

Assessment of Community-based Natural Resource Management in the Savannas Using the Capacity Continuum - Multiple Drivers Model

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ABSTRACT In southern Africa, despite the enormous development effort and attention that Community-based Natural Resource Management (CBNRM) has received there has been an increase in disillusionment with this approach due to its lack of conceptual rigour. In recent years CBNRM has received increasing criticism, with some scholars calling for its complete abandonment. This study employs a new conceptual model, the Capacity Continuum – Multiple Drivers (CCMD) model, to assess the conditions that are required for CBNRM to succeed at the local level. Interviews and a questionnaire survey were conducted at household level to determine the conditions which regulate the livelihood related choices and decisions among forest and woodland resource users. The results reveal that apart from institutional arrangements the success of CBNRM depends on the level of social utility, relative to individual utility. This revelation is important for designing CBNRM projects. The study concludes that instead of abandoning CBNRM as a resource management strategy, as suggested by some scholars, what is needed is a sound conceptual framework that helps to reshape the community's capacity continuum to enhance cooperation and foster a strong sense of community while simultaneously stifling resource use competition and social dissonance within the community.

INTRODUCTION

CBNRM has received considerable policy development and research attention in recent times (Christofferson et al. 1998; Getz et al. 1999) and its research methodologies have gained scholarly recognition and prominence in natural resource management thinking and practice (Lee 2002). CBNRM is a participatory approach to environmental resource management. The terms that are commonly used to describe participatory approaches are collaboration, co-operative, community and co-management, all of which are “employed to convey participatory sentiment and sharing of power” (Plummer and Fennell 2007: 944). These approaches increase participation by civil society in decision-making and

promote the sharing of rights and responsibilities in natural resource management (Plummer and Gibbon 2004). The prominence of CBNRM has resulted from sustained interest in participatory forms of natural resource management (Plummer and Fennell 2007). In southern Africa CBNRM “has absorbed an enormous amount of development effort and analytical attention” (Turner 2004: 7). Yet, CBNRM is increasingly criticized for its disappointing results (Emerton 2001; Rozenmeijer 2003; Duffy 2000; Hughes 2006; Igoe and Croucher 2007; Igoe and Fortwangler 2007), with some scholars demanding a new level of conceptual rigour in natural resource conservation (see for instance, Hamilton-Smith 2000). The disillusionment with CBNRM stems from the community's capacity for natural resource management that has not been built to the necessary level (Turner 2004), and the little attention that has been given to the economics of what CBNRM advocates, as well as its lack of a sound theoretical framework (Fabricius et al. 2004). Fabricius (2004: 20) notes:

There is also a growing realization that the theoretical foundations of CBNRM are on shaky ground: our predictive understanding

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of the relationship between people and natural resources is weak, as is our understanding of the factors that shape the outcome of this relationship.

This paper argues that the success of CBNRM initiatives could be enhanced by providing a conceptual framework within which it can be better understood. This realization has already prompted a number of academic initiatives in recent years. Examples of these initiatives include the development of the concept of scaling, where the success of CBNRM is supposedly achieved through the harmonization of the top-down and bottom-up approaches to resource governance (Murphree 2000), the Multi-Dimensional Model of Co-operative Management in Natural Resources (Plummer and FitzGibbon 2004), the Demand-Driven Model of Decentralised Land-use Planning and Natural Resource Management (Mandondo and Kozanayi 2006) the Capability Theory of CBNRM (Ogbaharya 2006) and Reciprocal Altruism Theory (Plummer and Fennell 2007). The researchers briefly discuss these initiatives here. The Multi-Dimensional Model of Co-operative Management consists of three key dimensions.

The first dimension reflects the extent power is shared among the actors and agencies involved in the agreement. The second dimension delineates who is involved in the management regime. Process, the third dimension, reflects the variety of ways in which co-management may function or proceed. The present model highlights dimensions requiring attention by those working within co-operative environmental management. The model is valuable as it reflects the complexity and range of such arrangements in practice (Plummer and FitzGibbon 2004: 63).

The Demand-Driven Model of Decentralized Land-use Planning and Natural Resource Management is based on the notion that decentralization is likely to result in empowerment if it is demand-driven, thus bestowing bundles of entrustments to local bodies and communities which are transferred from the state. "Such entrustments include regulatory and executive powers, responsibility and authority in decision-making, institutional infrastructure and assets, and administrative capacity" (Mandondo and Kozanayi 2006: 106). This model suggests that CBNRM will succeed only when power is devolved from the state to the local level where

decision-making will be wholly independent of central government. "Demand-driven empowerment stands a better chance of being based on people's felt needs and priorities than top-down and supply-led modes of empowerment" (Mandondo and Kozanayi 2006: 119).

The Capability Theory can be traced to Amartya Sen. It was originally advanced to express criteria that can be used to assess quality of life. Ogbaharya (2006:6) adapted the Capability Theory to CBNRM and presented it as a normative approach "that seeks to enhance social welfare by expanding the freedoms and capabilities of individuals and groups to voluntarily engage" in natural resource conservation. The theory focuses on social arrangements such as policies, institutions and programmes that undermine human freedom and expand human capabilities. The Capability Theory takes into account, and promotes not only the traditional material goals of development, but also the non-material goals of individuals and communities, and emphasizes the importance of people's agency and participation in development (Robino 2005). In this approach CBNRM (like in the original capabilities approach) is rights-based rather than a resource-based approach to communal welfare and advocates the transfer of rights to resources from central governments to local communities, thus enabling and empowering local communities to gain better resource use and access entitlements (Ogbaharya 2006). The Reciprocal Altruism Theory is a sociobiological theory (Plummer and Fennell 2007). The theory argues that individuals are only willing to participate in co-management if they perceive return benefits. It is this reciprocity that encourages people to co-operate with others in CBNRM. Thus reciprocity in CBNRM would be considered as the basis for symbiosis between individuals.

