified unit of production and consumption of goods and services with the aim to maximise utility subject to their production function, income, and total time constraint. This model is appropriate for the unique characteristics of rural households in Zimbabwe and can be used to derive the behaviour of rural households as a function of a set of household-specific and exogenous variables. These households are simultaneous producers and consumers and generally behave rationally, given their resource constraints, preferences, limited access to information, and imperfect markets they face.

The most important implication of this theory is that the household maximises profits and then maximises utility with respect to a standard budget constraint, which includes the value of these profits. Utility depends on the consumption of agricultural goods (C_a); forest products (C_f); leisure (C_l;) and (C_n) that represents all other commodities subject to household characteristics affecting preferences

(X_c). The household is considered to rely primarily on agriculture (a), with collection of NTFPs from public forest as secondary activity. Agricultural production is a function of household labour allocated to agriculture (L_a), accumulated agricultural knowledge (K_a) and household characteristics (X_p) such as ownership of fixed inputs (Pattanayak & Sills 2001). According to Rosenzweig and Binswanger (1993), agricultural knowledge measured by farming experience is an important variable in determining agricultural production.

NTFPs collection is a function of household labour in forest collection (L_f), household characteristics (X_p) and forest access and quality (F). Forest access and quality is a function of the accumulated forest knowledge and average distance to the tropical forest (Pattanayak & Sills 2001). Because of the diversity and complexity of the tropical forest, accumulated forest knowledge (K_f) gained affects the household's ability to collect. Although there are also risks in forest collection, the diversity of products that are collected suggests that the overall risk of forest collection is small in comparison to the risk of agricultural production and other types of risks to which households are exposed. Consequently, forest collection is a potential risk-mitigating activity. A time constraint (L) implies that labour in forest collection must be taken out of agricultural labour (L_a), leisure or other household activities (L_l,), or off-farm wage labour (L_w).

A standard budget constraint applies such that consumption expenditures must be less than the sum of net income from agriculture, forest collection, off-farm wage income, exogenous incomes (, e.g., remittances or pension), and net savings. Households choose labour allocations to produce agricultural goods (L_a), collect forest products (L_f), and earn off-farm wages (L_w), and consumption allocations of leisure (C_l), and agricultural (C_a), forest (C_f), and numeraire goods (C_n).

To understand the mitigatory role of tropical forests, consider the consumption and income smoothing opportunities offered by household forest collection. For example, the *ex post* responses to an economic shock, such as the unexpected illness/death of the breadwinner in which households collect NTFPs to smooth

consumption and income. The motivation for forest collection, however, is more complicated in a dynamic setting in which households develop and respond to expectations of future risk (Pattanayak and Sills 2001). In order to make use of the consumption-smoothing opportunity from the forests, households must *ex-ante* learn about the intensity of the economic shock imposed by illness or death of a household member. Households may also be motivated to collect from the forest to smooth income by adding NTFPs to current year savings, thereby helping to alleviate the impact of future HIV/AIDS income shocks.

The forest knowledge and savings motivations suggest that household forest collection trips and quantity of goods harvested per trip can be seen as part of an income diversification strategy in response to expected or long-term ill health risks. More often recognised components of this strategy include investment in liquidable assets (for example, livestock). The availability of these components, as well as other sources of consumption smoothing (off-farm wage labour and remittances) will influence the extent of forest collection. In sum, households take forest collection trips and quantity of NTFPs harvested (in kilograms and monetary terms) in any given year as part of a joint production strategy that generates forest products for consumption or savings and forest knowledge. Consequently, a positive relationship between quantity of forest products collected and unexpected HIV/AIDS economic shocks (consumption-smoothing response) and expected ill health risks (income-smoothing response) is expected. The household forest extraction behaviour is summarised using two equations. First, equation (2.1) presents the three constraints in the household extraction model. The assumptions underlying convex continous production functions are that agricultural production and forest extraction depend on labour input, knowledge and fixed inputs. Knowledge depends on the accumulation of labour inputs until the period prior to the shock (t-1). Income is subject to period-specific multiplicative risks, specified as the HIV/AIDS economic shock (Φ). The HIV/AIDS epidemic is assumed to reduce the household labour endowment. The labour time constraint implies that the sum of household's allocation of labour to agriculture, forestry, off-farm activities and leisure cannot exceed household

labour endowment at any given period (L_t). Given labour constraints, the household's expenditure must be less or equal to the sum of net income from agriculture, forest collection off-farm income, pensions and net savings.

$$C_{at} + C_{ft} + C_{nt} \leq \prod_t$$
$$\prod_t = at\,(L_{at} \mid K_{at}, X_c) + f_t(L_{ft}, K_{fi} \mid X_c) + F_t + I_t + S_t \tag{2.1}$$

In equation (2.2) a two period Lagrangian function (which can be generalised to n periods) is presented. The Lagrangian in equation (2.2) represents the household's objective function that includes period 1 utility and subsequent period expected utility, subject to their respective full income constraints. Households maximise utility in period t (U_t), which is assumed to be a concave, continuous, twice-differentiable function of goods and leisure conditioned by socio-economic demo-graphic characteristics, X_c.

$$H = U(C_1 \mid Xc) + \mu_1 \{\pi_1(L_{f1} \mid K_{f1} I, F, Xc)\ \Phi_1 - C_1\} + E\{\rho.(U(C_2 \mid Xc) + \mu_2\ [(\pi_2\ (K_{f2}$$
$$(L_{f1})\rho^{-1}\ S_1\ (L_{f1}) \mid I,\ Xc,\ F)\Phi_2 - C_2] + \ldots n\} \tag{2.2}$$

For all periods, C is the weighted composite consumption of C_a, C_f, C_l, and C_n. π is the full income comprising of the net income (from agriculture, forest, off-farm labour, exogenous income, and net savings). In period 1, π depends on forestry collection labour L_{f1}, agricultural production labour a_{Lt}, the HIV/AIDS economic shock (Φ) that is represented as a multiplicative factor, exogenous factors and other fixed effects[1]. In the subsequent periods, π is still affected and influenced by L_{f1} through the accumulation of forest knowledge K_f (which increases forest collection output) and savings (S); ρ measures the variability of intensity of the HIV/AIDS economic shock which determines the opportunity cost of capital (the growth rate of savings).

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[1] These include locational effects such as soil type, size of the community and level of development which determine the price of commodities.

2.8 Summary

This chapter provides an overview of the impact of HIV/ AIDS on rural economies. The HIV/AIDS epidemic is different from other shocks because of its long incubation period that transforms an idiosyncratic shock into a cumulative shock. In addition, HIV/AIDS kills the most productive members of the household thus intensifying the poverty level of vulnerable households. Debates on the usefulness of the term coping strategy in the context of HIV/AIDS were reviewed. Coping strategy was defined as a short-term best-response action to an unplanned crisis adopted by a household given its socioeconomic and physical constraints. There are several arguments on the usefulness of the term given the complex nature of the HIV/AIDS epidemic. Some authors argue that the definition obscures the negative impacts of the epidemic and is more appropriate for analysing socioeconomic impacts of one-time crises such as drought or famine. Despite some controversy regarding the concept 'coping', there is empirical evidence to support that some households actually cope effectively with the impact of HIV/AIDS economic shocks. However, special attention should be given to important determinants of successful coping and best response strategies. Finally, the role of forests in conditioning household vulnerability and responses to covariate risk and idiosyncratic health shocks was explored. Effects of HIV/AIDS on natural resources were also highlighted. The chapter ends with a conceptual framework for analysing the coping function of NTFPs.

CHAPTER 3

MANAGEMENT OF NON-TIMBER FORESTRY PRODUCTS EXTRACTION

The main objective of this chapter is to review the literature on NTFPs management issues and the impact of market forces on extraction to enable selection of a model for the study. It also discusses the theoretical framework to be adopted for the forth coming chapters

3.1 Managing non-timber forestry resources

NTFPs are derived from common property forests and woodlands (FAO 2003). Common Pool Resources (CPRs) are usually characterised by costly exclusion and, typically, there is rivalry in use (Ostrom *et al*. 1999). Scholars of the commons, therefore, have indicated sub-optimal outcomes of CPRs as they are subject to depletion because of the temptation to free ride. As CPRs are characterised by the pervasiveness of a range of market and policy failures, community-based property rights over CPRs are considered the most viable option for both ecological and economic sustainability of the commons.

NTFPs management strategies are not uniform: various categories of people engage in management for a variety of reasons and in various ways. The social and economic benefits derived from this activity are also highly varied. This is partly due to the highly fluctuating and fleeting nature of the external demand in forest products as conveyed by outside traders. Uncertainties are also introduced by the frequency of abrupt changes in policies and implementation of policies affecting NTFPs. Rural households react to this double uncertainty by maximising the profitability of extraction (ABCG 2004). The concern for immediate sustainability is always undermined by the lack of sustainability in the market and policy environment. Following Hall and Bawa (1993), sustainable utilisation of NTFPs can be defined as the level of harvest that does not impair the ability of the harvested population to replace itself. In boom periods, or in times of favourable policies, such as new systems linked to the decentralisation of forest management

in many tropical countries, the incentives for harvesting as much as possible (immediate profit, competition with outsiders, abuse of power from external authorities on local collectors) are obviously higher than incentives for sustainable management (ABCG 2004). Given the number of rural communities in the SSA that depend on NTFP today, it is highly likely that NTFP extraction will continue well into the foreseeable future, as will efforts to link conservation with livelihoods of such communities. While management of forests for NTFPs does not automatically guarantee conservation, it certainly provides a means of reducing ecological cost. In the long term, such NTFPs harvesting must be accompanied by appropriate incentives to minimise ecological cost (Ticktin 2004) and simultaneous efforts to augment community livelihoods. As long as there are people who are dependent on NTFPs, there is a need to continue to strive for the win-win situation as suggested by for example Ticktin (2004) and Shaanker *et al.* (2004).

Research on CPRs management has shown that local community level resources management is the most viable option of CPR management (Agrawal & Gibson 1999). The emphasis on the community-based approach arises from the assumptions that local communities not only understand their problems but also have greater incentive to find workable solutions to problems because their livelihoods depend on the natural resource (Belcher & Schreckenberg 2007). Further, as economic opportunities from utilising the resource grow, so the community will have greater incentive to conserve the resource base and manage it sustainably over time (FAO 2003). The IUCN's (2005) contention that indigenous knowledge and the equitable participation of local people are crucial in the management and conservation of medicinal plants in southern Africa is consistent with these arguments.

Although local control over natural resources is commonly regarded as a win-win solution for environmental preservation and local development, the empirical evidence is rather mixed (Malla 2000; Agrawal 2001). Community-based approaches in Asia have shown that local institutional arrangements, including

customs and social conventions designed to induce cooperative solutions, can overcome collective action problems and help achieve efficiency in the use of such resources (Agrawal 2007). Other studies, however, have shown that factors such as increasing market integration, high population pressure, lack of economic incentives, and the breakdown of traditional knowledge and beliefs increase the likelihood of degradation of CPRs under local control (Godoy 2001; Belcher & Schreckenberg 2007).

The degradation of NTFPs in southern Africa is primarily due to overexploitation and unsustainable harvesting practices (FAO 2003). Poverty, low incomes, and immediate survival needs often drive local people to over-harvest, at the expense of sustainability. As resources become degraded, so peoples' livelihoods become increasingly vulnerable (FAO 1996). In rural areas of Zimbabwe, for example, many people lack employment opportunities, due in part to their poor education and limited awareness about employment opportunities (FAO 1996). Moreover, in the face of the current uncertain economic environment in Zimbabwe, their poverty and marginalisation is expected to deepen and continue to the next generation, to the detriment of society as a whole (Saxena 2003). The indifference of local people, combined with increased demand for NTFPs, has accelerated the degradation of many valuable NTFPs resources.

In southern Africa, particularly Zimbabwe, no effective policy measures have been introduced to control the unsustainable harvest, protection, and conservation of NTFPs, and those provisions that have been made have been too poorly implemented to make a tangible impact (FAO 2003; Darlong & Barik 2005). Furthermore, too few efforts have been made to involve the local people who have a stake in these resources in the planning and management of NTFPs, including improving harvesting practices and controlling overexploitation (FAO 2003; Darlong & Barik 2005). An objective of this Chapter is to examine the extent to which forest degradation in south-eastern Zimbabwe is driven by existing local community management approaches, resources endowment and user characteristics, ecological knowledge, and marketing systems.

3.2 The uniqueness of NTFPs

A number of issues concerning NTFPs make them a difficult group of products to frame in terms of their characteristics and actual potential contribution to poverty alleviation, economic development in general and to sustainable natural resource conservation. Resource assessment of NTFPs is usually complicated for both plant and animal products. For plant products, unlike timber, few standard inventory methods can be applied. Species- specific population inventory techniques need to be adapted and combined with appropriate yield assessment techniques to arrive at production figures for such diverse products as roots, tubers, leaves, fruits, sap, bark, etc (FAO 2002). Sustainable management and harvesting recommendations can, therefore, be difficult to develop. They may need to be species-specific. Traditional knowledge exists but development and forestry professionals do not make enough use of this (Ticktin 2004). Quality assessment of the resource is difficult when the valuable ingredient(s) of the NTFPs requires complex chemical analysis (e.g., medicinal properties). There is considerable traditional knowledge on many of these quality-contributing factors, but it is often being rapidly lost as commercial pressure breaks age-old traditions of collaboration between collectors and specialist traders/end users (e.g., in Ayurvedic medicine). The products of many NTFPs are often the outcome of a series of successive, varied, and sometimes complex processing measures (FAO 2002).

3.3 Common pool resource management

An important distinction must be made between the CPRs and the resource management regimes under which they are held. Resource management regimes are often based on the property rights held over the resources. There are essentially four types of property rights (Heltberg 2001):

- Open access
- Common property
- Private property
- State ownership

Property rights regimes perform the function of limiting use, coordinating users

and responding to changing resource conditions. Thus, regimes have two main functions: flow and stock management. They define and enforce rules of resource access (flow management) and limit aggregate output from the resource to ensure continued future flow of benefits (stock management). CPRs are natural resources for which it is difficult to exclude potential users and which can be depleted through over-use (McKean 2000). Most CPRs in southern Africa (including Zimbabwe) are largely held under common property. *Common property* resources belong to the community and access rules are defined with respect to community membership. It is a system of shared private property with clear boundaries, rights, and management and use rules, yet potential free-rider problems have to be surmounted for communities to organise collective action (McKean 2000). Hence, conservation rules may or may not be established, resulting in regulated or unregulated common property regimes (Heltberg 2001). When access is limited by community membership, but conservation rules are not enforced, common property is unregulated. Unregulated common property is prone to cause resource degradation if (1) the user population is large relative to the resource stock, and (2) the income from exploiting the resource is high relative to the opportunity cost of time; for example, due to easy access, good extraction technology, high value of the resource, or if users lack outside employment options. Regulated common property has both access and conservation rules in place (Baland & Platteau 1996).

Local institutional management of CPRs in Zimbabwe is based on customary rights to resources. Zimbabwe has a history of colonial rule where land was appropriated by the state (Dzingirai 2004). Thus, common property regimes are nested within state property. The general setup in communal areas of Zimbabwe is that government authorities often create the general context in which resources are to be managed and then the local common property regimes carry out the on-site management (Mafaniso *et al.* 2009). Sengwe Communal is an exceptional case where the government protected area is engulfed by the local communal property system; both communal and state property regimes are involved in the management of certain resources, in particular wildlife. Although government

institutions are supposed to complement local institutional management regimes, there seems to be a conflict between customary and statutory rights particularly in areas surrounding protected areas such as Sengwe Communal (Dzingirai 2004). These conflicts functionally create systems in which some resources are managed under more than one management regime. It is important to examine whether common property regimes continue to function well and contribute to conservation. There has been limited research on common property regimes embedded with state property. The contrasting human, ecological, and institutional setup in Sengwe Communal makes it suitable for evaluating institutions relevant to common property management, and to determine factors that drive forest degradation if common property institutions are robust. Common property regimes in Sengwe Communal are suitable for evaluation of such institutional overlap.

3.4 The impact of market forces on NTFPs extraction

Exposure to market pressures and opportunities is inescapably changing many subsistence-based use systems to market-oriented production systems, with clear losses of biodiversity (Rico-Gray *et al*. 1990; Lawrence 1996; Bennett & Robinson 2000). Moreover, as market prices seldom reflect the values of environmental and other 'external' costs and benefits, market demand may lead to short-term over-exploitation and even to local extinction of some plants and animals that provide highly desired products (Witkowski & Lamont 1994; Fa *et al.* 1995). This divergence between market and real economic and societal values casts doubt on the argument that the increased values attributable to tropical forests because of higher commercial demand for NTFPs necessarily encourage conservation of the resource.

