



JOURNAL OF NATURAL RESOURCES AND DEVELOPMENT

Indigenous knowledge of Zigi community and forest management decision-making: a perspective of community forest interaction

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Article history

Received 16/01/2015
Accepted 29/09/2015
Published 15/03/2016

Keywords

Indigenous knowledge
Forest management
Decision making

Abstract

Indigenous knowledge (IK) regarding forests has existed for a long time and has defined community's forests interaction in various areas. This interaction has resulted in knowledge developed by indigenous communities that has been used to manage their interaction with the forests. However, IK is often regarded as invalid and unreliable to use in forest management and its value has been eroded and replaced with western scientific knowledge for both production and conservation forest management objectives. However, despite the application of modern scientific knowledge, forest status continues to decline. This paper aims to explore IK held by communities in the Zigi catchment in Tanzania and assess the influence of this form of knowledge on forest management. The study used focus group discussions to explore IK related to forest management from communities living adjacent to forest reserves and a checklist questionnaire to assess the level of use of IK in forest management at different levels of decision-making. The results reveal several IK and practices related to forests in this region. However, there is minimal evidence of consideration of this IK in forest management decision-making. This paper recommends that a serious review of IK related to forests is undertaken in Tanzania and that mechanisms are developed to integrate this form of knowledge with western scientific forest management in order develop a more holistic approach to sustainable forest management.

1. Introduction

Many members of local communities have a wealth of knowledge and observations but they generally lack the documentation needed to provide this information to the natural resources management authorities. In some cases, IK has shown a significant contribution to resources management. Consider the eminent roles of IK in the community of Zaka in Zimbabwe which for years have been used to conserve environmental resources by regulating forest use. Some forests are set as sacred, and the harvesting of edible fruits is limited and in some areas specific clans are made responsible for making sure that they do not run short of rainwater and other water supplies. With this responsibility, the clans act like police to protect forest resources. In these communities mixed farming is practiced to conserve soils. Sacred wells have remained unpolluted and ensured a clean water supply [1]. The Pennan hunter-gatherer communities of Malaysia for example, use their local knowledge to facilitate land use and influenced the inclusion of their interests in the government forest management plan [2]. The Pakhasukjai community in Thailand also managed to use their knowledge to restore the natural forest using *Imperata fallows* [3]. A report by the Nordic cabinet of ministers in 2015 points out efforts made to gather, document, share and integrate the knowledge of hunters and fishers in the Arctic into natural resources decision-making. Many local communities in Africa and Tanzania in particular depend directly on nature and have therefore developed knowledge to interact with nature; this knowledge is referred to as indigenous knowledge. It has not been fully harnessed to aid forest decisions despite its existence and proven significance around the world.

Indigenous knowledge varies from community to community; the variations are relative to how the community interacts with its surrounding natural resources. For this case the Zigi community, indigenous knowledge is reflected in the way they interact with various resources, mainly forests, for the purposes of land and water. The literature has documented the eastern Usambara communities' interaction with natural resources, in some cases particularly documenting their interaction with specific resources. Yanda and Munisi [4] documented the Zigi Community's interaction with water and land in general. Meshark [5] documented the indigenous knowledge of *allanblackia* fruits in the same community, while Bwagalilo [6] looked at the community's interaction with land and farmland trees. The same documentation was done by Shemdoo [7] in western Usambara mountain communities. All these give a clear picture of how important it is to understand indigenous knowledge in natural resource management and sustainability.

In the Eastern Usambara Mountains (EUM) where the Zigi catchment is found there are several ethnic groups with different cultural backgrounds. The catchment is home to the Sambia, Digo, Makonde, Bondei, Pare, Nyakyusa, Kinga, Tutsi and many other tribes. These communities reside in the eastern Usambara Mountains for different reasons. The main reason is said to be the establishment of tea estates during colonialism, the tea estates brought people from different corners of east Africa to work in the plantations, eventually becoming

one big community. The main community (also indigenous) is comprised of the Sambia, Digo and Bondei, who were later joined by other ethnic groups which have been living in the area for years and now form one large Zigi catchment community. However, Sambia, Digo and Bondei, which are the majority groups, are considered indigenous in this study.