The above theories have contributed enormously to our understanding of the relationship between people and environmental resources. We, however, argue that our understanding of how CBNRM works can be augmented if the weaknesses of these theories are addressed. Despite these initiatives CBNRM has remained hamstrung by the afore-stated weaknesses. One critical aspect. There are two major weaknesses that limit the usefulness of these theories. One of these weaknesses is that the role of individuals within the community is not given sufficient

prominence, yet in reality the actual decisions that affect the co-management of natural resources are made by individuals, in line with the needs of their households. It is often erroneously assumed that people in the community are willing to be easily mobilized to come together and participate in CBNRM initiatives. The second weakness that is inherent in existing CBNRM theories is that they either implicitly assume that the state of the environment remains the same or ignore the influence of environmental change altogether. In reality the environment is a dynamic entity in which the level of access to natural resources can be regulated by biophysical, socio-economic and political processes. These processes, which are discussed in the next section of the paper, are the drivers that determine people's willingness or unwillingness to participate in CBNRM. They shape human behavior as well as people's role in co-management. Thus, in their current state, existing CBNRM theories are unable to enhance "our predictive understanding of the relationship between people and natural resources" Fabricius (2004: 20). Furthermore, the above CBNRM theories do not explain what happens to CBNRM when the levels of resource supply change due to changes in environmental conditions, such as drought, overuse or due to other factors. Under these circumstances it could therefore be argued that though important, decentralization and devolution are not a sufficient condition for successful implementation of CBNRM. Similarly, empowering local communities by extending entrustments and entitlements to them (Mandondo and Kozanayi 2006) or expanding freedoms to communities (Ogbaharya 2006) or enhancing reciprocal altruism (Plummer and Fennell 2007) do not by themselves lead to successful CBNRM. While power sharing mechanisms regulate how power is brokered among actors and agencies (Plummer and FitzGibbon 2004), its influence on CBNRM is only exercised through the willingness of individuals to participate in co-management, relative to the influence of prevailing biophysical, socio-economic and political processes, that is, the drivers. Finally, the researchers argue that if the attributes of human behaviour that have an influence on CBNRM can be identified and predicted, the weaknesses noted above can be lessened because it will be easier to predict conditions under which CBNRM is likely to succeed. This takes us to the question: What kind of

CBNRM model would enhance our predictive understanding of the relationship between people and natural resources? Plummer and Fennell (2007) developed a typology of CBNRM theories. The typology comprises four categories of CBNRM schemes. The first category consists of modeling schemes, referring to diagrammatic representations of phenomena. The second category comprises propositional schemes. Basically, these emphasize the relationship between variables. The common pool resources theories that were advanced in the 1960s are an example of these schemes. The third category of CBNRM theories are analytical or sensitizing schemes, which Plummer and Fennell (2007: 947) refer to as "locally assembled congeries of concepts intended to sensitize and orient researchers and theories to certain critical approaches." Examples of these schemes are models of co-management in conservation ecology, which are generally intended to be flexible, dynamic and responsive to social learning. The fourth category of CBNRM theories are meta-theoretical schemes. These place emphasis on the assumption that underlie co-management, namely cooperation. Socio-biological theories, including the theory of reciprocal altruism that we discussed earlier belong to meta-theoretical schemes. In order to have a predictive power a CBNRM theory should not only reflect the above schemes but it must also incorporate human response to environmental change.

Based on a novel conceptual model, namely the CCMD model, this study examines how people make choices and decisions about conserving resources for the benefit of their communities in relation to the choices and decisions they make for individual benefit. The model rests on the principle that there is a matrix of choices that resource users need to make in relation to the diversity of physical and social factors that confront them (Mukwada 2009). The study argues that even though the choices that people make about resource use and conservation are not free, but driven by conditions that prevail in the environment in which they live, the choices are neither random nor unordered, but predictable. The study takes a multidisciplinary approach and is based on a fusion of qualitative and quantitative methodologies that were adapted from psycho-social schools of thought, economics, ecology and Sustainable Livelihood Approaches (SLAs). The study follows a deductive ap-

proach in which the CCMD model is proposed and tested using a case study, and conclusions and recommendations drawn from the results. Thus the CCMD model is not a generic derivation of an inductive process emerging from a case study. The aim of the study is to provide a conceptual framework within which generalizations can be drawn regarding collective capacity (that is, the community capacity, according to Turner 2004) to implement CBNRM.

In line with this aim the paper's objectives are to determine how:

- ♦ changes in demand for environmental resources influence CBNRM as well as spatiotemporal variations in resource availability.
- ♦ resource demand, utility and environmental drivers shape the choices and decisions of resource users regarding the implementation of CBNRM, leading either to its success or failure.

The remainder of this paper comprises four main parts. The first part describes the CCMD model. The second and third parts deal with the methodology and the results of the study, respectively. The last part discusses the major findings of the study and concludes the paper.

Description of the CCMD Model

The CCMD is a conceptual model that examines how collective responsibility varies through space and time to create different opportunities for CBNRM. Collective responsibility defines the capacity of the community to take voluntary collective action to conserve resources (an expression of willingness to participate in CBNRM) and is the main determinant of CBNRM. This view has gained currency and is in line with the notion that responsibilities for allocating and using resources are shared among multiple parties (Plummer and Armitage 2006). The model draws from the research that has been conducted in fields of psycho-social disciplines, economics, ecology and SLAs. In its basic form the CCMD model states that $C = f(U + D + E_{dr})$, where,

- C = level of collective capacity to implement CBNRM,
- f = function of,
- U = nature of the utility derived from the use of the resource,
- D = demand for the managed resource, and

E_{dr} - prevailing environmental conditions or drivers, including prevailing biophysical, socio-economic and political conditions affecting the livelihoods of the resource users.

In this context drivers are any natural or human induced factors that directly or indirectly cause a change in the environment (Corvalan et al. 2005). Corvalan et al. (2005) note that drivers of ecosystem change have the capacity to cause potentially irreversible changes in the environment, depending on socio-economic and political contexts.

The Components of the CCMD Model

As noted above, the CCMD model has three components. The first component is the utility component. It is based on the notion that individuals have to make choices about whether to pursue social utility (Su) or individual utility (Iu) (see Fig. 1). Utility, in this context, is a measure of satisfaction derived from sparing use of a given environmental resource. In this regard "social utility functions specify level of satisfaction as a function of outcome to self and others" (Loewenstein et al. 1989: 427). In an experiment on the relationship between social utility and decision making Loewenstein et al. (1989) observed that when individuals felt equality was not possible amongst themselves, they preferred that the other party be at a disadvantage relative to "the self", indicating that individuals put their interests before group interests when confronted with crises. In this regard social utility and individual utility are inversely related, since they cannot be pursued simultaneously. Within the context of CBNRM, individuals in the community will have to make a choice to pursue either goals of social utility or those of individual utility, since these goals do not always converge. However, since CBNRM is based on the cooperation of community members as well as collective capacity (community capacity according to Turner 2004) its goals are often in conflict with those of the individual, which are more akin to competition. This results from the fact that social utility thrives on social capital, that is, the social relationships, networks and "shared norms, values and understanding that facilitate cooperation within and among groups" (Plummer and FitzGibbon 2006: 52). Cooperation is a requirement for addressing environmental challenges (Fennell et al. 2008). The importance of

social capital in natural resource management is a long established phenomenon (Ostrom 1990; Ostrom 1992; Woolcock and Narayan 2000; Ostrom and Ahn 2003; Plummer and FitzGibbon 2006).

