

Problems with Participatory Mapping in Forest Management

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Problems with Participatory Mapping in Forest Management

A Case of Handei Village Forest Reserve, East Usambara, Muheza,
Tanzania

By

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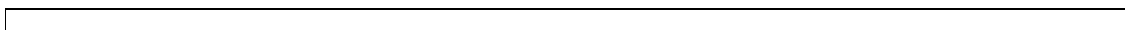
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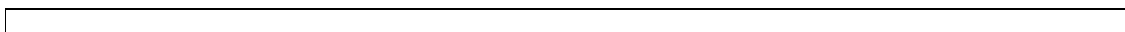


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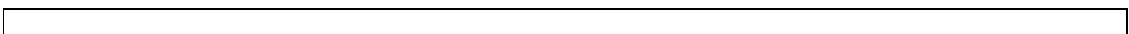
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List of Abbreviations and Acronyms

ANR	Amani Nature Reserve
CBFM	Community Based Natural Resource Management
EUCAMP	East Usambara Catchments and Management Programme
EUCFP	East Usambara Catchments and Forest Programme
EUTCO	East Usambara Tea Company
GI	Geographic Information
GIS	Geographic Information Systems
GPS	Global Positioning Systems
NTFPs	Non-Timber and Forest Products
PAPI	Participatory Aerial Photo Interpretation
VFR	Village Forest Reserve
VFLRs	Village Forest Land Reserves



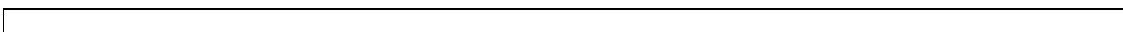
Abstract

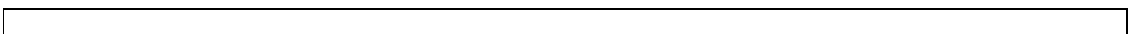
The use of participatory mapping is an enabling condition for collective management of natural resources in community forest management. But it is not a sufficient condition. Other conditions in the community need to be in place as well. The aim of the study was to explore why and how the use of participatory mapping would have effects on sustainable forest management. The focus of this study was changed after it was realised during the fieldwork that the local people did not want to cooperate in the participatory mapping exercise. Therefore the study aims to explore critical conditions - both positive and negative - for participatory mapping. First, the values and importance the community attached to the forest was established. Subsequently, the perception of the community on the conservation status of the forest and the potential technical relevance of participatory mapping was examined. Through these, the study elicited the conditions/barriers that may hinder local people's participation that are necessary to cooperate within the community.

Data was collected from primary and secondary sources using participatory approaches like group discussions, survey research and transect walk. The study revealed three 'clusters' of conditions and factors that would link participatory mapping to sustainable management. First, the local community attached value to the forest in ecological, sociological and economical terms. Second, the local community identified the need for forest management. Third, that participatory mapping is a relevant technique to be applied by the community. The status of the community is such that it had low social capital in terms of lack of participation, mistrust and imbalance in power sharing these had an effect on the local people.

In this village case study it was found that mistrust and lack of 'real' participation by the community tends to lead the people to be rebellious to conservation efforts especially if they think local leaders are involved in illegal activities. In this regard, the local community does not welcome introduction of the new technology like participatory mapping. Thus when participatory mapping is being introduced the local people should be fully involved from the beginning otherwise they do not appreciate results in which they had no input. The study clearly showed that participatory mapping might encounter barriers from other underlying factors as much as it is a relevant technique in local management.

Key words: participatory mapping, local community, conditions/barriers, and forest management





1 Introduction

1.1 Introduction

Tanzania has about 33.5 million hectares of forests and woodland. Out of the total area, almost two thirds consists of woodlands on public lands, which lack proper management (URT 1998). Tanzania has identified deforestation as its major problem. The main reasons for deforestation is attributed to clearing for agriculture, overgrazing and wildfires, charcoal burning and over exploitation of wild resources by the local people who live around these forests. This was because local people were not involved in conservation of the resource because there was no interaction between conservators and the people. In the recent past multi-disciplinary research has been initiated to address the problems of management and conservation of the forest resources. To this effect local people's involvement on forest management and conservation has become the major focus towards sustainable forest use.

Participatory mapping in forest management as it has been adopted in Tanzania is supposed to encourage co-learning between the local people and forest conservators. It is a method whereby they share knowledge in creating a forest management plan. Participatory mapping also incorporates perceptions of how people visualise their environment. The introduction of this approach was deemed necessary after the realisation by the Tanzanian government that deforestation is a major problem to the forest resource.

Participatory mapping in this study is done within the context of Community Based Forest Management (CBFM), which facilitates the establishment of Village Land Forest Reserves. The need for a participatory map in form of a sketch map is a mandate by the Tanzanian government through the Forest Act (2002). For a forest to be gazetted, a sketch map created through participatory mapping should be presented in the proposal. Thus, participatory mapping in forest management is assumed to be of relevance to both the local people and the government agencies because it would support community based forest management which is supposed to be beneficial for both the local community as well as the (outside) government.

Therefore, this study initially set out to see how participatory mapping could support sustainable management of community forest resources. To this end, a case study for fieldwork was identified in Handei Village Forest Reserve, Tanzania. However, while in the field, the local community did not want to cooperate in a participatory mapping exercise. This prompted a shift from the initial

focus of the study on the supportive role of participatory mapping to one, which attempts to elicit why a community would *not* be willing to participate in mapping their forest resources.

It is believed that understanding these barriers may also lead to a better understanding of critical conditions for participatory mapping and for managing common (forest) resources in general.

In order to substantiate the alleged rationale for participatory mapping in community forest management, this chapter presents an overview of the prevailing forest management situation in Tanzania. This will give an insight of how it was started and how it relates with participatory mapping. Thereafter background information on how community participation relates with CBFM is presented. After which the problem is stated and the objectives of the study are then stated. In closing the chapter the significance of the study and an overview of the structure of the thesis are given.

1.1.1 Community Based Forest Management in Tanzania

Community Based Forest Management (CBFM) is a term used, in Tanzania, to refer to any forest management regime in which local people play a major role. It has already taken root both in practice and policy (URT 1998). CBFM have been developed in reserved forests in the village or general lands or Government Forest Reserves (NFR or LAFR). 'Local people' or 'Community' in this context means those who live within or directly next to forests. Their historical relationship within or proximity to the forest makes them an appropriate group of citizens best able to maintain a sustained and effective management role over the forest (Alden-Wily, et al. 2000).

Four important distinctions of the Tanzanian approach to CBFM can be made as presented by Alden-Wily, et al. (2000),

- It develops systems, which enable the community to fully enforce their forest management regime, in a manner that is recognised by courts of law, should a person who breaks a rule seek to challenge village authority.
- These rules made in the village may exclude non-community members from accessing the forest.
- The approach aims to genuinely devolve forest authority and management to the local level, not just to involve communities in the management regimes of Government
- The approach addresses directly to fundamental questions of resource ownership of the forest represents the outstanding stake a community may have in a forest, and supports this development accordingly.

CBFM encompasses all aspects of forest management such as forest protection, regulation of access and use of the forest and actions to rehabilitate or develop the productive capacity of the forest. It looks first and foremost to local people as forest managers and custodians – and even owners in their own right and irrespective of whether or not they use the forest themselves. CBFM

therefore targets communities *not* as passive beneficiaries *but* as actors; *not* as users *but* as managers. Thus community involvement focuses upon forest – local communities as the main actor, assisted by foresters, rather than foresters being assisted by communities.

In Tanzania, local community has a special meaning in that every one in the rural areas belongs to one or other registered ‘village’. In this regard, CBFM does not create new institutions but builds upon those that already exist. The village is therefore the central institutional framework for rural communities. A village, for the purpose at hand is a recognised group of people living in a recognised area (village area). A major advantage of Tanzania’s system of village is that each village also has a legal and institutional base. The people within each village elect their own government (village council). Under Tanzania’s local government laws this body is given strong powers, to act on most matters relating to the community and the local land area. This includes the right to make Village-By-Laws, which enable local rules to be given the full weight of formal law. By law village councils are accountable to village members, acting upon their behalf.

Under CBFM a village can facilitate the establishment of a village Forest Reserve or Village Land Forest Reserve (VLFR). VLFR refers to a forest, which falls within the village area and is owned by the community as a whole and declared as a reserved forest area by the village council acting on the recommendation of the village Assembly. Local declaration of VLFRs has become the main, and now formal, route through which CBFM is structured and exercised. The National Forest Policy endorses the management of VLFR by the village government or other entities designated by the village government (GoT 2001; URT 1998). VLFRs are managed for production and/or protection, based on sustainable management objectives defined for each forest reserve. The management process is based on forest management plans, which are a mandate according to the 2002 Forest Act. These are the activities that may guide the local community. They are prepared in consultation with government officials, local authorities’ user or organisation of users of the forest or local communities. The management plans are supposed to be made in consultation with the whole community. A description of the rules on forest use; protection and management; boundaries and zones on how these zones will be demarcated and how it will be zoned for management; the offences and fines; financial management; and monitoring that will be used are provided in these plans.

1.1.2 Community Based Forest Management and Community Participation

In CBFM, community participation is the major emphasis of the process. Participation is an important component of the management process. Davis-Case et al (1992) cited in (Mallya 1998) define participation as involving the people affected by the change in decision-making about the change; an exercise that must have the support of all levels and an exercise that is necessary for

sustainability and successful projects. They go further and show that participation can be of different levels depending on the extent to which the (local) power structures are going to be affected. The lowest level conventional participation does not seek to transform the power structures. The second level – consultative participation – is where there is the desire to change the power structures but the actors are not courageous in that it is outsiders who set the agenda. The third level - partnership participation- involves negotiation between the parties, as regards the power structures. Lastly is the transformational participation in which the power structures are openly challenged and the agenda is set by the challengers (Davis-Case et al 1992 in Mallya (1998). The most appropriate in this study is the transformational participation whereby the challengers who are the locals have the resources that would enable them to force their way into decision-making table(s).

Community participation is important in that it helps projects to achieve the intended objectives. It assists the community to build trust between stakeholders and partners, and develop a sense of ownership and responsibility among local communities (Dungumaro and Madulu 2003). Furthermore it can bring other benefits to the community in that it tends to bring them together to define their problems.

CBFM encourages participation by the local people through formulation of management plans that are the basis of managing the forests. Villagers are encouraged to participate when drawing these plans, which include by-laws, agreeing on boundaries and zoning of different use zones for management purposes. It is in the zoning and boundary demarcation that the use of geographic information is essential. These two aspects are important in management because they allow people to visualize the resource that they are mandated to manage. The management plan encourages the use of participatory mapping to demarcate these zones and boundaries as a way to include the local people's views on management issues.

Participatory mapping is an activity that involves the community members in preparing maps that provide information about their environment and what they do with it. It is a venue where clarification about problems and their possible solutions can be made, plans can be developed and implementation arrangements discussed. Furthermore, it is a tool used by practitioners of participatory methods to acquire a systematic and graphic understanding of space. It permits a representation of an environment in terms of its make-up, the location of objects or features with respect to the other related or neighbouring objects (Mbile, et al. 2003).

In Community Based Forest Management, participatory mapping can be used in various aspects like creating awareness about management of the forest. One technique that could be used is sketch mapping of the particular resource that is needed to manage. In this way they can provide a way to renew commitment in management of resources. One reason why sketch mapping works well as a community participatory tool is that the mapping process can bring everyone (men,

women and youths) together to share information and concerns. Thus participatory mapping is used as methods that can assist the community learn from amongst themselves. Apart from providing a learning process it can serve as a way to assess what is being and has been done in terms of management by the community. And, as already pointed out, it facilitates community participation.

1.2 The Research Problem

The Tanzanian Government acknowledges that deforestation is the major problem in forest management and recognises that there have been inadequate consultations to encourage grassroots participation in forestry planning and implementation. Therefore local communities have been encouraged to participate in forestry activities of planning and decision-making through the promotion of participatory extension methods and approaches. With this in mind, village forest reserves were established to promote sustainable management (URT 1998). Further, the policy stipulates that a smaller committee of forest management to be put in place to facilitate the formulation of management plans. Village forest committees are encouraged to include a sketch map created through participatory mapping in these plans.

Reported participatory mapping exercises in local resource management experiences in most countries (Griffiths 2002; Okrah 2002; Özesmi and Özesmi 2003) have not been critically reviewed in terms of other factors like the social conditions within the community that may influence its successful implementation. Most participatory mapping experiences have been evaluated in terms of their technical performances and the advantages it facilitates to the community (Mbile, et al. 2003). Moreover, most of these experiences have been in communities that have collective cohesion. Other issues like the institutional set up of the community that may have an influence to the introduction of such techniques are not examined.

This study initially set out to see how participatory mapping could support sustainable management of community forest resources. To this end, a case study for fieldwork was identified in Handei Village Forest Reserve, Tanzania. However, while in the field, the local community did not want to cooperate in a participatory mapping exercise. This prompted a shift from the initial focus of the study on the supportive role of participatory mapping to one, which attempts to elicit why a community would *not* be willing to participate in mapping their forest resources. *This is the gap this study hopes to contribute to narrowing.*

1.3 Research objectives and questions

In general terms, the main objective of the study is to explore why and how the use of participatory mapping would have effects on sustainable forest management.

As this has been mentioned before, during the fieldwork it became necessary to focus the study on to barriers why a local community did *not* want to cooperate in participatory mapping. However, to rule out cases where the forest has no (or little) value to the community, we first have to establish what products are obtained from the forest and how the community perceives these. Second, the conservation status of the forest must be established in objective terms and as perceived by the community. Third, the potential technical role of participatory mapping is established. Only then, can we identify the conditions (including the barriers) that are necessary to cooperate within the community.