Researchers have debated whether markets worsen the well-being of forest users by eroding their traditional collective action (Bennett & Robinson 2000; Darlong & Barik 2005). If collective action weakens with market expansion, then greater economic vulnerability among local peoples may be expected as they enter the market economy and increased forest resource degradation. Little is known about how integration into the market affects traditional uses of NTFPs (Bury 2004).

Additionally, high volatility of NTFPs markets, seasonality of demand, poor infrastructure, and irregular supplies hinder the successful marketing of NTFPs in remote semi-arid tropical areas (Bista & Webb 2006). Exploitative extraction and trading relations are often the result. Increased market demands have led to over-exploitation of resources such as medicinal plants, herbs, fish and other edible fruits (Larsen *et al*. 2000; Shanley *et al*. 2002). Studies in India have also illustrated that increased demand tends to lead to more intense harvesting and overexploitation of NTFPs (Muraleedharan *et al*. 2005; Marshall *et al*. 2006).

3.5 Traditional ecosystem management

Government planners and policymakers often view indigenous people as objects to be managed rather than a society in the forest ecosystem (Agrawal & Gibson 1999). The indigenous knowledge and religious practices linked to the maintenance of biodiversity have already disappeared in some places because of government policies, market penetration, migration, external education, and integration (Cox 1999; Sutherland 2003). Government policies and regulations often assert state control over the forest resource, thereby further undermining the authority and effectiveness of community level institutions to control and manage forest use (Agrawal & Gibson 1999). It is important to realise that local knowledge is not necessarily static, pristine, and culturally specific; it is dynamic and continuously evolving (Thomas *et al*. 2004). This change is influenced by cultural variation, rising populations, market opportunities, and policy shifts. In the face of market pressures, efforts by some village leaders to enforce local rules proved ineffective in Nepal (Adhikari *et al*. 2004). However, other villages subjected to many of the same market pressures were able to maintain their forests because of their historically strong social cohesion and strong leadership. If biodiversity is to be maintained in the forest ecosystems, there is need to recognise that these forests are present because of the actions of the local people who live in and around them (Berkes *et al*. 2000). The role of government should be to assist local people in their reconstruction of emerging knowledge systems and the adaptation of strategies for interacting with large- and global-scale political economic realities (Agrawal 2007).

Indigenous groups offer alternative management perspectives and knowledge based on their time-tested management practices (Thomas *et al*. 2004). NTFP harvesters often know much about the limits of harvest as they relate to the potential for future production and the ecology. The challenge is to bring together ecological science and traditional knowledge and to build on existing local institutions. Strengthening local-level social institutions is not by itself sufficient to institute effective co-management (Ticktin 2004). Ecological impacts of traditional resource uses and management should be scientifically evaluated before they are abandoned or modified using legal instruments (Agrawal 2007). Capitalising on the positive dimensions of traditional knowledge and overcoming its negative dimensions through conventional science could enhance livelihoods of forest dwellers whilst reducing resource degradation (Larsen *et al*. 2000).

3.6 Conceptual framework of analysis

Wade (1988), Ostrom (1990), and Baland and Platteau (1996) suggested favourable conditions for sustainable governance of the commons. Agrawal (2001) synthesised these factors, and identified four clusters that are crucial to the successful governance of CPRs: characteristics of the resource system, user group, the institutional arrangements, and the external environment. This research draws on Agrawal's (2001) synthesis but also includes other factors that influence forest conditions (Figure 3.1). Additional factors were also drawn from Ostrom *et al.*'s (1999) design principles of long-lived management systems. The design principles are enabling conditions that should be in place for successful CPR management institutions to occur (Agrawal 2007).

Starting with resource characteristics, eight enabling (favourable) attributes for effective governance of forest commons are listed: size of the resource system, well-defined boundaries, resource mobility, possible storage benefits, predictability, feasibility of improving the resource, traceability of benefits to a management intervention, and ease of monitoring resource condition. Local institutions may help alter some of the features of the resource system but most of the attributes present problems because of the special features of NTFPs (Agrawal

2007). For example, perishability, unpredictability, infeasibility of improvement, and lack of traceability pose challenges to many forest commons that yield multiple products (Heltberg 2002).
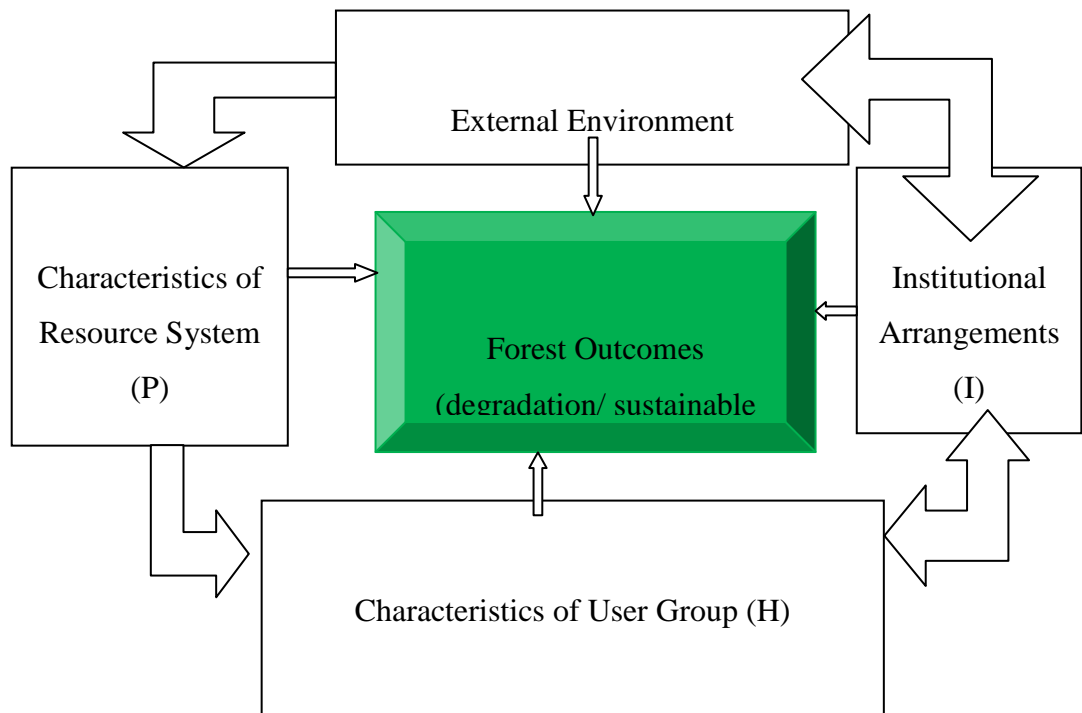
Figure 3.1: Conceptual framework for analysing the impact of local management institutions on CPRs management. Source: Heltberg (2001)

Research on the user group characteristics essential for successful CPRs management has uncovered many interesting findings, although there are substantial variations across time and space (Agrawal 2001). User group attributes include small size, clearly defined boundaries, shared norms, trust, past successful experiences, appropriate leadership, interdependence among group members, nature of heterogeneity among them, their dependence on the resource, and resources available to initiate and maintain collective action (Agrawal 2007). Although substantial research has been done on these issues, the way these attributes influence collective action is ambiguous and thus the impact on forest degradation is debatable. There is some evidence that smaller groups are more

likely to manage CPRs successfully (Ostrom 1999; Agrawal 2007). Nevertheless, there are inconsistencies about group heterogeneity – different dimensions of heterogeneity have different impacts on forest outcomes. CPRs are managed by people of different ethnicity, religion, sex, and wealth, leading to different social, economic, and political heterogeneity dimensions (Baland & Platteau 1996). There is limited empirical evidence that clearly states the roles of heterogeneity dimensions in initiating and maintaining collective action (Agrawal 2007).

This study will focus more on social heterogeneity, as it is crucial for the enforcement and monitoring of rules (Heltberg 2002). Social heterogeneity limits rule by compliance amongst the resource users and render social sanctions less effective because the transaction costs of collective action increase and the likelihood that some will lose as a consequence of institutional change increases (Varughese & Ostrom 2001). According to Heltberg (2002), successful CPR management is more likely if user groups depend on the resource for a substantial share of their income and potential loss from degradation are larger. Thus, they are more willing to incur the costs of collective action of driving institutional change and enforcing the rules. This proponent is of great importance in semi-arid tropics such as Sengwe Communal in south-eastern Zimbabwe, where people rely largely on NTFPs (Dzingirai 2004) because of large spatial variability of rainfall and missing insurance and credit markets. In summary, small, interdependent, and more homogeneous groups that are more dependent on the resource for their livelihood are more likely to create institutions that help regulate forest commons more effectively (Agrawal 2001).

Institutions are important enabling factors for effective governance of the forest commons. Institutions can more specifically be defined as a set of accepted social norms and rules for making decisions about resource use: they guide as to who controls the resource, how conflicts are resolved, and how the resource is managed and exploited (Richards 1997). They shape the resource users' actions and expectations. Institutions provide a number of economic functions such as coordinating the formation of expectations, encouraging cooperation and

collective action, and reducing transaction costs (Heltberg 2002). For effective governance of CPRs, rules should be easy to understand and enforce, locally devised, take into account differences in types of violation, help deal with conflicts, and hold users and their local leaders accountable (Agrawal 2001).

The final set of favourable conditions concerns the external environment: demographic, cultural, technological, market related factors, the nature of state agencies, and the level of external influence such as NGOs and international aid flows. Market pressures, demographic and economic shifts are considered important causal factors of forest degradation by scholars of the commons (Agrawal 2007). There are substantial variations across time and space of how these factors impact on forest outcomes and they are often beyond local institutional management's control.

3.7 Summary

Management of NTFPs is an essential component of a successful development and conservation strategy. Thus, the main objective of this chapter was to provide empirical and theoretical overview of the main issues relating to successful management of NTFPs. The chapter began by reviewing characteristics of NTFPs that make sustainable management difficult. NTFPs are CPRs that are derived from common property forest and woodlands, characterised by costly exclusion and rivalry in use. Sustainable management of NTFPs is always undermined by several factors, management strategies and socio-economic dynamics are varied across space and time. This makes it very difficult to develop sustainable management and harvesting recommendations. Though many recent studies have emphasised the community-based approach as the most viable management strategy for these CPRs, results have been mixed. Factors such as increasing market integration, high population pressure, lack of economic incentives, and the breakdown of traditional knowledge and beliefs have been cited as the main drivers of CPRs degradation under local control. Poverty, low incomes, and immediate survival needs also drive local people to over-harvest at the expense of sustainability.

CHAPTER 4
RESEARCH METHODOLOGY

In this chapter, the study area, data sources and collection methods are discussed, followed by an explanation of the theoretical and empirical model postulated to analyse the coping strategy and management of NTFPs. The parameters and variables for the multinomial logit regression and fixed-effects Tobit models are also described.

4.1 Study sites

This study draws from surveys conducted in 2008 and 2009 among five communities of south-eastern Zimbabwe, Masvingo Province, Chredzi district. These sites are within the proposed Great Limpopo Transfrontier Park (GLTP) and provide contrasting human and ecological settings. The 99 800 km^2 Gaza-Kruger-Gonarezhou Transfrontier Conservation Area (GLTFCA) was formally established in November 2000, when an agreement was signed by the governments of Zimbabwe, South Africa and Mozambique. In 2001 a smaller area containing the 'core protected areas' of Kruger National Park in South Africa, Gonarezhou National Park in Zimbabwe, and Limpopo National Park in Mozambique was recognised as GLTP (Wolmer 2003). A formal treaty for this 35 000 km^2 trans-boundary area was signed in November 2002 (Wolmer 2003) as a first step towards the wider, and rebranded, Great Limpopo TFCA. It is in Sengwe communal lands where the link (corridor) is proposed between Gonarezhou National Park (GNP) and Kruger National Park in South Africa since these parks do not share boundaries. Gonarezhou National Park (the second largest National Park in Zimbabwe) is surrounded by a number of communal lands, the main ones being Sangwe, Matibi 2 and Sengwe. The GLTP has generated interest amongst conservationists and researchers because of its potential to become one of the largest conservation areas in the world, with areas of great cultural diversity and historical value (Wolmer 2003). Practically, in southern Africa, TFCAs have been pushed forward at a rapid pace without much time for consultation with communities and other stakeholders (Katerere *et al*. 2001).

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Sengwe communal lands consist of five ward[2]s, four of which are communally owned. Gonakudzingwa Small Scale commercial area (Ward 12), close to the Naivasha Safari area to the north of the park, is a long-established resettlement scheme with a well defined land tenure system with title deeds. This resettlement is mainly composed of Karanga ethnic people, whose main livelihood is livestock ranching. They have their own hunting associations, which allow them a wildlife quota for hunting.

Malipati communal area (Ward 15) to the south of the Gonarezhou National Park consists mainly of the Shangaan and Ndebele ethnic people and operates Malipati Safari. Malipati Safari covers 15 400 hectares and falls under the Department of National Parks and Wildlife Management Authority of Zimbabwe, but has been leased to the community. The Park allows people from this community formal right to collect NTFPs through user permits. They market NTFPs through a local cooperative. The market organisation for the NTFPs involves various channels, including local cross-border traders, private buyers, and business operators from as far away as Bulawayo and Harare. Also of economic importance in this area is the Manjinji bird sanctuary and irrigation scheme. The Manjinji bird sanctuary is managed by the Park though it is outside the Park area. However, because of historical contingencies local people continue to extract NTFPs in the sanctuary, particularly fish and birds. There is conflict over ownership of the bird sanctuary – the local people claim control because it lies outside the Park. Malipati community is ethnically relatively heterogeneous and there are no strong kinship ties among residents. However, commercial activities such as the Safari and irrigation projects have created a tight-knit community. The close ties of the community are manifested in numerous joint

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[2] A ward is a small administrative unit with an average 5 -10 villages and approximately 700–1000 households.

cultural ceremonies such as *kutseva*[3] and rain ceremony. These projects have unified the community to the extent that all community characteristics required to manage common pool resources are found.

Sengwe communal area (Ward 14), which is close to the border with South Africa and Mozambique, is composed mainly of Shangaan ethnic people and survives on NTFP extraction from a dense thicket, called Pfungwe, and floodplain cultivation (Dzingirai 2004). Hunting, fruit and herb gathering, and fishing are part of their culture. The community is ethnically relatively homogeneous and there are strong kinship ties among residents. The long history and close ties of the community are manifested in numerous joint activities (such as community fish ceremonies) and extensive social networks. The community has most qualities and characteristics required for collective action to manage CPRs.

At the fourth site, Chikombedzi Communal (Ward 11) to the northeast of the National Park, NTFPs are scarce. Owing to its proximity to the district satellite growth point, it is a multi-ethnic community. NTFPs marketed through a local cooperative at the shopping centre are sourced from riverbanks, nearby commercial farms, and the National Park through user permits. The market for NTFPs is highly organised through market shows and attracts buyers from Chiredzi, Harare and Bulawayo, and is held once a month. This community is ethnically relatively heterogeneous and there are no strong kinship ties among residents. Thus, they do not have the qualities and characteristics required for collective action to manage CPRs.

In Pahlela, the fifth site (Ward 13), NTFPs collection is mostly from the periphery and buffer zones of the Park. Though the Shangaan ethnic people dominate in this community, there is a significant proportion of Karangas. Similar to the Sengwe

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[3] Fishing and bird-catching ceremony

community, Pahlela is ethnically relatively homogeneous though there are no strong kinship ties among residents. A unique feature of this community is that mainly the elderly and children do NTFPs extraction. There is virtually no marketing of NTFPs; extraction is mainly for subsistence and recreation purposes. Though ethnically homogeneous, no qualities of collective action are manifested in this community, through either extensive social networks or joint activities.

The study area lies in Agro-ecological region V, which is characterised by low rainfall, poor soils with low agricultural potential, and high temperatures. Mean annual rainfall ranges between 300 and 600 mm. Effective rainfall occurs from September to April. Average daily maximum temperatures range between 27ºC in June and 36ºC in January. There are significant changes in daily temperature in winter, which can be as low as 8.0ºC and as high as 29.2ºC. The climate is generally classified as hot and dry. In drought years, the climate is characterised by long hot and dry spells with day maximum temperatures exceeding 40ºC. (See Appendix A for a map.)