However, as shown in Figure 1, there must be a threshold of willingness amongst community members to cooperate and participate in CBNRM initiatives (T_w) and another for sense of ownership (T_o) that would allow CBNRM initiatives to take root. These thresholds occur at the stage where social utility is equal to individual utility (Fig. 1). Beyond these thresholds collective capacity becomes insignificant, rendering CBNRM impossible. Since the sense of ownership and willingness to participate in CBNRM vary with individuals and through time and space, individuals within the community express different levels of collective responsibility that define their preparedness to contribute to CBNRM, thus creating a “capacity continuum” on which they are differently positioned in resonance with the drivers that affect their livelihoods, as well as their adaptive capacity to cope with the drivers.

In summary, it can be inferred that when individual utility exceeds social utility ($I_u > S_u$ scenario) collective effort is diminished and

chances of CBNRM succeeding are reduced, while the opposite is true when social utility exceeds individual utility ($I_u < S_u$ scenario). The $I_u > S_u$ and $I_u < S_u$ scenarios are characterized by competition and cooperation, respectively. Individuals vacillate between the two scenarios, depending on both the changing dynamics of demand for environmental resources and on the nature of the drivers that affect their livelihoods. Accordingly, the two scenarios are expected to vary through space and time. For instance, when resources become scarce, people’s willingness to participate in CBNRM declines as community members pursue options that maximize individual utility. The shift between these two scenarios is the quintessence of the CCMD model, depicting the fluidity between cooperation and competition amongst community members. Whereas cooperation denotes social cohesion, competition reflects social dissonance.

The second component of the model is the demand component. It rests on the notion that since environmental resources take time to regenerate their supply is “fixed”, and scarcity is expected to increase as demand rises (shift from D1 to D2, Fig. 2), leading to competition for the remaining resources and consequently under-

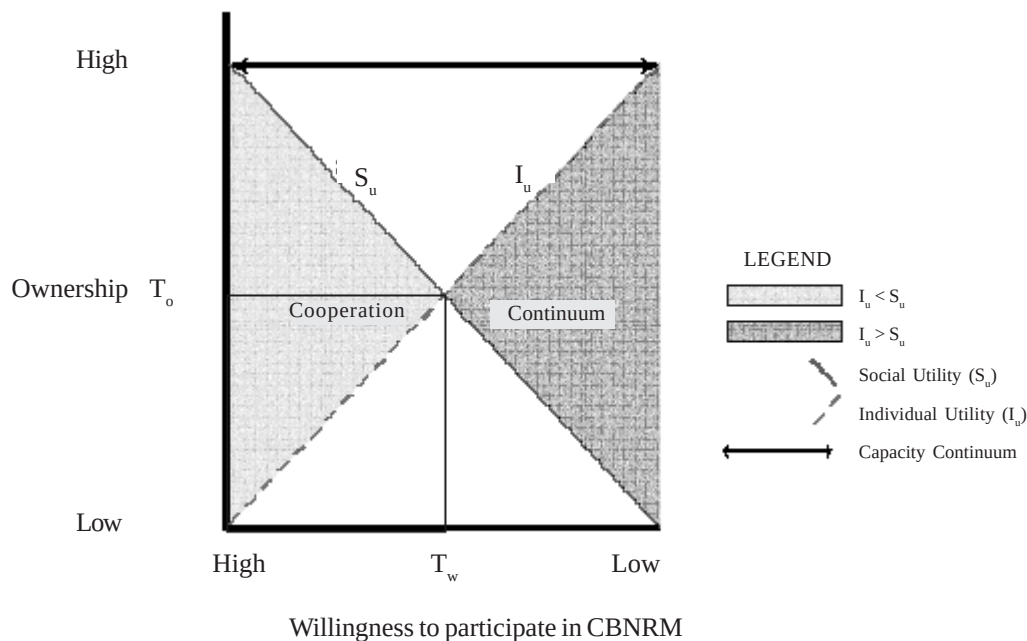


Fig. 1. The utility component

mining collective stewardship and CBNRM. This aspect of the model is consistent with propositional theories, which maintains that population growth enhances demand for resources as well competition amongst resource users.

As shown in Figure 2, when the quantity of resources demanded increases the price that resource consumers have to bear also rises (P_1 to P_2), especially in terms of the time and effort required to harvest the resources. The other price that the consumers have to bear is loss of collective effort required for CBNRM due to competition. The outcome is resource depletion, manifested through the privatization of the remaining resources as collective proprietorship wanes.

The third component of the CCMD model is the “drivers” component, denoting the environmental conditions which regulate both the capacity continuum and demand for environmental resources. These conditions determine how resources are used and managed in an environment where supply is “fixed”. The notion of “drivers” is compatible with Sustainable Livelihood Approaches (SLAs) which maintain that communities depend on physical, natural, human and social forms of capital that are found in their environment to eke a living. People use these

forms of capital to cope with shocks and stresses. Shocks are the sudden, inadvertent and extremely hostile conditions while stresses are the gradually worsening conditions that occur in the environment (Chambers and Cornway 1992). Shocks and stresses can be social, economic, political and bio-physical conditions in nature and they can regulate the manner in which environmental resources are used when people map their livelihoods. While some drivers induce cooperation and bind community members together, thus enhancing the community’s collective proprietorship and the capacity to implement CBNRM within the community, others enhance social dissonance because they promote individual utility and competition, oftentimes leading to resource overuse, scarcity and depletion.

