The Buffer Zone Livelihood Link under Community Managed Game Parks: Evidence from Nyatana Game Park, Zimbabwe

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Abstract. Buffer zones prominently feature and have been recommended in areas where wildlife share boundaries with communities as potential secondary livelihood sources. Regrettably, instead of being beneficiaries of natural biodiversity local communities have become victims. Using cross-sectional survey data from communities surrounding Nyatana Game Park, Zimbabwe this paper estimates dependence and correlates of buffer zone resource extractions. The paper concludes that local communities depend on buffer zones for wild foods, fire wood and construction material and their harvesting is conditioned by several socioeconomic and institutional factors. Evidence drawn from this study suggests a significant role of wild foods in complementing rural household food security worth targeting. Of interest also from a policy realm is the influence of market and extension on natural resources harvesting worth addressing to enhance smooth operation of the buffer zone livelihood link.

Keywords: Buffer zone livelihood link, nature conservation.

1. Introduction

Buffer zones have been in existence for a long time, especially where wildlife share boundaries with local communities [1]. Geographically buffer zones might be defined entirely inside or outside of, or as overlapping with, the original boundary of the protected area [2]. The legal and effectively the official management authority over buffer zones might therefore rest entirely with the protected area managers, local communities or it might be shared between different stakeholders [2]. Institutional support structures that created buffer zones had in mind the use of buffer zone products to supplement domestic requirements for the surrounding community, thereby sustainably combining conservation and development [3]-[4]. With reference to community managed Game Parks, the revenue from Game Parks was assumed to be the main livelihood source of the surrounding community, while buffer zone products and on-farm activities would be used as supplements.

In this regard, the buffer zone livelihood link gained popularity and is currently an agreed sustainable pathway followed by several wildlife practitioners. Sadly, in practice literature suggest that local communities that share boundaries with Game Parks rarely benefit from them, but rather are victims of human wildlife conflict, livestock predation, evictions, illegal imprisonment and even genocide [1],[5]-[10]. Given that background and available alternative livelihoods sources in such areas, buffer zone dependence still remains an important livelihood option for the surrounding community. Thus far, poorly designed buffer zones and total restriction to access by local communities, may seriously affect the welfare of the surrounding community. With that background, this paper investigates resources harvested from buffer zones by local communities and correlates of buffer zone resource extraction.

2. Problem Statement

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Buffer zones for the purpose of promoting conservation and development have, since 1968, been introduced specifically where conserved regions meet with human populations as a substitute for the local people`s use of protected resources [1], [3], [4]. However, in practice, people situated in or near biologically-diverse ecosystems often capture little economic benefits from conservation or sustainable resource use seriously compromising the conservation premise [11]. Sadly, literature also acknowledge that, to bolster support for biodiversity conservation, it is critical to produce a more nuanced approach to the interaction between protected areas and local communities for most protected areas have been responsible for diminishing the livelihood prospects of people sharing boundaries with them [12]. With that background, previous studies argue that, "left largely unexplained, however, are the benefits that protected areas may provide for these same people" [12 pg 3]. Thus far, there is need to investigate the much claimed potential of the buffer zone livelihood link [1]-[3] against a background on which several authors cushion its practical significance [11], [13]-[18].

2.1. Objectives

(a) To investigate buffer zone products harvested by local communities

(b) To investigate determinants of buffer zone resource extractions.

3. Literature Review

There is a growing body of literature on reconciling economic development and biodiversity conservation in developing countries, for it is widely recognized that protected areas affect the livelihoods of local people [1], [11], [19]-[21]. Furthermore, there is a growing body of literature which attempts to calculate the economic value of protected areas and the costs and benefits incurred by people living in the vicinity of such areas [8], [22]-[24]. Previous literature suggests that there are an increasing number of demonstration projects with the objective of linking biodiversity conservation with improvements in human welfare [25]. Such projects have largely been based on land use strategies, including biosphere reserves, multiple-use conservation areas, buffer zones on protected area boundaries, extractive reserves, social forestry and a variety of other approaches [11].

More recent studies have, however, focused on the buffer zone-livelihood link [2], [12], [26]- -[28]. A two way link between buffer zones and poverty is suggested; where, on the one hand, the literature argues that the poor depend on buffer zones (forests) as safety nets and, on the other, it states that forest communities are poor due to a reliance on forest activities which have a low return [26]. Other studies suggest that both the poor and rich depend on forests, only that the level of dependence is determined by differential socio-economic characteristics of the two groups [28], [29].