The specific objectives and research questions are summarised in the following table:

Table 1 Specific Objective and Research Questions

Objectives	Research questions
1) To establish what tangible and non-tangible products are obtained from the forest as perceived by the community	1) What tangible products does the community obtain from the forest? 2) How does the community perceive the non-tangible products of the benefits? 3) What are the local people's views about forest conservation?
2) To identify and describe the key threats to these resources. 2.b) To determine conservation knowledge of local community	1) What changes has the community observed about the forest reserve before and after the inception CBFM? 2) What does the community attribute the changes in forest resources to? 3) Which conservation methods is the local community aware of since the inception of the management regime?
3) To identify how geo-information can be used to establish the different land utilisations in the forest	1) How does the community perceive the boundaries of their forest reserve? 2) What are the different forest use activities and where are they located?
4) To identify and describe conditions/barriers influencing participatory mapping in forest management.	1) What factors influence participatory mapping in the community? 2) What are the reasons within the community as to why they are not cooperating in forest management

1.4 Significance of the study

Ultimately, the study should help in clarifying some barriers or conditions necessary for forest management. Therefore it is the hope of the researcher that in future before a new technique is introduced the barriers that may affect its proper use are examined beforehand.

1.5 Structure of the thesis

The remainder of this thesis is organised in five further chapters.

Chapter 2 gives a theoretical review and comments on the various aspects of literature on community participation and how geographic information can enhance such participation. Participatory mapping is used as an example of creating GI because of the role it has in resource management plans. How management plans are used to involve the community and the merits and demer-

its of participatory mapping will be discussed. The chapter will highlight some examples where lack of participation has negative results. Finally, the chapter will conceptualise the role of participatory mapping in community based forest management.

Chapter 3 describes data collection procedures that were used in the study. A brief of the study area is given and further explanation on the methods used is presented.

The findings of the study are stipulated in terms of the objectives as presented in **chapter 4**. Data collected for each objective is presented.

Chapter 5 presents an explanation to the findings in the previous chapter. The emerging issues and differences in relation to literature are highlighted and commented upon. Because the study was prompted to focus on the barriers in participatory mapping rather than on the role a concrete application of participatory mapping could play, this chapter also revisits the conceptual framework as presented in chapter 2. Thus, a better understanding of critical conditions of participatory mapping in community resource management will be obtained.

Summary of findings and lessons from the study are presented in **chapter 6**. Finally recommendations are offered on improvements on the implementation of participatory mapping.

2 Literature review

2.1 Introduction

This chapter presents a theoretical overview of how local communities have organised management of common pool resources in a sustainable manner. In addition how and why geographic information can be used and is being used for management purposes is given. It looks at what conditions support the management of resources in a sustainable manner. The chapter draws on Ostrom's (1990) institutional choice perspective. However, only the aspects of informal and formal rules, power sharing and trust are discussed. It is assumed these are some of the conditions necessary if management of a resource is to succeed. An explanation of why the deterioration of institutional landscape may affect management is offered. After that the environment conducive for management is also presented which include participation and community learning. The chapter also discusses why geographic information is important in management regimes of common pool resources like forests. Thereafter, techniques that can be used to create the geo-information needed are discussed. Also examples of the use of geo-information in management are given followed by examples of successful forest management regimes. Finally a conceptual framework of this study is given before concluding.

2.2 Management of Common Pool Resources

Forest policies around the world have undergone a broad transformation based, among other factors, on the recognition of the growing variety of goods and services provided by forests and trees at local, national and global levels (Petersen and Sandhovel 2001). Forests are no longer seen as just wood production or extraction plots but are valued for non-wood forest products and a range of environmental and social services like biodiversity conservation, carbon storage and sequestration, soil and water conservation, provision of employment and recreational opportunities and protection of natural and cultural heritage (FAO, 1999 cited in (Petersen and Sandhovel 2001). This transformation has affected the institutional and organisational landscape in which forests have been managed and utilised over time. One approach to improving management of natural resources is the transfer of forest management responsibilities and benefits to the community level, where responsibilities for forest management has involved the devolution of decision making

power to lower levels of administration. This notion has been challenged of late; the argument is that, forest use management has always existed in societies. Ostrom (2000) points out that extensive empirical research has challenged this theory and illustrated the many ways that forest users themselves have devised rules that regulate harvesting patterns so as to ensure sustainability of the forest overtime.

Additionally the work of other researchers provide evidence that a diversity of societies in the past and present have independently devised, maintained or adapted communal arrangements to manage common property resources. They argue that these arrangements build on knowledge of the resource and cultural norms that have evolved and been tested overtime (Berkes 1989; Blaikie and Brookfield 1987; McCay and Acheson 1987). They argue that local people have always managed resources that they rely on. In this respect they have made their own rules within which control measures are enforced. In the same vein, Berkes & Fervar 1998 in (Ahmad 2003) point out that whenever a society has needed a natural resource rules for its orderly use have been worked out.

However, these complex resource management systems are often susceptible to breakdown following intervention from the state, commercialisation, population pressure, encroachment and the expropriation of disproportionate shares of common resources by a few members of the community (Blaikie and Brookfield 1987). In this regard analysts now develop theories of common pool resource management that attempt to explain whether, and under what circumstances, common pool resources users can avoid the tragedy of the commons (Klooster 2000) . The expression ‘tragedy of the commons’ denotes the degradation of the environment that occurs whenever a great number of individuals share a subtractable resource without an effective property right regime (Theesfeld 2004). Klooster (2000) suggests that the ‘institutional choice’ is one of the most influential and theoretically powerful attempts to address this quest. The approach holds that people have the ability to craft the institutions (understood as rules) that govern their use of a resource held in common. First it looks at the kinds of rules that are necessary, often expressed as the design principles of successful commons management system. Second, under what conditions are groups likely to make these rules and follow them? (Klooster 2000).

Agrawal (2001) analysed the work of Ostrom (1990), Baland and Platteau (1996), and Wade (1988) as three comprehensive attempts to produce theoretically informed generalisations on the conditions under which groups of self-organised users are successful in managing their commons dilemmas. They identify three categories of factors – resource characteristics, user characteristics and other external factors that influence the emergence of local-level institutions (Ahmad 2003). Nevertheless importance attached to each of these factors by the different authors differs a great deal. But Agrawal (2001) argues that these studies generally only focus on a limited degree of resource, external social and physical environment characteristics. He adds that the arrival of new

technologies is likely to change the local power relations as various subgroups dependent on the resource gain different levels of access.

Ostrom's (1990) institutional choice perspective provides an explanation of the institutional change in commons summarised in a number of factors favouring collective action. First, users of a resource held by the community share judgement that lack of change will harm them. Second the resource users highly value the continuation of benefits from the common property resource and have a sense of common, valued future. Third they share norms of reciprocity and trust. This 'social capital' includes a capacity to communicate and make binding agreements, the ability to arrange for monitoring and enforcement provisions. Sustainable management of common pool resources depends not only on biophysical characteristics and user characteristics but also on a broader institutional framework. Institutions provide a set of rules for cooperation and competition and therefore adjust conflicting claims of different members of the community and groups for scarce resources (Ostrom 1990). Thus the broader institutional framework is an external factor that may influence the social capital.

2.3 Social Capital

Social capital refers to institutions, relationships and norms that shape the quality and quantity of the society's interactions (Ahmad 2003).

Ostrom and Ahn's recent work (2001) suggests that the ability of the community to arrive at collective action to deal with resource allocation problems depends on the level of social capital. In Ostrom's model different forms of social capital at local level – trust, norms of reciprocity, network and institutions, interact with each other and facilitate collective action (Ahmad 2003). Apart from this, the institutional set up of a community or organization also influences the behaviour and the way people perceive things.

It is difficult to imagine that low-level trust among community members would hamper sustainable management of common pool resources. Social capital can influence collective action through trust and norms of reciprocity among community members. On the other hand, community action can be successful only if it is backed by formal rules and people have respect and trust in public officials – who may be those appointed to perform a particular task. These factors will influence the actions of the community because ultimately rules shall be observed. Public officials can however only win the trust if they too operate within and follow the set rules.

Influential features like trust; power sharing and formal and informal rules may hinder or consolidate collective action. The former may occur if the people are not given enough opportunities to participate and learn in an environment that is transparent and vice-visa.

2.3.1 *Formal and informal rules*

In most local management regimes a large inconsistency exists between formal management intentions and informal institutional change at the local level. This situation creates an institutional vacuum due to institutional constraints like limited implementation capabilities of formal rules, limited law enforcement mechanisms and weak public administration capabilities. The high discrepancy between formal and effective rules provides conditions under which opportunistic behaviour is able to grow and persist. On the other hand opportunistic behaviour can be greatly influenced where there is a weak social capital. Opportunist behaviour here is understood as different expressions of self-interest seeking with guile including calculated efforts to mislead, deceive, obfuscate and confuse (Williamson 1996 in Theesfeld (2004). In discussing the importance of adequate enforcement mechanisms for common property management rules, institutionalists argue that a crucial function of enforcement and sanctions is to ensure that they are not being 'suckered' by others who break rules (Klooster 2000). "Enforcement increases the confidence of individuals that they are not suckers" (Ostrom 1990). Ostrom's framework recognises that rules have strong distributional effects, and points out that strong leaders and subgroups can inhibit efforts to change the rules that benefit them.

2.3.2 *Imbalance in Power sharing*

Power asymmetries of actors represent the main determinant of institutional change. An elite group may have power to influence decisions in the community. The impact of heterogeneity depends on how it is linked to expected benefits and costs of institutional change. Ostrom (2000) refers to collective-choice rules that offer a small group of the elite substantial power to block suggested changes that may generate positive overall gains to the entire community, but also losses for those in power. This influence on distributive considerations determines the way benefits should be distributed among various actors involved. Determinants for unequal distribution of power include factors such as control over the information flow of an organisation or community. Information and information asymmetries are important in influencing actors' evaluations of individual alternatives, or adding new alternatives (Knight, 1992 in Theesfeld (2004).

The way benefits that are distributed among various actors involved influence the likelihood of institutional change. Institutions shape human behaviour through their impact on incentives. The concept of incentives involves more than just financial rewards and penalties. Incentives are the positive and negative changes in outcomes that individuals perceive as likely to result from particular actions taken within a set of working rules, combined with the relevant individual physical, and social variables that also impinge on outcomes (Ostrom 2000). Incentives include material in-

duancements, power, and service for others, satisfaction in social relationships and a feeling of participation.

2.3.3 *Trust*

Trust is an issue central to the management process. Trust as social capital facilitates the provision of collective action. According to Ostrom and Ahn in (Agrawal 2001) trust is the most encompassing factor in collective action as it facilitates voluntary cooperation. Collective action needs credible commitment, and one decisive requirement for credible commitment is trust among other actors. When a society is pervaded by distrust, cooperative arrangements are unlikely to emerge. However, Ostrom and Ahn, argue that contextual factors may include the aspects of trust that cannot be reduced to one or other form of social capital. Trustworthiness of a population may depend on history and culture.

2.4 **Geographic information**

The need for spatial information in relation to decision-making can be considered from different perspectives. Spatial information may be provided as an input or just to be used for a specific assignment. The process of making decisions requires information as an input. The need for information in general and spatial information in particular can also be viewed from the point of view of impact. These impacts may be on a medium to long-term periods. In all cases the information needs to be predicted, controlled and over a long period it needs to be monitored and evaluated. Thus the support of spatial information is evident in the latter.

Geographical space is an important factor across a wide range of decision-making problems, not only because many human and environmental processes vary remarkably from one place to another but also because space determines people's perceptions of the world and ultimately what we call 'local' and 'global' (Carver 2001). Geographic information is information that is used for various purposes in society almost on a daily basis. The action of moving from one point to another using an address of a street name is geographic information. (Masser 1998) refers to geographic information as information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. By this definition he goes further to make a distinction between two types of geographic information, that is, location and attribute. Attributes give value to the locations that are identified. From this it is easy to see, for instance, the use of a particular area. However the attribute of a location may not always be important in terms of its use purposes but may help in other circumstances like making decisions and policies.

Aitken (2002) states that the public and private status of actions is often equated with the space in which they occur such as homes, community centres, planning departments.

Geographic information should for this reason, be designed in such a way that it gives the same information to everyone. Therefore it should have a representation that depicts the same/similar features to everyone that uses it. Geographic information is important in assisting in the identification of some commonality within the society hence it can be used to a large extent universally. For instance, a topographic map with a clearly defined legend will portray the same information to every individual who uses it. Therefore, there is need for universal marks of identifying the attributes. As pointed out by (Masser 1998) those elements of geographic information, which are of special significance, also require a considerable measure of consistency to be used effectively. This aspect can be used to concretise the information use within and between communities and higher-level authorities.

It is important to note that in every community the aspect of culture, institutional norms play a role in the use of (geographic) information. At organizational level different, say, departments will use the same information for a different purpose within their responsibility because they are dealing with a specific different aspect. According to (De Man and Van den Toorn 2002) culture programs how to deal with problems and it provides 'the collective programming of the mind'. It frames the collective mind set of a social group, provides values and norms to the group and acts as the 'hidden agenda' behind the responses society of the incoming technology. Thus GI is relevant for understanding and solving spatial problems (Molenaar 1989 in (De Man and Van den Toorn 2002)). They argue that the way in which human beings perceive problems is to a large extent culturally bound. Therefore, from the local community's point of view varying problem perceptions may arise.

