# **Livelihood adaptation choices, constraints and correlates of adaptation choices for households who share boundaries with game parks: Can game parks be trusted as livelihoods sources?**

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# **Abstract**

This paper investigated livelihood adaptation choices, possible constraints and correlates of adaptation choices for households who share boundaries with Nyatana Game Park in Zimbabwe. The paper was motivated by conflicting conclusions that surround the potential of game parks to address livelihoods in rural areas. Household survey data results suggest that game parks may not be trusted as a reliable and sustainable livelihood source due to insecure property rights and low returns. Full devolution of user rights to local communities, full utilisation of non-consumptive and consumptive ecotourism activities and reduction of high problem animal challenges were some of the suggested approaches.

**Key words:** Livelihoods adaptation choices, game parks as livelihoods sources

## 1. Introduction

Most rural areas in the marginal areas of Zimbabwe are characterised by adverse climatic conditions (Child, 1995; Rukuni *et al*. 2006). These conditions are typically characterised by high temperatures with low rainfall that is poorly distributed across the growing season of most crops (Bradley and McNamara, 1993). Also, soils are inherently poor as they consist primarily of sand soils with a lot of rock out-crop in the plough zone. Crop farming is therefore a gamble in these areas, a condition that significantly affects livelihood sources for most rural communities who are farmers by default (Bradley and McNamara, 1993).

Ellis (2000) noted that farming, on its own, does not provide a sufficient means of survival in rural areas. Effectively, most households from rural areas depend on a diverse portfolio of activities and income sources skewed in favour of natural resources, in order to complement farming (Ellis, 2000). Unfortunately, most of these natural resource activities, in rural areas, are not institutionally supported to enhance the livelihoods of rural communities for most African governments have been trying to foster farming activities (Carswell, 2000) at the expense of non-farm activities.

Against this backdrop, the livelihoods adaptation capacity of households may, therefore, strongly depend on the availability of adaptation choices, the constraints associated and communities` perceptions of the various portfolio diversification activities. In an effort to boost livelihood sources in the rural areas of Zimbabwe, formalised community managed game parks under the banner of Communal Areas Management Programmes for Indigenous Resources (CAMPFIRE) principles were established (Muchapondwa, 2003).

Literature suggests that game parks, in principle, could provide a potential livelihood source (Fernandez *et al.* 2009). This is specifically applicable to rural areas where wildlife is abundant and its management authority has been devolved to local communities; the likes of CAMPFIRE in Zimbabwe (Gadgil and Rao 1995) and Game Management Areas (GMAs) in Zambia. Mixed reporting, however, dominates the practical potential of community managed game parks as livelihoods sources, (Muchapondwa, 2003). Many researchers therefore caution against blanket success recommendations on the gains of community-based wildlife conservation (Child, 1995; Patel, 1998; Hasler, 1999), based on flagship examples.

In this regard, and for the purpose of understanding the practical potential of community managed game parks as livelihoods sources in rural areas, this study was tailor-made to consider households sharing boundaries with an operational community managed game park. The paper surveyed 240 households from the Uzumba Maramba Pfungwe (UMP), Mudzi and Rushinga communal areas of Zimbabwe, surrounding Nyatana Game Park. The objective was to assess livelihood adaptation strategies, possible constraints to adaptation choices and the socio-economic as well as institutional factors capable of influencing adaptation choices for surrounding communities.

These three communal areas (UMP, Mudzi and Rushinga) surround Nyatana Game Park, a wilderness area of approximately 75000ha [Nyatana Joint Management Trust (NJMT), 2011]. The entire game park is managed under consumptive and non consumptive ecotourism using CAMPFIRE principles with elephant trophy hunting as the main economic activity (NJMT, 2011). The paper primarily aimed to generate policy information regarding households` livelihoods adaptation strategies and policy targeting on enhancing the adaptation capacities of rural households who share boundaries with game parks.

## 2. Problem statement

Community managed game parks have been created on the assumption that possible ecotourism revenue may act as a livelihood source for surrounding communities capable of promoting wildlife conservation (Gadgil and Rao 1994, 1995; Muchapondwa, 2003; Fernandez *et al*. 2009). However, in practice, game parks seem to have failed to generate the necessary and sufficient revenue to address livelihood requirements for the ever-growing “livelihood-hungry” surrounding rural communities.

Several studies, therefore, question the practical potential of community game parks to address the livelihoods of their surrounding communities (Child, 1995, Patel, 1998 and Hasler, 1999). The current rampant elephant poaching (Wasser *et al*. 2010), under community managed game parks, and the invasion of game parks by surrounding communities may be clear warning signals of the failure of community managed game parks to act as a livelihood source.

Therefore, the need arises to evaluate the potential of game parks as community livelihood sources, the associated constraints and socio-economic correlates of livelihood adaptation choices for communities who share boundaries with community managed game parks.

## 3. Research objectives and hypotheses

The paper addressed the following research objectives;

1. to identify livelihood sources for communities that share boundaries with game parks,
2. to identify the barriers faced by households as they try to adapt to available non-farm livelihood sources and
3. to estimate the correlates of households` livelihoods adaptation choices.