4. Methodology

The data used in this study was collected from a sample of 289 households purposively selected from three districts (UMP, Mudzi and Rushinga) that surrounds Nyatana Game Park in Zimbabwe. The study estimated correlates of buffer zone resource extraction following the utility maximization assumption that participation in resource extraction may mean dependence and effectively relative importance. Econometrically, the study estimated the correlates of buffer zone resource extraction combinations as reported from the study area. The first four buffer zone resource extraction combinations from a total of seven were suggested as common by the majority of the respondents and therefore were used as the dependent variables. These are summarized as follows;

- Wild foods and fire wood combination represent an aggregate of combinations to include (i) fire wood for both domestic use and resale, and (ii) wild foods collection to include both flora and fauna species.
- Wild foods and construction combination represent an aggregate of combinations to include (i) wild foods collection to include both flora and fauna species and (ii) construction poles, thatching grass and reeds.
- Fire wood and construction combination represent an aggregate of combinations to include (i) fire wood for both domestic and commercial use and (ii) construction poles, thatching grass and reeds.

- All extractions combination represents an aggregate of all the combinations at once
- Fire wood only represents fire wood for both domestic use and resale.
- Construction only represents construction poles, thatching grass and reeds.
- Wild foods only represents wild foods collection to include both flora and fauna species.

The last three were not common; hence we excluded them from the models and focused on the first four. Considering the main four combinations, four binary logistic regression equations were formulated to assess the correlates of each combination. Based on this formulation, *Y* was assumed to be a dichotomous dependent variable, taking the value of 1, when the household chooses a combination in question and 0 otherwise. The binary logistic regression model, as specified in equations 1, following an approach by [30], was used to relate socio-economic and institutional variables to buffer zone resource extraction combinations made by *i*th household.

$$ln \frac{\left(P\left(Y=\frac{1}{X}\right)\right)}{\left(1-P\left(Y=\frac{1}{X}\right)\right)} = \alpha + \beta_1 X_1 + ... + \beta_n X_n ....1$$

Where; P = the predicted probability of participation in buffer zone resource extraction say combination (a) "wild foods and fire wood combination" , 1 – P = the predicted probability of non participation in buffer zone resource extraction combination (a), α = the constant of the equation, β = the coefficient of predictor variables, X = the predictor variables.
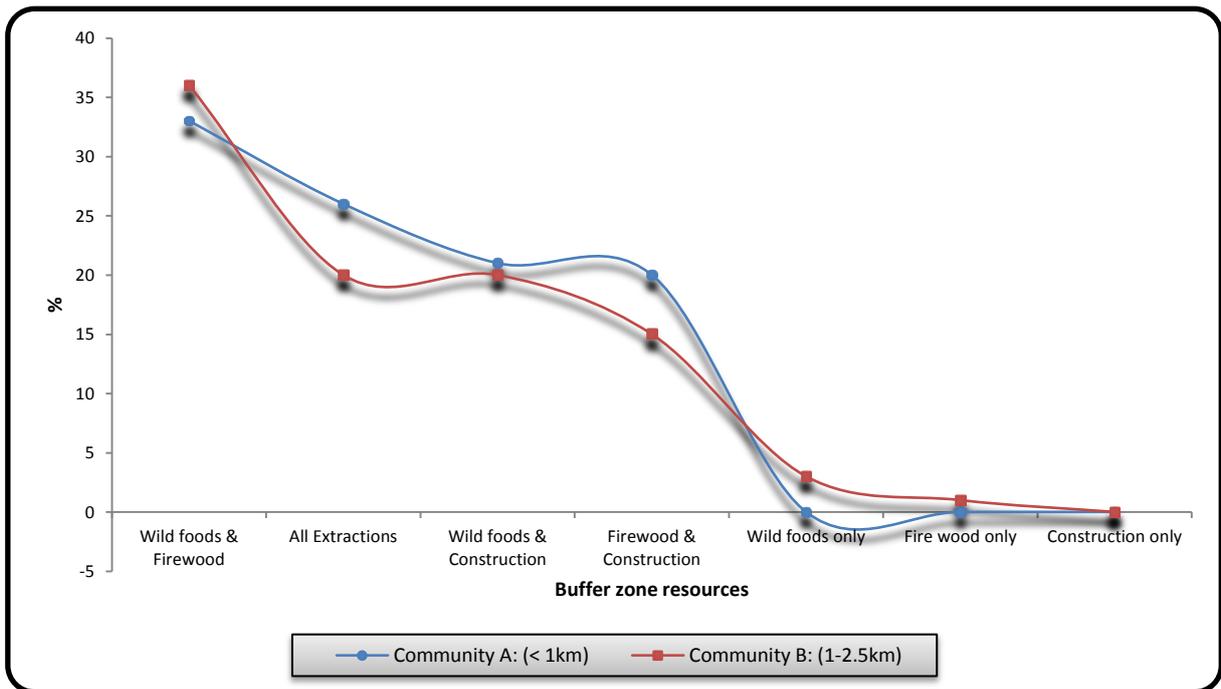