4.2 Data collection

4.2.1 Sampling procedure and research design

The sample frame consisted of 20 villages surrounding Mabalauta Section of Gonarezhou National Park. Survey villages and households were selected through a multistage sampling procedure. First, a complete list of villages was drawn up with the help of district leaders, local health practitioners, agricultural extension officers, and HIV/AIDS support organisations working in the districts. Based on their experience in working in these areas, the district health officers, agricultural extension officers, and HIV/AIDS organisations were asked to rank these villages according to intensity of NTFPs extraction and incidence of the HIV/AIDS epidemic. Ten villages were selected from the sample frame through stratified random sampling. Stratification was based on population, number of households, distance to the Park, village area, intensity of NTFPs extraction, and HIV/AIDS incidence. Two villages representing the most and the least affected by the epidemic were selected from each ward.

The second stage involved selection of the 10 afflicted households within each of the selected villages. The HIV/AIDS-afflicted group included households in which a member was known to be HIV-positive or currently ill from HIV/AIDS-related diseases such as STDs, tuberculosis, meningitis or pneumonia, or having died from HIV/AIDS in the three years prior to the study. Households looking after HIV/AIDS orphans[4] were also included in this group. The control group, households unafflicted by HIV/AIDS, was represented with a proxy household in which no member was known to be positive and/or suffered or died from illness related to HIV/AIDS. While this sampling method introduces bias, obtaining a complete sampling frame of afflicted households within the geographic bounds of the study was impossible. This method of recruitment has been recommended for studies of HIV/AIDS-afflicted households in Africa (Booysen *et al.* 2002). In proportion to the total number of HIV/AIDS-afflicted group elements in the same village, households in which prime-age adults were not chronically ill or deceased were systematically sampled using a list of households obtained from the village leader. Screening questions were used to determine that prime-aged adults were not chronically ill or deceased. As chronic illness and death in a household can be used as proxy indicators of HIV/AIDS-afflicted households (Ainsworth & Dayton 2003; Mastaglio 2002), these indicators were used inversely as proxies for unaffected households. The sampling design was also adjusted to capture anomalies in the spatial distribution of natural resources and HIV/AIDS prevalence. The sample was over-sampled by 25% to cater for high attrition involved with longitudinal studies and HIV/AIDS dynamics (Booysen *et al.* 2002).

A number of techniques were used for in-depth descriptive analysis, including focus group discussions, participatory observation, structured and semi-structured interviews. Community-level focus group discussion and in-depth interviews

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[4] Orphans in this case were defined as children under the age of 18 years whose parent(s) were not alive (Booysen *et al*. 2006).

with households were used to draw out qualitative and quantitative information that was used to guide the quantitative analysis. Each focus group consisted of a recorder (who recorded the comments of the group in writing) and a moderator (who followed a predetermined interview guide) to direct a discussion of eight people. Four community-level focus group discussions (two per round) were held to discern villagers' knowledge about community-level variables such as indicators of market access, natural resources access, indigenous ecological knowledge, and coping strategies. The household survey included information on the following:

- Incidence of ill health;
- The number of HIV/AIDS patients in the household;
- Type of household;
- Main sources of income;
- Shocks the household had experienced (for example, any income loss due to HIV/AIDS); and
- Whether the household had experienced the death of an economically active member from HIV/AIDS in the past three years at the time of household listing or had a chronically ill household member.

The household survey also collected information on crop and livestock production and transactions and physical and financial assets. Secondary data were collected from health centres, Chikombedzi Hospital, local NGOs, National Park, and Safaris operating in the communities. Hospital reports provided information on HIV/AIDs incidence and prevalence for each community. The HIV/AIDS non-governmental organisation and religious groups provided information on the number of ophans, HIV/AIDS patients and families they were helping and the form of assistance provided. Information on the various categories of wildlife that had been slaughtered and annual income obtained from wildlife was obtained from the Safaries and the National Park records. Additional data on population, land use, and forest offences were collected from administrative records for the same villages.

Primary data were collected mainly through two sessions of structured interviews. Two sessions were necessary to account for HIV/AIDS dynamics and seasonal variation in natural resource dependence. In the first interview round retrospective data for 2005–2008 were also collected. The second round interviews were done in the same season in 2009. The attrition rate was 5%, which does not raise a serious concern of attrition bias (Booysen *et al.* 2006). To increase accuracy, different household members were interviewed on the different parts of the questionnaire. For example, information on morbidity was collected from each prime-age member having been ill in the four weeks prior to the interview. Sections of the questionnaire regarding household characteristics, coping strategies, coping capacity, and mortality were administered to the household head. The household member most knowledgeable about natural resources and household food security was chosen to complete these sections. The same household members were interviewed in the second session.

4.2.2 Questionnaire design

This section provides a brief description of the questionnaire items, grouped according to the constructs they measured. Multiple-item questions regarding general household characteristics included those to measure:

- Adult equivalence units (e.g., number of household members);
- Household assets (e.g., hectares of land owned by household, number of livestock owned); and
- Gross household income over the last 12 months, disaggregated to increase respondents' ability to recall income from various sources (i.e. agricultural, wage labour, petty trade, transfers, remittances).

For the dependent variable, household natural resource dependence – attitudinal and behavioural dimensions were measured:

- The perception of natural resources as a buffer against contingencies and as a component of overall livelihood strategy;
- The type and frequency of natural resource product collection;
- Consumption of foods from natural resources;
- Income derived from the sale of natural resource products; and

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- Labour allocated to natural resource product collection.

Respondents were also asked to rank the importance of natural resources for income against other income sources available in the area, such as livestock income and remittances (Campbell *et al*. 2002).

Multi-item questions were used to measure food consumption and income from natural resources. Respondents collecting foods were asked to list the different types of food from natural resources that are consumed by the household. Categories were provided to facilitate recall (i.e. fruits, vegetables, nuts, insects, other animals). This method of measuring the frequency of wild food consumption was adopted from Shackleton *et al*. (1998).

Several questions were asked to measure change in natural stock compared to five years ago. Respondents were asked to indicate whether there had been changes in terms of availability of plants, difficulty of locating plants, and distance to collection site, and to specify the main reasons for the change. Labour allocated to collection as an indicator of scarcity of forest resources was measured by asking respondents if they had made special collection trips in the previous month, and if so, how many. This method was used by Pattanayak and Sills (2001).

Three variables were used to measure the direct socio-economic impacts of HIV/AIDS morbidity and mortality. Household health expenses were determined by summing several disaggregated items (e.g., costs of hospitalisations, costs of visits to health centres and practitioners including travel, and cost of medications). Effects of morbidity on household labour were measured as the number of days in the month prior to that an ill prime-age adult was unable to perform their usual activities, and the number of days that a prime-age adult was nursing another prime-age adult (Tibaijuka 1997).

The employment of coping strategies in response to these socio-economic impacts was measured using a multi-item scale. Respondents were asked to give an affirmative or negative response to whether, within the recall period, they had

engaged in high and low reversibility coping strategies as summarised by Mutangadura *et al*. (1999). The questionnaires used in this study are presented in Appendix B.

4.2.3 Ecological knowledge

One of the objectives of the survey was to ascertain the indigenous ecological knowledge of specific forest fruit trees and herbs that are being extracted, and changes in general forest conditions. Information was sought on the spatial distribution of NTFP trees, methods of harvesting employed, changes in the fruit productivity with time, regeneration status of NTFP species and other trees, the influence of epiphytic parasites on trees, pollination and dispersal modes of NTFP species, and the effect of fire and weeds on regeneration of the species (Shaanker *et al*. 2004). The percentage of the respondents for each site that expressed knowledge of each of the above issues was calculated. Respondents who had no idea of an issue were regarded as not possessing knowledge on the specific ecological feature. For responses where some knowledge was expressed, answers were categorised as unambiguously as possible into discrete categories, keeping the ecological relevance in mind.

4.2.4 Ecological costs

As a measure of the ecological costs, four variables were estimated. At each site, the percentages of cut and broken stems of the total stems were computed for regions near to (0–600m) and distant from (600–1 200m) human settlements. Sites with a greater percentage of cut and broken stems were assumed to bear a larger ecological cost than those with less damage, which was mainly attributable to the destructive means of harvest of NTFPs and to indirect pressures on the forest. As a measure of the effect of human disturbance, the frequency distribution of size and class of stems of NTFP species was calculated. The percentage reduction in the regeneration at regions near to (<600m) settlements compared to more distant regions (600–1 200m) was determined. Among the various methods used for harvesting forest fruits, two broad categories could be identified, namely those

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that are destructive to the trees and those not destructive. The former include practices such as cutting and breaking the branches, while in the latter fruits are picked or dislodged from the tree by shaking or beating the branches with sticks. Across the three sites, the percentage of respondents who adopted ecologically friendly (non-destructive) methods for harvesting fruits and herb collection was determined for the predominant NTFPs from the sites. While harvesting fruits from trees, collectors could collect the entire harvest (to maximise returns to their initial costs of having climbed the tree or having spent time at the tree) or leave a proportion of fruit that could be used by the local wildlife and to favour regeneration; such prudent practice could be at the expense of the short-term gains of the collector (Prasad *et al*. 2001). The percentage of the respondents who adopted such prudent practices in harvesting of forest fruits at the three sites was calculated.

4.3 Data Analysis

4.3.1 Empirical models of rural livelihood diversity to manage economic shocks

Descriptive and econometric analyses were carried out on household-level survey data to better understand:

- Household characteristics, assets, livelihood strategies and levels of well-being;
- Assets and asset combinations affecting household well-being; and
- The impacts of economic shocks and potential policy measures on household well-being.

4.3.1.1 Cluster analysis

Clustering households into a limited number of categories that pursue similar livelihood strategies is a useful way to apply the asset-based approach (Winters *et al*. 2002). Several methods for clustering based on the econometric literature, secondary data, and the household survey data were considered. Income proportions from household activities have been widely used to categorise

livelihood strategies (Birch-Thomsen *et al.* 2001). A household's income for a given period, however, is not only an outcome of its use of assets but may be influenced by random events such as weather conditions. Thus, a household's income in a given period reflects its short-term coping mechanism instead of a long-term livelihood strategy (Birch-Thomsen *et al.* 2001). Therefore, for this study, income proportions, average time allocation on different productive activities, and land use pattern were used to define a household's livelihood strategy. Time allocation and land use largely reflect the way in which the household puts its main assets (labour and land) to use. Income proportions show the share of total annual household income derived from own farm, salaried off-farm work (either agricultural or non-agricultural), forestry product sales, own business, and transfer payments. Household land use patterns were captured in terms of the proportion of farmland used for the production of basic grains, other annual crops, cash crops, and fallow (forest). Household time allocation was captured in terms of the proportion of time spent by its members on annual crops, livestock activities, off-farm agricultural activities (working on other peoples' farms), forestry products collection, and off-farm non-agricultural work.

The identification of clusters is empirically based rather than guided by appropriate economic theory (Hair *et al.* 1998). The reasoning is that there are some latent common features that enable the agglomeration of individual observations into a smaller number of groups, based on the similarity along particular, pre-determined dimensions of the individuals in each group. As agglomerative hierarchical cluster analysis can give rise to misclassification of observations at the boundaries between clusters (Wishart 1999), k-means cluster analysis was used instead in the study. In k-means cluster analysis, observations are initially randomly assigned to each of k clusters, and then reassigned using an iterative method to minimise within-cluster variance and maximise between-cluster variance (Wishart 1999).

4.3.1.2 Income diversity index

The Inverse Simpson diversity index (Valdivia *et al.* 1996) was used to calculate

the number of household activities and their share on the income being generated. This index measures the number of activities and evenness in the contribution to income of each activity. The Inverse Simpson diversity index for each strategy is calculated as 1/D, where

$$D = \sum_{n=1}^{s} p_n^2 \qquad\qquad (4.1)$$

with D being the diversity index, and p_n the income share derived from activity (n) in the portfolio of s economic activities.

4.3.1.3 Multinomial logit model

A multinomial logit model (MNL) was specified and estimated to explain a household's choice of livelihood strategy. Following Greene (2003), the MNL is specified as:

$$\ln(P_j/P_m) = \beta'_i X \qquad\qquad j = 1, 2, \ldots, m - 1 \qquad\qquad (4.2)$$

where ln = natural log, P_j is the probability that a given household falls into the jth cluster, X is the set of explanatory variables, and β' is the corresponding set of MNL regression coefficients to be estimated. The dependent variables in these equations are the log-odds ratios of being in cluster j versus being in cluster m (the benchmark cluster). A total of (m-1) binary logit equations are estimated simultaneously in the MNL, and the sum of the *m* predicated probabilities is restricted to 1 (Greene 2003). The probability of the ith household being in cluster j is computed as:

$$P_j = \frac{e^{\beta'_j X}}{1 + \sum_{j=1}^{m} e^{\beta'_j X}} \qquad\qquad (4.3)$$

Five clusters describing study household livelihood strategies are derived in

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section 5.2, while section 5.3 explains the choice of the benchmark cluster and presents the MNL results.

The ith household's probability of inclusion in cluster *m* is estimated by

$$P_m = \cfrac{1}{1 + \sum\limits_{j=1}^{m} e^{\beta'jX}} \qquad (4.4)$$

The effect of a unit change in any of the X explanatory variables on the probability that the ith study household will be in the m different livelihood clusters is given by the *marginal effect* statistic (Greene 2000, 2003) which is derived as:

$$\Delta P_j / \Delta X_i = P_j \left[\beta_j - \sum\limits_{k=1}^{m} P_k \beta_k\right] \qquad (4.5)$$

It is hypothesised in the MNL that the choice of a particular livelihood diversification strategy (cluster) is a function of household characteristics (Xs) and engagement in particular agricultural activities.livelihood diversification choice is alsoa function of i forestry resource extraction, non-farm activities, and the type/intensity of shock to which the household is subjected. The household characteristics can be interpreted as household physical, human (knowledge and labour), financial (income), and social (membership of organisations) capital endowments. According to Greene (2003), polychotomous models are usually associated with problems of multicollinearity. Multicollinearity among explanatory variables can lead to inaccurate parameter estimates. The variance inflation factor (VIF) of all included variables was used to test multicollinearity. VIF of all included factors were less than 10, indicating that multicollinearity was not a problem.

4.3.2 Empirical model of non-forest product collection and HIV/AIDS-induced economic shocks

The economic effects of HIV/AIDS on households were categorised as

expenditure-related effects (increased health spending), income effects (loss of income from the HIV-positive individuals and caregivers), and mitigation effects (coping strategies that a household may use) (Booysen *et al.* 2006).

Following the empirical literature on livelihood diversification in response to risks (Paxson 1992; Rosenzweig & Binswanger 1993; Morduch 1995; Kochar 1999; Pattanayak & Sills 2001; Rose 2001; Fisher 2002; Cameron & Worswick 2003), the theoretical framework underlying the empirical analysis is based on a two-period model involving household efforts into natural resource extraction. The first period is the one prior to the occurrence of a shock (such as illness or death of an economically active family member) and the second period is the one subsequent to the occurrence. The household collects NTFPs in each period.

In period 1 the household does not know the actual occurrence of Φ, but knows its mean value μ and variability of intensity ρ. The household's production and resources extraction in the first period (H_1) depend on Φ and ρ and also on other factors such as agricultural income (A), wealth index (W), remittances (R), wage income (P), demography (X) and other variables (see equation 4.6). Let $\varnothing$ be a vector of parameters describing non-timber forestry extraction.

$$H_1 = f(\mu_1, \rho, A_1, W_1, R_1, P_1, X_1, \varnothing_1) \qquad (4.6)$$

The variability of intensity (ρ) will affect H_1 in two ways; first through a 'portfolio' effect, i.e. given the wealth level, wage income and remittances the household may be assumed to adjust its resources. Second, there may be either a precautionary effect whereby the household might collect NTFPs to supplement or complemence farm harvest. Both of the above will generate positive effects of ρ on NTFPs extraction.

In period 2, the household knows the value of Φ and ρ, and responds to them directly; thus, the household's production and NTFPs extraction are conditional, depending on the decision in period 1 represented by:

$$H_2 = f((H_1)\gamma\mu_2, A_2, W_2, R_2, P_2, X_2, \varnothing_2) \qquad\qquad (4.7)$$

Where $\gamma = \Phi - \mu$

The economic shock γ is expected to affect NTFP extraction through income and substitution effects. When γ is high (low) income shortfalls are high (low) and the household will increase (reduce) NTFP extraction to smooth income.