Life in the Zigi catchments is mainly supported by the resources of the EUM. The land, forest and water resources support livelihoods in the area in various ways. Farming (both livestock keeping and cultivation) supported by the nutrient-rich soils of the mountains, timber and butterfly keeping supported by forests and water in the mountains, small and medium enterprises from non-timber forest products, to mention a few. These interactions with nature of the Zigi catchment have unique characteristics which define the status of the resources (forest) today. The behaviours of this interaction with the forest resources define the nature, use and dynamism of the resources; see McCall and Minang [8] and Minang and McCall [9]. The question remains as to how these interactions sustain the needs of the community from the forest and how this can be maintained for the next generation, since human survival on earth depends on natural resources and the fact that we need to manage our use/interaction with these resources so that they can sustainably serve human beings [10]. Another question is how to consider community interaction with the forest in decision making. Decisions to conserve forest resources, decisions which become policies aimed at conserving forest resources, existing forest management to face the challenges of increased degradation and limitation of indigenous needs from the forest. These concerns are essential because they raise questions of whether decisions made to manage the forest have considered indigenous needs and indigenous knowledge in forest management. Therefore, this paper attempts to explore 1) the IK held by communities in the Zigi catchment in Tanzania and 2) the influence of this form of knowledge on forest management.

2. Study area and Methods

2.1 Study area

The area for this study is the Zigi catchment, with a total area of 1100 km². It is located between latitude 4° 80' and 5° 26' S and longitude 38° 58' and 39° 10' E in the Tanga region, in the North Eastern part of Tanzania (Figure 1). The catchment is within three administrative districts, namely Muheza, Mkinga and Tanga and includes 14 wards and 54 villages. The area is the host of 14 forest reserves and 1 nature reserve (Figure 2). According to the land use and land cover map of 2000, the Zigi basin is dominated by six main land use and land cover classes, namely: cultivated land, forest, scattered cropland, grassland, and shrub land and water bodies. Agricultural land occupies about 45.8% and is the dominant land use. Forests and the scattered cropland occupy about 27.8 and 24.9% of the total basin area, respectively. The grassland, shrub land and water bodies have relatively small areas of about 1.5% in total. The cultivated land includes small-scale

farming and large-scale estate farming. The basin is covered by natural forests and plantation forests. The natural forests are divided into two categories on the basis of altitude. Forests that are on an altitude above or below 850m are considered lowland forests and sub-Montane forests, respectively [11]. **Figure 3.**

The estimated population in the catchment was 204,461 in 2012, with 100,843 males and 103,618 females. The population growth rate is estimated to be 2.2% per annum (NBS, 2012). Household size is 4.3 and the population density is 130 inhabitants/km² [12]. About 41% of the people are aged below 15 years. The main drivers of population increase include natural growth along with migration from other

