

RURAL LIVELIHOOD DIVERSITY TO MANAGE ECONOMIC SHOCKS: EVIDENCE FROM SOUTH-EAST ZIMBABWE

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ABSTRACT

Livelihood strategies used by households and individuals in rural communities are shaped by human, natural, financial, social and physical capital resources that can be accessed. The ability to diversify livelihoods depends on asset portfolios and the economic shocks that rural households face. The main objective of this paper is to improve understanding of rural livelihood challenges in south-east Zimbabwe and how households in this area diversify livelihoods to cope with these challenges. A cluster analysis of 200 households surveyed in 2008 in the Chiredzi district identified five distinct livelihood strategies: (1) subsistence smallholders/unskilled workers; (2) subsistence smallholders/nontimber 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. Multinomial logit model results showed that the level of education of the household head, value of physical assets, cattle numbers and income, remittances, NTFP income and economic shocks were the main determinants of these livelihood choices. There is also some evidence that those households that were statistically significantly affected by HIV/AIDS shock practised distress-push diversification by harvesting NTFPs. These results suggest that policymakers 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 bases of individual households.

Keywords: livelihoods, diversity, cluster analysis, multinomial logit, asset endowments

1 INTRODUCTION

The diversity of rural livelihoods is the key variable when 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-term resilience of a household's livelihood in the face of adverse trends or sudden shocks (Ellis 1998). Household livelihood strategies are constantly changing and adapting to dynamic natural and economic environments. When a relatively sudden shock occurs in the form of a drought and/or an economic crisis, the adaptation must happen more quickly (Freeman and Ellis 2005). Ellis (1998) defines rural

livelihood diversification as the process by which households construct a diverse portfolio of activities and social support capabilities for survival, and to improve their standard of living. Rural households combine a number of livelihood activities like agricultural crop production, livestock production, wage work, cottage industry and forest product collection to provide or supplement income and subsistence needs. The mix of activities depends on a household's ability to access different livelihood opportunities (Ellis 1998; Bryceson 2002).

There are many reasons why such diversification occurs (Ellis 1998; Barrett *et al.* 2001), such as economies of size in certain activities and economies of scope among distinct activities. Missing markets also compel self-provision of some goods and services by households. Similarly, diversification may be used as a risk management strategy. It is commonly assumed that households choose such patterns of diversification so as to achieve the best possible expected standard of living (Bryceson 2002; Barrett *et al.* 2001; Brown *et al.* 2006). 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 standard of living. 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).

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 and Conway 1992). Shocks that impinge upon livelihoods are the result of interactions between global forces and local contexts (de Haan and Zoomers 2005). Fluctuations in resource abundance, seasonal cycles of resource use and changes in access create conditions that bring challenges for rural households. Similarly, economic drivers (e.g., world markets, unaffordable credit) and policy drivers (e.g., misguided government programmes) also create shocks that impact on rural life (Millennium Ecosystem Assessment (MA) 2005). 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 generalize the effects and implications of such diversification across empirical case study data (Hussein and Nelson 1998).

This paper 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 understand the current dynamics of household-level investment in the context of HIV and 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 help government and nongovernment organisations reduce poverty vulnerability in Zimbabwe. The main goal is to understand livelihood challenges in rural Zimbabwe and how people deal with them. Specific objectives of the analysis are to (a) identify dominant patterns of livelihood diversification in Zimbabwe, (b) identify socioeconomic variables that determine livelihood diversification patterns, and (c) discuss the implications of the results for reducing poverty vulnerability amongst rural households in Zimbabwe.

The rest of the paper is organized as follows: Section 2 reviews literature on the economics of rural livelihood diversity. Section 3 outlines a conceptual framework for the study that uses the asset based approach to household livelihoods analysis. Section 4 describes the study site and research methodology, after which a concluding section discusses some policy implications of the study.

2 RURAL LIVELIHOOD DIVERSITY

Multiple motives prompt rural households and individuals to diversify assets, incomes and activities (de Haan and Zoomers 2005). There are two sets of motives, the first comprising push factors, which include 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 realization of strategic complementarities between activities, and specialization 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, namely, demand-pull and distress-push ('coping' and 'accumulation') diversification (Reardon *et al.* 1998; Haggblade *et al.* 2002).