The first objective was motivated by the need to evaluate the potential of game parks to provide a significant livelihood source for rural communities given the mixed conclusions that surround the potential of game parks as livelihood sources (Child, 1995; Patel, 1998; Hasler, 1999). The paper hypothesized that, game parks under the banner of the fauna portfolio are one of the major non-farm livelihood adaptation strategies for surrounding communities.

The motivation behind the second objective was centred on the assumption that the reluctance of rural households to adapt to several livelihood options, that may appear lucrative, may be due to constraints that make those livelihood sources risky in the minds of the local communities. Effectively, the paper hypothesized that, non-farm livelihood adaptation choices may be conditioned by institutional variables like property rights and markets.

Lastly, the paper estimated the socio-economic and institutional factors that may influence the adaptation choices of communities. This objective was motivated by the quest to understand the direction of association and significance of several socio-economic and institutional factors capable of “pushing” communities out of on-farm livelihood activities into non-farm choices. Household socio-economic variables, like household-head age, gender and education were therefore hypothesized to condition this possible transition.

## 4. Related Literature

Several studies of livelihoods sources, at the household level, broadly classify livelihood strategies as agricultural intensification, diversification and migration (Valentine 1993; Adams and He, 1995; Dercon and Krishnan, 1996; Barrett *et al.* 2001; Galab *et al.* 2002; Adugna, 2005; Berehanu, 2007). Diminutive attention is, however, given to the specifics of what comprises the non-farm activities and under which localities these are constituted. As a result, gaps still exist in literature with regard to the specific activities that comprise the non-farm activities at various household localities, their relative contribution and factors inhibiting their adoption.

Many studies also report the general influence of household and institutional factors towards the adaptation of livelihood strategies, ranging from gender, education to credit and extension (Bezemer and Lerman, 2002; Rao *et al.* 2004; Holden *et al.* 2004; Brown *et al.* 2006). More effort is, however, focused on econometric modelling with regard to the direction and significance of influence at the expense of soliciting for specific reasons, as reported by respondents.

More often than not, policy insights based on such approaches bear errors of commission and omission. Thus, this study targets the non-farm livelihood activities, as reported by households sharing boundaries with an operational community managed game park, with the implicit goal of understanding locality based livelihood adaptation strategies.

## 5. Methodology

The study was conducted in Mashonaland East and Central Provinces of Zimbabwe, specifically focusing on the three districts that surround Nyatana Game Park. Two hundred and forty households were randomly selected from a cluster of communities that share boundaries with Nyatana Game Park (UMP = 80 respondents; Mudzi = 80 respondents; Rushinga = 80 respondents). For purposes of understanding households` livelihoods adaptation strategies, stratified (based on districts) and randomly selected respondents from the three districts under “cluster A” were asked about their livelihood adaptation strategies using open-ended questions.

Accordingly, four livelihood adaptation categories were created, as detailed below. This paved the way for an analysis of the contribution made by each adaptation strategy. The created livelihood adaptation categories were further treated as the dependent variable in the multinomial logistic regression model. This was done to enhance the estimation of the manipulative and directional power of households and institutional factors that may influence households` adaptation choices.

### 5.1 Livelihood adaptation choices at household level

Ellis (2000) defined livelihood as comprising assets (natural, physical, human, financial and social capital), activities and access to these (mediated by institutions and social relations) that together determine the living gained by households. Chambers and Conway (1992) define livelihood as the capability, assets and activities required for a means of living. This study considers the latter, narrow definition of livelihood specifically looking at activities deemed critical for a means of living at the household level. Livelihood adaptation, according to Davies and Hossain (1997), may be defined as the continuous process of changes to livelihoods (assets and activities) which either enhance existing security and wealth or try to reduce vulnerability and poverty. With reference to the livelihood adaptation choices reported by residents from the selected wards, four categories were created, namely:

**(a)** **Mixed farming portfolio** representing an aggregate of choices undertaken to spread risk to include, (i) field crop production mainly small grains, (ii) horticulture, wetland, cultivation, and (iii) animal production mainly cattle, goats, sheep and poultry.

**(b) Mineral portfolio** summarising an aggregate of choices undertaken to spread risk to include, (i) small scale gold mining, (ii) gold panning that is abundant in the form of alluvial in most streams and rivers in the three districts, and (iii) any other mining activity.

**(c)** **Flora portfolio** representing an aggregate of choices considered to spread risk to include (i) collection of wild fruits, (ii) processing of wild fruits, (iii) collection of wild mushrooms, (iv) collection of wild edible leaf vegetables, (v) timber, (vi) collection of reeds and (vii) firewood.

**(d)** **Fauna portfolio** summarising an aggregate of choices considered critical for spreading risk to include, (i) community CAMPFIRE game proceeds, (ii) beekeeping (iii) hunting of small mammals, birds and reptiles, (iv) collection of caterpillars and termites, (v) fishing, and (vi) collection of bat droppings used as organic manure.