Total extraction for the year H_t is the sum of $H_1 + H_2$

$$H_t = f[H_1 + H_2 (H_1 \gamma\mu_2, A_2, W_2, R_2, P_2, X_2, \varnothing_2) + \ \dots\dots\ H_t (H_{t-1} \gamma\mu_t, A_t, W_t, R_t, P_t, X_t, \varnothing_t)\ ] \qquad (4.8)$$

The safety-net role of NTFP was examined in two ways. First, a household might respond to the shock by increasing its own consumption of NTFPs (wild foods and medicine) due to scarcity of cash income to buy food and medicine. Secondly, a household might respond to shocks by selling NTFPs to tide over a liquidity crisis caused by the economic shock.

In order to determine if NTFPs dependence of rural households afflicted by HIV/AIDS differs significantly from that of non-afflicted households, z and chi square tests were used for continuous and categorical variables, respectively. For this section panel data were used to analyse the household's participation behaviour and intensity of NTFPs extraction. Panel data sets possess several advantages over conventional cross sectional or time series data sets. Panel data take into account heterogeneity by considering individual-specific variables, give a large number of data points, thus increasing degrees of freedom, and reducing collinearity among explanatory variables, hence improving efficiency of regression estimates (Gujarati 2003). They are also better suited to studying dynamics of change, and to detect and measure effects that cannot be observed in pure cross section or time series data (Gujarati 2003). While it is possible to use ordinary multiple regression techniques on panel data, they may not be optimal. The estimates of coefficients derived from the regression may be subject to omitted variable bias – a problem that arises when there is some unknown variable or variables that cannot be controlled for, which affect the dependent variable. The

two most important techniques used to address the problem are the fixed effects model (FEM) and random effects model (REM). A fixed-effects Tobit model of NTFPs extraction was used to examine whether households use NTFPs to cope with HIV/AIDS economic shocks. Tobit analysis was necessary because some households did not extract NTFPs. The Tobit model accounts for this truncation in the dependent variable. The fixed effects model was used in this study because of the nature of the HIV/AIDS epidemic. The impact of the HIV/AIDS economic shock tends to depend on the HIV/AIDS staging of the individual in the household, the intensity of the shock, household asset endowment and income prior to the shock.   The regression equation is

$$Q_{ijt} = \beta_0 + \alpha_{ij} + \delta_{jt} + \nu_{t} + \beta_1 X_{ijt} + \beta_2 Z_{ijt} + \beta_3 S_{ijt} + \beta_4 \acute{n}_{ijt} + \beta_5 \acute{a}_{ijt} + \varepsilon_{ijt} \qquad (4.9)$$

where Q is the quantity of NTFPs extracted, subscripts i, j and t denote household, community and time respectively, α is the household fixed effects which are time-invariant, δ is the community specific and time-variant effects, ν is year effects, X is a set of household characteristics that are time-variant, Z is the HIV/AIDS stage in the impact cycle, S is a vector of HIV/AIDS economic shock, ń is the mitigation effect of NTFPs income, á is a vector for interaction of selected time-variant household characteristics and the shock, and ε is an error term.

The variables representing HIV/AIDS economic shocks were categorised as expenditure- and income-related effects. Expenditure-related effects included all costs associated with being ill, medical expenditures (i.e. hospital bills, consultation fees, buying medicine, transportation to hospital), and funeral costs. Also included here were cases where respondents mentioned special dietary requirements and sanitation that increased household expenditures. Income-related effects included income loss through reduced labour supply – directly through the sick person, and indirectly because of others being absent or accompanying or nursing the sick. Also included is the loss of income if the sick or deceased person

was an income earner.

Other regressors included value of physical assets[5], land size owned in the floodplain, value of livestock, and annual transfer incomes as household characteristics. Asset and livestock values represented forms of wealth that can be liquidated and thus reduce NTFPs extraction in the times of crisis (Godoy *et al*. 1997; McSweeney 2004). Transfer payments reflect field observations that most households experiencing economic shocks are most likely to be helped by remittances from their family members working in neighboring countries.

In addition, interaction terms of the shock variables with these household level characteristics were added to capture the differential effects of the economic shock. To account for human capital development conditioning economic decisions, household head years of education and average years of education of other household members were incorporated, as they influenced the household's desire and ability to buffer calamities in different ways (Kijima *et al.* 2006). The household's education is expected to have a negative effect on participation in NTFPs extraction, as well as on income flow from NTFPs, because the marginal value of educated labour is likely to be higher in other activities (e.g., off-farm work). According to Walker and Homma (1996), household characteristics are likely sources of heterogeneity in responses to anticipated risks. The value of forest may differ among classes of households, if they have different risk exposures, different levels of risk aversion and different abilities to use the forest. The age of the household head and its square was used to represent stage in life cycle. To avoid collinearity with age, the number of years the household was formed was included. Measures of labour availability stratified by age and gender

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[5] Household assets included bicycles, radios, wheelbarrows, TVs, mobile phones, chairs, tables, beds, motorcycles, vehicles, tractors, and other farm equipment (hand hoes, plough sets).

were also included to quantify the economic burden on working adults, especially women (Pattanayak & Sills 2001).

Table 4.1: Description of explanatory variables in the fixed effects Tobit model

Variable	Explanation	Expected Sign
Total annual income from NTFP extraction	Total annual income from NTFPs in South African Rand	
Household education	Average education of household members in years	-
Trips to the forest	Number of trips per year	+
Distance to the forest from the household	Average distance to the forest from the household in kilometres	-
Number of livestock owned	Number of livestock owned weighted by type of animals	-
Wealth index	Household Wealth index as determined by the Principal Component Analysis	-
Sick/death	Dummy variable equalling one if a member of the household fell sick in the year	±
Tradition	Dummy variable equal to one if parents of household head and/or spouse have a history of non-timber forest product extraction	+
Household head born	Dummy variable equal to one if the household head was born in the village	+
Household formed	Number of years the household was formed	+
Resident adults	Number of adults residing in the household (above 15 years)	+
Adults abroad	Number of adult household members working / staying in other countries	-
Child	Number of children in the household	±
Farm income	Average farm income	-
Age of household head	Age of household head in years	+
Squared age of household head	Square age of household head in years	-
% of households in the community affected by HIV/AIDS	% of household in community who experienced economic shock due to HIV/AIDS in the survey period	+
Off-farm income	Average income from non-farm income including remittances for 2007–2009	-

Source: 2.7 Conceptual framework for NTFPs as coping Strategies for rural households and communities afflicted by HIV/AIDS

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A community development index[6] and a NTFP diversity index[7] were included as the community-specific and time-variant effects (Pattanayak & Sills 2001). The NTFP diversity index was also used as a proxy for forest quality and access. It is expected that better forest quality or access raises returns on NTFP collection and, therefore, induces greater accumulation of human capital (Pattanayak & Sills 2001).

4.3.3 Theoretical and empirical models for the management of non-timber forestry products extraction

4.3.3.1 Principal Component Analysis

To obtain quantitative measures for local management effectiveness, Principal Component Analysis (PCA), which seeks linear combinations of variables called principal components, was used (Lam 1998). The purpose of PCA is to translate a large set of variables that are highlighted in the theoretical framework as indicators of effectiveness of local institutional management into main choice variables. PCA was performed on the four clusters identified by Agrawal and Ostrom's design principles, with the main aim of extracting dominant variables that influence the effectiveness of local institutional management in these rural communities. Thus, PCA was performed with the primary goal of data reduction and summarisation.

4.3.3.2 Econometric model

A multiple regression approach was used to identify the main factors that determine forest degradation (Heltberg 2002). Though Tobit analysis was the most

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[6] *Development Index* is the sum of schools (at various levels), banks, shops, irrigation facility, health centres, etc. existing in the community.

[7] Number of NTFPs collected.

appropriate tool for this bounded dependent variable, none of the observed values is close to the bounds of 3 and 15, hence the use of Ordinary Least Squares (OLS) regression. Estimation was based on the following relationship:

$$Y = f(P, I, H, Z, \varepsilon) \tag{4.10}$$

where Y is the forest outcome measured by a forest degradation index that ranges from 3 (not degraded) to 15 (degraded). P is a vector of resource system characteristics, I is a vector of institutional arrangements, H is a vector of characteristics of the user group, Z is a vector of the external environment such as market regime and technology progress, as recommended by Agrawal (2001), and ε is the error term.

The forest degradation index, a composite measure, is constructed as the sum of ecological condition, forest condition relative to earlier times (10–20 years back), and forest use penetration (the depth into the forest from the village boundary where use pressure was evident) (Heltberg 2001). Data on forest degradation were obtained from village and household surveys from three different variables: vegetation analysis with the help of the resident senior ecologist for the Park, by asking households and key informants to compare the condition of the forest today with earlier times (10–20 years back), and determination of forest use penetration. Vegetation was sampled along transects of 10 000 metres radiating from the settlement in five directions. The vegetation structure, several vegetation attributes such as tree diameter at breast height (DBH), tree height, abundance, and number of cut and broken stems were recorded in each transect, along with attributes such as GPS location and distance from the settlement. At each site, the percentage of cut and broken stems of the total stems was computed for regions near to (0–4 999 m) and more distant from (5 000–10 000 m) the human settlements. Sites with a greater percentage of cut and broken stems were assumed to bear higher forest damage than those with less damage, which was mainly attributable to the destructive means of harvest of NTFPs and to indirect pressures on the forest such as increased competition between people and wildlife.

As a measure of the effect of human disturbance, the frequency distribution of size and class of stems of NTFP species were computed. Across the four communal sites, the percentage of respondents that adopted ecologically friendly (non-destructive) methods for harvesting fruits and herb collection were determined (Shaanker *et al*. 2004). Based on vegetation analysis data, the ecological condition of the sites was described using a five-point interval scale (1 representing pristine and 5 high degradation). Forest condition relative to earlier times and forest use penetration were also coded on the same scale so that higher values show higher levels of forest degradation. The model adopted key explanatory variables whose importance has been highlighted in the conceptual framework in section 3.6. Table 4.2 provides a summary of the key variables included in the regression model and their expected signs.

Table 4.2: Description of Variables, forest degradation model, south-eastern Zimbabwe

Variable		Explanation	Expected Sign
Dependent Y	Forest degradation Index	Sum of ecological condition, forest condition relative to earlier times, and use penetration	
Characteristics of resource system P	Resource scarcity	Population size/ per unit area (forest + commons area)	+
Characteristics of user group H	Household education	Average education of household members (years)	-
	Household head age	Age of household head in years	+
	Ecological knowledge	Ecological Knowledge score[8]	-
	Wealth index	Household Wealth index as determined by the PCA (excluding livestock)	-
	Distance to the forest from the household	Average distance to the forest from the household in kilometres	-
	Number of livestock owned	Number of livestock owned	±
	Tradition	Dummy variable equal to one if parents of household head and/or spouse have a history of NTFPs extraction, 0 otherwise	+
	Household formed	Number of years ago the household was formed	±
	Livestock income	Average livestock income in US$	±
	Off-farm income	Average annual income from non-farm income including remittances	-
Resource regime and institutional arrangements I	Local institution effectiveness	Dummy variable equal to one if management is active (extracted from PCA), 0 otherwise	-
External environment Z	Infrastructure development	Measured by a development index[9]	-
	Market integration	Dummy variable equal to one if there is an organised market for NTFPs, 0 otherwise	+

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[8] $KS = \sum_{i=1}^{n} A_i$ where *KS* is the knowledge score in (%); A_i (0;1). If the answer to a statement *i* is correct/wrong, one/zero points are attributed (*Ai*).

[9] *Development Index* is the sum of schools (at various levels), banks, shops, irrigation facility, health centres, etc. existing in the village.

4.4 Summary

This chapter provided an overview of the methods used to collect primary data and the analytical techniques used to analyse the data. Empirical models of rural livelihood diversity to manage economic shocks were developed to determine the importance of household asset endowments and other factors in livelihood diversity. In addition, an empirical model of NTFPs and HIV/AIDS-induced economic shocks was developed to use panel data to capture the inter-temporal economic impacts of HIV/AIDS on household livelihoods. The final section presented the empirical specification and estimation procedure for analysis of the ecological cost of NTFPs extraction.

CHAPTER 5

LIVELIHOODS DIVERSIFICATION PATTERNS[10]

In this chapter, the key household characteristics and livelihood diversification patterns are presented. A summary of the main determinants of livelihood strategies choice is also presented.

5.1 Salient household characteristics for the five sites

Table 5.1 summarises descriptive statistics for the socio-economic characteristics of the sampled households for the five study sites. Gonakudzingwa households tend to have older household heads (56 years), larger household (15) and farm sizes (1543.16 acres), are primarily engaged in commercial livestock production, and have the lowest proportion of female-headed households. Gonakudzingwa households had the highest proportion of households that invested in agricultural assets as well as household assets, such as bicycles, televisions, radios, and cell phones.The Malipati Communal area differed significantly ($p \leq 0.05$) from the other three communal sites – it had the highest proportion of households that derived most of their income from NTFPs. This community owned a bird sanctuary and safari operation, and had a well-organised local market for NTFPs.

Sengwe Communal area households differed significantly from their counterparts in terms of income sources and type of households. Of these households, 48% derived most of their income from remittances and about 53% of the total were female-headed households. Due to its location furthest from the provincial town, temporary and permanent migration activities are part of the livelihoods strategies used in Sengwe. This area is also the least serviced with public infrastructure, and

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[10] Another versionof this chapter is published as: **Mutenje MJ, Ortmann GF, Ferrer SRD & Darroch MAG (2010)**. Rural livelihood diversity to manage economic shocks: Evidence from south-east Zimbabwe. *Agrekon* 49(3): 340-359.

so tends to have the least educated household heads.

Table 5.1: Salient characteristics of sample households in the five communities, Chiredzi district, south-eastern Zimbabwe, 2008

Characteristic	Gonakudzingwa n = 40	Malipate n= 40	Sengwe n = 40	Pahlela n = 40	Chikombedzi n = 40
Average age of household head	56 (12.6)	43 (11.3)	45 (11.9)	44 (12.2)	49 (12.1)
Household size	15	9 (4.6)	6	7 (3.8)	8 (5.0)
% female-headed households *de facto*	10	21	16	20.7	33.3
% female-headed households *de jure*	0	12.5	37.3	11.8	9.7
% child headed households	0	5.6	6.8	5.3	11.8
Cattle owned (mean)	57 (40.8)	3 (4.6)	8.7 (11.9)	6.2 (7.3)	6 (7.1)
Mean size of farm (acres)	1543.16 (718.87)	8.7 (4.9)	5.8 (4.5)	5.2 (3.9)	3.23 (6.98)
Mean livestock income per year (Rand)	17552.63 (23923.78)	846.53 (1933.49)	2106 (5487.61)	802.67 (1005.33)	1575.49 (4117.50)
Mean remittance per month (Rand)	842.10 (1489.25)	487.04 (667.74)	540.80 (594.82)	449.81 (754.31)	828.63 (2104.09)
Mean NTFPs income per year (Rands)	5763.16 (2820.40)	1948.90 (2598.08)	767.80 (1033.54)	143.06 (312.45)	1086.37 (1479.46)
% households off-farm main income source	5.2	16	0	21	15.7
% households remittances main income source	5.3	26	48	43.2	29.4
% households agriculture main income source	89.5	24	28	33.6	31.4
% households NTFPs main income source	0	34	24	2.2	23.5
% household with at least 3 agricultural assets	100	24	12	10	33.3
% households with at least 3 household assets	100	46	50	41.1	45.2
% households who had livestock loss (due to theft or wildlife) 3 years prior to survey	65	53	45	19.6	13
% households who experienced death/chronic illness of bread winner 3 years prior to survey	15	27	19	21	35
Distance to health centre (km)	30	5	20	13	2
Distance to market (km)	30	5	80	35	2
Distance to nearest town (km)	90	75	140	95	60

Note: Figures in parentheses are standard deviations. Source: survey date 2008

Pahlela had almost similar characteristics with Sengwe Communal. Of the

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households, 43.2% derived most of their income from transfers from non-resident members working either in Mozambique or South Africa. In this community, very few households (2.2%) depended on NTFPs income. Off-farm income, in particular beer brewing and brick making, were the main sources of livelihood for 21% of the households in the community.

Chikombedzi Communal area is closest to the provincial town and is the district satellite growth point, and had a significantly higher proportion of child- and female-headed households. This area also had significantly smaller farm sizes and a significantly higher proportion of the households derived their income from off-farm activities such as formal employment in government.