The objective of distress-push diversification is to stabilize income flows and consumption in the face of adversity. It thus implies engaging in economic activities that are less productive than agricultural production could be on a full-time employment basis. It is an outcome of constraints-related motives, and is

thus related to necessity or 'limited risk-bearing capacity'. It typically occurs in an environment of risk, of market imperfections (e.g., incomplete or weak financial systems) and of hidden agricultural unemployment. Less-endowed and lower-income households typically resort to distress-push diversification (Bezemer *et al.* 2005; Barrett *et al.* 2001; Ellis 2000). Conversely, demand-pull diversification follows from the desire to seize new opportunities. For example, households may adopt new market or technological opportunities that 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 initial investments (Ruben and 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 as to their diversification behaviour and, therefore, what sort of interventions might be effective in reducing poverty vulnerability. This helps 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 access to markets and institutions (Ellis 2000; Barrett *et al.* 2001; Ruben and 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 (Barret *et al.* 2002). Opportunities to diversity vary among 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 it having the skills, location, capital, credit and social connections to pursue other activities (Hussein and 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 and Pender 2004).

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). Recent literature has emphasized 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, though it is a very important factor of diverse rural livelihoods that can lead to improved rural livelihoods, and improving rather than degrading natural resources (de Haan 1999). Given the overall desirability of diversification, the question is: how do migrations promote or inhibit diversification, both of the on-farm type and the non-farm type given the vulnerability of rural households?

3 CONCEPTUAL FRAMEWORK

The conceptual framework used in this study adapts 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 wellbeing, environmental conservation and community prosperity (Hussein and 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 base approach is well suited for understanding and analyzing the 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 and Nelson 1998; Barrett *et al.* 2005). This framework (Figure 1) includes the following components: assets, the context (policies and shocks), household livelihood strategies, and outcomes (measures of household wellbeing). 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 wellbeing (Moser 1998; Winters *et al.* 2002). Given the available information in household data set and supplementary secondary data sources, each asset (or capital type) is defined as follows:

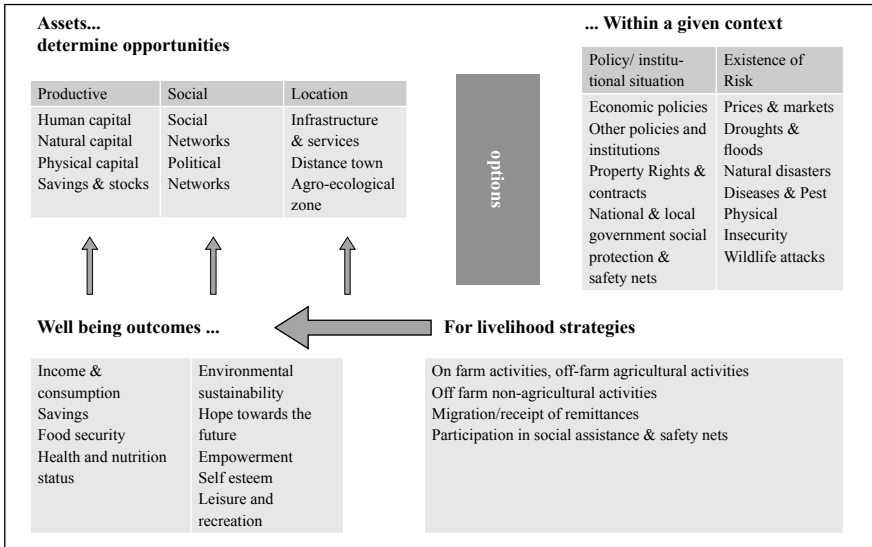


Figure 1: Asset-based approach
 Source: Chambers and Conway (1992).