Fig. 1: Reported buffer zone resource extraction combinations

5. Results and Discussion

This section presents research findings on buffer zone products extracted by local communities and factors that condition their extraction.

5.1. Buffer zone products extracted by local communities

Results as presented in Fig. 1 indicate that respondents preferred combinations more than individual products harvesting. These findings suggest high dependence and relative importance of buffer zone to local communities. Wild foods and firewood were the dominant product combination targeted by locals followed by all extractions, wild foods and construction and firewood and construction. The dominance of wild foods

in several targeted product combinations further reinforce the importance of buffer zone in providing food sources to locals. Communities closer to the Game Parks (< 1km) dominated in combinations harvesting while communities residing beyond 1km were targeting individual buffer zone products. This may be as a result of access challenges as suggested by respondents.

5.2. Correlates of buffer zone resource extraction

For the purpose of complementing the descriptive results presented in the previous section, several regression analyses were conducted on the reported buffer zone resource extraction combinations as summarized in Table 1. With regards to the model fit, the Lemeshow Goodness-of-Fit test statistics for the overall fit of the models showed that the explanatory variables were jointly significant in explaining each of the dependent variables at an acceptable level. The following *Nagelkerke* R^2 were obtained 0.60, 0.68, 0.79 and 0.73, thus indicating that more of the variation was explained by the models with overall prediction percentages of 84.8%, 90.0%, 91.0% and 91.7%, respectively.

Results confirm a positive association between household size and participation in all buffer zone extraction. The results therefore suggest that household size seems to matter in as far as buffer zone resource extraction is concerned. The labour intensive and time allocation nature of buffer zone resource extraction activities, as acknowledged by [31], under forest conditions may explain why a larger household size may be more willing to pursue various resource extraction combinations.

Household gender was positively and significantly correlated with wild foods and fire wood resource extraction, but did not seem to matter much for the other resource extraction combinations. Previous studies associate the gathering nature of common pool resources with femininity [29] contrary to our findings. Respondents from the study area argue that, while females dominated the sphere of fire wood collection for domestic use, males dominated that of fire wood collection for sale. In addition, the collection of wild foods was dominated by fishing, the gathering of edible fruits and honey collection which was considered to be a male domain, within the bounds of the study area. Age was negatively related to all buffer zone resource extraction combinations implying that the resource extraction may be an activity for younger households. These results support previous literature which suggests that older households may have less time and physical strength to engage in forestry activities [32].

The total Livestock Units (LUs) owned did not seem to be an important predictor variable of buffer zone resource extraction for the firewood and construction combination. However, the amount of livestock owned had a positive significant effect on wild foods and construction, wild foods and fire wood and the all extraction combination. Similar comparable findings were earlier on suggested in literature attributing the association to supplementary fodder requirements for livestock [26]-[33]. Thus far, in the process of heading livestock in buffer zones cattle headers reported opportunities for wild food, firewood and construction material collection.

Table 1: Correlates of buffer zone resource extraction

Predictor Variables		Reported buffer zone resource extraction combinations			
		All Extractions	Wild foods & Firewood	Wild foods & Construction	Firewood & Construction
Constant	β_0	-5.057	-8.860	-6.498	-4.376
		[.031]	[.001]	[.003]	[.028]
1. Household size	β_1	.230	.409	.303	.305
		[.026]*	[.000]**	[.002]**	[.001]**
2. Household head gender	β_2	.242	1.361	.439	-.290
		[.577]	[.003]**	[.276]	[.443]