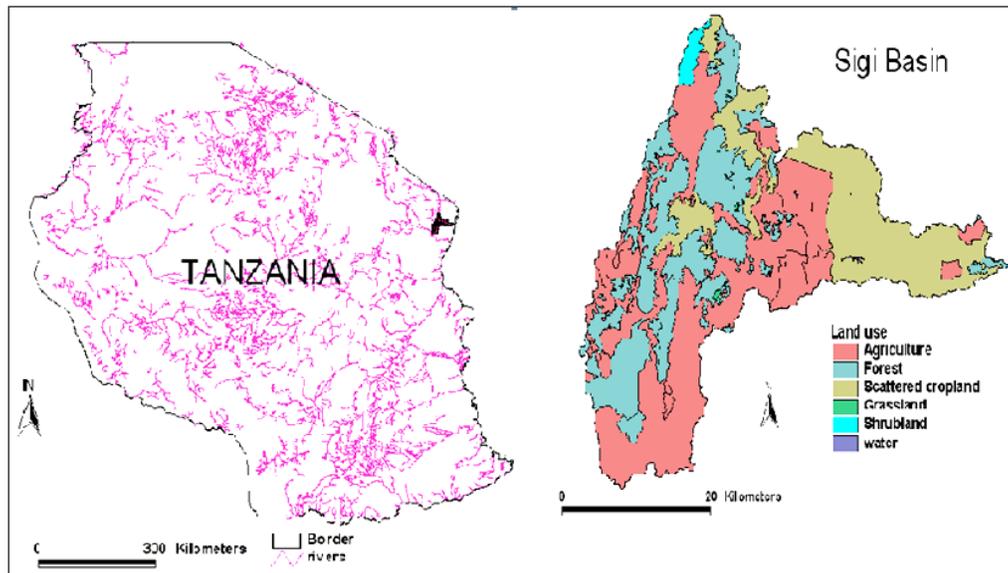


Figure 1: Zigi basin Land use

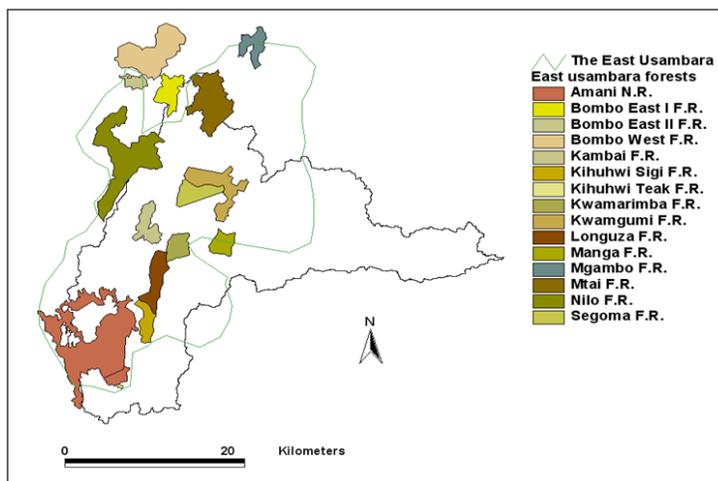


Figure 2: Zigi catchment, Eastern Usambara and its forest cover

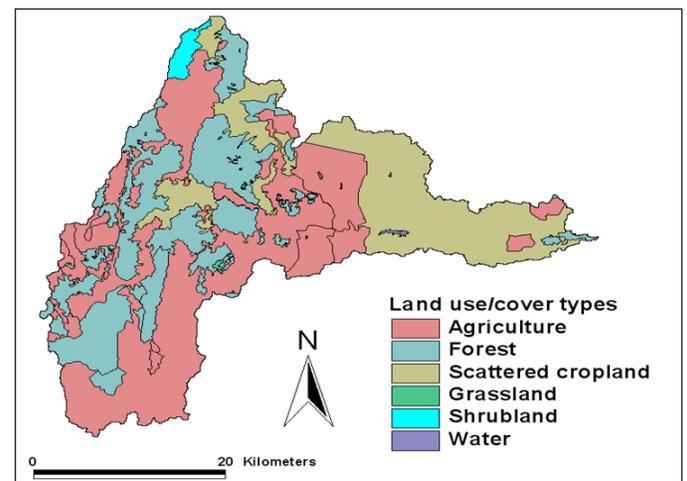


Figure 3: Land use in Zigi catchment

parts of the country. The migration pattern in the catchment indicates that, about 32.6% of the current inhabitants have migrated into the catchment in search of farmland and employment in the large sisal and tea estates. The population was 78,510 people in 1967, 91,110 in 1978, 105,740 in 1988, 129,480 in 2002 and 204,461 in 2012. The catchment population has maintained this rate while the national growth rate was 3% between 1967 and 2012, dropping to 2.8% in 2014.

The dominant economic activities in the catchment are cash crop cultivation, harvesting of non-timber forests products (NTFP) and animal grazing. Crop production and harvesting of NTFPs are the most practiced livelihoods by the majority of the households in the area. The average household farm size is 3.3 acres with mixed crops in most of the farms. Wood resources are harvested for both home consumption and for commercial purposes. Harvesting of wood resources involves collection of firewood, charcoal making, cutting

poles, thatch grasses, collecting wild fruit, wild vegetables and honey, and hunting wild animals. These products are mostly used by the rural communities for energy, food and for raw materials for the construction of houses.

The study area is important for cardamom, a high-value crop. The cardamom is grown in the high altitude forests (submontane) and the entire cardamom production is for export. In the mid-1970s cardamom production was 760 ton per annum or 20% of the world production. This made Tanzania the third largest cardamom producer after India and Guatemala [13].