Tangible assets (natural, productive, physical, livestock and other forms of stock), intangible assets (social capital and nonmarket institutions allowing access to or control of assets or resources), and capabilities (human and cultural capital, and life cycle characteristics) shape livelihood strategies (Chambers and 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 maximizing 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 dependents 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 and 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 and Meizen-Dick 2002). The context in which households operate helps determine the welfare-generating potential of assets and prospects for improved wellbeing. 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 reduce household wellbeing. Communities around Gonarezou 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 and AIDS), and loss of employment. These shocks are examined in this study, along with estimates of monetary loss in terms of actual damage incurred 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 wellbeing 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 and Meizen-Dick 2002). Livelihood strategies thus refer to the choices that people employ regarding the use of their asset portfolio, in pursuing income, security, wellbeing 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, which determine the ability to undertake a given enterprise and the productivity of resources allocated to that enterprise, while the potential returns also depend on the context. Livelihood strategies include a wide range of on- and off-farm agricultural and non-agricultural activities (Corral and Reardon 2001). In the asset base approach, asset accumulation and changes in livelihood strategies are important drivers of sustained improvements in wellbeing.

Finally, selected livelihood strategies determine outcomes that reflect household wellbeing and prospects for growth over time. The asset base conceptual framework provides a variety of measures of household wellbeing. 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 concerning the future (Moser 1998). Barrett *et al.* (2001) argue that assets, livelihoods, and income all have limitations as indicators and, therefore, should be used in combination. This approach is adopted in this paper.

4 RESEARCH METHODOLOGY

4.1 Study site

The study was carried out at four sites in the south-eastern lowveld of Zimbabwe, in Masvingo province, Chiredzi district. These four sites are located within the Limpopo Great Transfrontier Park and provide contrasting human and ecological settings. Gonakudzingwa small-scale commercial area, to the north of Gonarezhou National Park, is a long established resettlement scheme with a well-defined land tenure system with title deeds. Malipati communal area lies to the south of the Gonarezhou National Park. Sengwe communal area is on the border with South Africa and Mozambique, and has long been bypassed by development initiatives (Dzingirai 2004). The fourth site, Chikombedzi communal area, is to the north-east of the National Park.

The main agricultural activities for these rural households are production of livestock (mainly cattle and goats) and coarse grains such as maize, sorghum and millet (Dzingirai 2004). These households operate in a low potential semi-arid agro-ecological area, and typically accumulate wealth in the form of livestock, and engage in mixed crop-livestock production to generate income and satisfy household subsistence requirements. In poorer households, livestock sales are driven largely by liquidity constraints and the seasonal need to purchase food, pay school fees or emergency health expenditures. In wealthier households, livestock sales more commonly represent transactional turnover (Dzingirai 2004).

4.2 Data collection

Primary data were collected using focus group discussions and structured interviews with 50 households from each of the four rural communities participating in the study in 2008. These data included detailed information about the demographic characteristics of household members, their sources of livelihood, their use of resources from public forest land, and the economic and natural hazards that they had experienced prior to the survey.

4.3 Analytical techniques

Descriptive and econometric analyses were carried out on household-level survey data to improve understanding of (a) household characteristics, assets, livelihood strategies and levels of wellbeing; (b) assets and asset combinations affecting household wellbeing; and (c) the impacts of economic shocks and potential policy measures on household wellbeing.

4.3.1 Cluster analysis

Clustering households into a limited number of categories that pursue similar livelihood strategies is a useful way to apply the asset base 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 proportion 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 farm land 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, predetermined 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 in the study instead. In k-means cluster analysis, observations are initially randomly assigned to each of k clusters, and then reassigned using an iterative method to minimize within-cluster variance and maximize between-cluster variance (Wishart 1999).

4.3.2 Income diversity index

The Inverse Simpson diversity index (Valdivia *et al.* 1996) was used to calculate the number of household activities and their share of 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

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

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

4.3.3 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:

$$\ln(P_j/P_m) = \beta'_j X \quad j=1, 2, \dots, m-1 \quad (2)$$

where \ln = natural log, P_j is the probability that a given household falls into the j th 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 i th household being in cluster j is computed as:

$$P_j = \frac{e^{\beta_j X}}{1 + \sum_{j=1}^m e^{\beta_j X}} \quad (3)$$

Five clusters describing study household livelihood strategies are derived in section 4.2, while section 4.3 explains the choice of the benchmark cluster and presents the MNL results.