The mixed farming portfolio was treated as the base category in this study because crop and livestock production are the common household livelihood adaptation strategies in rural areas (Bradley and MacNamara, 1993; Ellis, 2000). This implies that almost every one considers this adaptation portfolio as a livelihood source although it is not secure. In this study, efforts were targeted at understanding the potential of households to consider other portfolio diversification strategies, specifically game farming (game parks) as defined by the fauna portfolio. It is against this background that the mixed farming portfolio was treated as the base, or reference category.

### 5.2 Econometric modelling

A decision regarding whether or not to choose any livelihood adaptation strategy was assumed, in this study, to fall under the general framework of utility and profit maximisation. Taking the case of a rational household, which seeks to maximise the present value of expected benefits of production over a specified time, and that must choose among a set of *j* livelihoodadaptation options, household *i* would rationally be expectedto use *j* livelihoodadaptation option if the perceived benefit from option *j* is greater than the utility from other options (say, *k*) depicted, as suggested by Gbetibouo, Hassan and Ringler (2010) in equation 3.1.

(3.1)

Where;

* U*ij* and U*ik* shall be the perceived utility by household *i*of livelihoods adaptation options *j*and *k* respectively
* X*i* shall be the vector of explanatory variables that influence the choice of adaptation option
* β*j* and β*k* shall be parameters to be estimated
* ε*j* and ε*k* shall be error terms

Based on the revealed preference assumption that the household practices an adaptation option that generates net benefits, and does not practice an adaptation option otherwise, the study relates the observable discrete choice of practice to the unobservable (latent) continuous net benefit variables as Y*ij* = 1 if U*ij*> 0 and Y*ij* = 0 if U*ij* < 0 (Gbetibouo, Hassan and Ringler*,* 2010).

Based on this formulation, *Y* shall be a dichotomous dependent variable, taking the value of 1, when the household, chooses an adaptation option in question and 0 otherwise. Effectively, the probability that household *i* will choose livelihood adaptation option *j* among the set of livelihood adaptation options shall be defined as follows (Gbetibouo, Hassan and Ringler*,* 2010);

P (Y = 1/X) = P(U*ij* > U*ik*/X)...................................................................... ............(3.2)

= P(

= P(

= P(β*\**X*i* + ε*\** > 0/X) = F(β*\**X*i*),

Where;

* ε\* shall be a random disturbance term
* β\* treated as a vector of unknown parameters that can be interpreted as the net influence of the vector of explanatory variables influencing adaptation
* F (β\*X*i*) shall be the cumulative distribution of ε\* evaluated at β\*X*i*.

With reference to utility measurement, O’ Sullivan, Sheffrin and Perez (2006) explain that it is difficult to measure utility directly; it is therefore assumed, in this study, that households make livelihood adaptation choices depending on the option that maximizes their utility. That is, subject to household socio-economic and institutional factors, decisions to choose the mineral, floral or fauna portfolios from the mixed farming portfolio signifies the direction which maximizes their utility. Based on this assumption, multinomial logistic regression was used to relate the decisions to adapt in mineral, flora or fauna portfolios from the mixed farming portfolio strategy and household socio-economic and institutional factors that influence these choices.

Following an approach used by Gbetibouo, Hassan and Ringler (2010), the probability that household *i* with characteristics *X* chooses livelihood adaptation portfolio option *J* is therefore specified as follows;

(3.3)

Where;

* β is the vector of parameters that satisfy ln(P*ij*/P*ik*) = X`(β*j* – β*k*).

Greene (2003) notes that to avoid bias and maintain consistent parameter estimates of the multinomial logistic model in equation 3.3, (given the true reality that a household can choose more than two adaptation strategies) the assumption of independence of irrelevant alternatives (IIA)[[1]](#footnote-1) must hold. By differentiating equation 3.3 with respect to each predictor variable, the marginal effects of these variables may also be estimated as shown in equation 3.4.

(3.4)

### 5.3 Model variables and hypothesis to be tested

Mixed farming portfolio was treated as the baseline group taking the value of 0, mineral portfolio 1, flora portfolio 2 and fauna portfolio 3. Explanatory variables were chosen based on data availability and inferred conclusions from other similar studies. Table 3.1 gives a summary of explanatory variables and their expected direction of influence on adaptation choices.

### Household characteristics

Barrett *et al.* (2001) note that education was one of the most important determinants of non-farm earnings, especially in more remunerative and skilled employment in rural Africa. Contrary to this, Galab *et al.* (2002) and Berehanu (2007) report a negative association between education and diversification into non-farm activities. Comparable conclusions were also inferred by Muchapondwa (2003) who notes that the more educated households become, the more unlikely they are to participate in non-farm activities like elephant management programmes. Either a positive or a negative association was therefore conjectured for this variable in this study.

With regard to age, Rao *et al.* (2004) observe a negative relationship between age and willingness to diversify into non-farm livelihood sources. Lack of agricultural land may be the pushing factor for young households which may opt to consider other livelihood sources. Depending on the nature of available non-farm activities, Vedeld *et al*. (2004) and Kohlin and Parks (2001) further argue that older people may lack the physical strength and time to engage in most non-farm, forest activities. A negative correlation was, therefore, expected for this variable.