The Theoretical Assumptions of the CCMD Model

The CCMD model is premised on a number of theoretical assumptions. The first assumption is that the success of CBNRM in heterogeneous communities is forestalled by social dissonance and lack of social utility. This assumption is based on the argument that while social

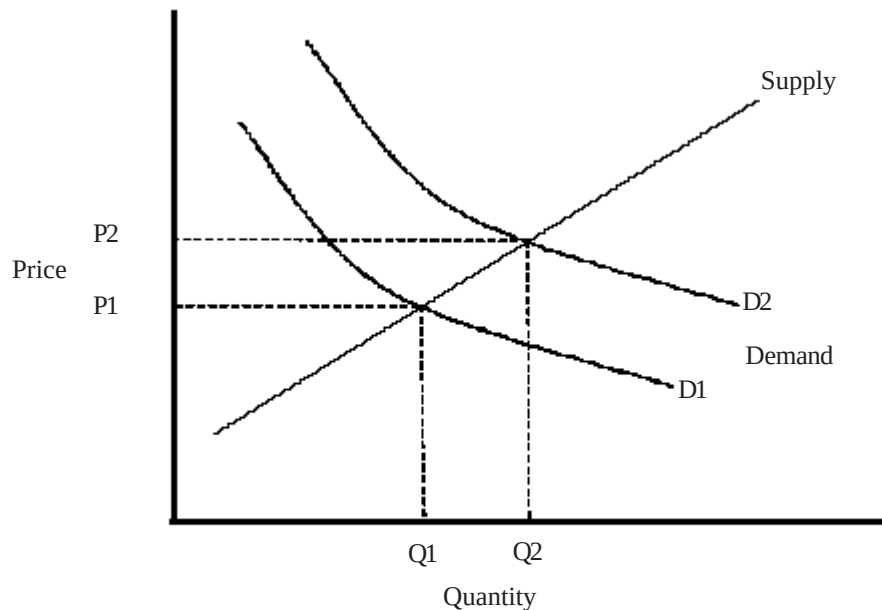


Fig. 2. The demand component

cohesion is essential for CBNRM, communities are far from being homogeneous because they are usually divided by factors such as class, caste, religion, ethnicity, gender, geographical origin, length of settlement, or even household cycle considerations (Bruce 1989; Leach et al. 1999).

The second assumption is that there is an inverse relationship between social utility and individual utility in resource management (Fig. 2). When one of the two parameters increases the other is expected to decrease. This argument is derived from Ostrom's (1990) notion of common-pool resources (CPRs) (see also Ostrom et al. 1994), and it is based on the argument that people strive to maximize individual utility from scarce environmental resources that they compete to use (Blaikie and Brookfield 1987).

The third assumption is that shocks and stresses drive communities into practices that destroy the resources on which they depend for livelihood. This view is emblematic of Armitage's (2005) argument that efforts to enhance community-based natural resource management performance require an analysis of exogenous and endogenous conditions that influence how people act collectively. Thus, collective action involving sparing use of resources is not determined by chance but regulated by societal controls (Nhira and Fortman 1993). Societal controls drive communities towards better resource stewardship. While shocks and stresses reflect adverse conditions within the environment, societal controls are an internal mechanism that communities adopt to cushion themselves from resource destruction or from shocks and stresses. Societal controls function as cohesive drivers and galvanize community members. These controls include sacred controls, pragmatic controls, civil contract, and the setting up of institutions and rules within local communities (Nhira and Fortman 1993; Ranger 2003).

METHODOLOGY

A case study approach was employed in this research study, involving the testing of the CCMD model using empirical data that was collected from Mufurudzi resettlement scheme in Zimbabwe (Fig. 3). The resettlement scheme is about 82 595 hectares in size and is situated in miombo woodlands (type of savanna woodland dominated by *Brachystegia spiciformis* and *Julbernardia globiflora*). Located in Shamva dis-

trict, Mashonaland Central province, Mufurudzi comprises a total of 33 former commercial farms which are situated along Mufurudzi River, a tributary of the Mazowe River. The Mazowe River is one of the major rivers in the Zambezi basin. The commercial farms were acquired for resettlement by government on a "willing-buyer-willing seller" basis with the help of British funding. The study was carried out in eight villages which are found on farms that were randomly sampled in the scheme (Fig. 3).

The villages were founded at different times and their ages ranged between 10 and 24 years. Methodological integration was employed in the study, involving the collection and analysis of qualitative and quantitative data. Qualitative data were collected through in-depth interviews which were held with the villagers, lineage leaders (including village heads, headmen, chiefs), as well as government officials from the Environmental Management Agency (EMA) and Forestry Commission. The interviews were recorded and transcribed. The consent of the interviewees was sought prior to the interviews, while conditions of anonymity were assured.

Quantitative data were collected through questionnaire and vegetation surveys. A total of 213 households (about 58% of the households) were included in the questionnaire survey.

The respondents were the household heads. A census approach was adopted, where the questionnaire was administered on all the household heads who were present in the villages when the survey was conducted. The data that were collected included the types of forest and woodland products that villagers use, importance of the resources to villagers' livelihoods, villagers' perceptions about ownership of the resources, measures that the villagers take to conserve the resources, their willingness to contribute to community-based forest and woodland management projects and the constraints that undermine the conservation of forest and woodland resources in the area. Data were also collected on villagers' perceptions about shortage of forest and woodland resources in their villages and the distances they travel in order to access different types of forest and woodland products.

Vegetation surveys were undertaken in each sampled village to determine how socio-economic and political drivers have impacted on CBNRM. The Point Centre Quarter Method (PCQM),