5.2 Dominant livelihoods diversification patterns

Five clusters or dominant livelihood diversification patterns were identified in the Chiredzi district households (Table 5.2). The first strategy (Cluster 1) represents 'subsistence smallholders/unskilled workers' and contains 13.5% of the sample households. Low cropping potential regions such as the Chiredzi district have a relatively weak demand for agricultural wage labourers, so relatively poorer people cannot depend only on the farming sector for their livelihoods. For these *least diversified* of the sample households, 79% of the total income on average is derived from income transfers. These spend much of their time (56% per year) working on farms in neighbouring countries as casual labourers. By contrast, only 4% of the total income on average is from farming. These patterns are consistent with results found in other studies of income diversification by subsistence households in rural Africa (Reardon 1997; Barrett *et al*. 2005).

The households in Cluster 2, 'subsistence smallholders/non-timber forestry product (NTFPs) harvesters', make up 21.5% of the total sample. They derive about 66% of their total gross annual income from craft selling, and had slightly larger landholdings, but cultivated less area under maize compared to Cluster 1 households. They also invest much less time in unskilled off-farm agricultural activities than did Cluster 1 households. A higher than average proportion of

Cluster 2 households participate in agricultural, women's, and church organisations, and in non-governmental organisation projects.

Table 5.2: Clusters of livelihood diversification patterns for survey households, Chiredzi district, south-eastern Zimbabwe, 2008

Cluster characteristics	Cluster				
	1	**2**	**3**	**4**	**5**
Number of households	26 (13 %)	43 (21.5%)	35 (17.5%)	73 (36.5%)	23 (11.5%)
Physical capital					
Average area of land owned (acres)	6.45 (4.59)	9.16 (5.04)	9.39 (8.94)	33.57 (21.66)	1398.43 (868.91)
Average area cultivated (acres)	3.63 (2.14)	4.44 (2.03)	5.58 (5.54)	17.22 (7.84)	34.96 (18.61)
Average area under maize (acres)	2.71 (1.89)	1.67 (0.52)	1.90 (1.73)	6.98 (3.24)	13.49 (9.02)
Average area under sorghum (acres)	0.92 (0.92)	2.40 (0.63)	3.15 (3.54)	10.34 (4.58)	21.47 (15.41)
Human capital					
Household size	7 (3.91)	8 (3.1)	8 (4.5)	9 (4.8)	13 (7.6)
% of time allocated per year to: Crop production Livestock production NTFPs extraction Unskilled farm work Skilled non-farm work	20% 4% 11% 56% 0.002%	23% 9% 35.4% 27% 0.05%	33.7% 13% 32.8% 15% 3%	41.6% 15% 21% 3% 17.9%	26.3 57.9% 6% 0.001% 7%
Financial capital					
% farm income	4%	13.5%	44%	44%	67.4%
% NTFPs income	17%	66.1%	34%	25%	21.6%
% income from transfers – remittances	79%	20.4	22%	31%	11%
Social capital					
% households in: Agricultural organisation Women's organisation Church organisation Non-governmental organisation (NGO)/project	6% 3% 15% 11%	67% 79% 59% 63%	53% 21% 27% 44%	44% 29% 51% 33%	100% 30% 68% 9%
Inverse Simpson diversity index	1.53	2.01	2.80	2.84	1.95

Source: Field survey data analysis, 2008

Cluster 3 households, '**crop production and NTFPs integrators**', have a relatively greater reliance on crop production and NTFPs as their main sources of income. These households (17.5% of the total sample) allocate relatively more of

their labour (66.5% on average) to crop production and NTFPs extraction. They tend to supplement their farm income with NTFPs sales and are thus relatively more diversified in their income sources than are Cluster 1 and 2 households. Over half of these households participate in agricultural organisations.

Cluster 4, '**commercial smallholders with regular off-farm employment**', is the largest of the five livelihood strategies, representing 36.5% of the total sample of households. These households allocate the highest proportion of labour to agricultural production and skilled off-farm employment earning higher returns. They are distinguished from Cluster 1, 2 and 3 households by larger landholdings and crop areas cultivated, access to off-farm skilled employment, and less time allocated to unskilled agricultural work. They are thus the most diversified households in terms of income sources (highest Inverse Simpson diversity index).

Cluster 5 is best described as '**specialised commercial livestock producers**', and is the smallest cluster with only 11.5% of the sample households. They allocate over half of their land and labour to livestock production, mainly of improved exotic beef cattle. These households supplement their on-farm income with high return off-farm businesses and skilled off-farm employment; all participate in agricultural organisations, and a higher than average proportion participates in church organisations.

5.3 MNL model of the determinants of livelihoods diversification patterns

Cluster 4, commercial smallholders with regular off-farm employment, was selected as the benchmark cluster m for the MNL because it was the most diversified cluster and contained the highest proportion of surveyed households. Table 5.3 shows the estimated coefficients and marginal effects for the MNL. The Chi-square test results indicate that likelihood ratio statistics are highly statistically significant (p<0.0001) suggesting that the MNL has strong explanatory power. The set of explanatory variables differs across the cluster contrasts and in terms of marginal effects.

For the Cluster 1 contrast, the parameter estimates for dependency ratio and remittances were positive and statistically significant. This suggests that the odds of being subsistence smallholders/unskilled workers relative to Cluster 4 rise for those households with higher dependency ratios, and that depends solely on transfers as their main source of income. The negative marginal effects of household head education level, value of assets, number of cattle, livestock income, and HIV/AIDS economic shock show that unit increases in these variables reduce the probability of being in Cluster 1 relative to Cluster 4.

Table 5.3: MNL coefficient and marginal effect estimates by household livelihood strategy choice (cluster contrast), Chiredzi district, south-eastern Zimbabwe, 2008

Variables	Cluster contrast							
	Cluster 1 (P_1/P_4)		Cluster 2 (P_2/P_4)		Cluster 3 (P_3/P_4)		Cluster 5 (P_5/P_4)	
	Coefficients	Marginal effects	Coefficients	Marginal effects	Coefficients	Marginal effects	Coefficients	Marginal effects
Household head education (years)	-1.009**	-0.287	-1.114**	-0.363	-0.504*	-0.023	0.274 NS	0.094
Dependency ratio	0.193*	0.202	0.386 NS	0.093	0.091 NS	0.006	0.103 NS	0.010
Household head marital status	0.132 NS	0.098	-0.154**	-0.050	0.0190 NS	0.011	0.091 NS	0.072
Asset values (Rand)	-0.365***	-0.218	-0.769**	-0.092	-0.035**	-0.027	0.657**	0.159
Number of cattle owned	-0.468**	-0.315	-1.354**	-0.336	-0.524*	-0.013	1.986***	0.131
Livestock income (Rand)	-1.747**	-0.462	-1.069***	-0.219	0.073 NS	0.004	1.247**	0.356
Remittances (Rand)	2.441***	0.618	-0.307 NS	-0.009	0.423 NS	0.080	-0.058 NS	-0.016
NTFPs income (Rand)	0.144 NS	0.007	1.832***	0.178	0.214**	0.126	0.124 NS	0.005
HIV/AIDS shock	-1.106***	-0.519	0.375**	0.010	-0.508	-0.015	-0.067	-0.025
Livestock loss	-0.116	-0.053	-0.229	-0.033	0.281**	0.083	0.743**	0.293

Note: *, ** and *** denote statistical significance at the 10, 5, and 1% levels, respectively; NS = not statistically significant.
Log likelihood = 183.189
Overall % households correctly predicted = 79.8%
N = 200 households. Source: Field survey data analysis, 2008

Study households with more educated household heads, higher asset values, larger cattle herds, and livestock incomes, and who had also experienced HIV/AIDS economic shocks thus had more diversified livelihood strategies. These results are consistent with past studies that showed the important role of education, physical assets, and exposure shocks as determinants of livelihood choice, diversification and household welfare (Ellis 1998; Barrett *et al.* 2005).

Higher levels of NTFPs income and exposure to an HIV/AIDS shock increase the probability of being in Cluster 2 (subsistence smallholders/non-timber forestry product (NTFPs) harvesters), relative to Cluster 4. The negative marginal effect for marital status implies that the probability of female-headed households being in Cluster 2 is higher relative to the reference category. Additionally, households with more educated household heads, higher asset values, and again more cattle and higher livestock incomes are less likely to adopt this livelihood strategy. These results support theoretical arguments that education, as well as physical and livestock assets can be essential resources for generating livelihoods of rural households to better cope with economic shocks (Reardon *et al.* 2000; Adato and Meinzen-Dick 2002).

For the Cluster 3 contrast, NTFPs income and the shock of livestock loss increase, while education of the household head, value of physical assets, and number of cattle decrease the probability of sample households being crop production and NTFPs integrators, relative to the probability of being in Cluster 4, *ceteris paribus*. Finally, exposure to livestock loss, higher physical asset values, larger cattle herds, and larger livestock incomes increase the probability of sample households being specialised commercial livestock producers (in Cluster 5), rather than commercial smallholders with regular off-farm employment.

Overall, the results provide some support for the asset-based approach to analysing choice of livelihoods, as different degrees of livelihood diversification were associated with different levels of education of the household head, physical asset values, cattle numbers, NTFPs and livestock incomes, and exposure to

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economic shocks. There is also some evidence that sample households that were statistically significantly affected by an HIV/AIDS shock were more likely to harvest NTFPs. Further research is required to deconstruct the dynamics of this cause-and-effect relationship.

5.4 Summary

Study results showed that the representative sample of 200 households in the Chiredzi district of south-eastern Zimbabwe each used one of five distinct livelihood diversity strategies in 2008:

1. Subsistence smallholders/unskilled workers;
2. Subsistence smallholders/non-timber forestry products (NTFPs) harvesters;
3. Crop production and NTFPs extraction integrators;
4. Commercial smallholders with regular off-farm employment; and
5. Specialised commercial livestock producers.

The main determinants of these choices of livelihood strategies were differences in asset endowments – especially education, land, and livestock – and the impacts of economic shocks. There is also some evidence that these asset constraints compel diversification into lower-return activities such as NTFPs extraction. About 40% of the sample households (particularly strategy 2 and 3) derive over 30% of income from these common resources. The results also suggest that sample households that were statistically significantly affected by an HIV/AIDS shock were more likely to harvest NTFPs. This supports past research that identified distress-push diversification as a coping strategy in rural communities (Reardon *et al.* 2000; Barrett *et al.* 2005).

CHAPTER 6
COPING STRATEGIES IN HIV/AIDS-AFFECTED COMMUNITIES OF SOUTH-EASTERN ZIMBABWE[11]

This chapter provides empirical results and a discussion of the use of NTFPs as response strategies for HIV/AIDS economic shocks. Results of the fixed-effects Tobit model are also presented.

6.1 Socio-economic summary of sampled households

Table 6.1, which presents selected household characteristics by HIV/AIDS dynamics, shows that HIV/AIDS-afflicted households tended to be relatively young and had more non-resident adults compared to the non-afflicted households. The average time of household formation was 17.04 years for the HIV/AIDS-afflicted households compared to 32.5 years for the non-afflicted households. These results are consistent with past research indicating that HIV prevalence is higher among people in the younger, more productive age groups in Zimbabwe (UNAIDS 2005). There were significantly more women-headed households among the HIV-afflicted cases compared to the non-afflicted. Most non-afflicted household heads were farmers (87%). Among the afflicted households only 15% were farmers, 11% civil servants, 29% cross-border traders, and 45% were unskilled workers. According to community focus group discussions, 40% of the chronically ill returned to their rural households from South Africa. There were no significant differences in socioeconomic characteristics such as household head education level and household size (Table 6.1). The similarities of education and household size may imply that the pair of

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[11] This chapter is based on this article: **Mutenje MJ, Ortmann GF & Ferrer SRD (2010).** Coping strategies in HIV/AIDS affected communities of south-eastern Zimbabwe. Submitted for review to the *African Journal of AIDS Research*.

households originated from a similar socioeconomic background and, therefore, the control group (non-afflicted) is a good proxy. The number of cattle owned and annual livestock income was significantly lower among HIV/AIDS-afflicted households (4.3 and US$208 versus 14.7 and US$1730, respectively). HIV/AIDS-afflicted households derived a higher average income from transfers and NTFPs extraction compared to the non-afflicted.

Table 6.1: Socio-economic characteristics of sampled households of Sengwe Communal, south-eastern Zimbabwe, 2008

Variable	HIV/AIDS-afflicted	Non-HIV/AIDS-afflicted	P value	Overall
Sample size	100	100		200
Household size	8.67 (4.38)	9.02 (3.61)	0.70	8.85 (4.00)
Household head number of years in school	6.13 (4.21)	5.58 (3.54)	0.16	5.86 (3.88)
Household head occupation: %Farmer %Civil servants %Cross border traders %Unskilled workers[12]	15 11 29 45	87 3 2 8	$0.001_{(x)}$	54 7 11.5 26.5
% Women-headed households	37	9	$0.003_{(x)}$	23
Resident adults	1.8 (1.93)	3.18 (2.89)	0.061	2.49 (2.41)
Non-resident adults	2.31 (1.77)	1.29 (1.41)	0.0037	1.8 (1.6)
Length of household formation (years)	17.04 (13.97)	32.50 (20.34)	0.0001	24.77 (34.31)
Value of assets (US$)	741 (1871)	2 209 (3 612)	0.002	1 475 (2 742)
Cattle owned (mean)	4.3 (8.52)	14.7 (11.9)	0.0001	9.5 (10.21)
Mean livestock income per year (US$)	208 (446)	1 730 (1 783)	0.006	969
Mean remittance per month (US$)	65 (85)	45 (60)	0.074	55 (72.5)
Mean NTFPs income per year (US$)	281 (415)	156 (279)	0.087	218.5 (347)
Average land cultivated per year (ha)	1.29 (1.86)	3.2 (2.35)	0.003	2.25 (2.11)

Note: Values in parentheses are standard deviations.
Source : field survey data 2008

The two groups differed significantly in terms of asset value and average land

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[12] Unskilled workers – mainly working on farms, mines, plantations, and construction in Mozambique and South Africa

cultivated per year, both of which were significantly lower among the afflicted households. These results are consistent with other studies from southern Africa that show significant reduction in asset value and agricultural production in HIV/AIDS-affected households (Booysen *et al*. 2006; Mutangadura *et al*. 1999).

6.2 Coping strategies used in response to worst shocks experienced by households

Four forms of economic shocks were ranked as the most devastating calamities that had driven most households to self-insure in all four communities. These are illness, death of a breadwinner, crop destruction by wild animals, and cattle theft (Table 6.2).

Table 6.2 also provides an overview of the common strategies used to respond to these calamities by different households. The HIV/AIDS-afflicted households relied mainly on small stock, NTFPs and ilala wine sales, and family help when faced with chronic illness. The non-afflicted households relied mainly on cattle and ilala wine sales.According to focus group discussion, Ilala wine sale was a common strategy in both cases because of its lucrative market both locally and in Mozambique. Livestock sales, in particular small stock, and cash loans from relatives were the primary financial resort in times of financial crisis. NTFPs sales were used indirectly to self-insure; almost 43% of the HIV/AIDS-afflicted households sold NTFPs to repay financial debts. These findings on the forest safety-net role are consistent with previous studies, which show that desperate households increasingly depend on forest resources (Booysen 2003; McSweeney 2004). Family help was the common strategy in the event of death in both cases. Close relatives, friends, and neighbours contributed cash in kind or labour. NTFPs, ilala wine, and small stock sales were the common coping strategies to deal with crop destruction in afflicted households. Conversely, non-afflicted households used casual labour and sales of cattle and small stock as their main responses. Risk sharing was also a popular coping strategy in response to cattle theft in both cases. Relatives and close friends would lend a few herds to households that had lost their cattle to thieves, particularly during planting

periods. These results provide evidence to support the literature on the importance of social networks as *ex post* risk-coping mechanism (McSweeney 2004; Kijima *et al*. 2006; De Weerdt & Dercon 2006).

Table 6.2: Overview of shocks experienced and coping strategies adopted in Sengwe Communal over the past five years (2005–2009)

Responses	Worst shocks experienced by sampled households in the past five years (percent of households)							
	Illness		Death		Crop Destruction		Livestock Theft	
	Afflicted n = 100	Control n = 100	Afflicted n = 100	Control n = 100	Afflicted n = 100	Control n = 100	Afflicted n = 100	Control n = 100
Sale of Assets								
Small stock[13]	53	9	13	2	34	28	5	15
Cattle	15	47	41	10	25	30	0	0
Rent out land	12	2	2	0	13	0	8	3
Durable assets	9	1	18	5	4	3	2	1
Earn Extra Income								
Casual labour	9	11	5	3	10	46	12	34
NTFPs	43	19	2	1	52	17	26	7
Ilala wine	31	21	3	2	47	14	3	1
Risk Sharing								
Family help	21	19	79	67	5	15	35	41
Private loan	0	5	6	2	3	1	0	0
Community organisations	13	9	22	8	5	2	0	0
Others								
Taking children from school	10	2	0	0	0	0	0	0
Non-governmental organisations	1	1	10	3	0	0	0	0

Source : field survey data analysis 2008

6.3 Motives for NTFPs extraction

During the survey, households were asked about their motivation for extracting

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[13] Small stock includes goats, sheep and poultry.