Geographic information technology as an institution might contribute to achieving some degree of social coherence and commonness (group identity) within society (De Man and Van den Toorn 2002). Village sketch maps – 'as grassroots' - provide good illustrations of this point.

2.4.1 Geographic information and community participation

Geo-information often results from combining geodata with expert knowledge. Hence, when asked to produce geographic information the local community will incorporate their indigenous knowledge. The flow of communication and information in local institutions is often in terms of indigenous knowledge, folk perceptions of the world, narratives (stories) and images rather than texts and tables (De Man and Van den Toorn 2002). Information about the world can be created by way of GI. It can be seen as a special case of information as a whole. GI may be represented in various forms like maps, images or aerial photographs. There are many approaches that can be

used to create spatial information in organizations and at local levels. At organizational level trained personnel produce such maps. But it can be created at community level as well through participatory approaches.

Decision making for sustainable forest use can be achieved through the geo information link and is based on several data sources (Mansberger 2003). Tenure rights define the rights to a specific piece of forestland. The use and the condition of land can be described by physical data in form of topographic maps, sketch maps, aerial photographs and satellite images. Added to this group is the information about forest use zones, boundaries and the land cover. Finally is the group that characterises the value of the forest economically as well as historically to the local community.

Decision-making is not only based on information about the forest. It also depends on the social environment, on the culture and on the economic condition of the community. This information has to be integrated into the geo-information system to guarantee appropriate decisions. Spatial information offers a tool with which these different spatial datasets these may include data on use features of the area, could be brought together and put to use through a common reference.

In forest management participatory approaches of creating spatial information enable the community to have an input in that information. In doing so the community may value and trust this information. GI created in this manner may be described in a participation ladder that begins with a simple 'right to know' but ends with full participation in decision-making. Such a ladder can simply be described as one which will include participation in the collection, consolidation, processing/analysing and finally in the presentation of data (see fig. 1). GI technologies enable higher levels of participation, which enhances the ability to define interests, determine agendas, assess risks, recommend solutions and participate in decision-making (Aitken 2002). In the process it brings them together and creates some commonness. Consequently collectively valued information may bring about definitions of spatial problems (De Man 2000). These approaches are designed to empower communities to take informal decisions, based upon a shared perception and understanding of the state of the environment. Further to this, (De Man 2000) views participatory approaches in using information as essentially social processes in the construction of information.

Public Participation in Final Decision
Presentation of data
Processing/analysis of data
Consolidation of data
Data collection

Figure 1 Participation ladder

Participatory mapping is a method, which has been used for creating GI within a community. Participatory use of information involves sharing, dialogue and collaboration among individuals.

In order for participatory community mapping to contribute significantly to the rural development process there must be mutual understanding of the issues facing local people. Geographic information systems and related spatial technologies have become important tools for management agencies to administer resources and protect the environment (Sieber 2002). Geographic information use are particularly significant when social groups collectively deal with development problems most of which having important spatial and location dimensions (De Man 2000). It is likely to have limited effects in societies that are not supportive to participation.

Several ways of creating GI have been devised through participatory approaches. The ensuing paragraphs give a brief narrative of why these methods are important in terms of forest management regimes.

2.4.2 *Participatory Mapping*

Most approaches to obtain resource or land use maps are usually conducted by outsiders who interpret remotely sensed images without profound knowledge of local resource conditions. Limited field experience and lack of knowledge may result in inaccurate delineation and misinterpretation of land use classes. Participatory community mapping to create sketch maps is more accurate as it incorporates local knowledge than those which are usually produced by field workers in isolation from local people (Jackson, et al. 1994). The objective of participatory community mapping is to enable villagers to carry out the interpretation of aspects of their land resources, which are of significant importance to them.

Participatory community mapping is a tool used by advocates of participatory methods to acquire a systematic and graphic understanding of space. It is a useful tool for enabling the participation and empowerment of communities through providing them with increased information for decision-making if it focuses on community needs (Garvin and Shrestha 1999; Jordan 2002). This tool has been used in resource management areas to assist in information requirements on issues of land use, tenure, location and condition of local forests, existing use rights of common forest and the perceptions of forest users. In this regard, it is an effective method of diffusion of information to the community at local level.

Effective communication at community level is important as it calls for more participation. If members of the community are free to communicate they participate more by airing their views on what they think. Decisions made in such a participatory manner are more likely to be transparent as all the participants are involved. But in order for participation to lead to better decision-making, learning within and amongst the community must take place. In this context (Hamilton, et

al. 2001) defines learning as the synthesis and analysis of information obtained through communication. The learning process must however, be a two way process. In the case of participatory community mapping the facilitator must learn from the people and vice versa. In this way, learning takes place in different dimensions by experience and exchange of views.

Hamilton (2001) goes further to explain that whilst participating in the planning process, not only does experiential learning take place but if group interaction is encouraged, consensus on causes of action can be arrived at. They identify the learning theory to the context of participation planning with four levels as follows access, comprehension, and interaction and finally learning. In terms of geographic information preparation using participatory community mapping these levels once achieved implies that the information, if developed for the purpose of, for instance, management plans will be collectively valued. People would have gone through all levels of learning this information may be used for management plans.

The planning process can be greatly enhanced by the appropriate use of visualization and communication technologies. Such technologies include aerial photographs, satellite images and topographic maps. The range and variety of information and communication technologies are increasing and providing a more advanced digital tool kit that can be applied to find solutions to real world problems. An example of this is geographic information systems (GIS) as, will be explained later, a means to make more accurate the geographic information made by the community. Because it is computer based it limits access to the community. However, the best measure of success is found in the participant's willingness to continue the process and learn. Learning can hence be concluded to be a necessary condition in resource management.

The spatial analysis and visualization make geographic information a suitable extension to learning and understanding the environment. Different perceptions of the same space or resource that may be difficult to verbalize and externalise can be visualised using GI. Sharing information about common problems of a resource can be managed and it facilitates generation of views, which are not seen before. Hence, may guide appropriate and collective action (Gonzalez 2002).

2.4.3 Merits and Demerits of participatory community mapping

On its own participatory community mapping has several advantages in the way that it is used as a tool to generate geographic information. It must be noted that major output of this exercise are sketch maps to which most of these advantages and disadvantages refer (Alcorn 2000; Carter 1996; Mbile, et al. 2003) tabulate the advantages of participatory community mapping in uses of various resources as follows,

Advantages

- It is easy for field workers to prepare a good quality map that contains a great deal of essential information about forests.
- It is less threatening to villagers because they can readily see what is being produced
- It helps build community cohesion
- The local people are able to determine rights over and access to natural resources
- It promotes intra-community co-operation.

Disadvantages

- It is difficult to use as supporting documentation in formal or legal contexts
- It may contain a limited number of information sets
- It is observed that the basic input-participatory community map-is spatially confined to social, cultural and economic domains of those who produce it
- The maps need to be translated into more precisely scaled authoritative information that could be used officially for management purposes.
- The maps tend to freeze what are in reality fluid boundaries and systems of land use
- Maps may exclude the concepts of those who are not involved, both people within the communities (often women) and those outside their boundaries
- The few elites in the community may dominate the exercise

Participatory community mapping has however, been criticized on the aspect that the products of maps in sketch form are not accurate. To this effect, other methods have been used to make them more authentic. These include participatory aerial photograph interpretation (PAPI), the use of a global positioning systems (GPS) and geographic information systems (GIS). In the following paragraphs these methods will be explained in order to show how they can be incorporated in participatory community mapping.

2.4.4 *Participatory aerial photograph interpretation*

Greater accuracy may be achieved by consulting, and incorporating information from, alternative sources such as existing maps or aerial photographs (Carter 1996). Aerial photographs have been found to be good 'ice breakers' and have thus been used for awareness raising and for stimulating local discussions on land use and habitat changes. The single most important finding was that aerial photographs made information, issues surrounding forest management, and participatory processes more accessible to non-literate people, thereby empowering them to take greater control over decision-making (Mather, et al. 2003; Mabile, et al. 2003). In addition, (Mather, et al. 2003)

points out that the local people find it easy to interpret aerial photos. They also found that aerial photographs are a basis for participatory mapping, transferring information between groups. The products of this method are photomaps (participatory maps drawn on a transparency over an aerial photograph), which are an effective tool for participatory communication on village level to: (Mather, et al. 2003)

- Visualize resource use to facilitate discussions without communication barriers, to motivate participants to reflect and discuss about land issues;
- Allow a rapid identification of social, economic and environmental problems by determining and debating issues with active participation of the community;
- Create a common understanding among local people and administrative bodies on spatial distribution and status of resources and resource use;
- Provide a tool for joint and demand-driven decision making between different villages and between villages and state entities;
- Acquire accurate spatial data on large scale on the basis of local knowledge;
- Provide options for participatory impact monitoring for rural development investments from government and other donors;
- Settle prevailing boundary conflicts;
- Elaborate accurately scaled information that could be officially approved for management purposes.

2.4.5 *Global Positioning System (GPS)*

A global positioning system (GPS) is further used in producing geographically accurate maps with local communities. It is capable of providing the latitude and longitude reading of any position on the surface of the earth (Mbile, et al. 2003). GPS enables the operator to plot the position on the ground. Thus, for example, by moving through a territory with local people, it is possible to draw a very accurate boundary map that can be elaborated upon to show the position of different resources and important local uses of the area (Carter 1996). Although these techniques do allow community members to decide what is put into the maps, they do, however, generally rely to some extent on trained personnel from outside to prepare the base maps, record the field data directly on maps, or in the computer and print up the final maps (Griffiths 2002). These marked positions need to be verified further through the use of a geographic information system (GIS).

2.4.6 *Geographic Information Systems (GIS)*

A geographic information system is a relational database whose main feature is the use of a common coordinate system for accessing both spatial data (on objects) and descriptive or attribute in-

formation defining those objects (Mbile, et al. 2003). A GIS can capture, store, update, retrieve, organize, manipulate, analyse and display spatial information. It provides a means to integrate many layers of spatial information, to develop dynamic models, to analyse trends over time and to stimulate scenarios (Sirait, et al. 1994). This feature makes a GIS ideal for storing and analysing information and thus helps understanding the relationship between spatial objects and the context in which they exist. It also has the potential to facilitate monitoring change in quantities and relationships, over time and between locations.

Therefore the integration of information generated by PCM into a GIS is important. This is for the data to serve the purpose of demonstrating the value of knowledge, especially retrospectively, and eventually putting local people in a 'real world' context, it should be in a storable, retrievable, transformable form, and one in which it can be combined and integrated say in a regional, national or international context (Mbile, et al. 2003). In a research conducted by (Garvin and Shrestha 1999) in Nepal they were able to identify the following advantages and disadvantages of using a GIS in a participatory manner.

Advantages

- If it is viewed as a participatory process it can empower the local people by involving them in the decision-making process
- It can be used to effectively combine quantitative and qualitative approaches to community forestry and rural development in general
- Maps, resource management information and other spatial information can be given to the community to aid them with their decision-making and negotiations without the need for them to have access to GIS
- Information can be easily collated, analysed and returned to stakeholders

Disadvantages

- No potential to assist extractive collection of information
- It can disempower disadvantaged groups and further distance them from the decision-making process
- It emphasises on technical issues not participation in that only those who are trained can use it

2.5 The use of participatory community mapping - some examples

The tool of participatory community mapping has been used for several resource mapping exercises. For this purpose a number of examples are drawn from the community forestry manage-

ment areas where it has been widely applied. Community forestry requires secure tenure, if the local people are to have any confidence that they will reap the benefits of their efforts. Participatory community mapping can be a powerful tool to help communities think about the lands, represent their land use system and assert their rights to the forests they seek to control (Colchester 2002).

The use of participatory community mapping technologies by indigenous people to demonstrate their relationship to their lands, resources and to mount land claims is a relatively recent phenomenon. In South East Asia the basic idea and technology was introduced in the early 1990s and the technique has since spread. Community mapping exercises are now underway in India, Philippines, Malaysia, Indonesia, Papua New Guinea, Solomon Islands and Thailand. The technologies used vary widely as already pointed out. In Thailand these maps made by the communities have proved to be useful tools for community mobilization and village level discussions of land claims and natural resource management planning (Colchester 2002).

In Guyana, Griffiths (2002) reports on a research undertaken on six communities who decided to map out their traditional land and demonstrate that all the forests and savannahs in their territory have been used and occupied by them according to their custom for generations. They argued that drawing up their own map would help demonstrate their view of property; ownership and resource use that was very different to government view. The research proved that a combination of village-level capacity building in land rights issues and participatory community mapping can be empowering for local people and also provide the basis for an effective territorial defence strategy (Griffiths 2002). The local people were able to use the method to prove that they have a different perception of the land and forests that they use.

On the method of aerial photograph interpretation work has been done in Nepal and (Mather, et al. 2003) found that its use was very important and a vital visual instrument. When used with the community, participatory aerial photo interpretation proved to be an easy tool to interpret. It created an atmosphere in which the objectives of the users and District Forest Office were seen to be complementary. People are able to relate their perceptions with the real world.

In Turkey, (Özesmi and Özesmi 2003) used an approach to quantify the subjective perceptions of different stakeholder groups; this method is the fuzzy cognitive mapping which is also participatory. Fuzzy Cognitive Mapping (FCM) are models of how a system operates based on defined variables and the causal links of these variables (Özesmi and Özesmi 2003). The method was helpful in obtaining the support of the participants and to compare the similarities and differences among the groups of stakeholders. It can be used to get the views of the different stakeholder groups their differences and similarities and these results were used to make recommendations for the ecosystem management plan. They conclude that different stakeholder groups have different perceptions about what the most important factors are and how they affect each other.