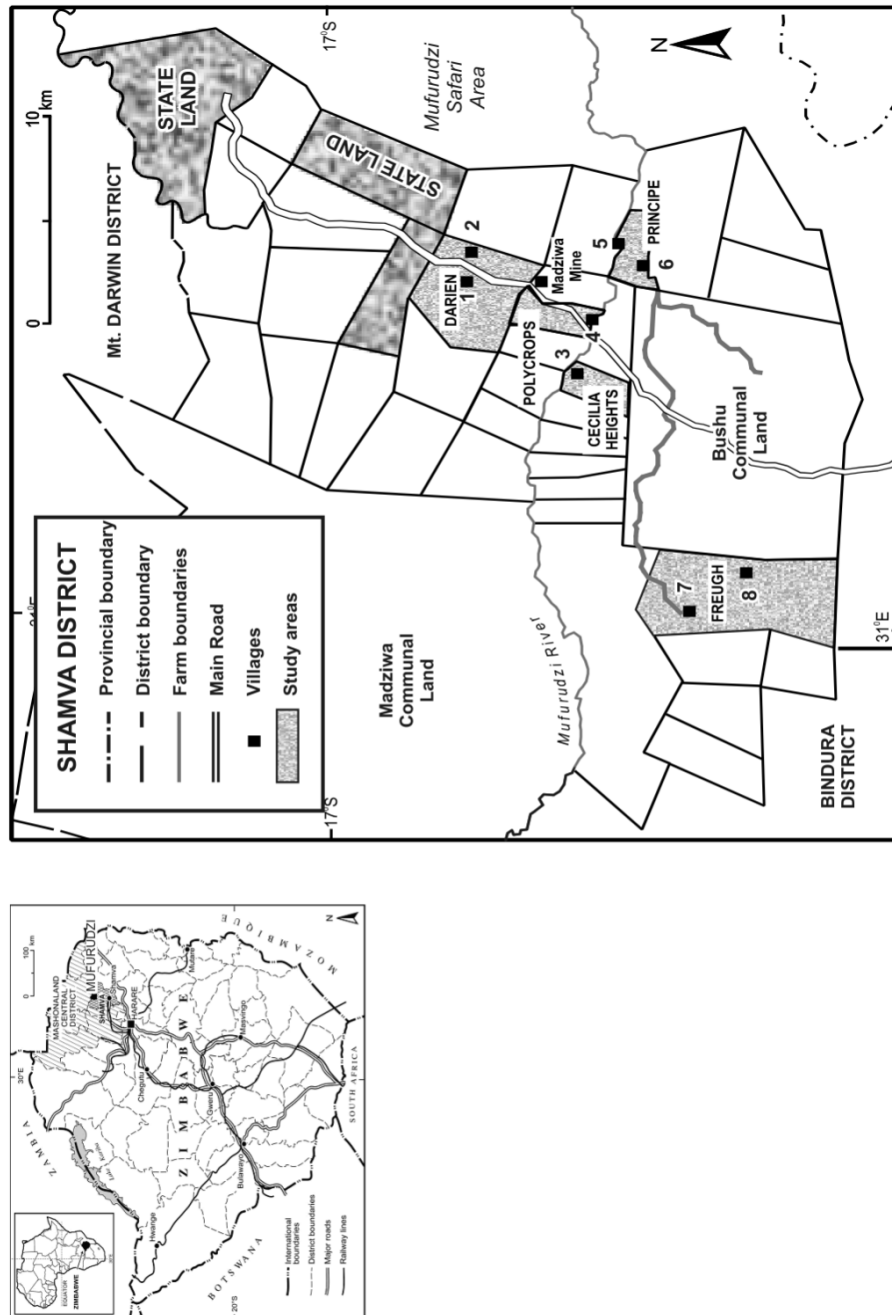


Fig. 3. Location of study areas (Adopted from Mukwada, 2008: 42-43)

a transect analysis type of survey was employed. The PCQM involves the use of a cross-shaped sampling frame. According to the PCQM, tree density is the inverse of the squared sum of the distances measured between sampling points and the nearest trees in each quarter of the sampling frame. Tree densities were determined at every 10 metre point along the transect and average densities were computed for every 100 metre stretch of the transect. The surveyed transects were approximately 500 metres long and were aligned to the paths which are mostly used by the villagers when harvesting tree resources, as recommended by Brown and Lapuyade (2001).

The Kruskal-Wallis test was used to check if the age of the villages had any effect on tree densities in Mufurudzi, and to determine whether tree densities varied through space, that is from village to village within the resettlement scheme. This was in line with the objective to determine how changes in demand for environmental resources have affected CBNRM and the relative availability of the resources. The Spearman rank correlation test was performed to determine if there was any relationship between increase in population size and the computed average tree densities and also whether the ages of the villages contributed to such variations. The objective was to determine whether temporal variations in tree densities are related to changes in population size, the key determinant of resource demand. The annual household increase ratio (that is the number of new households in the village divided by the age of the household, that is the length of the period over which the household had been established in the resettlement area) was used as a surrogate variable for population size. This provided a basis for comparison since the actual number of people in the villages could not be ascertained due to the fact that some homesteads were not occupied when the survey was conducted.

RESULTS

Changes of Utility Patterns in Mufurudzi

An analysis of the narratives of the villagers, as well as those of EMA and Forestry Commission officials indicated that tree resource distribution in Mufurudzi resettlement area has changed since the establishment of the scheme. However, this change is variable, both spatially

and through time, presenting two main scenarios as predicted by the CCMD model, namely the $Iu < Su$ and $Iu > Su$ scenarios.

The $Iu < Su$ Scenario

This scenario characterized the early stages of resettlement, in the early 1980s when decisions related to tree resource conservation were made collectively by the villagers. The collective views of the villagers were also sought by government planning agencies when tree and animals species that required special protection were identified. Taboos and community bylaws were collectively enforced to protect sacred areas and species. Examples of tree species that were accorded special protection include *mukamba* (*Azelia quansensis*), *muhacha* (*Parinari curatellifolia*), and *mutoto* (*Pseudolachnostylis maprouneifolia*). The first two are used in rainmaking ceremonies while the last one is used in burial ceremonies. None of the three species is supposed to be used for firewood, while cutting them is regarded as a way of evoking calamity from the spirit world. Fruit trees, notably *Strychnos spp.*, *Syzygium cordatum*, *Uapaca kirkiana*, and *Diospyros mespiliformis*, which cushion villagers from hunger, were accorded equal protection. During that period CBNRM was more successful in protecting designated species. Taboos and community bylaws were effective in preventing deforestation at gravesites and sites where rainmaking ceremonies are conducted.

Another important development that characterized the $Iu < Su$ scenario was the setting up of communal woodlots, where villagers collectively planted trees in designated areas, usually wetlands. This initiative resulted from the Forestry Commission's Rural Afforestation Programme (RAP), which was launched country-wide in the early 1980s. Though RAP has been long abandoned due to community apathy (Mukwada 2006) some woodlots that were established during this time still exist, particularly in older villages such as Mudzingi, Zvataida, Chidumbwe I and Chidumbwe II.