NTFPs over the past three years (Table 6.3). The main motive for the HIV/AIDS-afflicted households was to smooth consumption (cited by 56% of the sample households). Focus group discussions in all the communities further reinforced the consumption-smoothening role of forest resources. Increased food and nutrition requirements, as well as special diets and herbs, were cited as the main reasons that led these households to fall back on the forest.

Table 6.3: Motives for NTFPs extraction

Motive	HIV/AIDS-afflicted (%)	Non-Afflicted (%)
Smooth consumption		
Food expenses	56	21.2
Clothing	1.4	15.1
Self-finance		
Children's education	17.5	6.7
Capital to start up cross-border trading	2.7	18.9
Invest in agriculture	8.5	23.3
Acquire tools	2.1	4.2
Self-insure		
Pay for medical expenses	27.3	5.2
Funeral expenses	12.2	2.2
To repay cash loans	37.3	1.4

Source: Field survey data analysis 2008

By contrast, the non-afflicted households cited agricultural investment as their main motive for NTFPs extraction (23.3%). HIV/AIDS-afflicted households also used NTFPs extraction as an indirect way to self-insure. A total of 37% of these households extracted NTFPs to repay cash loans, and 27.3% to pay for medical expenses. In comparison, the non-afflicted households used NTFPs extraction to self-finance various activities (Table 6.3).

6.4 Determinants of NTFPs extraction in households and communities afflicted by HIV/AIDS.

The Tobit fixed-effects estimation results of the function of NTFPs extraction in households and communities afflicted by HIV/AIDS are shown in Table 6.4 above. There is a positive and significant relationship between household size and quantity of NTFPs extracted ($p<0.001$). This suggests that the response to idiosyncratic health shocks could differ with household size and composition. The estimated coefficients of the household head and other members' education level were negative and significant ($p<0.001$ and $p<0.05$, respectively). This

implies that the ability of households to substantially offset the effect of the shock differ greatly with the level of human capital development. The educated households may have access to better means of mitigating HIV/AIDS economic effects (Kijima *et al.* 2006). This reflects that education is an important factor in coping with health shocks. The Tobit model indicated that remittances had a significant negative correlation with NTFPs extraction ($p<0.1$), but did not substantially offset the economic effects of HIV/AIDS. This is probably because most of adult non-residents work in low-return unskilled jobs.

Table 6.4: Determinants of NTFPs extraction in HIV/AIDS-afflicted households, panel data, 2008 and 2009

Independent Variables	Coefficients	t-value
Household size	2.55	4.361***
Household head age	-3.68	-3.38***
Household head education (years)	-0.15	-3.59***
Resident adults (number)	1.37	1.79*
Average education of other household members	-0.11	-2.46**
Remittances ($/month)	-0.42	-1.73*
Land size (acres)	-0.04	-0.9
Livestock value (US $)	-0.74	-2.61**
Household Assets	-0.15	-1.08
HIV/AIDS stage		
Stage 1	0.09	1.15
Stage 2	0.34	1.84*
Stage 3	0.25	2.76**
Stage 4	0.37	4.021***
HIV/AIDS economic shock	0.39	2.89**
Shock X NTFPs income	-0.48	-3.157***
Shock X livestock value	-0.91	-2.967***
Shock X asset value	-0.13	1.47
Shock X land size	0.061	0.076
Community Development index	1.356	0.506
NTFP Diversity index	1.083	0.662
Constant	45.6	1.68*
Number of observation (n)	400	
LR chi^2	387.4	(0.001)
Pseudo R^2	0.46	

***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Source: Field survey data anaysis 2008 and 2009.

The estimated coefficient of livestock value was negative and significant, suggesting that the response to HIV/AIDS shocks could differ between those with livestock and those without. The interaction effect between livestock value and

HIV/AIDS economic shock was negative and significant (p<0.001). The mean livestock value offsets 91% of the shock. The results are consistent with other studies from eastern and southern Africa, which show that livestock is the most liquid asset for most rural households to mitigate shocks (Dercon 1998; Barnett & Grellier 2003; FAO 2003).

It was found that HIV/AIDS staging had positive and significant correlations with NTFPs extraction. Households that had experienced HIV/AIDS chronic illness prior to the survey (t-1) (Stage 2) increased NTFPs extraction by 34%. Households that had experienced death and having a chronically ill member (Stage 3) increased NTFPs extraction by 25%. Households sheltering orphans or orphan-headed households (Stage 4) increased NTFPs extraction by 37%. This study confirms the natural insurance of forest products in buffering HIV/AIDS economic shocks (Loibooki *et al*. 2002; Barany *et al*. 2001). Households responded to the crisis by increasing NTFPs extraction both as consumption- and income-smoothing strategies. The resource-constrained condition due to a dilapidating health system and pervasive economic crisis in Zimbabwe compelled increased reliance on NTFPs even in labour-constrained households (such as in Stage 3). Focus groups in all the communities revealed increased subsistence collection of wild foods (honey, fish, nuts and marula fruits) and use of medicinal plants as a primary response to HIV/AIDS illnesses. These results concur with findings in Mozambique and Malawi that showed increased importance of woodlands coping strategies in HIV/AIDS-affected communities (Barany *et al.* 2005). These findings reveal the need for capacity building within the health care and education systems to achieve a win–win situation in communities with a high HIV prevalence. The interaction effect between NTFPs income and the shock was negative and significant (p<0.001). NTFPs income offsets about 48% of the shock. The importance of NTFPs' safety-net role lies more in its timing than in its magnitude as a share of total household contribution (FAO 1995; Townson 1995). In summary, NTFPs extraction appeared to be a vital *ex-post* coping mechanism for the HIV/AIDS-afflicted households. The main motives of the NTFPs extraction were to smooth consumption and to self-insure. The main effect of

HIV/AIDS on NTFPs dependence was in part a function of household size, education level of the household head and other household members, transfer payments, HIV/AIDS staging, household wealth, and the intensity of the HIV/AIDS economic shock.

6.5 Summary

This chapter examined the importance of NTFPs extraction as an *ex-post* coping strategy among rural households and communities afflicted by HIV/AIDS in Sengwe communal lands, south-eastern Zimbabwe. Findings from a comparative analysis of HIV/AIDS-afflicted and non-afflicted households revealed that HIV/AIDS-afflicted households were relatively young, with relatively few physical and livestock assets. A higher proportion of household heads in afflicted households were cross-border traders (29%) and unskilled workers (45%) in neighbouring countries. These households relied more on small stock, NTFPs, and family help to cope with health shocks. Conversely, the non-afflicted households were relatively old, mainly composed of farmers (87%) and well established, with significantly more physical and livestock assets. The non-afflicted households relied mainly on their livestock to cope with economic shocks. HIV/AIDS-afflicted households used NTFPs extraction as an indirect way to self-ensure, whereas the non-afflicted employed it to self-finance. These results suggest that the afflicted households relied more on NTFPs as an idiosyncratic health shock coping mechanism compared to the non-afflicted households. This is probably because HIV/AIDS prevalence is high among young adults in the early stages of their life cycle with limited economic portfolios to depend on during crises.

A fixed-effect Tobit model showed that NTFPs extraction was an important *ex-post* coping strategy for HIV/AIDS-afflicted households. The findings revealed a positive significant relationship between HIV staging and quantity of NTFPs extracted. These results suggest that households responded to the HIV/AIDS economic crisis by increasing NTFPs extraction as consumption- and income-smoothing strategies. The results also indicated that relatively young, poorly educated households with low household coping capacity in terms of livestock value relied more on the natural insurance of forests in buffering HIV/AIDS

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economic shocks. Thus, NTFPs extraction is an important self-insurance resource for young, poor households with limited options for coping with the idiosyncratic HIV/AIDS economic shock. Sustainable forest management is, therefore, of great value for semi-arid tropical areas, such as Sengwe Communal, hard hit by the HIV/AIDS epidemic. These results have important policy implications for development planners, conservationists, and non-governmental organisations working in the region. HIV/AIDS advocate groups and various non-governmental organisations have been pursuing HIV/AIDS campaign awareness and education in other parts of the country, particularly in urban areas. They should also target remote areas of the country such as Sengwe communal. In view of the findings of this study, that young households tend to rely more on the forest as a coping strategy, the government and other organisations should focus more on improving capabilities and access to key resources required by these households to venture into high return investments. Investment and promotion of appropriate agricultural projects and technologies, skills training, strategic income generating activities and health services are some of the approaches that can significantly reduce reliance on forest resources in HIV/AIDS affected communities.

CHAPTER 7

MANAGEMENT OF NON-TIMBER FORESTRY PRODUCTS: LOCAL INSTITUTIONS, ECOLOGICAL KNOWLEDGE AND MARKET STRUCTURE IN SOUTH-EASTERN ZIMBABWE[14]

This chapter presents and discusses empirical results on the use and management of NTFPs. It provides an overview of the common NTFPs extracted in the five communities and discusses the most important attributes determining the effectiveness of local institutions in the management of CPRs. Factors that determine forest degradation are also presented.

7.1 Types and extent of NTFPs use

The types of NTFPs collected and the average quantity extracted per year per household are summarised in Table 7.1. Sampled households participated in NTFPs extraction for food, fodder, crafts, or medicine/herbs. Collection of nuts and juice were higher in Malipati and Sengwe than in other communities. Collection of *Sphenostylis marginata* tubers for fodder was only common in Chikombedzi owing to the limited grazing area. Focus group discussion results revealed that this extraction component was highest in drought years and prolonged droughts in recent years had led to the scarcity of this NTFP resource. The major NTFP activities (Table 7.1) in these communities are harvesting of *Hyphaene benguellensis* (ilala) and *Sclerocarya birrea* (marula), hunting, fishing, and mopane worm gathering. *Hyphaene benguellensis* has multiple uses, which include weaving mats, baskets, hats and brooms, and fruits and wine. This has led to increases in social conflicts among households, prompting local traditional

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[14] This chapter is based on the following article: **Mutenje MJ, Ortmann GF & Ferrer SRD (2011).** Management of non-timber forestry products extraction: Local institutions, ecological knowledge and market structure in south-eastern Zimbabwe. *Ecological Economics* 70(3): 454-466.

leaders in the Malipati and Sengwe communal areas to allocate the *Hyphaene benguellensis* plots privately among households. Wildlife hunting was highest amongst communities closest to National Parks, such as Gonakudzingwa and Malipati. Gonakudzingwa community has its own hunting safaris whereas Malipati community hires private hunters to operate in areas leased to them by the park. In both communities, the meat and income are distributed proportionally among all the households.

Table 7.1: Common NTFPs collected, parts used and quantity (average kg per season) extracted in all the communities, south-eastern Zimbabwe

NTFP resource	Scientific Name	Part(s) used	Gonakudzingwa	Malipati	Pahlela	Chikombedzi	Sengwe
Nuts/Juice	*Sclerocarya birrea*	fruits, seed	504	645	130	250	864
	Strychnos madagascariensis	fruits	315	53	120	379	0
	Hyphaene benguellensis	fruits, stem	0	321	0	0	435
	Diospyros mespiliformis	fruits	20	96	0	52	70
	Berchemia discolor/ zeyheri	fruits	512	0	409	225	0
	Syzygium cordatum/guineense	fruits	20	72	0	25	64
	Ximenia caffra	fruits	10	15	30	21	22
	Grewia flavescens	fruits, bark	25	310	362	254	387
	Flueggea virosa	fruits	10	0	88	125	0
Services, fodder	*Sphenostylis marginata*	tuber	0	0	0	1320	0
	Kigelia africana	fruits, leaves branches,	0	675	0	0	0
	Combretum mopane	leaves	240	0	0	320	0
Honey		honey, wax	540	230	322	120	324
Wildlife meat	elephants, kudu, scrub hare, wild pig, buffalo, common duiker	meat	1200	975	55	20	673
Fish		fish	150	234	342	120	721
Crafts	*Hyphaene benguellensis*	leaves	530	638	48	215	356
	thatching grass		840	410	367	117	485
Mopane worms		mopane worm	525	105	22	370	0

Source: survey data 2008 and 2009

In contrast, Sengwe community survives on traditional hunting of stray wildlife

from the Kruger National Park and adult men of the community are part of the hunting team. Meat is shared according to household size in the community. Fishing ceremonies are common in this area. NTFPs are commonly marketed locally but to maintain seed viability, traditional leaders do not allow people to sell fruits.

7.2 Dimensions of local institutional management

The PCA indicated the most important attributes determining the effectiveness of local institutions in the management of CPRs.

Table 7.2: Dimensions of local institutional management, south-eastern Zimbabwe

Variables	Principal components (Eigen values)		
	1 (2.586)	2 (2.341)	3 (1.342)
Clearly defined boundaries	0.301	0.551	0.491
Suitable rules for contributing private benefits	0.654	0.589	0.421
Member contribution to decision making	0.473	0.413	0.076
Monitoring and enforcement of rules	0.855	-0.645	-0.464
Proportional sanction	0.557	-0.651	-0.322
Local court for resolving conflicts	0.200	-0.051	-0.901
Contribution to household consumption and welfare in crisis times	0.318	0.449	0.761
Proportion of household income from CPRs	-0. 098	0.554	0.719
Social homogeneity[15]	0.712	0. 069	-0.621
Strong beliefs in ancestral spirits	0.773	0.216	-0.602
Percent of Variance Explained	29.7	24.1	21.3
Institutional Performance	Strength of local institutions	Enforcement of rules	Conflict resolution

source : survey data 2008 & 2009

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[15] The index was computed following Varughese and Ostrom (2001).

$$A = \sum_{i=1}^{n} (Pi)^2$$

where *Pi* is the proportion of total population in the *i*th social group. *A* varies from 0 to 1 and measures the probability that two randomly selected persons will not be in the same social group.

The results in Table 7.2 show that the first three principal components had Eigen values greater than one (2.586, 2.341, and 1.342, respectively) using Kaiser criterion and explained 75.1% of the total variation in the variables used. Variables with coefficients with an absolute value above 0.5 are said to be dominating (Nieuwoudt 1977), hence should be used in the analysis. The different factors extracted represent different dimensions of local institutional management of forests in the selected communal areas of south-eastern Zimbabwe.

Component 1 explains 29.7% of the variation in the variables included in the model and represents strength of local institutional management of the commons. The results show that good rules, effective enforcement of rules, and a high degree of cultural homogeneity are associated with effective local governance of CPRs. These results are consistent with those of Agrawal (2001) and Adams *et al.* (2003), where clearly-specified use rules, monitoring, and sanctions are prerequisites for effective local governance of CPRs. The relatively high coefficient associated with strong beliefs in ancestral spirits reflects the importance of religious taboos and moral persuasions in monitoring and deterring community members from breaking rules (Heltberg 2002).

The dominating variables in the second factor, which explains 24.1% of the variation in the variables, were clearly defined boundaries (0.551), proportion of household income from CPRs (0.554), suitable use and contributing rules (0.589), proper monitoring of the agreed-upon rules (-0.645), and sanctions that are proportional to the kind of rule violation (-0.651). The negative signs on two of the variables suggest that having suitable rules does not guarantee effective governance of local resources. According to Ostrom (1990), local institutions become fragile whenever one or more principles are missing. This component represented strength of local enforcement of rules.

The third component, which explains 21.3% of the variation in the variables, represents conflict resolution strategies dominated by local courts for resolving conflicts (-0.901), household consumption and welfare (0.761), proportion of

household income from NTFPs extraction (0.719), social homogeneity (-0.621) and strong beliefs in ancestral spirits (-0.602). The negative signs suggest that lack of local courts for resolving conflicts and cultural diversity are associated with high extraction of NTFPs. Social and/or cultural heterogeneity is generally believed to lead to fragile local institutional management of the commons, because of the absence of shared values and norms, a low level of trust, and a lack of social cohesion, which make social sanctions less effective (Baland & Platteau 2007; Varughese & Ostrom 2001).