From the foregoing it can be noted that participatory community mapping as a tool for local participation is important and it not only helps in the sustainable use of resources but also assists in establishing local boundaries. This can be exemplified by a situation in Ghana where the government did not consult the communities living in the reserve about the creation of a protected area. The interest of the local migrant families were not taken into account on the onset. Because of this the local people have failed to recognize the government's position and have thus refused to relocate. The example shows the need to take into account the interests of all the relevant stakeholders (Okrah 2002).

Trakolis (2001) conducted a research into the ensuing conflicts of the Prespes Lakes in Greece that were designated as a restricted National Park. The people had lived near and utilised these lakes for traditional purposes such as farming, fishing, hunting and forestry activities. A conflict ensued when the community did not agree that their activities posed a threat to the environment. The study revealed that local people's perceptions could produce useful information that could be incorporated into the decision-making process and lead to resolution of conflicts. The absence of the people when decisions were taken led them not to honour them.

An analysis of a comparative case study of community forestry by Klooster (2000) in Mexico reveals that some social systems of common pool resource management are successful in sustaining the resource than others. He made a comparison of one unsuccessful community with seven successful communities within Mexico. The successful logging communities have been able to control corruption and mismanagement in the communal forestry business and to establish effective controls over individual uses of the forest. They control timber smuggling, reverse deforestation, and invest in the future productivity of their forests. These communities have a number of common property management rules.

He concludes that the comparison of this one community with the seven successful communities suggest that 'community' and social norms do more than provide cheap sanctions and discourage free riding.

2.6 Conceptual Framework

Participatory mapping can have an influence on the community (actor group), the perceptions of the resource and the institutional structure in which it is conducted. At institutional level participatory mapping can facilitate communication, as the community is able to argue and discuss what to include in the sketch map. In so doing it allows for the inclusion of indigenous knowledge and creates a sense of ownership, which makes the community have the mandate in the management of their resources. In this way the community gains also the power to have an input in the mapping exercise. Through being involved in participatory mapping and within the institutional

framework the actor group (the community) will develop trust with those in charge, in this case the forest committee as well as amongst themselves. This formation of positive social capital like trust, power and information sharing will also lead to positive resource utilisation.

Through participatory mapping the actor group can see the condition of their resources and possibly perceive a common problem in their management. Thus the actor group and the state of the resource have an influence on each other in that the community sees exactly what is required and take appropriate action.

All in all participatory mapping works to the assist the community in perceiving a common problem through visualisation. The community will work well if the institutional conditions support it. It works to achieve community cohesion. Therefore, participatory mapping encourages a form of forest management, which leads to improved management of the resource.

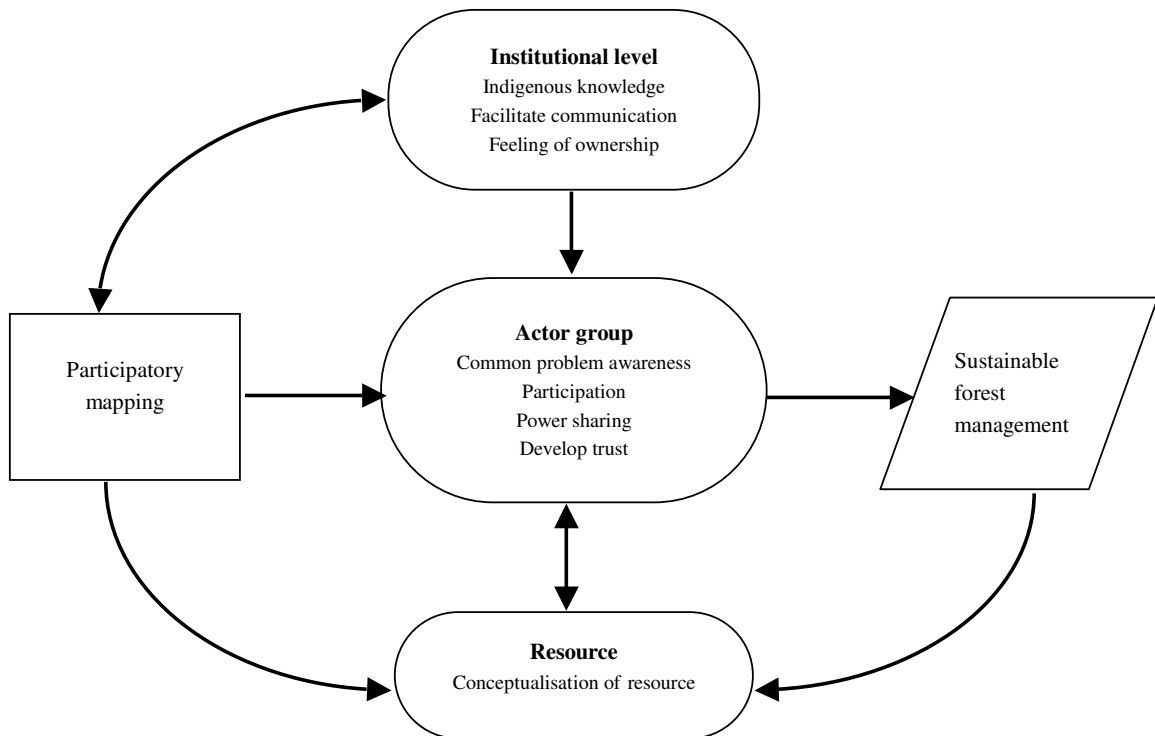


Figure 2 Conceptual Framework

2.7 Conclusion

The reviewed literature was intended to show the advantages that participatory mapping could bring to a community. To begin with the institutional choice perspective is used to explain the necessary conditions for communities to cooperate. Thereafter three distinct aspects are elabo-

rated *i.e.* trust, power imbalance, limited access to information and inappropriateness formal and informal rules. The literature provides that change in these variables may have a crucial impact on the community members' ability to cooperate to do community activities like participatory mapping.

In addition literature was reviewed to highlight and show the importance of geographic information for various purposes at community level. It endeavoured to show that geographic information is institutionally and culturally bound (De Man and Van den Toorn 2002). Though not exhaustive it can be concluded that geographic information when used as a participation tool can achieve a lot of things. The use of participatory mapping has a number of advantages if done in an atmosphere that has a high level of social capital in terms of trust, power sharing and adherence to formal and informal rules. In this way it can be used to generate common problematic issues about the environment and natural resources. Such consensus has been developed in a number of areas in Nepal, Guyana, and Ghana among others as presented. Added to this are other methods like participatory aerial photography interpretation, the GPS use in transecting walks and finally the 'feeding' of the information into a GIS in order that all maps are properly geo-referenced to obtain a more accurate output. This would be of particular importance when the locally produced geo-information is to be integrated with geo-data and information at higher administrative level. To summarise how participatory mapping works to assist the community in identifying common problem of management a conceptual framework is presented. From the foregoing it is clear that the use of geographic information through participatory mapping can be an effective tool to generate a shared perception of common problematic issues through visualisation of the resource and hence can be used for various aspects in natural resource management.

3 Study area and methods

3.1 General overview of study area

3.1.1 *Mgambo Village*

Mgambo village is located at the Southern part of East Usambara on the Amani plateau in Muheza district. It is a highland village, in Misalai ward of Amani Division. The village has a land area of about 618ha surrounded by tea estates. Administratively, the village started in 1974 following villagilisation programme in Tanzania. There are 7 sub villages each represented to the village government. Population data of 1994 indicate that village has about 1103 inhabitants living in 210 households altogether with average family size being 5.3 household members. The population of the village is greatly influenced by its proximity to the estates workers' camp which is now an integral part of the village and a large and diverse immigrant population putting added pressure on land, water and forest resources. The diversity of the village population reduces the legitimacy of the village government and makes it difficult for it to enforce unpopular control measures.

Table 2 Summary of basic data on Mgambo Village

LOCATION	
District	Muheza
Division	Amani
POPULATION	
Households	240
Male	572
Female	531
Total	1103
SUB-VILLAGES	
	7
LAND AREA (Ha)	
	618
FOREST AREA (Ha)	
	156

Source Population data 1994

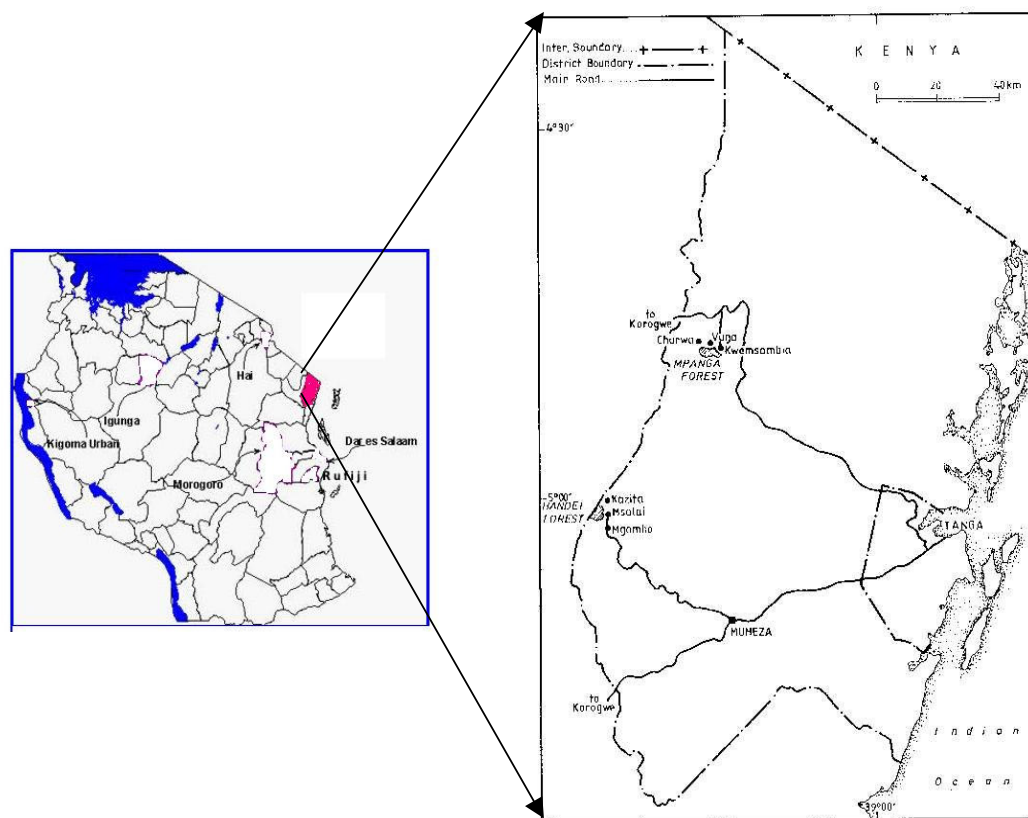


Figure 3 Study Area

Land use classifications generally include settlement areas, cultivated land, livestock-open grazing land and commercial land under tea companies. Main economic activity for the people is farming. Others are such as animal keeping and petty business done by few on small scale. However, people can engage on casual employment to the tea company. Crops grown include maize and cassava used for subsistence crops.

The village has shortage of both agricultural and forest lands. The village is greatly influenced by the proximity to tea plantations of the East Usambara Tea Company (EUTCO). Since establishment of the tea estates in 1950s there was no further opportunities for extending village boundaries, so this resulted to increased pressure on the forested areas in the village as population expansion was taking place (Ellaman 1996). The village own a 156ha block of natural resource forest called Handei forest.

3.1.2 *Brief history of Handei Village forest*

Handei forest was named after the settlers who came in the 19th century from Handeni, a lowland area in the South Western Tanga Region. The forest is believed to be the site of an important battle between rival Kilindi chiefs. The first leader of the settlers was called Mbega, then Kimweri and Mnkande. They settled in the forest in Amani, in locations today belonging to the Kazita and Mgambo Miembeni villages. It has great ritual significance both as a burial site and for rainmaking and other ceremonies (Ellaman 1996). Elders of both Mgambo and Kazita (a sub village of Misalai which was traditional home for Kilindi chiefs) used Handei as a sacrificial site and viewed it as an important water conservation area. For this reason there were until recently strong sanctions protecting its use, felling of trees in particular being totally forbidden. The forest was very famous for conducting different rituals such as praying for rain, fertility and protection against disasters and diseases (Veltheim and Kijazi 2002). Many young people were frightened even to go into Handei forest for fear of supernatural sanctions.

In recent years, however, these sanctions have become less effective. Shortage of agricultural land, linked to growing disregard for traditional authority has led to encroachment of the forest boundaries for cultivation purposes and to felling for pit sawing of many of the most valuable trees.

There has been some replanting of trees close to Handei forest boundary, but despite this the extent of forest has been greatly reduced. In 1993, the then village Executive Officer of Mgambo requested EUCFP assistance to conserve what remained of Handei forest. EUCFP decided to take it on a pilot project for village forest management (Bohero 1997).

3.1.3 *Conservation efforts in the 1980s and 1990s*

In the late 1980s the village of Mgambo Miembeni started to worry about the changes in the microclimate in the area and sort advice from foresters working for East Usambara Development Programme (EUDP). Trees were planted in open areas, but as they were not made aware of the purpose of forest conservation and some village leaders felt that the forest was there to benefit them only. As a result the encroachment, grazing and timber harvesting continued for the benefit of a minority group in the village.