Several studies suggest that female headed households may be less likely to participate in non-farm activities mainly because of culture, social mobility limitations and differential ownership/access to assets (Galab *et al.* 2002; Adugna, 2005). In contrast, literature also suggests that women in general may be more willing to participate in common pool property resources than men and may be more involved in gathering activities than men (Folbre, 1994; Grossman, 1996; Narain *et al*. 2005). With this background, either a positive or a negative influence was expected for this variable in the study.

With reference to the wealth status of households, Tembo, Bandyopadhyay and Pauy (2009) observe that rich and educated community members may be more likely to participate in community resource boards, lending support to the positive correlation between wealth status and participation in non-farm activities. Earlier, Adhikari (2005) has noted that household wealth endowment may be expected to influence benefits from forests directly, as productive wealth creates more opportunities for better-off households to use biomass resources. In addition, several studies suggest that wealthier households, with larger herds of cattle and more land, may have a greater need for animal fodder and agricultural compost (Varughese and Ostrom, 2001; Narain *et al*. 2005). A positive association was therefore conjectured for this variable in the study.

### Institutional and other factors

Samuel (2003) reports a positive association between frequency of extension services and diversification into non-farm activities. Similar earlier conclusions were inferred by Gaspert *et al*. (1999) who suggest that access to institutions may enhance awareness of the potential gains from forests. More recently, Adhikari (2005) further argues that access to institutions raise awareness on policy information that may directly affect forest communities. A positive association was, therefore, expected for this variable.

Recent observations suggest that communities` willingness to participate in non-farm actives may be based on the ability of exchanging resultant non-farm extracts in a competitive market for income generation (driven demand). The availability of markets for non-farm products may reduce risks and act as a livelihood source guarantee with respect to the specific non-farm livelihood source supported by the market, from a community point of view. Therefore, a positive link was expected for this variable.

Several studies reveal that the larger the land size, the less likely will owners be willing to diversify into other non-farm activities (Lanjouw and Lanjouw, 1995; Berehanu 2007), provided that owners are getting meaningful returns. On the contrary, several studies suggest a positive association based on the complementary nature of the farming system and forests (Fisher, 2004; Adhikari, 2005) notably agricultural compost (Varughese and Ostrom, 2001; Narain *et al*. 2005). Either a positive or a negative association was, therefore, conjectured for this variable.

Table 1 presents a summary of the variables expected to influence the adaptation choices of households. A brief description of each variable is given together with the unit of measurement and the expected sign.

**Table 1:** Variables hypothesised to affect adaptation choices of households

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Description and Measurement** | **Unit** | **Expected sign** |
| **Household characteristics** | | | |
| 1. Education | Level of education classified as follows; uneducated, educated to primary level; educated to secondary level and above | Uneducated = 0; educated to primary level = 1; educated to secondary level and above = 2 | -/+ |
| 1. Age | Age of household-head | Years | - |
| 1. Gender | Household head gender | 1 = male , 0 female | -/+ |
| 1. Wealth status | An index was constructed using household`s ownership of 6 agreed livelihoods strategic assets[[2]](#footnote-2). Those with a score < 3 were deem rural poor and those with a score > 3 deemed rural rich | 0 = Poor , 1 = rich | + |
| **Institutional factors** | | | |
| 1. Extension | Access to extension | 1 = yes, 0 = no | + |
| 1. Market | If markets exists for natural resources to be traded competitively | 1 = yes, 0 = no | + |
| **Other factors** | | | |
| 1. Land size | Estimate of size of farming area (≤ 2ha deemed small and > 2ha deemed large | 1 = small land size , 2 = large land size | -/+ |

## 6. Results and discussion

This sub-section presents study results initially based on descriptive findings and econometrics results latter. Table 2 provides the basic sample characteristics from the study area. A total of 240 respondents were considered for this study with a mean household-head age of 37 years. The asymmetry of distribution was both positively and negatively skewed, as shown in Table 2. Livelihood choices, education, age and extension were positively skewed, while gender, wealth status, market and land size were negatively skewed. Most of the characteristics had skewness values below 1, with the exception of gender and extension; this suggests that the distribution did not differ significantly from a normal symmetric distribution.

**Table 2:** Basic sample characteristics from the study area

| **Basic Sample Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Livelihood Choices | Education | Age | Gender | Wealth Status | Extension | Market | Land Size |
| N | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| 1. Mean | .87 | .85 | 37.10 | .78 | .53 | .28 | .69 | 1.60 |
| 1. Median | 1.00 | 1.00 | 31.00 | 1.00 | 1.00 | .00 | 1.00 | 2.00 |
| 1. Std. Deviation | .910 | .794 | 12.174 | .418 | .500 | .447 | .463 | .490 |
| 1. Skewness | .805 | .275 | .641 | -1.325 | -.101 | 1.014 | -.835 | -.429 |
| 1. Minimum | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 1 |
| 1. Maximum | 3 | 2 | 56 | 1 | 1 | 1 | 1 | 2 |

**Key: Livelihoods Choices:** 0 = mixed farming; 1 = mineral portfolio; 2 = flora portfolio; 3 = fauna portfolio

* For other variables coding is as described in Table 1

### 6.2 Livelihood adaptation choices

This section focuses on reported livelihood adaptation choices from the study area. Livelihood adaptation choices were investigated against a null hypothesis that fauna portfolio diversification provides a significant livelihood source for communities that share boundaries with game parks. Table 3 summaries the descriptive results of livelihood adaptation choices as reported by households who share boundaries with Nyatana Game Park.