7.3 Forest outcomes

Table 7.3 provides the econometric outputs of the impact of local institutions and other key variables on forest outcomes (degradation). The explanatory variables jointly significantly explain forest degradation, while the adjusted R^2 value is 0.58. Resource scarcity had a significant positive parameter. This suggests that the more the users relative to the forest area, the greater the resource degradation. These results confirmed Bardhan's (1993) proposition that at high levels of scarcity and ecological stress, institutional arrangements break down as people scramble for survival and discount rates increase.

Table 7.3: Determinants of forest outcomes (degradation), south-eastern Zimbabwe (2009)

Variables	B coefficients	Standard error	t-value
Constant	-0.421	0.083	1.071
Resource scarcity	0.514	0.002	2.659**
Ecological knowledge[16]	-1.724	0.045	-3.012***
Wealth index	-1.524	0.471	-1.874*
Livestock income	-2.431	0.203	-3.116***
Household head born	-0. 741	0.020	-1.826*
Household formed	-2.250	0.112	-3.223***
Local institution effective	-0.548	0.059	-2.562**
Market integration	3.212	0.401	3.072***
Infrastructure development	1.159	0.314	2.661**

R^2 = 0.60; adjusted R^2 = 0.58; F test = 13.502***; n = 200. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Source: field survey data analysis 2009

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[16] Ecological Knowledge score = $\sum_{i=1}^{n} Ai.Ci$ where n is the number of questions/statements, A_i is the answer (dummy variable 1 if it is correct, 0 otherwise), and C is the certainty factor indicated on the seven-point scale of certainty, as recommended by Verdurme and Viaene (2003).

Market integration also had a highly significant positive parameter. This suggests that villages that had highly organised and exploitative markets were more likely to experience severe forest degradation, other factors being held constant. These results are in line with findings from India where increased demand led to more intense harvesting and overexploitation of NTFPs (Muraleedharan *et al*. 2005; Marshall *et al*. 2006). Infrastructure development had an unexpected, highly significant (5% level) positive relationship with the forest degradation index. This was attributed to prevailing harsh economic conditions. This was also supported by results from semi-structured interviews in which 75% of the key informants constantly lamented and blamed the prevailing socioeconomic conditions for forest degradation. These findings also confirm the literature, which highlights the importance of forest insurance (FAO 1995; Townson 1995).

The wealth index and effective local institutions had the expected negative parameters. A higher wealth index is associated with less forest degradation. The results also suggest that effective local institutional management plays a significant role in reducing forest degradation (Heltberg 2001; Ostrom 1990). A high ecological knowledge score was also associated with less forest degradation. According to Shaanker *et al* (2004), high ecological knowledge compels people to adopt ecologically friendly and prudent methods of harvesting NTFPs. The number of years ago the household was formed (proxy of life cycle stage) had a highly significant negative parameter. Thus, older and well-established households impose less severe forest degradation compared to relatively young households. Livestock income had a significant negative effect on the forest degradation index. The importance of livestock in these communities provides an incentive to collectively invest and preserve the natural resource base. This is also supported by Heltberg's (2002) findings that if a community depends on the forest resource for a substantial share of income, the more likely is the collective action for resource management. It was also noted during interviews with key informants that burning of forest in grazing commons attracted a fine of one heifer to the traditional leaders in the area.

7.4 Summary

The main objective of this chapter was to examine the extent to which forest degradation in the semi-arid Sengwe communal area of Zimbabwe is driven by existing common property management regimes, resource and user group characteristics, ecological knowledge, and marketing system. In summary, the PCA revealed that social homogeneity, religious taboos, proportion of income from NTFPs and their contribution to household consumption and welfare in times of crisis, monitoring and enforcement of rules, and suitable rules for contributing benefits were important variables in explaining the effectiveness of local institutions in governing forest commons. There seems to be a positive correlation between social homogeneity, monitoring and enforcement of rules, religious taboos, and effective local institutional governance of CPRs. By contrast, high dependence on the resource in times of crisis and for income, and lack of local courts to resolve conflicts lead to fragile local institutional management of CPRs. The results suggest that strong suitable rules, enforcement of these rules, and conflict resolution strategies are essential for an effective local management system.

Multiple regression results revealed a positive relationship between resource scarcity, market integration, infrastructure development, and forest degradation. The significant negative relationship between degradation, household formation period, and household head born in the area implies that households formed earlier and household heads born in the area were more likely to engage in prudent NTFPs extraction activities. The negative and significant relationship with livestock income showed the importance of livestock in semi-arid areas.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

This chapter summarises the study and provides conclusions and policy implications of rural livelihood diversification and NTFPs extraction in the context of HIV/AIDS in south-eastern Zimbabwe.

8.1 Conclusions

The overall objective of the study was to examine the capacity of forests in conditioning household vulnerability and responses to idiosyncratic health shocks in south-eastern Zimbabwe. The livelihood strategies and well-being of many rural households in sub-Saharan Africa (SSA) have been affected by short-term shocks and long-duration stresses owing to the HIV/AIDS epidemic. These rural households have a degree of control over this idiosyncratic health risk through the use of safety nets. Extraction of common property resources is one of the main coping strategies. This natural insurance is particularly important in rural areas of SSA characterised by agricultural, epidemiological, and market uncertainties. The remoteness of rural communities also results in scarcity of insurance alternatives, such as formal credit or insurance programmes. Empirical evidence showed that a household's degree of vulnerability to HIV/AIDS-related shocks and the extent to which forest products can be used as a safety net are determined by the nature, probability, and intensity of the shock and the household's ability to cope with such shocks in terms of safety nets, alternative income sources and insurance mechanisms. Despite increasing HIV/AIDS prevalence and the importance of NTFPs as safety nets in rural livelihoods of SSA, very few studies have critically analysed the dynamic socio-economic impact of HIV/AIDS on the use and management of NTFPs.

This study used a two-year panel of data collected in 2008 and 2009 from five rural communities in south-eastern Zimbabwe. Using both structured and semi-structured questionnaires, retrospective data for 2005–2008 were collected in the first round of interviews. Various techniques were used for in-depth analysis,

including focus group discussions and participatory observation.

The cluster analysis technique was applied to generate dominant livelihood strategies in Sengwe Communal according to the main household socioeconomic features. This typological analysis yielded five clusters:

1. Subsistence smallholders/unskilled workers;
2. Subsistence smallholders/non-timber forestry products (NTFPs) harvesters;
3. Crop production and NTFPs extraction integrators;
4. Commercial smallholders with regular off-farm employment; and
5. Specialised commercial livestock producers.

Cluster 1 was the least diversified group, consisting of 13.5% of the sampled households and deriving most of their income from casual labour in neighbouring countries. Cluster 2 comprised 21.5% of the sampled households, and derived about 66% of their total gross annual income from craft selling. Cluster 3, composed of 17.5% of the total sampled households, had a relatively greater reliance on crop production and NTFPs as their main sources of income (78%). Cluster 4 represented the most diversified households in terms of income sources (highest Inverse Simpson diversity index); it was also the largest of the five livelihood strategies, representing 36.5% of the total sample of households. Cluster 5 households derived much of their income from livestock production; diversification for this category was an outcome of choice, not constraints.

The findings of this cluster analysis can assist in the designing of intervention strategies and support systems based on the vulnerability and needs of household categories. Results of the multinomial logistic regression model revealed that differences in asset endowments – especially education, land, and livestock – and the impacts of economic shocks were the main determinants of these choices of livelihood strategies. Though the determinants were variable across the cluster contrasts and in terms of marginal effects, sampled households with more educated household heads, higher asset values, larger cattle herds and livestock incomes, and those who had experienced HIV/AIDS economic shocks, had more

diversified livelihood strategies (Cluster 4). These results suggest that asset constraints compelled diversification into lower-return activities such as casual labour and NTFPs extraction (Clusters 1 and 2). The results also revealed that sampled households that were statistically significantly affected by an HIV/AIDS shock were more likely to harvest NTFPs.

The study also examined the importance of NTFPs extraction as an *ex-post* coping strategy among rural households and communities afflicted by HIV/AIDS. The results from the comparative analysis of the HIV/AIDS-afflicted and non-afflicted households showed that the former were relatively young, with low physical and livestock endowments. The majority of these households relied on casual labour in neighbouring countries (Mozambique and South Africa) and cross-border trading as the main livelihood sources. NTFPs extraction and family help appeared to be the most *ex-post* mechanisms to deal with HIV/AIDS economic shocks. The main motives for NTFPs extraction were to smooth consumption and pay for medical expenses. In contrast, the non-afflicted households were older and relied mainly on livestock production as livelihood source. The most common devastating economic shocks for these households were crop destruction and livestock theft. The primary response strategies to shocks employed by such households were livestock sales and family help (risk-sharing), respectively. These results suggest that social capital is an important *ex-post* risk coping mechanism for both types of households.

The fixed-effects Tobit model results revealed that the main effect of HIV/AIDS on NTFP dependence was in part a function of household size, education level of the household head and other household members, transfer payments, HIV/AIDS staging, household wealth and the intensity of the HIV/AIDS economic shock. There was a significant positive correlation between household size and quantity of NTFPs extracted ($p<0.001$). The ability of households to substantially offset the effect of the shock differs greatly with the level of education. These results suggested that households with educated household heads and/or other members had access to better employment opportunities and information. This implies that

education is an important factor in coping with health shocks. The results also showed that the mean livestock value offsets 91% of the shock. These results suggest that livestock is the most liquidable asset for most rural households to mitigate shocks. HIV/AIDS staging had positive and significant correlations with NTFP extraction. Households that had experienced HIV/AIDS chronic illness prior to the survey (t-1) increased NTFP extraction by 34%. Households sheltering orphans or orphan-headed households increased NTFPs extraction by 37%. This implies that households responded to the HIV/AIDS economic crisis by increasing NTFP extraction both as a consumption- and an income-smoothing strategy.

The study also explored the changes in use and management of CPRs in communities' local responses to HIV/AIDS. The PCA showed that the existence of agreed-upon rules governing usage, enforcement of these rules, sanctions for rule violations that are proportional to the severity of rule violation, social homogeneity, and strong beliefs in ancestral spirits were the most important attributes determining effectiveness of local institutions in the management of CPRs. The results revealed that good rules, effective enforcement of rules, and a high degree of cultural homogeneity are associated with effective local governance of CPRs. The relatively high principal component coefficients of strong belief in ancestral spirits and social homogeneity revealed the importance of religious taboos and moral persuasions in the effectiveness of local institution management of CPRs. A high dependence on NTFPs for income, absence of local courts to resolve conflicts, and social/ cultural heterogeneity lead to weak local institutional management systems. These results suggest that shared values and norms, a high level of trust, and social cohesion are prerequisites for effective local governance of CPRs.

Empirical results from a regression analysis showed that resource scarcity, market integration, and infrastructural development lead to greater resource degradation, while livestock income, high ecological knowledge, older households, and effective local institutional management of the commons reduce resource degradation. The results suggested that the higher the number of users relative to

the forest area, the greater the resource degradation, leading to the breakdown of local institutional management systems of CPRs as people struggle for survival and discount rates increase. Highly organised, exploitative markets and well-developed infrastructure had a positive influence on forest degradation. The results revealed that older and well-established households imposed less severe forest degradation compared to relatively young households. Livestock income had a significant negative effect on the forest degradation index. The importance of livestock in these communities provides an incentive to collectively invest and preserve the natural resource base. Strong local institutional management systems, as well as high ecological knowledge and wealth indices, were positively associated with low forest degradation. This implies that effective local institutional management, ecological knowledge, and relative wealth are important determinants of forest outcomes.

8.2 Recommendations

This study provided insights on the diversity of rural livelihoods and their importance in sustaining both household and individual well-being in marginal environments impacted by HIV/AIDS. The findings revealed that rural livelihood diversification is a function of household asset endowments and the shocks to which they are exposed. Households in these constrained environments invest in a variety of coping strategies when faced with the HIV/AIDS economic crisis, the most common of which are NTFP extraction from common pool resources and migration. These research results have policy implications for government and other stakeholders in the Chiredzi district, and potentially in other semi-arid areas of Zimbabwe. Whilst government policy and interventions are often made along sectoral lines, household livelihoods in this study sample are highly diverse. Policymakers therefore need to reflect on the most suitable ways of promoting diversity, for example by facilitating access to the assets that people need to diversify or by improving risk management capacities. Multinomial regression analysis identified locational, demographic and physical asset endowments as the main determinants of livelihood choice. These results revealed that households with highly educated and skilled household heads are more likely to diversify into

higher return investments. Investment in education and skills training provide focal points for targeting interventions to help households adopt higher-return livelihood strategies.

For the study area the fact that more than 40% of households are surviving by exploiting common pool resources (Cluster 2 and 3) raises concern. Households deriving most of their income from exploiting common natural resources are less likely to undertake resource conservation measures. The positive correlation between poverty and common pool resource extraction, combined with the HIV/AIDS economic shock and low asset endowment, locks these households into a vicious cycle of poverty. Breaking this cycle will require specific interventions tailor-made for these households to increase the productivity of their labour and land whilst reducing their exposure to HIV/AIDS shock. NGO and government investment and promotion of strategic agricultural projects and income generating activities, skills training and access to health services is required to support the the vulnerable groups in HIV/AIDS-affected communities such as young households, orphans and women.

The results also indicated that relatively young, poorly educated households with low household coping capacity in terms of livestock and physical assets relied more on the natural insurance of forests in buffering HIV/AIDS economic shocks. Thus, NTFP extraction is an important self-insurance resource for young, poor households with limited options for coping with the idiosyncratic HIV/AIDS economic shock. Sustainable forest management would, therefore, be of great value for semi-arid tropical areas hard-hit by the HIV/AIDS epidemic. These results have important policy implications for development planners, conservationists, and non-governmental organisations working in the region. There is a need for programmes that reduce pressure on forest resources, such as income generating enterprises (small livestock raising projects), and improved access to education and health care, thus helping the poor to cope with the HIV/AIDS economic crisis. There is a need for adaptive local management systems that enhance the ecological knowledge of users and regulate market

structures in favour of long-term livelihood securities of these forest fringe communities. Based on the findings of the regression analysis, highly organised markets for NTFPs lead to a break-down of collective action and unsustainable harvest of forest products. On contrast, poorly developed markets compel people to harvest and sell more from the common pool resources in order to meet their basic needs.   However, based on these results, local context is very important for the construction of strong community-based forest resource management institutions. However, government intervention is required to help the communities to adopt marketing systems that are not exploitative and formulate resource regulations that are aligned with incentives for long-term sustainable use of resources.

8.3 Areas of Further Research

Although this study focused on the role of NTFPs as buffer against the economic effects of HIV/AIDS, further research is needed on how to mitigate the impact of HIV/AIDS through comprehensive strategies that improve gender equality and support networks, while reducing cultural barriers, stigma, and discrimination in these rural areas. In Sengwe Communal, a region still dependent on agriculture, the frequency of drought drives cross-border migration. Migration is commonly acknowledged as one of the main facilitating conditions of HIV transmission (UNAIDS 1998; Crush *et al.,* 2006). It is necessary to understand the links between cross-border migration and HIV risk factors in order to control the spread of the epidemic in areas such as Sengwe Communal, which borders three countries. A deeper understanding of the link between community resource endowment, migration and HIV/AIDS is also required to shed light on possible win-win policies.