In the mid 1990s, the East Usambara Catchments and Forest Programme (EUCFP) included Mgambo village in some extension activities like video shows of successful forest management in other areas. After the visit of forest committee members from Mpanga Village Forest Reserve to the village, the villagers decided to conserve their forest. With the assistance of EUCFP, the Handei forest was surveyed and a map prepared showing the area to be 156ha. The villagers par-

ticipated in the survey and border clearing and digging of directional trenches were done as communal work (Veltheim and Kijazi 2002).

The village formulated by-laws but had a dispute because it was felt that the committee was not elected in a transparent manner therefore only represented a minority in the village. Follow up by EUCFP was weak. The by-law was never passed through the ward development committee and was not submitted to the District Council. Therefore it never gained legal status and could not be used for management of the forest. As a result, forest destruction continued as the forest committee chairman authorised cutting and timber harvesting for the benefit of a small minority in the village. All this demoralised and discouraged the villagers to attend any of the forest management activities or take responsibility for forest protection.

Management Planning in 2001-2002

The preparation of a new by-law was started in October 2001. In one of the discussions it was revealed that the forest committee Chairman had continued pit sawing in the forest. And that the village had started collecting entry fees from visitors to the forest. However, there was no proper plan on how this revenue should be used. Thus a management plan was seen as a way forward to solve these problems.

The village assembly selected a planning team of 12 people comprising 7 men and 5 women and started the planning exercise by reviewing the past management. The planning team found several weaknesses in the past management plan. These included the fact that the forest committee was not selected by the village assembly and therefore represented only a minority group that used the forest to their own benefit. Since the village government had selected the forest committee it was difficult for the villagers to intervene to the misuse of the forest. Coupled with this was the fact that there was no management tool in place as the first by-law was neither passed by the Development committee nor approved by the District Council. Lastly, the revenue collected as entry fees from visitors to enter the Handei forest was not used to the benefit of the community.

3.2 Data collection procedure

Participatory tools which included secondary data search, group discussions, and semi-structured interviews and transect walks were used to collect data. How information was collected to meet each objective is described below.

3.2.1 Group discussions

Group discussions were used to extract information from the community on various issues. This also included the importance and values attached to the forest by the community. The checklist

used during the discussions is shown in appendix 2. During group discussions efforts was made to encourage every person to participate. The local people were regarded as experts and principle source to obtain information about local people's perceptions.

In each sub village one group discussion was conducted. Each group was composed of the ordinary villagers who are forest users in one-way or another. Because the community is mostly Islam, the groups were divided according to gender. This was designed to allow for more free discussions especially with the women. In total 3 groups of men, 3 groups of women and 2 of youths comprised the groups interviewed. An informal interview was also held with the members of the forest committee and village government. An attempt was made to include at least 10 people in each group so that more ideas could be raised. The average attendance was 12 per group. Discussions were documented.

Group discussions are valid and effective methods of soliciting information because they provide an environment where flexibility and informality are considered important (Beckley 1999 cited in (Parkins 1999). Participants influence each other, opinions change, and new insights emerge. They learn from each other. The main advantages of group discussions noted by (Maundu, 1995 quoted in (Mapanda 2003) are:

- High rate of information generation
- More correct information

Direct observation method was also used. It allows the investigator the opportunity to visit the case study site.

3.2.2 *Establishing known rules to forest conservation*

An evaluation list based on the rules listed in the management plan was devised to determine what rules the community knew about forest resource use. These same questions were posed to all the groups. Groups were allowed to mention whatever rule they were aware of while the researcher ticked what was mentioned. Those rules mentioned which were not in the list were added to the list.

Triangulation was used to cross check on information received from a number of sources. This means looking at a problem from three or more different angles (McCall 2003). For instance, in semi structured interviews the same or similar questions are posed separately to three or more different people or groups and the responses are compared. Alternatively, the same or similar questions are put in three or more different contexts – individual informants, group meetings, and focus group discussions – and the results are compared.

3.2.3 *Questionnaire interview*

A questionnaire interview was used to elicit information from the community. The answers to these questions were noted in a separate notebook (Van der Zee 2003). The questionnaire constituted a checklist of important elements of information required and guided the interview on a semi-open ended basis. Individual interviews were conducted within households.

3.2.4 *Transect walk*

Transect walks are systematic walks with key informants through the area of interest, observing, asking, listening, looking and identifying zones. By walking through a field spatial data such as land use, settlement patterns and people's perceptions of these can be investigated and discussed in detail. The tool helps generate an overview of a given area and at the same time draws attention to unusual characteristics. Used in connection with semi-structured interviews this tool can be particularly helpful in understanding interactions between the physical environment and human activities. The walk was used to identify the various activities/land utilisations in the forest. To some extent it also served to verify what the discussions revealed as per objective 1 and 2. The information gathered was used to develop a map that shows different points of activities in the forest. The waypoints were marked using a global positioning system (GPS). The different activities as observed on the ground were recorded. A checklist questionnaire was used in the discussions to establish various uses of the forest.

3.2.5 *Secondary data collection*

Secondary data searching is seen as important and is basically performed on data collected by other researchers usually on related problem issues. For this study the ITC library, Amani Nature Reserve offices, EUCAMP and Forest and Bee Keeping departmental libraries were used.

3.2.6 *Limitations to data collection*

The limitation to the study mainly lies in the dependence of the local community's disposition.

The way points created may not be representative of the varying conditions of the forest.

The researcher could not speak the Tanzanian native language Swahili. It was therefore difficult to have comprehensive group discussions without the services of a translator. Since the responses had to be translated from English to Swahili and vice-versa some issues may not be represented adequately.

The study of a behaviour community needs more time to allow for comparisons but only one study was undertaken therefore the findings might vary within a short time.

3.3 Data analysis

Content analysis was used to analyse qualitative information from the group discussions and participant observation. The analysis aimed to study the themes and tendencies portrayed in the content of recorded conversations and observations in the field. Content analysis is a research tool used to determine the presence of certain words or concepts within texts or set of texts. Texts can be defined broadly as books, essays, interviews, discussions, conversations or really any occurrence of communicative language. The major advantages of this method are that it can allow for both quantitative and qualitative operations and can provide valuable historical/cultural insights overtime through analysis of texts (Mayring 2000).

Time trends analysis was used in identifying important changes overtime on how and why a forest has been encroached on; the extent to which land has become more available, rainfall more or less abundant and reliable. Trends can be drawn on paper ground or discussed in-group or individual interviews. For this study these were discussed in groups.

This technique was important in showing both actual and perceived changes in features of trends in factors affecting the opportunities and risks to which the village members are subjected. In this context it was mostly used in gaining an understanding of the history of misuse of Handei in discussing peoples' perceptions of the forest.

Data collected from questionnaire survey was used to draw matrix tables, frequency or percentages. For the rules that the community was aware of an evaluation list was used. This is what is in the management plan and those, which were identified by the community, were recorded by ticking and new ones were added on.

The waypoints from the GPS are used to create a point map to show the various activities in the forest. The boundary of Handei Village Forest Reserve was created using the survey data of the Survey department, which assisted the community in demarcating the boundary. A comparison with the map, which shows the different use zones as, proposed by the committee and the conservator, was made. The sketch map is not altered for this purpose it is scanned and used the purpose above. The forest committee created the sketch map with the assistance of the conservator. This is further used to analyse data in objective 3. The created map is used also to verify some of what was revealed in the discussions. For the purpose of creating the point map Arcmap software was used. Further verifications in terms of obtaining metadata for verifying the coordinates the 1989 topographic map of the area were used.

4 Results

The ensuing chapter presents the findings of the study. The results for each objective of the study are presented. A discussion to these results will be provided in the next chapter.

4.1 To establish the importance of the forest as perceived by the community

4.1.1 *The importance of the forest to the local community in terms of products and values*

Many local communities in East Usambara utilise a variety of non-timber forest products. The objective sought to establish what benefits the local community obtains from the forest. Different people within the community harvest several products from the forest. The findings from this research suggest that the different community groups collect different products from the forest as presented in table 4.1. The villagers identified the products themselves. Among all the groups the youth, women, and men collect firewood. Similar findings are observed in the study conducted by (Kidombo 1997) that most firewood used in the village comes from the forest reserves. Traditionally the people of Mgambo village have mostly relied on the forest for harvest of non-timber forest products (NTFPs) (Kessy 1998).

Building materials for both community work and household building is another product obtained from the forest. The community was at the time of this study building a community school for which some materials like building poles were obtained from the forest with permission from Amani Nature Reserve through the forest committee. Most houses in the study area are built using NTFPs like poles and ropes; similar observations recorded by Katigula (1999) in his study. To many rural communities, local people's demand for local products, especially building materials is very high and immediate alternatives are prohibitively expensive.

The women also include medicinal plants as an item available in the forest. Women elaborated that they collect roots and leaves for 'small' ailments in the family. Traditional medicine collection takes place at two levels, i.e. by specialised healers and by household members. Knowledge of plants that treat most common diseases is shared by the household members, making it necessary to consult a specialist only when the case is complicated (Kessy 1998). In addition, (Hamilton & Smith, 1989; Owen, 1992 quoted in Katigula (1999) provide a comprehensive list of forest species in East Usambara useful as medicines.

Mushrooms are also collected as a supplement to their diet. Although it is quite scarce and seasonal most people in Tanzania are found to include mushroom to their diet and during the rainy season, some tribes may have a daily mushroom meal (Harkonen et al 1995 quoted in Katigula (1999).

Table 3 Matrix scoring of products obtained from the forest

Products Obtained	Kwamsambu Women	Kwemukashi Men	Mhomboni Youth	Miembeni Youth	Madukani Men	Kivumo Women	Kwamusoso Women
Firewood	***	*	*	*	*	***	***
Vegetables	**	0	0	0	0	**	*
Building material	0	0	***	***	**	0	0
Medicinal plants (roots & leaves)	***	**	*	*	**	***	***
Mushrooms	*	0	0	0	0	*	*

NB: 3-most important 2-important 1-less important 0-not important

The table shows ranking to determine the preferences of products among the different village groups. This is evident from the exercise conducted in which the participants were asked to rank, through matrix scoring. Using a range of products as criteria the groups ranked the products according to how much they withdrew from the forest. Scoring was done with 3 indicating highest and zero allocated to what they did not directly collect from the forest. Women's groups reveal that mostly collected firewood, medicines and vegetables. Mushrooms were ranked as less important by women as they are seasonal and expert knowledge is needed to identify those that are edible. Men rank the building materials as most important followed by medicines and they attach less importance to firewood. It is evident that they rank the products according to their specific chores that they perform in terms of gender. Firewood collection is almost entirely the responsibility of women while building materials collection is the men's responsibility (Kessy 1998).

The local community of Mgambo village also have some significance attached to the forest. These values can be divided into three categories ecological, economic and cultural. Forest values originate from the interaction of society with the physical environment system of which forest forms a part (Kennedy 1985). Different groups interviewed indicated that they are aware of ecological returns that the forest provides. The most common response is that forests regulate good climatic conditions and that it provided a source for rivers. However, this may also be due to the repeated awareness education from Amani Nature Reserve and EUCAMP during facilitation and initial introduction of the management programmes (Veltheim and Kijazi 2002). The data suggests that residents have a relatively good understanding of the importance of the forest. Kessy

(1998) adds that, the forests in the East Usambara are appreciated locally, regionally and nationally for their catchment's values. Forest value therefore is not only an essential quality of the forest but is also related to the characteristics of the valuing subject and on the relationships of this subject to the forest. The value attached to a certain forest can therefore differ from person to person or amongst groups within a community.

Table 4 Values attached to the forest

Values	Kwamsambu	*Kwe.	Mhomboni	Miembeni	Madukani	Kivumo	*Kwa.
Good climatic conditions	✓		✓		✓		✓
Source of rivers		✓	✓			✓	✓
Worshipping purposes		✓	✓			✓	
Eco-tourism (blue monkey & African Violet)		✓		✓	✓		
Fees from visitors to forest		✓	Not aware			Not aware	

*Kwe – Kwemkashi

*Kwa. - Kwamsoso

Culturally, the forest was also known as a worshipping site. However, out of all the 7 groups interviewed only 3 attributed the forest for worshipping/ritual purposes. Kidombo (1997) points to the fact that the Wasambaa are by nature traditionalists and forest have always been protected for purposes of traditional/cultural values. There are special forest areas that have special religious and sacred importance. In the men's group only those who were elderly mentioned the fact that the forest is used to worship. The rest of the group however agreed that it was used for such purposes a long time ago. The women's group also added that it was used for rituals like female circumcision, a practice that has since phased away.

Economically, the men saw prospects of eco-tourism and were optimistic that the presence of the blue monkeys and the African violet in the forest could encourage tourism activities. The younger generation seem more enthusiastic about the possibility of ecotourism as an option to employment opportunities. The women on the other hand are only aware of the availability of the African violet due to the influx of researchers to the area. For instance at the time of this study, a mapping exercise was been conducted of the locations of the African violet.

Only one group out all the groups are aware that there was a forest fees paid prior to visiting the forest. Apart from ecological values like good climate conditions and water catchments, there are economic and social values of the forest.

4.1.2 *Local perceptions of rules on forest management*

To establish the perceptions of the local community about management, the known rules governing the resource use were solicited from the people. Based on the following understanding: “Rules provide information about the actions an actor ‘must’ perform (obligation), ‘must not’ perform (prohibition), or ‘may’ perform (permission) if the actor is to avoid the possibility of sanctions being imposed” (Ostrom et al, 1994 quoted in Theesfeld (2004), rules are an essential component of the management process. The table below presents a list of rules that the community are aware of. The management plan has stipulated what rules should be adhered to by the local community. Out of the 7 prohibited uses of the forest the community is only mentioned 5 prohibited uses. From the representation it can be deduced that the fact that it is not allowed to cut down trees is a frequent answer and possibly most observed rule in the community. Of all interviewees within the sampled households, 51% mentioned it as a prohibited act. The second common rule known is that animals are not to be grazed in the forest to which represents 21% of the responses from the sample. The score on whether they are allowed or not allowed to collect medicines are the same 8%. However 12% the sample indicates that they do not know any rules concerning forest management.