2.2 Methods

Indigenous knowledge practices applied to forest management were collected via FGD. This involved an informal discussion with some of the elderly people residing in the Zigi catchment from selected villages. Data on how their knowledge is incorporated into the decision-making stream was also collected via this method. During FGD, digital video and voice recording was used as appropriate and necessary. About 10 FGD were conducted in ten different villages with 8 to 10 participants. Villages and elderly people were randomly selected with regards to the gradient of the catchment. This tool aimed to capture the indigenous knowledge of the Zigi catchment community regarding interaction with forest resources. During FGD, important issues such as forest resource use and agriculture were discussed and captured. Subsequently, an observatory participant method was used to collect real-time data and validate the information provided during FGD. Finally, a checklist was used to collect data from different forest and water managing institutions in the Tanga region in order to identify the use and the extent of usage of IK on forest management according to the experience of the forest officials.

3. Results and discussion

3.1 Community's Forest Resources

A better understanding of the IK in a community is gained from the community's ways of living and interaction with nature in spatial and temporal terms. In this case the focus is on forest governance and conservation. It is therefore important to understand the community's interaction with the forests. Communities in the Zigi catchment are almost surrounded by Forest Reserves and a Nature Reserve. There are about 14 forest reserves and one nature reserve. The number of protected areas in this area gives a picture of the community's forest interaction, showing that it is inflexible and limited. In this area the use of forest resources is for house construction, wild food, wild/traditional medicine, firewood and worshiping, with the exception of a few plantations which are entirely business oriented. However, due to restrictions on other uses, firewood and timber are obtained from household farm trees [3]

The behaviour of community forest interaction differs with altitude; this is because the upstream and downstream communities differ in their needs and what the forest offers. This is also influenced by the proximity to forest reserves. Community's adjacent to forest reserves present different interactions to those further away from forest reserves. However, all communities have their own knowledge and specific forest interaction. While obtaining their forest needs, they also have practices which aim to maintain forest services. These practices are indigenously originated and have been passed from generation to generation. **Table 1** below provides a summary of indigenous practices with their relation to forest management.

The Zigi catchment serves in various ways, apart from providing water to the inhabitants Tanga of the Municipality, it is also of vital important to many other people in different ways. For the local population for example, the forests often do not have much direct commercial importance, but they are important for the daily subsistence of the people. Forests provide fuel wood (from an estimated 33 tree species), poles (35 species), ropes (43 species), food (28 species), medicine (185 species), and household utensils (83 species). Apart from these material functions, the local people value the forests for their environmental or religious (e.g. traditional rainmaking ceremonies) value. The estimates have more to tell because what local people extract from the forest has long traditional links to systematic selection of species for a specific need.

All these and the agriculture practices explained below show the indigenous elements and their interaction with forest resources. Some tree species are important for construction of houses, medicines, worships, fruits, and their uses are well-structured indigenously. The Zigi people do not randomly cut down trees for constructing houses, trees are chosen for not only construction purposes but also for protection against harmful organisms, for instance, Msambia (*sispela* spp), Mwiza (*Brideli micrathesi*), Mnawia, which are believed to be natural snakes repellents and are natural mosquito repellents. Traditional houses built from these tree species would last for an average of 50-60 years compared to current houses which last only 5-10 years. Agricultural practices also demonstrate indigenous ways of living and interacting with nature, particularly the forest. The types of crops cultivated are those which do not require clearing the forest but need more forest covers to provide shades and control wind movement, such as cardamom (*Elettaria cardamomum*) and black pepper (*Piper nigrum*). These crops yield better and more when covered with forest. Farm trees cultivation is currently proliferating, thus reducing overdependence on forests for forest resources.

Traditional practices like forest worshiping create a distance between people and the forest. As with any other religious beliefs, a sacred place or item is respected by all. The same is true with sacred forests. People do not encroach on sacred forests for fear of being punished by gods. Another custom avoids overexploitation of forest resources; it directs people to harvest what they aimed for against harvesting anything found in the forest, an aspect also observed by Kweka [14]. The selection of certain trees species for house construction also counts significantly towards forest conservation. The Zigi communities

do not just harvest trees randomly but carefully select strong species which will last for 50-60 years instead of the reconstruction of new houses. This leads to a significant succession period for tree species to regenerate and then be harvested sustainably by the next generation.