Four major livelihood portfolio strategies (mixed farming, mineral, flora and fauna) were common in the three communal areas. The descriptive findings reveal that mixed farming was the dominant livelihood adaptation choice (42.1% share) for most of the households. Similar comparable observations were inferred by Carswell (2000) who notes that contributions made by off-farm livelihoods in rural areas, has often been neglected by policy makers who have chosen to concentrate on agriculture.

**Table 3:** Reported livelihood choices from the study area

| **Reported livelihood choices** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 1. Mixed Farming | 101 | 42.1 | 42.1 | 42.1 |
| 1. Mineral Portfolio | 86 | 35.8 | 35.8 | 77.9 |
| 1. Flora Portfolio | 37 | 15.4 | 15.4 | 93.3 |
| 1. Fauna Portfolio | 16 | 6.7 | 6.7 | 100.0 |
| **Total** | **240** | **100.0** | **100.0** |  |

In Latin America, several studies from Bolivia also observed that although there is a significant share of total household income from non-agricultural activities, agricultural production was still the most important source of income (Comisión Europea, 2000; Jimenez and Lizarraga 2003). Respondents noted the significant potential of livestock production complemented by grazing land from the game park although predation, conflict with Safari Operator and disease outbreak were some of the potential threats. Cropping activities were largely confined to small grains and groundnuts with minor contributions implying that livestock production was the dominant activity.

The mineral portfolio (gold panning) was the second best livelihood adaptation choice for most households after mixed farming, with 35.8% share. Respondents reported a lucrative potential of small scale mining activities although this was deemed illegal. The “pull” factors, according to the respondents, were the quick returns (quick cash), specifically for alluvial gold, and easy entry requirements. This was followed by the flora portfolio with a 15.4% share and, lastly, the fauna portfolio with a 6.7% share. The fauna portfolio was, to a large extent, defined by proceeds from the game park. Although all respondents were fully aware of the existence of the Nyatana Game Park, considering it as a livelihood adaptation choice was deemed risky and unreliable. Respondents labelled the game park as more of a pest than a livelihood source worth choosing.

Similar findings were inferred by Muchapondwa, Carlsson and Kohlin (2008) who noted that 62% of the households from the Mudzi rural area in Zimbabwe, adjacent to Nyatana Game Park, did not support elephant preservation but rather preferred their translocation. Fernandez *et al.* (2009) also noted that losses from crop damage by wildlife were a threat to some positive benefits from game parks. Based on these limited descriptive results, the study therefore rejects the null hypothesis.

### 6.3 Constraints to non-farm adaptation choices as reported by respondents

In this section, the paper tries to uncover potential constraints faced by households in trying to adapt to non-farm livelihood sources. More attention was given to the “Fauna Portfolio” that was hypothesized to provide a significant livelihood source. Several constraints were reported from the three communities, as shown in Table 4.

The last column gives the average percentage share of each constraint across all districts and portfolios. An insecure property rights system, typical of most non-farm activities, was cited as the major barrier across all possible non-farm livelihood adaptation choices. Regardless of how lucrative livelihood sources may appear, if not supported by tradable and secure rights, such sources are normally deemed risky and insecure according to the respondents. The security of livelihood sources may therefore mean a lot to rural communities for their day-to-day survival seems wholly dependent on such livelihoods.

Effectively, insecurity in livelihood sources may translate into insecurity in their day-to-day survival. In this regard, households may therefore be rational by holding on to mixed farming activities where rights are more secure, even though faced with more threats than non-farm activities full of lucrative potential, but with insecure property rights.

With reference to the Fauna Portfolio, 50%, 32% and 77% of the respondents from UMP, Mudzi and Rushinga respectively, reported elements of insecurity in game farming and several fauna extracts from the game park. These results suggest that the devolved user rights to communities under CAMPFIRE principles may be procedural but not substantive. Although Muchapondwa (2003) noted that, under CAMPFIRE, people living in Zimbabwe’s marginalized communal areas essentially claim the same right of proprietorship as private landholders, but through their RDC. These results suggest that the application of such “technical principles”[[3]](#footnote-3) at the grassroots level may be a challenge.