The questionnaires also sort to elicit how the people knew about the rules. The most frequent answer to this was that they just heard from their fellow village mates. Table 4.3 presents a summary of the responses from the interviews.

Table 5 Rules for forest management

<i>Known rules on resource use</i>	<i>Total number of mention</i>	<i>Number of mention in %</i>
Not allowed to cut down trees	46	51.1
Not permitted to collect local medicine	7	7.8
Not allowed to graze animals	19	21.1
Allowed to collect medicinal plants but ensure that the trees survive	7	7.8
Do not know any rules	12	12.2
Total	90	100.0

Finally, as way of assessing other management practices, the objective also sorts to identify how the community harvested the products from the forest. To this effect the community was asked to list any rules regarding the harvesting of the products that they obtain. Considering that all mem-

bers in the community have rights of access following mutually agreed upon rules and responsibilities it is expected that they are all aware. In order to have a more representative overview the amounts and time of collection was asked. This was to establish how harvesting of NTFPs was done as it is a major product that they obtain. And to see if local people realised the need to conserve or use the forest resource sustainably. Table 4.4 tabulates the results.

Table 6 Permitted actions in the forest

<i>Rules pertaining to collection of products</i>	<i>Women</i>	<i>Men</i>
Who is permitted	<ul style="list-style-type: none"> • Anyone 	<ul style="list-style-type: none"> • Anyone
Which are the permitted areas	<ul style="list-style-type: none"> • No specific areas 	<ul style="list-style-type: none"> • Specific place for medicines • Designated place for fire-wood
What is the harvest system	<ul style="list-style-type: none"> • Anytime • Any day 	<ul style="list-style-type: none"> • Anytime • Any day
What amount can be collected	<ul style="list-style-type: none"> • Any 	<ul style="list-style-type: none"> • Specify amount as one gets permission for community development • Any amount but should be for home use
What are the fees towards collection	<ul style="list-style-type: none"> • No fees 	<ul style="list-style-type: none"> • No fees

A comparison on the responses from the men and the women was made. Both groups responded that anyone could collect products from the forest at no cost/fees. A contradiction arose on the areas that are permitted to harvest products from the women, who displayed ignorance of the designated areas for utilisation. The women feel that they can collect any amount they need for home use a response, which the men also concur with but mention that this should be from designated areas. The men on the other hand further elaborate that for the purpose of community development permission is sort from Amani Nature Reserve, which facilitates conservation efforts. But they can harvest anywhere for their own construction needs.

4.2 To identify and describe the key threats to the forest

4.2.1 Observed changes to the forest as perceived by the community

In order to establish the key threats to the resource the community was first asked what changes they had observed whether positive or negative in the forest resource. These changes range from the observations to activities in the forest. These can also be said to be indicators to the local people of forest degradation. The following is a list of changes that the community is able to identify and present. The changes to the forest are either positive or negative in terms of its effect to the forest as a whole. However the negative attributes seem to override the positive aspects. The negative effects are very detrimental to the forest. The fact that more rainfall is perceived as a positive aspect could only be for the previous season that the people observed more rainfall. Dur-

ing the interviews one woman in the discussion even mentions that *'the distance of where to collect firewood has lengthened she said that one may go the whole day only to come back with a small bundle'*. The group from Mhomboni who compared the forest as being thinner than it was before reiterates this. The village is near the forest and in the lowland to them the stones on the hill in the forest where a few years ago not visible from the village.

Table 7 Observed changes to the forest

Village	Observed change	Positive or negative outcome
Kwamsambu	Grazing of animals has not changed Firewood distance farther	N
		N
Madukani	Income from visitors Rules governing resource use Less rainfall	P
		P
		N
Kivumo	Less rainfall	N
Kwemukashi	Rules governing resource use No other activities (farming)	P
		P
Miembeni	Many activities like grazing, harvesting of building materials like timber and stones More rainfall	N
		P
Mhomboni	Forest thinner than before Less rainfall Harvesting of products (timber) still on going	N
		N
		N
Kwamusoso	Firewood scarce in the forest Less rainfall	N
		N

NB: N negative effect to the forest P is positive effect to the forest

4.2.2 Most depleted tree species as perceived by the community

The most depleted trees species as observed by the community was presented. The use of these tree species was also sort to see why the trees where so depleted in the forest according to people's perception.

Table 8 most depleted trees species and it use

*Species name	Use of the trees	*Frequency mentioned
Minyasa (<i>Newtonia buchananii</i>)	Timber	6
	Cleared for cultivation purposes	4
Mukondo ngogo (<i>Sapium ellipticum</i>)	Firewood	2
Mihesi (<i>Maesopsis eminii</i>)	Firewood	6
Mukanyi or Msambu (<i>Allanblackia stuhlmanii</i>)	Ropes for mat making	1
Mtambaa (<i>Cephalospharea usambarensis</i>)	Timber	1

*No of village in which the species was mentioned

*Species local name, in brackets botanical name of the tree

(Source: Field survey 2003)

From the table it can be seen that most trees are cut for timber purposes. This timber was mostly used for building of houses and other community developments. The timber was also being illegally logged or pit-sawed. The use of mtambaa and minyasa for timber purposes was also observed in earlier studies in the area (Kessy 1998). The other most depleted tree species is the mi-hesi, which they mention is good for use as firewood and other home use purposes. They also point out that the minyasa tree is depleted because it was cleared to pave way to cultivation activities. It must however be noted that these are results that the community identify over a period of time. The provisions of these results counteract the people's knowledge of what has really deteriorated in their forest. The fact that they are able to relate this fact is that they are aware and possibly threatened to the fact that the most useful trees are finishing fast.

4.3 To determine conservation knowledge of the community

4.3.1 Conservation methods the community is aware of

The village people also have their own way that they feel conservation should take place. They are aware of the need to observe some conservation methods which they think would be very useful to the forest committee in charge of the conservation of the forest. Suffice to mention though that some of the methods mentioned are already what the management plan has tabulated. They think that the best outcome would be achieved if certain procedures and rules in the plan were followed. The following are the answers they give when asked *what conservation methods they knew or what they could advise given the chance*. Incidentally different village communities give different methods they think should be added or should be done. The responses are presented in the following table:

Notably the women suggest that there should be a day designated for firewood collection as they feel that indiscriminate collection is not at all a viable method. Asked if it was not to their advantage they mention that it was good for the forest. Contrary to the result that Kessy (1998) observed whereby the women complained that it wasn't sufficient to go to the forest only once a week.

Another method mentioned as a way to conserve the forest is that the forest committee leaders should be replaced. 78% of the interviewees representing 70 answered that the forest committee was put in position by the village government and the rest 22% responded that they did not know. The people know the importance of awareness on conservation issues. To this effect the youth group stresses the need for creating this awareness to the entire community. A frequent response was that there was a need to plant more trees as a way to recuperate the forest.

Table 9 List of suggested conservation methods by the villages

Village name	Suggested conservation methods
Kwamsambu	<ul style="list-style-type: none"> • Village government should have a watch man in the forest • The village government should arrange for a special day for collecting firewood • They should be provided with more seed to plant trees
Madukani	<ul style="list-style-type: none"> • Need to plant more trees • All community members should follow rules
Kivumo	<ul style="list-style-type: none"> • Nobody should be allowed to cut down trees
Kwemukashi	<ul style="list-style-type: none"> • Nobody should cut down trees • Prohibition of grazing of animals should be followed strictly
Miembeni	<ul style="list-style-type: none"> • There is need to educate the people on the conservation methods
Mhomboni	<ul style="list-style-type: none"> • Passing in the forest should be prohibited • There is need to change the forest leaders • Introduce a watch man in the forest
Kwamusoso	<ul style="list-style-type: none"> • Introduce day for firewood collection • Plant more trees

4.4 Observed activities in forest

The transect walk in the forest was necessitated so as to verify some of the claims in the discussions and also to have a physical look at the forest with the village members. While undertaking the walk a GPS was used to get points of various activities in the forest. The activities marked were either obvious or a discussion was made before agreeing upon the final activity. The points of the boundary of the forest were then used to create a segment map of Handei village forest reserve using GIS software Arcmap. Thereafter, the points taken using a GPS were added to show the various activities in the forest (see fig. 5). This map is used to make a comparison with figure 4, a sketch map presented to the District Office on the use zones of the forest.

The sketch map (fig.4) is a result of a participatory mapping exercise conducted by the conservators and the forest committee. According to procedure this map is supposed to be a 'proposal' to the rest of the community. After being taught the forest committee is supposed to do the exercise with the rest of the community in order to ensure that their perceptions are included. Only then is the sketch map, after modifications supposed to be presented to the District Office for approval. It is the duty of the forest committee to educate and explain to the community what and why they need the sketch map developed through participatory mapping. In this study the group discussions reveal that this stage was missed, hence they did not have an input to its construction. A discussion with the facilitator at the Conservator's office reveals that even though the District Office has not given its final approval the management plan including the sketch map can be used for management purposes. This sketch map is used to make a comparison with the actual activities on the ground as presented in figure 5.

The transect walk undertaken revealed that the forest had other activities. The activities found include grazing of animals, pit sawing, palm leaves collection, old and recent cultivation, proposed hotel site and a settlement. These are activities that are not permitted in the forest. On site examination reveal that there are new and old cultivation activities in the forest despite the new management plan.

Firewood is collected in a number of areas in the forest. It is evident that the people collect wherever they find the firewood and where it is convenient for them. In figure 5 one area in which firewood is collected has been zoned as the biodiversity and research zone, which has been identified as potential for eco-tourism. However, in this area apart from firewood people also collect palm leaves and graze animals there. These activities if left unchecked will cause a lot of damage to the endemic plants and insects present in the area. Pit sawing sites are located further in the forest though some looked like they had not been used for sometime. These sites were identified in several places although it was agreed that they were not used for some time, some looked as though effort had been made to disguise them.

While in the forest it was noticed that there is a settlement. Although the settlers have always been living in the forest the new management plan does not have a provision for them. Such activities were not pointed out at openly in some group discussions. Only two groups mentioned about a settlement in the forest but the general consensus was that they had always been there. The community did not seem to have any problem with these people living in the forest. Nevertheless, all the community members are agreeable to the boundary as surveyed with assistance from ANR and EUCAMP. It was observed that the community did not clear the boundary. The boundary is properly surveyed and beacons have been put in place (see fig. 5 created with the same boundary points).

It is evident in the spatial data collected the harvest of such products like firewood, vegetables and medicines is done wherever available.

A comparison to the sketch map shows that the zones demarcated by the forest committee are not being followed. Even the site that was originally considered a scared place for worship purposes is no longer respected because other activities like palm leaves collection are evident in this area. However, this has been zoned now to represent a reserved historic site (fig. 4). In this area also are old graves; the local people also revealed that it was in this area that some rituals like female circumcision used to take place. This confirms also what is provided in literature that the place was used for ritual activities. The walk also revealed a proposed and already surveyed hotel site in the forest. This site is apportioned and is only waiting for approval from the District Office. Nonetheless, there seems to be a controversy on the proposed site to build a tourist hotel. The villagers feel that this will just accelerate the destruction already in existence in the forest. Others

feel that they will lose ownership of the forest, as the benefits in terms of tax will go to the Government and not to the village.