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APPENDIX A: MAP OF THE RESEARCH AREA
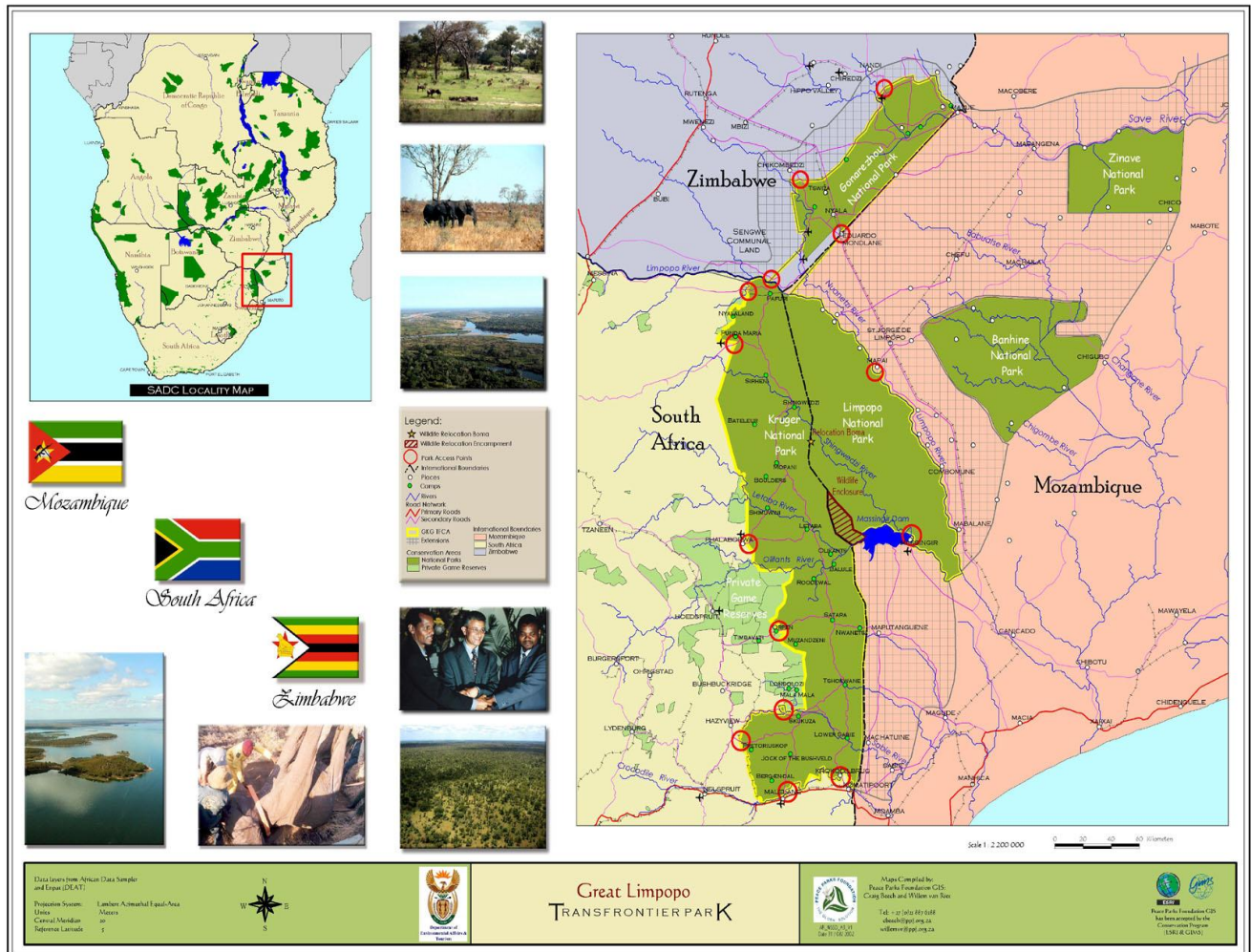
QUESTIONNAIRE ON NON-TIMBER FORESTRY PRODUCTS (NTFPS) AS COPING STRATEGIES OF HOUSEHOLDS AND COMMUNITIESAFFLICTED BY HIV & AIDS

This questionnaire is supposed to be completed by the household member most familiar with the section to be completed. It is meant to generate information on the socio-economic effect of HIV/AIDS on use and management of non-timber forestry products in Rural Households. When completing the questionnaire you are not required to give your name and any information that you provide will be treated confidentially. The information shall be used only for the purpose of this research and there are no right or wrong answers. When completing the questionnaire indicate your responses by ticking the appropriate boxes or by filling your responses in the blank spaces provided.

Questionnaire **No…………………………**   **Date ....**

Interviewer's name…………………………   Ward..

Village Name……………………………   Sex of Respondent ....

SECTION A: HOUSEHOLD DEMOGRAPHY

1. Who is the head of the household? ....

(1) Both male and female present; (2) only female head present; male employed elsewhere; (3) only female head present, husband deceased; (4) only male head present, wife employed elsewhere; (5) only male head present, wife deceased; (6) only children present, both parents deceased; (7) other (specify)

2. Table on household demography

Name	Relation with household head (3a)	Marital status (3b)	Sex 1=male 2=female	Age (yrs)	Highest level of education	Professional training	Occupation (3c)	Religion

3 (a) – (1) father (2) mother (3) son (4) daughter (5) daughter in law (6) son in law (7) other (specify)

(b) – (1) single (2) married (3) widowed (4) divorced 3

(c) – (1) teacher (2) student (3) church leader (4) trader (5) builder (6) nurse (7) soldier (8) police officer (9) other (specify)

SECTION B: HOUSEHOLD ENDOWMENTS

3. What type of housing do you have?

i) Burnt bricks iron/ asbestos roofed   ii) pole and dagga and thatched

iii) burnt bricks, iron roofed /asbestos and grass thatched   iv) other (specify) ....

4. Do you have a house in town/residential stand in town? Yes ….   No ….

If yes, please specify (location and estimated value) ....

Land ownership

5. How much land do you possess? No. of acres……   of plots ....

Characteristics	Plot 1	Plot 2	Plot 3	Plot 4
Size in acres				
Distance from homestead (km)				
Type of land holding 1 = dry land 2 = wet land 3 = irrigated land 4 = both dry land and wet land				

6. How much land did you cultivate 2007/8 season? ....

7. Livestock ownership

Type of livestock and poultry	Number Owned	How many did you acquire in the last four years?	How many did you sell in the last four years?
Bulls			
Oxen			
Cows			
Steers			
Heifers			
Calves			
Sheep			
Goats			
Donkeys			
Chickens			
Turkeys			

Pigs			
Others (specify)			

8. Physical assets owned

Assets	How many implements in working condition do you possess?	When did you acquire them?
Farm Implements		
Tractor		
Ox-drawn plough		
Cultivator		
Harrow		
Planter		
Ripper		
Ridger		
Wheelbarrow		
Scotch cart		
Household Assets		
Radio		
Television		
Tables		
Chairs		
Sewing Machine		
Bicycle		
Car		
Others (specify)		

9. Income sources

What are your major sources of income? (2007/8) Rank according to their reliability as income sources, where one (1) is the most reliable source

Source of income	Amount	Uses of income	Reliability rank
Crop sales			
Livestock sales			
Gardening			
Off farm income (specify)			
Remittances			
Fruit selling			
Crafts selling			
Other (specify)			

Use code 1= household daily requirements; 2 = school fees; 3 = clothing; 4 = Agricultural inputs; 5 = health expenses; 6 = other specify

10. Crop production on the farm

Which crops were grown on the farm in 2007/8 and what area was grown to each?

Crops	Area under production (Acres)	Quantity harvested (kgs)	Quantity Sold (kgs)
Maize			
Groundnuts			
Sunflower			
Soyabeans			
Tobacco			
Cotton			
Other (Specify)			

Food Security section

11. In average years, do you normally produce adequate food for your family? Yes... No ...

If no, how do you make up for the deficit? ....

12. Classify your Food Security status according to the following:

1. Stable/ enduring _____   2. Resilient _____   3. Fragile (chronic) _____

Rank according to the importance the following as sources of food, where one (1) is the most important source.

Item	Rank
Production	
Purchases	
Remittances/ gifts	
Wild food	
Government/Donor Food Handouts	
Others (specify)	

13. How many meals do you have per day under normal circumstances? ....

14. Does food availability change with seasons? Yes…..   No……

If yes, please specify whether it changes in quality or quantity or both ....

15. Do you distribute food prepared among the family members according to Sex_____

Age_____   Please specify ....

16. How often do your food reserves run out before the next harvest? ....

17. When faced with food shortages what are the most common methods used to acquire food? Rank in

order of importance where one (1) represents the most important.

Food source	Rank
Borrow from friends and relatives	
Government/donor food aid	
Wild food	
Purchase (specify source of income)	
Labour exchange	
Other (specify)	

SECTION C: NTFPS UTILISATION SECTION

18. To what extent do you agree/ disagree with the following statements. (Tick the appropriate answer.)

Responses	Strongly agree	Somewhat agree	Some what disagree	Strongly disagree	Indifferent
Natural resources are important sources of food in your area in times of crisis such drought, death, prolonged illness of a prime-aged household member, or an economic crisis					
Natural resources are important sources of income in your area in times of crisis such drought, death, during prolonged illness of a prime aged household member					
Natural resources are important sources of medicine in your area prolonged illness of a prime-aged household member or an economic crisis.					
Natural resources are more important sources of food, income, medicine, to rural households in your area now than in the 1990`s					

19. Using Non-Timber Forestry products as coping strategy: Matrix ranking. (Rank in order of importance, where one (1) represents the most important.)

Problem	Safety Nets					
	Wild food	Medi Plants	Family/ Neighbour	Crafts	Fishery	Goats/chickens
Drought						
Cyclones						
Illness						
Death						
Uncontrolled sell of maize						
Pest and diseases						
Conflicting animals						
Orphan						
Uncontrolled fire						

20. Indicate the type, quantity and frequency of natural resource products that your household gathers from the forest for food, medicine and income

Type of NTFPs (Species)	Use	Parts of the plant used	Collection frequency	Person responsible for harvesting	Quantity gathered /month

Use code 1= food, 2 = medicine, 3 = sale (including crafts), 4 = fodder, 5 other (specify):

Frequency code 1= almost daily, 2 = 2-4 times per week, 3 = once a week, 4 = every two weeks, 5 = monthly, 6= special occasions, 7= seldom, 8 = never.

21. Has there been a change in quantity of NTFPs harvested in your household in recent years? Yes….

No…. If yes, please explain ....

22. When collecting NTFPs from the forest do you fear any arrest? Yes……   No…...

If yes, please specify ....

23. If your household collects NTFPs for food indicate the types of food, quantity and frequency of consumption on the following table.

Type of food	Quantity	Frequency of Consumption
Fruits		
Vegetables		

Nuts		
Other (specify)		

Frequency code 1= almost daily, 2 = 2-4 times per week, 3 = once a week, 4 = every two weeks, 5 = monthly, 6= special occasions, 7= seldom, 8 = never.

24. For those species gathered for sale indicate the quantity sold and the number of labour hours involved, from collection to the finished product.

Item	Quantity sold/month (Kgs)	Labour (Hours)	Unit Price for the item

25. What was the most important use to which the income from NTFPs was put? Rank your uses in order of importance; where one (1) represents the most important

Use	Rank
Household Dairy requirements	
School fees	
Agricultural inputs	
Health expenses	
Funeral Expenses	
Other (specify)	

26. Do you exchange NTFPs for food/grains? Yes …. No ….

If yes, please specify the terms of the deal...

SECTION D: ECOLOGICAL KNOWLEDGE

27. What are the common NTFPs that are normally harvested in this area?............................

28. Are there any customary rules that govern use of NTFPs? Yes……   ....No…….

If yes, please specify ....

29. When collecting NTFPs (eg fruits) do you leave some? Yes ….. No……

If yes, please explain ....

30. Are there harvesting methods that are traditionally recommended for NTFPs?

Yes….. No…... If yes, please specify ....

31. From your own observation has there been a change in the forestry conditions surrounding your village comparing it with the condition a decade ago?. Yes…   No….

If yes, explain the change in condition that have occurred ....

32. For the NTFPs that you use have you observed any plant species that promote or inhibit its regeneration in its natural setting? Yes………… No……

If yes, please specify ....

33. For NTFPs that you use have you observed interactions between plant and animals in their natural setting? ....

34. For the NTFPs that you use how are seeds dispersed in their natural setting? ....

35. From your experience of living in this village is there any change in the rate at which forest fire occurs compared to the past five years?   Yes……..   No………

36. From your own opinion do you think forest fires have an effect on regeneration of NTFPs, plant species that you harvest?   Yes…..…   No……….

If yes, explain the effect and give examples of tree species most affected...............................

Section E: Institutional Arrangements, Community Participation and

Co-Management of NTFPs

37. How does the community in your village control use/harvest of NTFPs ?

Responses	Tick the appropriate
a) Use of government laws, including conditions of permits	
b) Use of community by-laws	
c) Reliance on traditional institutions (spirit mediums)	
d) Reliance on traditional or local political leadership (councillors, chiefs, headmen etc)	
e) Other means (specify)	

38. In your opinion, who owns the forest and woodland products that are found in your village?

Responses	Tick the appropriate
a) Government	
b) Community/ villagers	
c) Traditional institutions (spirit mediums)	
d) Traditional and local political leadership (councillors, chiefs, headmen etc)	
e) Local government	
f) Other means (specify)	

39. Among the following, who should be involved in the management of the NTFPs forest resources that occur in your village and why?

Responses	Role (reason for involvement)
a) Central government	
b) Community/ villagers	
c) Traditional institutions (spirit mediums)	
d) Traditional leadership (councillors, chiefs, headmen etc)	
e) Local government	
f) Other means (specify)	

40. In your opinion what could best be done to prevent over-harvest of NTFPs?

Best methods of controlling Over-harvest	Rank (where1 represents most effective)
a) Law enforcement by government	
b) Environmental education and awareness campaigns	
c) Use harvest permits	
d) Empowerment of the community to deal with the problem	
e) There is no solution	
f) Others (specify below)	

41. What would be the main constraint(s) in implementing the solution that you have suggested above?

Best methods of preventing Over-harvest	Constraint(s)
a) Law enforcement by government	
b) Environmental education, training and awareness campaigns	
c) Use harvest permits	
d) Empowerment of the community to deal with the problem	
e) There is no solution	
f) Others (specify below)	

Thank you

CHECKLIST QUESTIONNAIRE

STUDY ON USING NON-TIMBER FORESTRY PRODUCTS AS COPING STRATEGIES OF HOUSEHOLDS AND COMMUNITIES
AFFLICTED BY HIV & AIDS

In sub-Saharan Africa, non-timber forestry products (NTFPs) serve as a safety net for rural households and communities in times of economic crisis, illness or agricultural shortfalls. NTFPs provide a wide array of products that meet numerous households' needs. Taken together, the trends of rising adult mortality and continuing environmental degradation poses severe threats to rural sub-Saharan African livelihoods. The overall goal of this proposed research is to identify interventions that could lower ecological costs whilst maintaining or enhancing the long-term viability of natural resources as a household/community responses to HIV/AIDS. It uses multi-stakeholder participation and interdisciplinary approach to explore the opportunities for the establishment of community forestry based management systems.

PLEASE READ THE FOLLOWING STATEMENT CAREFULLY BEFORE SIGNING OR COMPLETING THE QUESTIONNAIRE.

Participation in this survey is important to us and is completely voluntary. The data captured in the survey will be used solely for economic study at the University of KwaZulu-Natal. If you agree to complete the questionnaire, you will answer questions regarding yourself, your ideas, attitudes and behavior regarding different aspects of HIV/AIDS and non-timber forestry products. Your answers will be kept confidential and only the researchers and study personnel will have access to this information. Completing the questionnaire will take between 15 and 20 minutes; and will be kept in such a manner as to guarantee your privacy.

Please mark with an X if you agree or not to complete the questionnaire.

I do not wish to complete the questionnaire _____

I agree to complete the questionnaire and do so in a completely voluntary manner. I understand that my

responses will be kept confidential. _____

Signature _____

Date _____

Questionnaire No _____

Date: Day __ Month ___ Year _____

1	**Household Demography**	• Sex, age, economic role of the household head • Number of children in the household • Percentage of dependents in the household • Household Wealth

2	**HIV & AIDS Presence through proxy indicators**	• Presence (& number) of chronically ill (CI) adult(s) (18-49) in the HH
		• Recent (over past 12 months) death of adult(s) following CI
		
		   • Sex
		   • relationship to household head
		   • Economic role

3	**HIV/AIDS Impact on food consumption**	• Whether the CI / death caused a decline in the quality/quantity of food
4	**Coping strategies**	• Main strategies adopted by the HH to minimise the negative effects of the CI / death • Coping strategies/differences in the level of stress

5	**Orphans and vulnerable children (OVC)Presence, Education & Labour**	• Presence (& number) of orphans in the HH
		
		   • Orphan status (mother orphan, father orphan, double orphan, etc.)
		   • Sex
		   • Age
		   • Nutritional status and health
		
		• Enrolment
		• Reasons for non-enrolment
		• Absenteeism
		• Reasons for absenteeism
		• Involvement in household chores
		• Involvement in family work (HH field, family business, NTFPs collection and processing)
		• Involvement in non-family work

6	**Community Response**	• Awareness of the community

		- Coping mechanisms and efficiency - Institutions, formal and informal groups - Junior Farmers Field & Life School (JFFLS) - Conservation Agriculture - Support to Vulnerable Groups - Problems regarding access to services and assistance Home-based Care (HBC) - Tuberculosis (TB) treatment - Anti-retroviral treatment (ARV) - Prevention mother-to-child transmission (PMTCT) activities