The $Iu > Su$ Scenario

While communally owned RAP woodlots have largely been abandoned, "private woodlots" belonging to individual households, some of which were established during RAP period,

are still flourishing. This indicates that “private woodlots” have received better attention than the communal woodlots, suggesting that the $Iu>Su$ scenario has already taken root in Mufurudzi. The $Iu>Su$ scenario is most evident in the older villages such as Mudzingi, Zvataida, Chidumbwe I and Chidumbwe II, where natural woodlands have been severely degraded and are no longer able to supply some essential products, especially building materials. In these villages the $Iu>Su$ scenario has been characterized by a steep rise in competition for both agricultural land and forest and woodland resources, leading to severe deforestation.

The increasing flouting of taboos and community bylaws, including the cutting of trees and harvesting of non-timber forest products (NTFPs) at gravesites and sacred sites such as groves where rainmaking ceremonies are conducted is evidence that societal controls such as taboos are waning. In Chidumbwe II there are gravesites where trees have been cut. At one gravesite in Chidumbwe II village there was evidence of extraction of latex from the *mutowa* or horn-pod (*Diplorhynchus condylocarpon*) trees. The latex is used to treat a variety of ailments, including coughs.

The increasing breaking of taboos and community bylaws has partly resulted from recurrence of drought and the worsening of the macroeconomic environment in Zimbabwe. In Mufurudzi, these conditions have led to increasing commercialization and vending of firewood and wild fruit and have caused an increasing dependence on these products as a strategy for coping with livelihood threats. Interviews with villagers indicated that the collection and vending of firewood and wild fruits always escalate during drought years. An important development that has occurred in Mufurudzi is the “privatization” of tree resources in the fields and areas close to homesteads, which other villagers are prevented from accessing.

In concluding this section it is noteworthy that in most villages the $Iu>Su$ and the $Iu<Su$ scenarios are not necessarily distinct or permanent conditions, neither are they universally applicable for all forest products. However, as shown in the next section of this paper, increased tree resource use in Mufurudzi has resulted from increased demand for forest and woodland resources due to population pressure.

Demand for Forest and Woodland Resource and Demographic Pressures in Mufurudzi

Vegetation surveys revealed that tree densities generally decrease with distance from homesteads. There were exceptional cases though. In Mupedzanhamo, for example, tree densities portray a complex case where forest and woodland resources have been differentially exploited, varying according to proximity to homesteads, fields, brick moulding sites, gardens and sites of economically viable activities, thus exhibiting multiple entry points from which forest and woodland products have been differentially accessed. This has created degraded woodlands characterized by clumps of trees and patches of bare land, thereby distorting the expected pattern where tree densities increased with distance from homesteads, as would be expected in a village of its age. In this village, while tree resource over-utilization is evident in some places extraction of tree resources from communal gravesites is not yet conspicuous.

Statistical tests revealed that there was a difference in tree densities between older and newer villages ($\chi^2 = 23.23$, $p < 0.002$, Kruskal-Wallis test). There was evidence that tree resource depletion is more in older villages, where villagers now have to travel longer distances to fetch forest products. This was confirmed in interviews that were held with the villagers in the scheme. Over 90% of the household heads who took part in the questionnaire survey in Mufurudzi indicated that they now have to travel longer distances when harvesting products such as construction materials, firewood, venison and wild fruits than when they first arrived in the scheme (Table 1).

Table 1 shows that with the exception of NTFPs, there has been a significant decline in availability of forest products between 1986 and 2005. The Kruskal-Wallis test revealed a clear distinction between the perceptions of villagers in old and new villages regarding the availability of tree based resources (Table 2). As shown in Table 2, there was a difference between tree densities of villages of different ages ($\chi^2 = 14.13$, $p < 0.001$, Kruskal-Wallis test), indicating that areas where demand for tree resources has been longer have become more deforested.

Coupled with agriculture, the building of new structures such as livestock pens, fowl coops and homesteads exerts considerable pressure

Table 1: Percentage of villagers who indicated that they were able to access forest products within 1km from their homesteads

Forest products	% of villagers who obtained resources within 1km:	
	1986	2003
Construction materials	98.1	15.0
Firewood	99.1	31.5
Raw materials for carving and crafts	97.2	27.2
Bush meat	85.3	12.7
Wild fruit	92.4	53.1
Other NTFPs*	97.6	95.3

*Edible insects, including *nhowa* (*Anaphe panda*), *harati* (*Cirina forda*), *masinini* (*Lobobunaea* spp.) and *macimbi* (*Gonimbrasia belina*) at lava stage.

Table 2: Relationship between ages of villages and tree density

Age of village in years	N	Median tree density
10	5	1148.7
11	10	3119.0
24	22	1084.5

p = 0.001

on tree resources. Deforestation is most conspicuous within the immediate surroundings of villages where construction and fencing materials are more easily accessed. The influence of demand on the tree resource base was confirmed by the negative correlation between tree densities in the villages and annual household increase ratios (Table 3). This resulted from uncontrolled massive influx of people into Mufurudzi resettlement area from the surrounding communal areas at the height of land invasions in 2000.

However, with a coefficient of -0.3 ($p < 0.05$), the correlation between population size and tree

densities can be considered as weak, signifying that besides population size there are other factors that have an influence on tree resource distribution. These factors are the drivers noted below.

Key Drivers Influencing the State of Household-based Forest and Woodland Resources in Mufurudzi

While generalizations about $Iu < Su$ and $Iu > Su$ scenarios provide clues about conditions under which CBNRM succeeds, a “fine grained analysis” of oral history accounts from interviewed villagers in Mufurudzi indicated, as discussed below, that there are a number of interconnected drivers that are responsible for creating these scenarios.