**Table 4:** Constraints to adaptation choices as reported by respondents

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Constraints** | **UMP** | | | **Mudzi** | | | **Rushinga** | | | **Average % share of constraints across all districts and portfolios** |
| **Fauna** | **Flora** | **Min** | **Fauna** | **Flora** | **Min** | **Fauna** | **Flora** | **Min** |
| **% of the respondents** | | | | | | | | |
| 1. No constraints | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 1 | **1.56** |
| 1. Restrictive policies | 0 | 60 | 74 | 0 | 54 | 78 | 0 | 56 | 78 | **44.44** |
| 1. Lack of knowledge | 10 | 35 | 17 | 5 | 20 | 74 | 7 | 56 | 82 | **34.00** |
| 1. Lack of credit to kick-start | 0 | 8 | 66 | 0 | 32 | 54 | 0 | 21 | 67 | **27.56** |
| 1. Lack of formal market | 0 | 45 | 90 | 0 | 77 | 85 | 0 | 89 | 100 | **54.00** |
| 1. Low returns | 86 | 11 | 8 | 75 | 23 | 13 | 98 | 14 | 13 | **37.89** |
| 1. Limited extractable area | 0 | 98 | 43 | 0 | 73 | 27 | 0 | 81 | 52 | **41.56** |
| 1. High risk | 0 | 2 | 80 | 0 | 8 | 98 | 0 | 17 | 100 | **33.89** |
| 1. Insecure property rights | 50 | 51 | 75 | 32 | 84 | 68 | 77 | 100 | 76 | **68.11** |
| 1. Lack of extension services | 30 | 44 | 60 | 11 | 69 | 56 | 20 | 73 | 80 | **49.22** |
| 1. Poor infrastructural support | 0 | 7 | 48 | 0 | 47 | 54 | 0 | 27 | 69 | **28.00** |
| 1. Other | 4 | 0 | 9 | 0 | 2 | 6 | 0 | 2 | 1 | **2.67** |
|  | | | | | | | | | | |
| **% share of constraints / portfolio** | **15.08** | **30.17** | **47.67** | **10.33** | **40.92** | **51.17** | **17.00** | **44.92** | **59.92** |  |
| 1. **Pooled average % share of constraints for the Fauna Portfolio = 14%** | | | | | | | | | | |
| 1. **Pooled average % share of constraints for the Flora Portfolio = 39%** | | | | | | | | | | |
| 1. **Pooled average % share of constraints of the Mineral Portfolio = 53%** | | | | | | | | | | |

**Key:** Min- mineral

Thus, in as much as a private landholder may use a land title deed to claim ownership, Child *et al.* (1997) argue that a villager on communal land only has statutory rights to use such resources as part of a local authority i.e. the RDC that has been granted Appropriate Authority (AA) status by the Department of National Parks and Wildlife Management. Full devolution of user rights may therefore enhance the non-farm livelihood adaptation choices of rural communities.

The lack of a formal market for most extractable game park natural resources was also cited as a second critical constraint by most respondents, with the exception of the Fauna Portfolio. Respondents noted the significant potential of the Flora Portfolio, specifically timber extracts (*Mopane* poles and fire wood) and forest edible products. Unfortunately, the available formal markets classify such products as illegal. From a legal perspective, the Zimbabwean Communal Lands and Forest Produce Act prohibits the commercial harvesting of all forest produce. The reported “missing markets” may therefore be a result of legal restrictions.

With respect to the mineral portfolio, the lack of formal markets was also cited as a critical barrier which inhibits local communities. For this portfolio, gold panning from surrounding streams and, to a greater extent, from inside the game park (Mazoe River) was the dominant activity reported from the three communities. In as much as those venturing in gold panning were comfortable with their illegal activities, for purposes of enjoying high “black market” prices and avoiding environmental mitigation measures, most aspiring respondents noted that they were deterred from such activities due to the lack of formal markets.

A lack of extension was also noted as a potential barrier across all portfolios. This development may not be surprising for the flora and mineral portfolio, mainly because of the current sectorial policy conflict. Extension officers teach the concept of domestic utilization of forest produce in line with procedures specified in the Communal Lands and Forest Produce Act. Contrary to this pure conservation approach, respondents suggested that due to their meagre livelihood sources, as a result of their location, the sustainable commercial harvesting of natural resources was their only hope. Unfortunately, no extension advice with respect to such approaches was available.

Restrictive policies were also cited as a potential barrier with respect to the flora and mineral portfolios. These findings suggest that the available environmental policies seem to be more skewed in favour of pure conservation, at the expense of actual utilisation with commercial components. The limited extractable area was also cited as a potential barrier; this suggests that the existing buffer zone may have, with time, become too small to accommodate an increasing number of surrounding communities.

The pooled percent share of constraints, per source of livelihood, suggests that the fauna portfolio may have the lowest constraints followed by the flora and, lastly, by the mineral portfolio, as shown in Table 4. Surprisingly, households were choosing other livelihood sources with higher constraint levels (mineral and flora) instead of the fauna portfolio with few barriers. This observation suggests that the few reported constraints for the fauna portfolio (low returns; insecure property rights) may be significant enough to deter respondents. Public policies that address issues of insecure property rights and meaningful returns may, therefore, go a long way towards unlocking non-farm livelihood sources for rural communities.

Based on the descriptive statistics presented here, low returns and insecure property rights may be some of the major barriers deterring surrounding communities from choosing game farming as a reliable and sustainable livelihood source. Results further suggest that the mineral portfolio may, therefore, be a potential livelihood source in this area. These findings further provide sufficient descriptive evidence to reject the null hypothesis that game parks provide a significant livelihood source for surrounding communities.