The *i*th household’s probability of inclusion in cluster *m* is estimated by

$$P_m = \frac{1}{1 + \sum_{j=1}^m e^{\beta_j' X}} \tag{4}$$

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

$$\Delta P_j / \Delta X_i = P_j [\beta_j - \sum_{k=1}^m P_k \beta_k] \tag{5}$$

It is hypothesized in the MNL that the choice of a particular livelihood diversification strategy (cluster) is a function of the *X*s representing household characteristics and engagement in particular agricultural activities, including forestry resource extraction, nonfarm activities and the type/intensity of shock that the household is subjected to. The household characteristics can be interpreted as household physical, human (knowledge and labour), financial (income), and social (membership of organisations) capital endowments. –

5 RESULTS AND DISCUSSION

5.1 Salient household characteristics for the four sites

Table 1 summarises descriptive statistics for the socioeconomic characteristics of the sampled households at the four sites. Gonakudzingwa farmers tend to have older household heads, larger households and farms are primarily engaged in commercial livestock production, and have the least proportion of female headed households. The Malipati communal area differed significantly (at the 5 per cent level of probability) from the other three 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. Gonakudzingwa households had the highest proportion of households that invested in household assets such as bicycles, television sets, radios and cell phones, and in agricultural assets.

Sengwe communal area households differed significantly from their counterparts in terms of income sources and type of households. Forty-eight per cent of the households derived most of their income from remittances and about 53 per cent were mostly female headed households. Due to its location

furthest from the provincial town, temporary and permanent migration activities are part of the livelihood strategies used in Sengwe. This area also is the least serviced with public infrastructure, and so tends to have the least educated

Table 1: Salient characteristics of sample households in the four communities, Chiredzi district, south-east Zimbabwe, 2008

Characteristic	Gonakudzingwa	Malipati	Sengwe	Chikombedzi
Average age of household head	56 (12.6)	43 (11.3)	45 (11.9)	49 (12.1)
Household size	15	9 (4.6)	6	8 (5.0)
% female headed households <i>de facto</i>	10	21	16	33.3
% female head households <i>de jure</i>	0	12.5	37.3	9.7
% child headed households	0	5.6	6.8	11.8
Cattle owned (mean)	57 (40.8)	3 (4.6)	8.7 (11.9)	6 (7.1)
Mean size of farm (acres)	1543.16 (718.87)	8.7 (4.9)	5.8 (4.5)	3.23 (6.98)
Mean livestock income per year (Rand)	17552.63 (23923.78)	846.53 (1933.49)	2106 (5487.61)	1575.49 (4117.50)
Mean remittance per month (Rand)	842.10 (1489.25)	487.04 (667.74)	540.80 (594.82)	828.63 (2104.09)
Mean NTFP income per year (Rands)	5763.16 (2820.40)	1948.90 (2598.08)	767.80 (1033.54)	1086.37 (1479.46)
% households off-farm main income source	5.2	14	0	15.7
% households remittances main income source	5.2	26	48	29.4
% households agriculture main income source	89.5	24	28	31.4
% households NTFPs main income source	0	34	20	23.5
% household with at least 3 agricultural assets	100	24	12	33.3
% households with at least 3 household assets	100	46	50	45.2

% households had livestock loss (due to theft or wildlife) 3 years prior to survey	65	53	45	13
% households experienced death/chronic illness of breadwinner 3 years prior to survey	15	27	19	35
Distance to health centre (km)	30	5	20	2
Distance to market (km)	30	5	80	2
Distance to nearest town (km)	90	75	140	60

Note: Figures in parentheses are standard deviations

household heads. Chikombedzi communal area, being closest to the provincial town and having the district satellite growth point, 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 livelihood diversification patterns

Five clusters or dominant livelihood diversification patterns were identified in the Chiredzi district households (see Table 2). The first strategy (Cluster 1) represents ‘**subsistence smallholders/unskilled workers**’ and contains 13.5 per cent 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 only depend on the farming sector for their livelihoods. For these *least-diversified* of the sample households, 79 per cent of total income on average is derived from off-farm casual labour. By contrast, only 4 per cent of 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/nontimber forestry product (NTFP) harvesters**”, made up 21.5 per cent of the total sample. They derived about 66 per cent 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 invested much less time in unskilled off-farm agricultural activities than did Cluster 1 households. A higher than average proportion of Cluster 2 households participated in agricultural, women’s and church organisations, and in nongovernmental organisation projects.