3. Household head age	β_3	-.029 [.019]*	-.037 [.008]**	-.035 [.004]**	-.027 [.009]**
4. Household head education	β_4	.392 [.056]	.416 [.068]	.315 [.098]	.289 [.098]
5. Access to wetland garden	β_5	.159 [.717]	-.406 [.397]	-.414 [.316]	-.487 [.192]
6. Arable land size	β_6	.310 [.387]	.497 [.247]	.477 [.173]	.478 [.145]
7. Livestock Units	β_7	.974 [.004]**	1.100 [.003]**	1.166 [.000]**	.295 [.310]
8. Access to extension	β_8	-1.100 [.000]**	-.744 [.021]*	-.650 [.019]*	-.674 [.010]*
9. Wealth status	β_9	.549 [.289]	.786 [.170]	.644 [.191]	1.266 [.005]**
10. Access to markets	β_{10}	.945 [.006]**	1.694 [.000]**	.823 [.009]**	1.467 [.000]**
11. Distance to buffer zone	β_{11}	.716 [.064]	.248 [.520]	.622 [.077]	-.427 [.158]
a) Chi-Square (df = 11)		21.743	6.323	31.735	8.871
b) (-2)Log Likelihood		172.525	140.267	191.775	225.030
c) Accuracy of prediction; Overall (%)		91.7	91.0	90.0	84.8
d) Nagelkerke R^2		0.73	0.79	0.68	0.60

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

Extension was negatively associated with all resource extraction combinations. Actual resource extraction was dominated by the cutting of firewood for sale, the cutting of *Mopane* construction poles for sale, and the bulk collection of wild foods for sale. All these activities are deemed illegal according to the Zimbabwe Communal Lands and Forestry Produce Act (CLFPA), which is used by extension officers. In light of this, the negative association between extension and resource extraction points to conflicts in policies where, on the one hand, the available natural resource regulations currently being used by extension officers (CLFPA) holistically restrict the commercial harvesting and resale of natural resources. On the other hand, the Appropriate Authority (AA) status conferred to local communities by the Parks and Wildlife Management Act (PWMA) under CAMPFIRE principles empowers local communities to commercially benefit from their natural resources.

Wealth status did not seem to be a significant predictor for all other buffer zone resource extraction combinations, with the exception of the firewood and construction combination. Firewood for sale was reported to be a lucrative economic business, especially for wealthy households who could transport firewood in bulk for resale in nearby Growth Points (GPs). Access to markets was positively and significantly associated with all resource extraction combinations. The results therefore suggest that buffer zone resource extraction may be a more market driven activity, rather than a local consumption activity. That is, as households collect firewood and construction timber resources from the buffer zone their primary aim may be to resell these products for financial gain. In addition, as households collect wild foods from the buffer zone, the results suggest that their primary objective may be to resell them for financial benefits.

6. Conclusions

The paper concludes that local communities depend on buffer zone for wild foods, fire wood and construction material. With reference to correlates of resource extraction, the paper concludes that the following factors condition buffer zone resources harvesting: household size, household-head gender, household-head age, access to extension, number of livestock units, wealth status and access to markets.

7. Policy Insights

- The observed dependence by local communities on wild foods may suggest relative importance of buffer zone products as food security safety nets worth understanding (from a research, investment and policy point of view) their potential role towards addressing rural household food security.
- The extension conflict revealed in this paper may signal a policy conflict that requires harmonisation.
- Market influence, as suggested in this paper, may point to the fact that buffer zone resource extraction is currently more market driven than local and personal consumption.

Three challenges emerge as follows;

- Firstly, buffer zone extractions were created in view of local non-commercial consumption by surrounding communities in order to supplement their livelihoods.
- Secondly, legal and formal markets for buffer zone products are currently absent for their initial creation (buffer zones) was never meant to accommodate commercial harvesting, but was meant to foster local consumption.
- Thirdly, overexploitation may be an explicit possibility given the high market demand which is capable of creating further buffer zone boundary conflicts as surrounding communities requires a larger area to extract marketable natural resources. Moreover, residences that are distant from other wards and, possibly, other districts may scramble for sellable buffer zone resources.

The paper, therefore, calls for extreme caution whenever the buffer zone livelihood link is considered as a possible livelihood source under community managed Game Parks. This is because of several institutional design conflicts that may require harmonization to accommodate the emerging market driven resource harvesting without creating pressure on renewal buffer zone natural resources whose marginal productivity rate is very low.

8. Acknowledgements

9. References

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