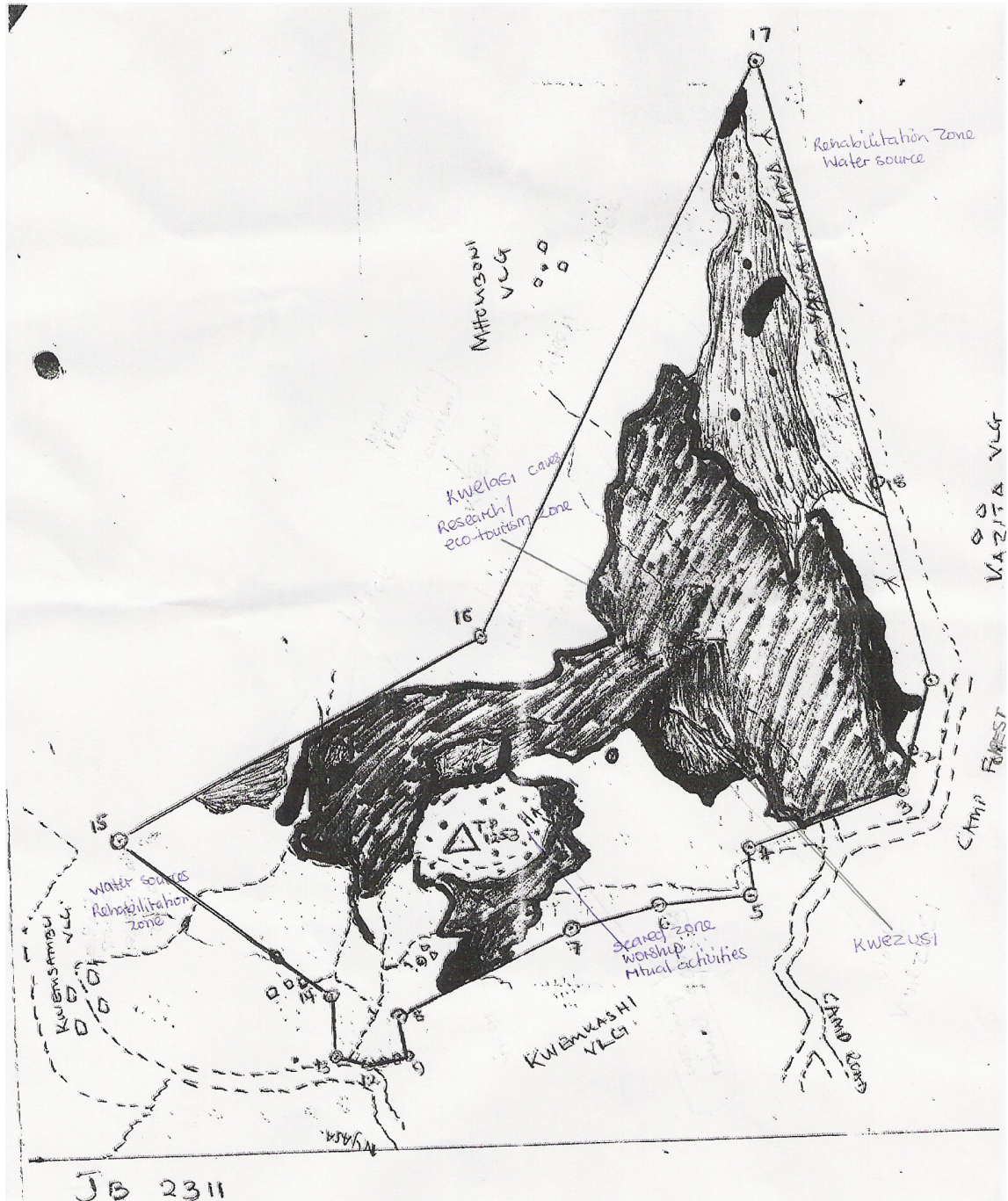


Figure 4 Sketch Map of Handei Village Forest Reserve

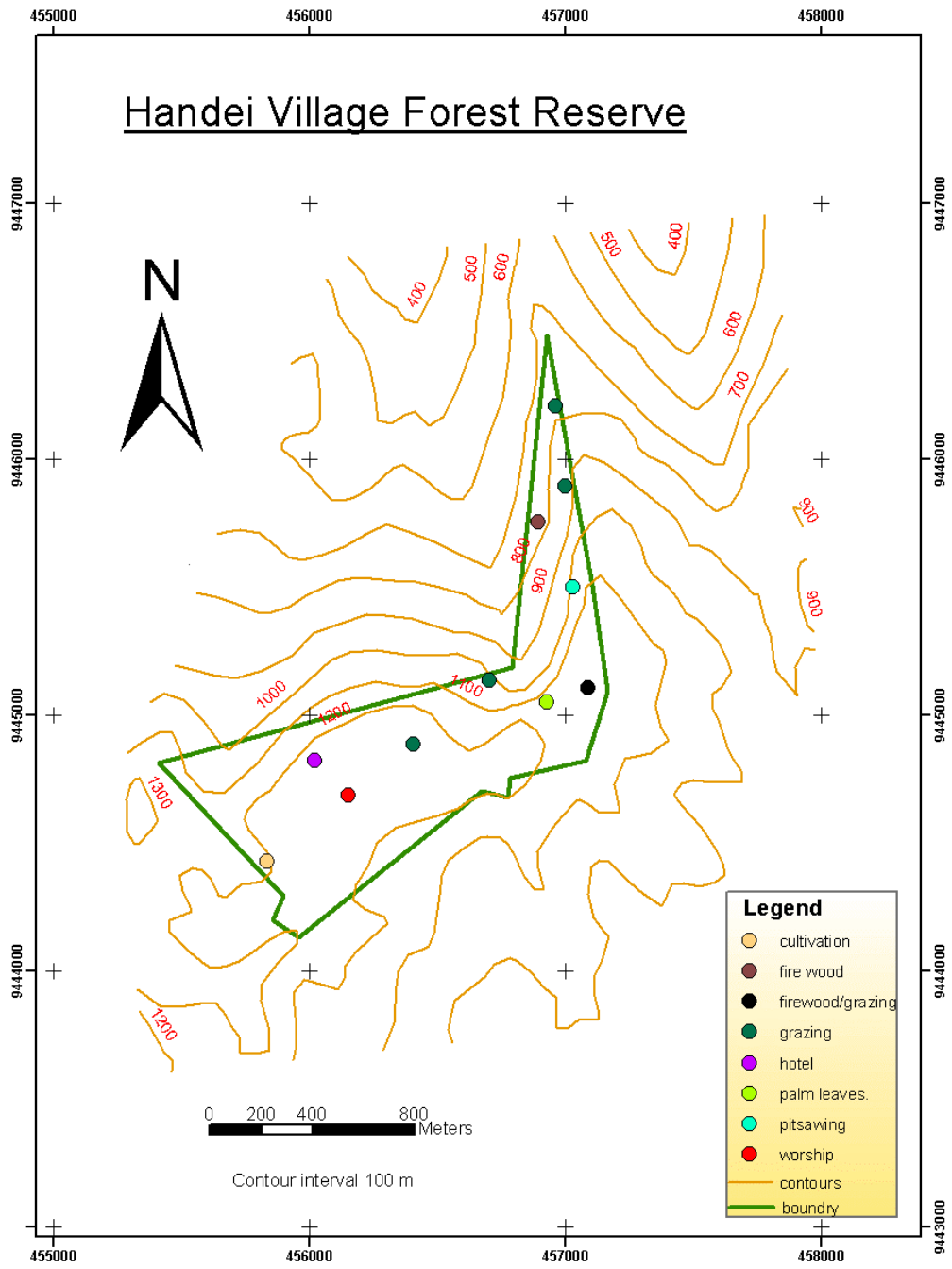


Figure 5 Point Map of Activities in the forest

5 Discussion

5.1 The importance of the forest to the community

The forest is a significant resource to the local community. The local community relies on the forest for a variety of products. For most of their daily livelihood they depend on the forest. All the benefits that are taken are important in one way or another. The importance that each one attaches to the forest creates an incentive for the people to manage the forest in a sustainable manner (see section 4.1.1). Local people may have historical claims on the forest and be the first to feel the impact of any changes in the extent on quality of the forest. Within the community, different community groups may attach value to the forest differently. Decisions made by other stakeholders will not address the needs of local communities unless the values of each interest group are taken into consideration during the planning process.

Ideally local people are thought to have more incentives to manage well the forest because they derive significant benefits from it and have higher expectations of the future dependence on the forest. These benefits may influence the way the local community looks at the resource. It is important that benefits must be significant if the community is to go to the trouble of establishing and enforcing rules about resource use. In addition the benefits must be greater than those that would be obtained from competing land use. Only under conditions where future benefits are secure i.e. where institutions are strong and threat levels are low will long-term management occur (Wollenberg 1998).

Women's interest on the forest often relate to getting fuel wood, vegetables etc. In search of these commodities, two days will not pass without a woman entering the forest (EUCFP 1995). This observation is reiterated in this study where by the appropriation of forest products are unrestricted. According to the people there are no rules and regulations governing this activity yet the management plan stipulates when it is allowed to collect forest products and the villagers collect as much as they want. It was found that the villagers are free to collect dry and fallen twigs as long as they did not cut down any trees.

A variation in the ranking of products could also be in the way the infrastructure is built. The village of Madukani can be seen to be the central village. It contains all the administrative offices, the community school, and the grinding mill is in this village. Moreover, field observations reveal that most of this village is electrified. Thus the Madukani village has other existing alternative sources of energy explaining why firewood is not a common product obtained from the forest.

Furthermore most of the houses of this village are built out of 'soil' bricks contrary to the other villages where the houses are of wood and covered by mud. A pilot project of using alternative methods of building and energy for cooking has started in this village as distinct from other villages. Being the central village, Madukani village has a well-established market and a bus stop. This makes it much easier for the people of this village to obtain household products from the local market or from the nearby town Muheza where the bus goes every other day. The relative isolation of other sub villages may explain that the people will continue to collect forest products illegally. Consequently more attention needs to be given to their values and concerns (Kessy 1998). The table 4.1 shows community perception about the importance of forests. The gender difference in responses indicates that men are influenced more by economic options while women by living conditions.

The nearest health centre to all the villages is about 20 km away and was established by the tea company. As such mostly the women treat common or 'small' illnesses locally and at home. The local traditional healers assist in sicknesses that are more complex. An interview with the traditional medicine woman revealed that she treats most illnesses especially on children. An explanation to this could be that the distance to the clinic is too long coupled with the poor means of transport. The bus leaves early every morning and only returns in the late afternoon. Besides it is not reliable and it comes every other day if at all.

5.2 The values of the forest as perceived by the community

The forest is not seen as just a provider of wood products but it is also valued for other environmental services. The community is well aware of this and hence they have varying reasons as to why the forest should be managed in a sustainable way. It is believed that the forest assists in regulating rainfall this is evident from responses from the discussions whereby almost every group interviewed mentioned it as a most significant value from the forest. Rainfall is important to the community for the returns it brings in terms of agricultural produce. To them the denser the forest the more it will be able to contribute to good climatic conditions. Apart from agricultural produce, forests are thought to be able to hold water, which is an essential commodity in all livelihoods. If as the saying goes '*water is life*' then it explains why the local community value the forest for what it provides in their lives.

The community of Mgambo village even see prospects of employment from the forest. The people particularly the youth see the forest as a source that would provide employment if eco-tourism is enhanced in the forest. This is attributed to the many prospects in the forest. These include the availability of endemic products. The eco-tourism potential of Handei Village Forest Reserve is further endorsed by (Veltheim and Kijazi 2002) who observed that the presence of the African violet and the blue monkeys, and the nice view from the escarpment over the Lwengera valley to

the West Usambara as some of the economic values of the forest. One revelation during discussion is that there is a proposed site to develop a hotel in the forest. The proposed site has a very nice view and would make an ideal place for such a venture. Nevertheless the villagers are not agreeable to this proposal and are highly opposed to this suggestion.

They reason that the introduction of a hotel in the forest will lead to complete degradation of the forest because of increased activities it will bring with it. Contrary to the villagers the forest committee, though they do not state openly, seems to be for the idea of the hotel. These contradicting views have increased the already existing feud between the committee leadership and the villagers. This shows how the people take their ownership rights of the forest. The local people feel the village is going to lose while the government gains in terms of tax payment, which will go directly to the government and not to the village. In turn they will have no authority over the forest.

5.3 Deterioration of rules on forest management

The effectiveness of the management process depends upon the capacity of the local community to devise rules and structure in which community organisations have sufficient incentive to contribute their best. Two important questions that need to be answered concern the nature of factors that influenced the institution of the village community and its implication for forest committee formed under the management regime. Recent studies on long-enduring and robust institutions, which collectively manage forest, water fisheries have demonstrated that they survive when the resource users themselves have devised, applied, and monitored rules to control and use resources (Jentoft 2004). These rules are designed following set principles of constitutional, collective and operation level decision-making. Local institutions are rules about the use maintenance and distribution of the forest; and the leadership and organisations interpreting, applying or creating such rules and sanctions. They function to support management norms and the distribution of benefits. To enforce the rules and regulations of resource utilisation and for the protection of the forest, the forest committee have been empowered by the village by-laws. They have also developed their own formal and informal institutional arrangements to protect the forest and to check that the villagers adhere to the rules and regulations.

However, for effective management the community should know the laid down rules. To this effect the Mgambo community has put down rules that assist in the management of the forest. Some mechanisms have to be enforced to ensure that the community at large is made aware of these rules. But villagers of Mgambo village do not seem to be aware of these rules pertaining to utilisation of the resource. In the questionnaire interview the most common rule is that of prohibition to cut down trees (see chapter 4, table 4.3). The rules are known from fellow villagers and not the

forest committee who have been mandated to do so. It follows that despite the strictness of conservation measures against local utilisation of the resource in practical reality the forest is still subject to uncontrolled and unplanned, mostly illegal utilisation resulting in forest destruction. Nonetheless the community may just be saying this to use it as a way to continue with the activities in the forest. An observation indicates that the people accuse the forest committee leadership as being in the forefront of mismanaging the resource by breaking the rules. According to literature available on the village this is an on going problem, which was observed and has always frustrated conservation efforts. The situation is that there are a few village leaders who do not comply with forest rules and regulations and continue to illegally fell trees. The small elite that is supposed to be responsible for management issues is the major culprits of mismanagement. Added to this the involvement of the community in management planning is absent. Although the people are conscious of conservation requirements, they now oppose the management authority. This may be because the management authority has failed to understand the local people's aspirations and perceptions. As a result the rest of the community does not see the need to adhere to the rules. Therefore the villagers went about their utilisation activities without any restriction. The same reason was given for the failure to do participatory mapping of use zones in this study because they point out that since collection is done anywhere they do not know where to start. In spite of this they are not willing to even sketch the way they perceive the forest should be managed. The forest committee is empowered to fine the offenders. As far as possible the forest committee deals with the offenders themselves when they fail to deal with the matter the cases are reported to the court of law. One of the sources of revenue for the forest committee is the fines collected from the offenders. The revenue collected may reflect the grip of governance but it is not an indicator of the sustainable use of resources. The more crimes are committed the more fines are collected, and the more revenue is collected all at the cost of the forest. If such a thing persists it becomes a form of regularization of offences, hence failing to serve the real reason it was intended.