The literature contains arguments against the cultivation of cardamom (*Elettaria cardamomum*) and black pepper (*Piper nigrum*) as sources of forest deterioration. The main argument being the clearing of the undergrowth which prevents forest succession. EUCAMP [15] and Reyes et al [16] have provided a clear explanation of how these crops are linked to forest deterioration. However, the explanation provided by Reyes et al [16] does not rule out the fact that temporal aspects of forest deterioration as a result of cultivating cardamom and black pepper are not the same as forest deterioration as a result of commercial logging. Since the introduction of these crops in the late 19th century, the indigenous people have depended

on it. Their practices are indigenously linked to forest health and succession because good production depends on how healthy the forest cover is. Evidence shows serious deterioration of forests in eastern Usambara starting in the 1920s until the 1980s. In 1986 the government of Tanzania therefore started to seriously enforce logging bans [15] [17]. It is therefore not only cultivation that causes significant forest deterioration, but is rather seriously propagated by colonial commercial logging.

It should be understood that the explanations are not meant to argue against the causes of forest deterioration but rather to establish the facts of indigenous practises which directly or indirectly have a positive relationship to forest conservation. Following this argument a list of indigenous practices have been identified in the Zigi Catchment and proved to significantly support forest health.

Table 1: Indigenous practices and their relation to forest management

Indigenous Practice	Relation to Forest Management
Sacred respect for Kwezitu forest (a name meaning thick forest) is believed to be a tree which gives milk like nursing women. People are not traditionally allowed to access the forest. The fear limits people's access to the forest	<p>All these examples of Indigenous Knowledge regarding forest management have implications on the forests in various ways. Such as:</p> <ul style="list-style-type: none"> • Some forests remained intact and kept servicing the indirect needs of the people with a natural untouched forest ecosystem • Under the framework of forest and water this prevented catchment damage and allowed forest succession in the catchment because all tributaries were left to distribute water to various parts of the catchment. • Allowed the harvesting and use of fewer selected species which had a significant interval between one harvest and another. Therefore there was good forest succession
There is Ndola forest which is considered sacred and is only used as a tradition place for respect to Gods, no one is allowed to harvest anything from the forest	
The so-called MATUKURU (samba word meaning something not allowed), people are not allowed to access the forest as it was traditionally used as a dumping ground for one of a set of twins or child born illegitimately (without a known father) as it was considered an abomination for the Sambia to have twins or to have a baby with no known father	
Traditional declaration of forest use. The people have a traditional declared distance in the forest, if anyone goes beyond the agreed distance they will disappear for more than a week. You will not die but you will disappear (for instance, not more than 2 Km from a village)	
If a woman enters the forest in order to collect wild vegetables, for example, she should only do that and nothing else. If you collect anything apart from wild vegetables you will also get lost in the forest	
In kyala (the sources of Zigi River) no one is allowed to enter the water or bathe in the source. It is a real source of the name Zigi, a woman named MZIGI disobeyed the rule and she sank and died, from then on the river was named ZIGI. It is said that at the source the water sometimes erupts like a bomb, it is highly respected even today	
A lake known as Nanthondu was used to bathe infertile women so that they could get pregnant and bear children.	
Tradition selection of tree species: House construction from forest resources was very selective of certain types of tree species- some were abandoned e.g. Msambia (<i>sispela</i> spp), Mwiza (<i>Brideli micrathesi</i>), Mnawia, some of these were believed to be friendly to snakes	

3.2 Cultivation of spices

Since the late 19th Century and after the introduction of spice crops to the Zigi catchment, indigenous people have adapted to this cultivation and later they learnt how to make it better with their surrounding environment. This is why cultivation of crops like cardamom (*Elettaria cardamomum*) and black pepper (*Piper nigrum*) involve selective pruning of tree species. The practice was against clearance of forests to establish farms. It was German settlers who introduced these crops in the 1890's, however they had already cleared large parts of forest cover for tea and coffee. The forest became more significant after the start of commercial logging. Cardamom and black pepper production still proves to be friendly to the forest as it has shifted from depending on natural forest to farmland trees, showing that this cultivation practice has a long-term positive relationship with the forest. Although Reyes argues the best production unit between natural forest grown cardamom and black pepper, the fact remains that these crops grows better with forest cover and therefore serve people and forests