### 6.4 Determinants of non-farm livelihood adaptation choices - inferred econometrics results

This section presents the econometric results of correlates of non-farm livelihood choices for communities who share boundaries with Nyatana Game Park. The multinomial logistic regression results for determinants of non-farm livelihood adaptation choices are presented in Table 6. With reference to the proportion of variance in the dependent variable associated with the predictor variables, a pseudo R2 of 0.555 was obtained, as shown in Table 6; this suggests that more of the variation was explained by the model. The model fit, as summarised by the likelihood ratio test (LR) of the model (final) against one in which all the parameter coefficients are null (0), resulted in a significant Chi-Square (169.905: 0.000) suggesting that the final model outperformed the null.

The results, as presented in Table 6, suggest that gender, wealth status, market and age condition non-farm livelihood choices of households with reference to the mineral portfolio. Gender, extension and land size condition non-farm livelihood choices of households with reference to the flora portfolio. Access to formal markets also influences the non-farm livelihood choices of households with reference to the fauna portfolio.

With reference to age, the results (-0.090: 0.008) suggest that young households currently absorbed in mixed farming may be more willing to choose the mineral portfolio than older households. The high return – low investment and “quick cash” possible with gold panning may be its “pulling” factors, regardless of several constraints associated with the mineral portfolio for the young who are normally risk takers. The observed reluctance to choose mining as an option, by older households, may be due to the fact that older people may have less time and physical strength to engage in mining activities. In addition, older households may have more experience and accumulated high social capital capable of assisting them to survive under farming. Similar comparable conclusions were inferred by Kohlin and Parks (2001) and Vedeld *et al*., (2004) with reference to the willingness to participate in forest activities.

**Table 6:** Determinants of non-farm livelihood adaptation choices

|  |  |  |  |
| --- | --- | --- | --- |
| **Predictor Variables** | **Reported livelihoods adaptation choices** | | |
| **Mineral Portfolio** | **Flora Portfolio** | **Fauna Portfolio** |
|  | | | |
| 1. Education | -0.084  [0.855] | -0.183  [0.710] | -1.156  [0.162] |
| 1. Age | -0.090  [0.008]\*\* | 0.041  [0.255] | -0.046  [0.423] |
| 1. Gender | 2.217  [0.004]\*\* | -1.434  [0.034]\* | -0.910  [0.496] |
| 1. Wealth Status | 1.415  [0.002]\*\* | 0.070  [0.886] | 1.018  [0.233] |
| 1. Extension | 0.793  [0.318] | -2.059  [0.002]\*\* | -0.190  [0.894] |
| 1. Market | 1.572  [0.041]\* | 0.345  [0.502] | -2.718  [0.007]\*\* |
| 1. Land Size | 0.703  [0.128] | 1.429  [0.029]\* | 1.483  [0.137] |
| Intercept | -2.272  [0.146] | -3.515  [0.016]\* | -0.323  [0.894] |
|  | | | |
| 1. Base Category | Mixed farming | | |
| 1. No. of Observations | 240 | | |
| 1. LR chi-square (21) | 169.905\*\* | | |
| 1. Overall Classification % | 67.1 | | |
| 1. Pseudo R -Squared | 0.555 | | |
|  | | | |

**Notes:** \*\* and \* indicates significance at 0.01 and 0.05 probability level respectively; *p-value* in square brackets [].

Male-headed households may be more likely to choose the mineral portfolio diversification option as a livelihood adaptation strategy, while female-headed households may be more likely to opt for the flora portfolio. The observed positive association between gender and the mineral portfolio (2.217: 0.004) may be explained by the risky nature of mining activities, specifically gold panning, capable of technically excluding female headed households from participating. On the other hand, the observed negative association between gender and the flora portfolio (-1.434: 0.034) may be based on the fact that the collection of wild fruits, edible vegetables under the banner of the flora portfolio livelihood diversification is normally a female adaptation strategy (Folbre, 1994; Grossman, 1996; Narain *et al*. 2005).

The more wealth that households have, the greater their willingness to diversify into non-farm activities, in this case the mineral portfolio option (1.415: 0.002). A similar positive association between wealth status and the diversification into non-farm activities was noted by Adhikari (2005). Respondents labelled mining as one of the potential rural livelihood sources from the study area, with meaningful returns (although very risk). Though the analysis could not confirm causality between the two variables, inferential results suggest that risk takers (miners, male and young households) comprised of the rich group from the study area. Removing the current constraints associated with mining activities and formalising its operations, supported by markets that recognise small scale gold panners, may address poverty in the study area.

The model results suggest that access to extension may negatively influence the probability of choosing the flora portfolio (-2.059: 0.002). These results contradict previous studies which suggest a positive association (Gaspert *et al*. 1999; Samuel, 2003; Adhikari, 2005). Current extension services offered in Zimbabwe promote the sustainable harvesting of natural resources for domestic use, in line with the available laws (Communal Lands and Forestry Produce Act; Environmental Management Act).