Cluster 3 households, ‘**crop production and NTFP integrators**’, have a relatively greater reliance on crop production and NTFPs as their main sources of

income. These households (17.5 per cent of the total sample) allocate relatively more of their labour (66.5 per cent in total) to crop production and NTFP extraction. They tend to supplement their farm income with NTFP 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.

Table 2: Clusters of livelihood diversification patterns for survey households, Chiredzi district, south-east 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	20%	23%	33.7%	41.6%	26.3
Livestock production	4%	9%	13%	15%	57.9%
NTFP extraction	11%	35.4%	32.8%	21%	6%
Unskilled farm work	56%	27%	15%	3%	0.001%
Skilled nonfarm work	0.002%	0.05%	3%	17.9%	7%
Financial capital					
% farm income	4%	13.5%	44%	44%	67.4%
% NTFP income	17%	66.1%	34%	25%	21.6%
% income from transfers-remittances	79%	20.4	22%	31%	11%
Social capital					
% households in:					
Agricultural organisation	6%	67%	53%	44%	100%
Women's organisation	3%	79%	21%	29%	30%
Church organisation	15%	59%	27%	51%	68%
Nongovernmental organisation (NGO)/project	11%	63%	44%	33%	9%
Inverse Simpson diversity index	1.53	2.01	2.80	2.84	1.95

Cluster 4, ‘**commercial smallholders with regular off-farm employment**’, is the largest of the five livelihood strategies, representing 36.5 per cent 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 per cent 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 participate 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 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 depend 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. Study households with more educated household heads, higher asset values, larger cattle herds and livestock incomes, and who had 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).

Table 3: MNL coefficient and marginal effect estimates by household livelihood strategy choice (cluster contrast), Chiredzi district, south-east Zimbabwe, 2008

Variables	Cluster contrast							
	Cluster 1 (P1/P4)		Cluster 2 (P2/P4)		Cluster 3 (P3/P4)		Cluster 5 (P5/P4)	
	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	0.274NS	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%

Source: Field survey data analysis, 2008

Higher levels of NTFP income and exposure to an HIV/AIDS shock increase the probability of being in Cluster 2, subsistence smallholders/nontimber forestry product (NTFP) 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, physical and livestock assets can be essential resources for generating livelihoods of rural households that cope better with economic shocks (Reardon *et al.* 2000; Adato and Meizen-Dick 2002).

For the Cluster 3 contrast, NTFP 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 study households being crop production and NTFP 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 study 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, NTFP and livestock incomes, and exposure to 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 decompose the dynamics of this cause-and-effect relationship.

6 CONCLUSION

Study results showed that the representative sample of 200 households in the Chiredzi district of south-east Zimbabwe each used one of five distinct livelihood diversity strategies in 2008: (1) subsistence smallholders/unskilled workers; (2) subsistence smallholders/nontimber forestry product (NTFP) harvesters; (3) crop production and NTFP 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 impact of economic shocks. There is also some evidence that these asset constraints compel diversification into lower return activities such as NTFP extraction. About 40 per cent of the sample households (particularly strategy 2 and 3) derive over 30 per cent 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).

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 made along sectoral lines, household livelihoods in this study sample are highly diverse. Policymakers thus need to reflect on the most suitable ways of promoting wellbeing. Multinomial regression analysis identifies locational, demographic and physical asset endowments as the main determinants of livelihood choice. The results provide focal points for targeting interventions to help households adopt higher return livelihood strategies.

For the study area the fact that about 40 per cent of the households are surviving by exploiting common pool resources (Clusters 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 HIV/AIDS economic shock and low asset endowment locks these households into a vicious cycle of poverty. Breaking this poverty cycle requires specific interventions tailor-made for these households, which increase the productivity of their labour and land whilst reducing their exposure to HIV/AIDS shock.

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NOTE

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