3.3 Rituals

This is another set of indigenous practices with a direct connection to forest conservation. Rituals are still practiced in some of the Zigi Communities. In the villages visited there are some customs which manifested a direct forest conservation link between community traditions and interaction with the forest, such as Lake Nanthondu used to treat infertile women. Infertile women are taken to the lake and bathe to ask gods to enable them to conceive and bear children. Kyala, which is the source of the Zigi River, was respected and still is for this purpose. Its conservation started before the start of conventional ways of catchment protection. In Kyala no individual is allowed to fetch water or bathe. The story goes that a woman known as Mzigi disobeyed the rules, she was drowned and disappeared, her name is said to be the origin of the river's name (Zigi). The Sambaa had a custom known as Matukuru which means a not allowed thing. This is a name given to a forest which was used as a dumping ground for new-born twins and illegitimate children, as in those day it was a curse for a Sambaa to have twins or to have a baby with an unknown father. For these cases therefore, no one could access the forest as it was feared and respected. In Mlesa village there is a forest called Ndola which is a sacred forest used as a worshiping place. No harvesting of any forest resources is allowed from this forest. The indigenous also have a tradition which defines a distance from a village to the forest (assumed to be around 2 km) beyond this distance a person will disappear for two weeks in the forest. Another custom prohibits multiple harvesting of forest resources for the fear of getting lost in the forest, for instance if a women goes for firewood, she is not supposed to collect fruits or any other forest resource apart from firewood.

3.4 Tree Species Selection

The indigenous have a unique interaction with tree species. The construction of houses is selective to certain trees species e.g. Msambia (*sispela* spp), Mwiza (*Brideli micrathesi*), which last longer

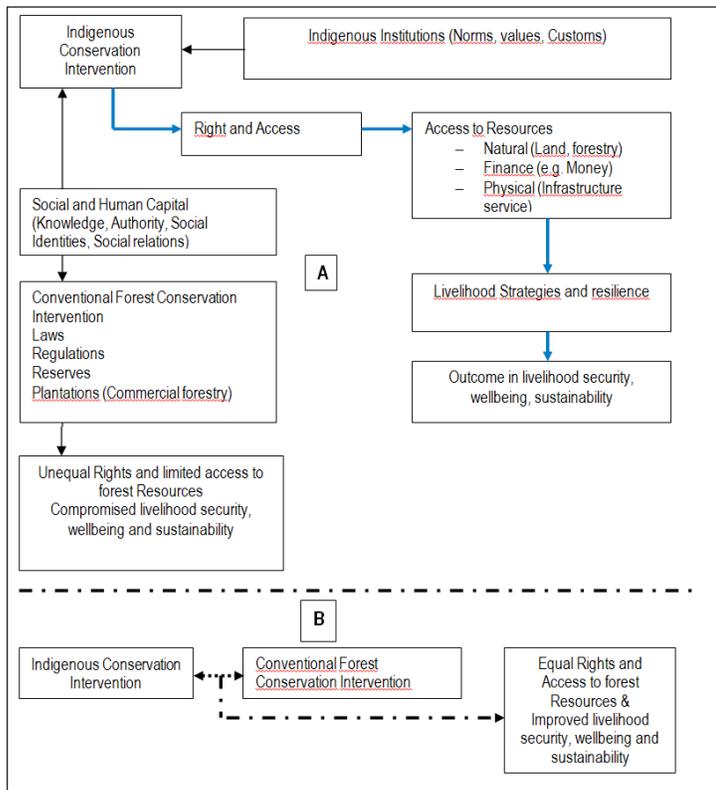
when used for construction than other trees species. Furthermore, these tree species are also snake repellents. Various sacred trees were also identified, including *Ficus* sp (Mvumo), *Sterculia appendiculata* (Mgude) *Diospyros mespiliformis* (Mkulwe), *Albizia gumifera* (Mshai) and *Erythrina abyssinica* (Muungu). They are protected for various uses including medicines, rituals and places where people meet. Anyone cutting a sacred tree is fined a tup or white/black rooster, which is slaughtered to pacify the angered spirits. Some tree species are believed to harbour evil spirits (majini); examples of such tree species are *Adansonia digitata* (Mbuyu) and *Sterculia appendiculata* (Mgongo, mgude). Whoever cuts these trees is likely to be affected by evil spirits. Trees on top of mountains and in water sources are not cut due to the belief that they bring rainfall and conserve water; this is also documented in Kweka [14]