In contrast, local communities were commercialising forestry produce to enhance their livelihoods. The choice of considering the flora portfolio from a community point of view may, therefore, be based on the ability to commercialise forestry products - specifically timber and firewood. Unfortunately, such activities are not currently supported by available laws and extension services in Zimbabwe. The observed negative association between extension and the flora portfolio may suggest a conflict of interest between extension and communities, the former targeting sustainable domestic use of forestry produce while the latter targets the sustainable commercialisation of forest harvests.

As expected, access to markets increased the likelihood of choosing the mineral portfolio adaptation option (1.572: 0.041). In as much as current miners were comfortable with the illegal nature of gold panning for personal benefits, the majority of aspiring miners cited the lack of a formal market for gold panning as a crucial barrier which deters them from choosing such activities. Policies which create formalised markets for small scale miners may have multiple effects. Firstly these could include, improved livelihoods for more communal households in areas rich with minerals, and secondly, environmental conservation through the internalisation of negative externalities as small scale miners will be forced to pay for social costs (polluter pays principle) under formalised mining.

With reference to the fauna portfolio, the results suggest a decrease in the likelihood of choosing this option with increased access to markets (-2.718: 0.007). Though surprising, respondents argue that better access to markets for game animals would mean more elephants in the park and effectively more Problem Animal (PA) conflicts. These findings suggest that the surrounding communities were facing more problems from the game park than available benefits. Similar conclusions were also inferred by Muchapondawa (2003) who used household data from one community that shares boundaries with the same game park – Mudzi communal area.

Finally, the results suggest a positive likelihood of choosing the flora portfolio with respect to increase in land size (1.429: 0.029). Respondents noted that they were getting a lot of manure from the game park for their fields. These findings suggest that forests may be seen as important sources of intermediate products that serve as input in the farming system (Fisher, 2004; Adhikari, 2005). Effectively, the promotion of easy and secure access to game park floral activities may positively influence the development of household agriculture.

## 7. Conclusions and policy implications

The study concludes that mixed farming still remains the dominant livelihood adaptation strategy for communities who share boundaries with game parks in rural areas. Available non-farm livelihood adaptation sources (mineral, flora and fauna portfolios) potentially face several constraints (insecure property rights and low returns) that deter surrounding communities from participating, thereby forcing them to remain locked up in mixed farming. The possible transition from mixed farming to non-farm livelihood sources, by households who share boundaries with game parks, is however conditioned by several household socio-economic (age, gender and wealth status) and institutional (extension, market and land size) factors.

Strategies to unlock the total economic value hidden in game parks for the direct benefit of surrounding communities may therefore be the missing critical policy intervention; if households who share boundaries with wildlife reserves are ever to consider the fauna portfolio, as a non-farm livelihood adaptation option. The following approaches may boost the total economic value of game parks to surrounding communities;

* promotion of both consumptive and non consumptive ecotourism,
* devolution of user rights from RDC to producer wildlife communities and
* legalising the commercial trade of buffer zone extracts from CAMPFIRE districts using the quota and branding systems.

Strategies to lower the associated social costs of having game parks may be equally important to surrounding households. This implies a reduction in the human-wildlife conflict so that the accrued benefits remain higher to attract the willingness of households to consider the fauna portfolio as a reliable and sustainable livelihood adaptation option. The following approaches may reduce social cost of having game parks to surrounding communities;

* adopting biological bee fence as suggested by King (2010) to deter elephants from evading fields of surrounding communities
* internalisation of social costs (negative externalities) by safari operators

An insecure property rights regime for game farming was also cited as one of the possible constraints inhibiting surrounding communities from considering game farming as a livelihood source. The following approach may enhance secure property rights to producer communities;

* full devolution of user rights to local communities, from the current statutory rights to use natural resources as part of a local authority.

The current status quo of game parks in relation to surrounding communities (insecure property rights, low and unreliable revenue amidst high social costs) may provide no incentive for communities to consider them as a livelihood adaptation option. In essence, there is high incentive to destroy game parks because they interfere with other sustainable livelihood sources which are critical for the survival of communities (crop damage and livestock predation).

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1. The IIA assumption requires that the likelihood of a household using a certain adaptation strategy needs to be independent of alternative adaptation strategies used by the same household. Thus, the IIA assumption implies independent and homoscedastic disturbance terms of the adaptation model in Equation (1) (Gbetibouo, Hassan and Ringler, 2010). [↑](#footnote-ref-1)
2. Kabubo-Mariara (2008) notes that a more permanent measure of classifying rural communities into either rich or poor may be one that takes into account more permanent measures of wealth such as land holding, livestock units and other fixed assets. It is against this background that this study used the following six livelihood strategic assets as suggested by local communities from the study area: (a) Land holding, (b) Total livestock units, (c) Farm capital inputs, (d) Household assets (e) Quality of dwelling (f) Household-head`s education [↑](#footnote-ref-2)
3. Claiming the right of proprietorship as private landholders, through their Rural District Councils [↑](#footnote-ref-3)