Natural and Anthropogenic Hazards

While the primary source of livelihood for most villagers in Mufurudzi is farming there are some villagers who engage in off-farm activities, especially as a way of coping with natural hazards. For instance, during the 1991-92 and 2001-02 droughts, about 58% of the surveyed households (mostly lower income households) relied on income from NTFPs for livelihood. It would appear that when the community in Mufurudzi is affected by natural hazards such as drought its poorer members improvise livelihoods and diversify into off-farm entrepreneurial activities. These activities include wood carving, craft making, basketry, fishing, as well as vending of firewood and NTFPs such wild foods like bush meat, wild honey, fruit and mushrooms. These products are sold within the community or in abutting communal areas and in nearby towns such as Shamva and Bindura. The off-

Table 3: Changes in number of households in Mufurudzi between 1981 and 2004

Name of village	Year of establishment	Original number of households	Number of new household	Annual household increase ratio
Mudzinge	1981	33	51	2.2
Zvataida	1981	27	13	0.6
Mufurudzi II	1994	26	10	1.0
Principe A	1993	30	6	0.5
Principe B	1993	30	5	0.5
Chidumbwe I	1981	33	23	1.0
Chidumbwe II	1982	20	17	0.8
Mupedzanhamo	1981	13	31	1.3
Average		26.5	19.5	1.0

farm livelihood activities that are pursued by “poor” households, for instance the harvesting of NTFPs, promote deforestation and undermine CBNRM. Thus the environmental drivers that prevail in their environment compel the poor to engage in environmentally destructive practices, which they adopt as a necessity rather than out of sheer negligence.

Entrepreneurship

Some villagers who possess certain rare skills, including artisanal skills or tacit knowledge capitalize on the economic crisis prevailing in the country to eke a living. These include ethnopharmacists, wood carvers and vendors of woodland products such as firewood, crafts, carvings, baskets, wild honey, *mazhanje* and other sellable forest products like edible insects and venison. *Mazhanje* (plural) is fruit from the wild loquat tree (*Uapacca kirkii*) and is sometimes harvested before it has fully ripened because of the high prices that it fetches in urban markets. It must be noted that it is generally considered as taboo to sell wild fruits, let alone to harvest them before they are ripe.

Another example of an entrepreneurial practice is tobacco farming. In Mufurudzi II, Chudumbwe II and Mupedzanhamo villages, tobacco growing has already become an important livelihood strategy. Nearly 20% of the households in these villages grow it on a regular basis. The type of tobacco that is grown by most villagers is Virginia, which needs to be flue cured before sale. About 1.5 m³ to 2 m³ of wood, equivalent to about four mature *Brachystegia boehmii* trees, is required to cure every 140kg – 180kg (about 2 bales) of the crop. The average tobacco yield is four bales per acre. Thus, for every acre of tobacco that is planted at least eight mature trees are felled. Trees that are easy to fell, including *Brachystegia boehmii*, *Acacia* spp., *Combretum fragrans* and *Diospyros kirkii*, a taboo protected fruit tree, are usually targeted. The felling of fruit trees for economic expediency demonstrates how individual utility can override social utility and goals of CBNRM, thus promoting the Iu>Su scenario. The case of Mufurudzi demonstrates that communities respond to the environmental drivers that prevail in their environment through economic practices which themselves become drivers of environmental change.

Social Stratification

Socially, the resettled community in Mufurudzi is heterogeneous and highly fragmented. This is the case in terms of differences in level of formal education among community members, type of environmental knowledge held by individuals, gender and religious differences among community members. These variations create social dissonance and undermine CBNRM. The heterogeneity that characterize the community, creates different levels of entitlements, that is “the range of possibilities that people can have” (Leach et al. 1999: 232), thus making access to forest and woodland resources “socially differentiated”.

Political Conflicts

In Mufurudzi, there is co-existence of people from different political persuasions. Liberation war veterans, particularly members of ZANU PF, live side by side with their opponents from the Movement for Democratic Change (MDC). Countrywide, conflict and political polarization exist between the two belligerent groups which are jockeying for power. In Mufurudzi, political polarization has been responsible for serious disagreements between the supporters of the two parties, in some cases even leading to the dethronement of lineage leaders who were viewed to be sympathetic to the MDC, thus putting further strain on social cohesion, and thwarting CBNRM in the process.

Government Policy and Insecurity of Tenure

Despite the constraints imposed by its “thin budget”, the Forestry Commission has managed to set up about 70 village “community projects”, including nursery, agroforestry, tree planting, woodland management and forest utilization projects. The majority of the projects that have succeeded belong to individual households or schools. The failure of collective CBNRM initiatives and the success of individual projects underscores the importance of tenurial security in CBNRM. The landholding permits that were granted to resettled villagers in Mufurudzi do not confer any individual rights of land ownership to them. Without title deeds to the land that was allocated to them, there is insecurity of tenure and villagers are indirectly subjected to per-

petual threat of eviction. During the early stages of resettlement threats of eviction from the then resident resettlement officers were quite effective in deterring deforesters. While it could be argued that by placing villagers under such insecure terms it was easy to enforce environmentally friendly practices (which could not be easily achieved if the villagers had title deeds), as interviewed government officials were keen to claim, tenurial insecurity seems to have produced the opposite result in more ways than one.

First, without secure tenure, communities in Mufurudzi are more inclined to deplete forest and woodland resources than to conserve them since their stay in the resettlement area is not guaranteed. Second, tenurial insecurity restricts the range of tree species that villagers plant in their own woodlots. Villagers prefer to grow exotic trees (especially *Eucalypts* and fruit trees), in their backyards, that is species they are able to claim ownership of without contest, since these trees cannot be mistaken to have grown naturally on their own. Third, villagers only grow trees in areas which they have control over, particularly their own gardens and home fields, rather than in areas that are experiencing deforestation. Thus, without security of tenure villagers become less willing to invest time and effort in CBNRM initiatives but become more inclined to pursue conservation goals that promote individual utility.

Institutional Arrangements

The institutional arrangements that prevail in Mufurudzi are largely antagonistic to CBNRM. Institutional arrangements include:

“legislation and regulations, policies and guidelines, administrative structures, economic and financial arrangements, political structures and processes, historical and traditional customs and values and key participants and actors” (Plummer and FitzGibbon 2004: 69).

The role of institutional arrangements in determining access to environmental resources as well as CBNRM has long been established (see Leach et al. 1999; Murphree 2000). From a legal point of view in Mufurudzi, as is the case throughout Zimbabwe, the mandate to control the way forest and woodland resources are used and managed rests with government institutions such as the Forest Commission and the Envi-

ronment Management Agency (EMA). The effectiveness of these institutions, however, has been handicapped by budgetary constraints as a result of the collapse of the national economy. Locally based formal community leaders such as village heads lacked the legitimacy and power to enforce conservation policies. As noted by Plummer and FitzGibbon (2004: 65), “power is the ability to control, potential to influence and capability to exercise authority”. While the scope of government institutions is limited by lack of financial resources, such a situation leaves real power in the hands of chiefs and headmen from the surrounding communal areas, to whom the village heads in Mufurudzi are subordinate.