3.5 Indigenous Practices and Forest Governance

Conservation of forest resources like any other resource with direct value to people, possesses complex socio-ecological systems and so needs serious consideration in decision making. Over two decades ago the world in Rio drew attention to the critical state of the ecosystem on our planet. At the centre of attention and efforts lies the conservation of tropical forests [18]. It is from that moment that new redefinition and formulation of forest policies began. This however does not mean there were no conservation efforts before, as there were efforts to conserve forests by strictness and surveillance. Little consideration was put in the complexities of the socio-ecological systems: the interaction between human communities and the forest, the interdependency between the two. The Tanzania national environmental policy [19] clearly states the importance of a harmonious relationship between people and natural resources for sustainable development. It is however a question of how this understanding is taken on board during conservation decision making. The Zigi Catchment has 15 forest reserves which is almost 25% of the total land of the catchment. Many of these emerged in the early 1990s to the 2000s. The people of the Zigi Catchment are said to have existed in the area for more than 2000 years. For all these years, the indigenous of the Zigi Catchment have learnt to interact with the forest for Agriculture, Non-Timber Forest Products, Energy, Worship etc. All these practices have a degree extent conservation to the forest as compared to commercial logging. Sacred forests are respected, medical trees are also respected, not every tree is cut for domestic use, and catchment areas are too highly respected. Together these constitute positive interaction between the people and the resources. Many policies which came after the Rio conference focused on the negative interaction between the indigenous and the forests. As a result of this indigenous practices/knowledge of forest conservation were left out and new conservation strategies.

Theoretically, new explicit forest conservation policies and strategies seem nice; however, they do not manifest and acknowledge the complex roles of indigenous interaction with forest resources. Direct benefits accrued from the forest by the indigenous are now limited by conventional conservation strategies, while the indigenous practices give access and rights to forest resources in an organized implicit way. Conventional conservation approaches limit rights and

accessibility. The decision to conserve and establish forest reserves has left aside the complex socio-ecological systems that have existed for a long time (see **Figure 4**).



Adopted and Modified from Rantalla, 2013

Figure 4: Complex Socio-Ecological Interaction Indigenous Knowledge perspective

The interaction between the indigenous and the forests has shown a positive relationship in livelihood security and wellbeing as well as sustainability. Their social set-up (Norms, Values and Customs) provides rights to resources and well-structured access to the forest resources which both define livelihood strategies and resilience. There is an opposing interaction as shown in part A of the figure: limited rights and accessibility to forest resources caused by conventional forest conservation intervention.

The fact that conventional approaches in forest governance aim to protect the world from turning into a wasteland is appreciated worldwide. However, in some areas conventional approaches have either failed or compromised the livelihood of the indigenous, resulting in serious conflicting interaction between people and the forest. The conflicts arise from disturbance of the links between the indigenous and forest resources, caused by conventional forest conservation interventions. Conventional forest management superseded IK and introduced limits which took away communities' rights to access and own forests

4. Conclusion and Recommendations

Indigenous knowledge has long been misperceived as irrational and incompatible with conventional approaches to natural resource governance, or was at some point considered a source of natural resource degradation. This is manifested in the eastern Usambara region where many advocates of forest governance have placed blame on Cardamom and Black pepper cultivation for forest degradation. However, as time passes more challenges to forest governance arise and we need to realize the importance of complex and largely ignored indigenous knowledge and its interaction with the forest, and thus integrate it into conventional conservation approaches to forest governance, identifying many more drivers of forest degradations, including the misperception of important aspects like indigenous knowledge.

The championing of Community Based Forest Management in Tanzania (CBFM) in the 1990s is evidence of inefficiency in the command and control of conventional approaches to forest conservation. The approaches which restrict people's access and rights to forest resources, although the CBFM shifted forest ownership from the state to communities, still limit access to forest resources and are unfriendly to communities livelihoods [20], documenting a significant financial gain from community managed forest reserves. However, there is limited proof of how the gain is permeated to per capita growth in livelihood. Moreover, the diverse culture and ways of interaction with the forest creates a huge challenge for the application to other localities of conventional approaches which have shown positive results in one locality.

Understanding these complex socio-ecological interactions is very useful to forest governance as it will allow customization of conventional approaches to forest governance to a particular community. This will also ensure integration of indigenous ways of forest conservation in the conventional approaches in order to improve livelihoods, rights and access to forest resources and maintain sustainability. According to Brondizio et al [21], understanding sociological interaction uncovers the great social capital embedded within communities adjacent to forests and aids forest decisions for sustainable livelihoods and forest conservation. Communities' perspectives on forests should therefore be taken serious in decision making for sustainable forests and livelihoods.

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