Based in resource impoverished communal areas chiefs and headmen exercise a claim on how forest and woodland resources are used in the resettlement area. They demand that people in the communal areas must be accorded better access to the forest and woodland resources that are found in the area, often causing deforestation in the resettlement area. Thus, due to prevailing power configurations competition often arises in resource use between communities that are resident in Mufurudzi and those from the abutting communal areas. Such a situation perpetuates the $Iu > Su$ scenario and undermines CBNRM in the resettlement area. This state of affairs makes informal institutional arrangements such as taboos and community bylaws a far more important tool in CBNRM than formal institutions. The importance of taboos and community bylaws was alluded to in all villages in Mufurudzi. In the case of Mufurudzi, taboos and community bylaws promote the $Iu < Su$ scenario. Even though taboos and community bylaws are not always effective, they play a significant role in tree resource conservation in the scheme.

While adherence to taboos is more widespread than the use of community bylaws, community bylaws constitute a more innovative approach to conservation than taboos because they directly address perceived problems rather than being a mere passive response to gained tacit knowledge. In Mupedzanhamo, for instance, a community bylaw has been instituted to forbid the cutting of all the trees that one requires for tobacco curing from any one single location. This ensures that the ground is not left completely bare. Another bylaw recommends the pollarding of trees instead of cutting them completely. In Zvataida, Chidumbwe I and Chidum-

bwe II there is a bylaw that requires villagers to seek permission from village heads whenever the cutting of large numbers of trees or prohibited tree species is inevitable. However, continual deforestation suggests that the effectiveness of taboos and bylaws is limited. Unfortunately, due to social differentiation taboos and community bylaws are not uniformly upheld, as not all community members feel bound by them.

DISCUSSION

This study applied the CCMD model as a conceptual tool for identifying the major conditions that regulate the choices and decisions that individuals make when implementing CBNRM. The CCMD model is a multi-disciplinary model whose theoretical bases are rooted in what Plummer and Fennell (2007) termed propositional, sensitizing and meta-theoretical schemes of typologies of CBNRM theory. The study focused on community-based forest and woodland resource management in Mufurudzi resettlement area in Zimbabwe. One of the major findings of the study is that the community's capacity to implement CBNRM depends on social cohesion and sense of collective proprietorship, as well as the capacity of the community to minimize social dissonance and competition on resource use.

In Mufurudzi CBNRM is partly threatened by environmental drivers, including crises that undermine the community's collective capacity to manage tree resources. This makes individual community members more inclined to pursue individual utility at the expense of social utility. These crises include the worsening of the national macroeconomic environment, persistent droughts and pressure from the surrounding resource impoverished communal areas. These crises promote resource commercialization and social dissonance at the expense of collective stewardship and CBNRM. Other conditions that promote social dissonance include social differentiation, posed by differences in level of education, type of environmental knowledge held, gender and differences related to political, tribal and religious affiliations. These conditions make it difficult to develop the strong community leadership that would be required for CBNRM to flourish. Yet, evidence from this study suggests that lack of strong community leadership and

social dissonance lead to choices and decisions that promote individual utility at the expense of social utility and, consequently undermining CBNRM. This state of affairs validates Bruce's (1989) observation that social cohesion is a necessary prerequisite for the management of common property resources. Social dissonance or lack of social cohesion is an indicator of diminished altruism.

However, the fluidity between $I_u > S_u$ and $I_u < S_u$ scenarios suggested by the CCMD model puts to question the assumption that if a group shares use rights over resources the group will manage the resources according to its own rules and strategies to ensure the conservation of the resources (Nhira and Fortmann 1993). In Mufurudzi, as shown by the results of this study, human behavior, including the choices and decisions that people make about CBNRM, is regulated by biophysical, socio-economic and political processes. In Mufurudzi, use rights alone are not sufficient basis for effective CBNRM, especially in an environment where resource users have the latitude to break their own rules. This reinforces the argument made earlier in this paper that those intending to pursue CBNRM initiatives need to have the ability to develop mechanisms that enhance cooperation and a strong sense of community while simultaneously diminishing prospects for competition in resource use among community members.

Another important finding emerging from this study is that while population size can affect how tree resources are used in an area, by itself it cannot sufficiently explain patterns of tree resource use or shortage of these resources. As revealed in this study the relationship between population size and tree densities is weak, indicating that apart from population there are several other drivers that affect these patterns, including natural and human induced conditions (Corvalan et al. 2005), such as natural hazards, forms of entrepreneurship, social stratification, political conflicts, government policy, tenurial security and institutional arrangements like prevailing power configurations, taboos and community bylaws. Some of these conditions are exogenous and are beyond the control of the resettled community, as is the case with drought, a failing national economy, government policy, legislation and security of tenure.

CONCLUSION

From the foregoing discussion it can be concluded that the CCMD model provides a sound conceptual framework for assessing the choices and decisions that people make regarding the use and conservation of tree resources within the limits imposed by their biophysical, socio-economic and political environment. The model can enhance our predictive understanding of the relationship between people and natural resources by opening CBNRM to more diverse forms of scientific inquiry. In that context the model provides an answer to the demands for a new level of conceptual rigour in conservation by focusing on the choices and decisions people make about CBNRM. One of the major strengths of the CCMD model is that though it focuses on the choices and decisions that people make, it is multi-faceted. This is because it is a fusion of propositional, sensitizing and meta-theoretical schemes.

The multidisciplinary approach adopted in this study provides some scope for understanding the limits that are imposed on communities when implementing CBNRM. We can therefore also conclude that the choices and decisions that are made by communities are not irrational as often portrayed in certain scholarly quarters, but are a logical response by communities to the conditions that prevail in the environment. On the basis of the findings of this study there is a strong case to argue and conclude that instead of abandoning CBNRM, either for conceptual or for practical reasons, as suggested by some scholars, there is need to re-conceptualize it so that it is understood better. The CCMD model provides room for that.

RECOMMENDATIONS

It is still too early to call for a paradigm shift that requires an outright disposal of CBNRM as a natural resource management philosophy. However, since this study was based on a single case of forest and woodland resource management in a relatively small geographical area within the savannas it is recommended that more research is done to test the effectiveness of the CCMD model in the assessment of community-based management of other environmental resources, including water, wildlife and soil, under different geographical situations.

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