5.4 Community perception on the need to manage the forest

The recognition of how local people identify changes of the forest is very important. Local indicators of what threatens the forest resource set the trigger to know that intervention is needed. Effective management of natural resources needs a clear, well-structured, workable and transparent framework of goals, objectives and indicators (Petersen and Sandhovel 2001). Indicators provide a means to measure, assess and demonstrate progress in sustainability of forest area overtime. In participatory iterative process, objectives, goals and indicators should be defined and formulated and villagers should be involved.

From the discussions with the local people it can be seen that they have realised that the forest needs to be used in a sustainable manner. The changes are seen and they notice what causes these changes and realise which activities have a positive or negative effect to the forest. To the people the introduction of the management regime has not brought about much change in terms of forest use. Local people use their own knowledge during interviews to reveal the changes to the forest. To this effect different village groups mention varying ways of identifying the changes. Those nearer to and are able to see the forest use indicators like denseness of the forest to measure its changes. The others for instance the group of women use the distance they have to cover to collect products like firewood to show that the forest is no longer the same.

5.5 Deterioration of social capital

Further discussions reveal that the major culprits of timber harvesting the most prohibited activity are some of the forest committee members. This group of the elite is able to continue its activities without intervention from the village government. As literature suggests (see section 2.2.2) a small group in the community may have substantial power and use it to their benefit. This is an on going problem in this study village and has always frustrated conservation efforts of this forest. The same results were noted by EUCFP when they proposed to have a management plan in 1995. It was observed then that a small group of villagers were pit sawing illegally in Handei VFR, and the village government appeared powerless to intervene (Ellaman 1996), the same results are noted in 2001 when another initiative to make a village forest reserve are initiated, where the forest committee chairman was pit sawing in the VFR without the village government interfering (Veltheim and Kijazi 2002). Several reasons can be given to this effect. First, the heterogeneity of the village population has weakened the authority both of the village government and traditional controls. Second, the deterioration of social capital within the community, in particular trust. Finally the community felt that the forest committee was not elected in a transparent way in the village assembly and therefore represented only a minority in the village. The Handei case study illustrates the difficulty faced by an elected village government, especially with a population as diverse as Mgambo's, in disciplining its fellow villagers even when the actions of a few are clearly against the interests of the majority. This is similar to an observation by Ellaman (1996).

The failure of the village government to control pit sawing and failure to take enforcement measures by the village government has lead to lose of confidence in the forest committee by the locals. In turn the community has adopted the *'if you can't beat them join them attitude'* whereby no one follows the rules anymore.

As a result some of the forest committee members collude with the village government officials and prevent significant participation of the people in forest management. When an individual is assigned the authority to make decisions affecting others the mere existence of the unequal decision making capabilities potentially creates incentives and opportunities for the individuals with authority to exploit and prey upon the efforts of others (Ostrom 1996 quoted in (Ballabh, et al. 2002) Such conspiracy activities can be illustrated by findings recorded by (Veltheim and Kijazi 2002), when the village government requested a permit to pit saw in Handei forest from Amani Nature Reserve (ANR) for the purpose of constructing school desks and expansion of school classrooms. A permit was issued to harvest two dead logs of *Newtonia buchananii* in the forest and one dead log of *Milicia excelsa*, outside the forest for community development. The permit emphasised that the work should be conducted without a contractor. The village government on the contrary used a contractor who was the forest committee chairman. For the work done the contractor charged two thirds of the produced planks thus leaving only one third for community development. Out of the required 400 pieces only 60 pieces were handed over to the school and an official report was never produced. This may also be reason why trees like *Newtonia buchananii* are mentioned as the most depleted species. During this study the similar concerns were raised. The people also add that one of the leaders cultivates in the forest. Because of such activities there is a lot of mistrust to the local leadership, which will require a lot of effort and changes to mend.

Such revelations provide an answer why the most depleted trees are those that are used for timber or firewood. Almost all the groups mention timber harvesting as the most deleterious activity. The local people feel that a few people use the forest for the forest to benefit themselves financially while the rest of the village is being asked to conserve. Their lack of trust in the leadership has caused failure in management for the rest of the community to cooperate in management efforts and abide by the rules.

5.6 Conservation methods as perceived by the community

From a management point of view this is an indication that any management strategy that does not sufficiently involve all stakeholders in the decision making process is likely to face problems resulting from independent decisions made by neglected stakeholders. From the answers given by the interviews during the fieldwork it is evident that cutting down of trees is a rampant exercise, which really threatens the forest management. The frequent mention of this rule could also be a way to show that the leadership who are instead supposed to enforce it are mostly committing the offence despite its gravity.

While the relationship between local people and the forests is often described as deleterious to forest biodiversity, the study has shown that some indigenous forest/trees management contributed to conservation. However some indigenous management strategies such as the management of ritual forests are deteriorating. The deterioration of these traditional management strategies proceeds without any obvious replacement in the sense that new local initiatives to conserve specific portions of the forest are not evident mainly because forest management have not exclusively added them to it. As revealed in Handei VFR the ritual sites have been included to the forest, previously these areas were scared and no one was allowed to pass there. The Handei VFR study shows that these areas have been included in the new management plan as areas reserved as historic sites. Thus certain activities like collection of forest products are not permitted in this area but it opens it up to tourists. This is different from indigenous management that restricted entrance to the area. In so doing the trees were allowed to grow with little destruction. In most forests, like in Handei VFR, the area that was reserved is also the source for rivers. The local community of Mgambo are aware of this fact but at the same time they say that this is a practice that has since phased away. Therefore it is no longer a feared place to go and this may be one reason as to why the water sources have been disturbed as observed during the walk through the forest undertaken as will be described in section 5.7.

5.7 GI as a communication tool

The use of GPS in the study to locate the various activities in the forest yielded some useful findings. The technique was found to be an accurate and efficient counterchecking tool on information that the probing questionnaires may fail to elicit. Local people may not be free to declare all the illegalities in the forest. Moreover on site observations show signs of where high concentration of extraction activities have taken place and this can be a guide for management operations such as natural regeneration, enrichment-planting establishment of utilisation buffer zones etc. During the preliminary walks in Handei VFR it became very evident that this reserve was badly degraded due to uncontrolled use in the past. By looking at the forest it is clear that the main objective of management would be protection in order to let the forests to recover from past exploitation.

From this simple participatory forest assessment the following observations were made:

- Many footpaths were present in the forest leading to cut trees, poles and firewood
- Pit sawing was continuing in the forest
- Encroachment had taken place through farming and building inside the forest
- The forest border was not clearly marked and cleared from undergrowth
- Some water sources had been destroyed

The simple assessment provided the assurance that the forest had suffered from severe degradation. From the interviews the actual inspection in the forest made a confirmation of what had been discussed earlier in the groups or in the interviews.

5.7.1 *Ownership feeling and participation*

As mandated by the management plan a map to show use zones is a requirement if the forest is to be gazetted by the Government. The existing sketch map indicating these purposes is not being followed in Handei VFR. The people play ignorance to its existence while others just point out that *it's not their map* and do not bother about it. Obviously this has led to the indiscriminate utilisation of the forest products. As discussed earlier the local people's eroded confidence in the leadership has had adverse effects on the community. Their lack of confidence in any management efforts has led the people to be uncooperative when asked to do participatory mapping. The local people claim that they never participated in the production of the earlier sketch map (fig.4) that is being used to designate the use zones. An explanation to their attitude could be because they feel it will not yield any positive results for as long as the leadership is the same. As a consequence they do not even want to cooperate when asked to do a participatory mapping exercise during this study. Further the leadership has not disseminated this existing information to the people as required. The community claim that they only hear about conservation from village mates instead of an organised meeting with the committee. The discussion in chapter 2 (section 2.3) reiterates the community's need to participate in the creation of spatial information if they have to value it. They have to have an input so that they can point out the common problems as revealed in this study.

5.7.2 *Inappropriateness of formal and informal rules*

A walk in the forest confirms the perception of the people that the forest is severely degraded and almost bare. Because they did not participate they feel they should not follow the rules or follow the use zones as demarcated by the forest management committee. There are reasons to this effect one could be that they get no incentives for following the rules yet within the community other people utilise the forest to their own benefit and go unpunished. Ideally it is thought that such institutions are put in place to shape human behaviour and have an impact through the incentives they provide to the majority in the community. Second, the forest committee on the other hand have failed to reinforce the rules. Their failure is attributed to the fact that the community feel that they abuse power. Lack of enforcement of the rules results in the indiscriminate use of the resource without anyone to check and put measures to it. Finally they control the forest through ineffective information flow within the community.

This information, such as mapping of the forest is done with the forest committee who in turn have the mandate to disseminate it to the entire community. But in the community of Mgambo re-

sults indicate that this is lacking. The forest committee have learnt the new techniques but do not let it to the rest of the community. To this effect a gap has been created between the community and the leadership. On one hand this may be that the leadership does not get enough support while on the other hand it could be that it is a way that the forest committee keeps the rest of the community ignorant so that they can accomplish their own motives. Although the community is supposed to contribute and take part in the mapping, in this community this did not take place. Thus the rest of the community does not value the information created. This is evident in the discussion with the people who indicate that they do not know about the sketch map to show use zones. Further this is elaborated in the response they give that they never heard of any forest rules from the committee members but from the fellow village mates who also come to know about it elsewhere. Lack of information sharing including, geographic information, and not participating in information gathering activities misses the opportunity to share common problem perceptions both indicates and leads to growing levels of mistrust and ultimately to unsustainable resource use. From the map created to show utilisation sites it is clear that harvest is done wherever it is possible. A general observation shows that grazing is done mostly in the periphery areas but is steadily moving inside the forest probably due to the gradual decrease of pasture in these areas. Firewood collection is done in the interior of the forest this may explain the fact that now they have to move to far places in search of firewood. This is contrary to the management plan that allows a 0-50m utilisation zone from the boundary.

5.7.3 *Opportunistic behaviour/ power abuse*

A beautiful spot that could be used for eco-tourism has been zoned for a proposed hotel that the community does not seem to favour. However the forest committee is for this idea despite calls to decline this offer from the community. Although the investor proposing to build this hotel is, according to the agreement, offering to build a school and clinic for the community but they are still sceptical about the idea. The community feels that the acceptance of such a venture will in the long run lead to total lose of control of the forest. In addition the conservators' office is not for the idea also. These contradicting viewpoints have to date caused the proposal to be still on hold although interviews with the forest committee members reveal that they have forwarded the proposal to the District Office to seek permission. The move provokes a question of whether the forest committee and the Village Government will proceed with the idea if the District Office gives a go ahead. If approved this will further the distrust that is prevailing in this community. Besides it will further show that the ultimate decision is that of the forest committee. The people's views and perceptions are supposed to be taken into consideration as the Community Based Forest Management purports. On one hand this shows the way power is been used to the benefit of only a

a minority in the group and on the other hand the community's ownership feeling is clearly displayed. Despite all this the walk in the forest reveals that the proposed site has been surveyed and beacons to apportion the area are in place.

From the above discussion it can be seen that there are differing problem perceptions in the community but they have not reached a commonness that is needed to act in a collective manner. Failure to achieve this has led to overuse of the resource. Hence going ahead to implement a new technique without the full approval of the community will be a decision that will divide them further and destruction in the forest may continue apace. Spatial information conducted through the walk helped elicit more information from the community and showed that the people lacked community cohesion to work as a team.

While walking through the forest it was revealed that those who graze their animals in the forest are mostly from Mhomboni village. This was evident from the path that entered the forest from the village. Although this could not be the basis of the argument observations and a visit to the village concurs with this perspective. In this village zero grazing is not practiced, animals are let free to graze on their own in particular the small ones like the sheep, goats and pigs. Zero grazing is keeping animals in a stall, and bringing fodder to them instead of allowing them to graze outside. A look at the village indicates there are cattle raring but during the day are taken out for grazing. The litter from droppings of these animals in the village presents an answer before one asks or finds out. This is different with the other villages whereby the practice zero grazing like Madukani the village is neat and one sees the animals in enclosures all the time. Zero grazing is one method proposed by the management plan to act as a conservation method. Although zero grazing is one of the proposed methods for conservation in the management plan it is not practiced adequately and by all villages. Apart from Madukani village the rest of the villages do not have such measures they take their animals for grazing.

The boundary of the forest was done with the assistance of the conservators from ANR and EU-CAMP. There seems to be no problem with this as the people agree to it and confirm that they were consulted before it was demarcated. This is some form of confirmation that when the people are involved and have participated they respect the rules and act in a collective manner. However, an on site checks reveals that the boundary is not cleared as demanded by the management plan. If the community were well informed about what is expected of them they would perform it diligently. They need the information to this effect. Well tailored information may embody the potential of fast and precise action, reaction, the involvement and participation of many stakeholders which would in turn increase quality of effectiveness of social management and in turn mitigate economic and social disaster (De Man and Van den Toorn 2002).

5.8 Summary

From the discussion it is evident that participatory mapping is an important tool in forest management. However, the findings have proved that for participatory mapping to be effective other social conditions in the community should be in place. In a way the findings support literature that includes institutional framework like levels of social capital to contribute to introduction of new technologies to a community. This community 'suffers' from low levels of social capital especially trust and power abuse. The deterioration of these has had an adverse impact on the community.

An earlier exercise performed in this society has proved to the people to benefit only a minority. The findings show that it is not the exercise but the conditions in which it was conducted. During this study the community is totally uncooperative about the mapping exercise. It is not the mapping that is important but also under what conditions it is being done. The fact that the community is very willing and open to reveal a lot of vices to the researcher shows how much they could cooperate given all the necessary conditions. But because of lack of trust of the leaders and power abuse the intended objectives of participatory mapping are not achieved. The negative result of the previous exercise has a negative effect on the proposed efforts in this study. From the foregoing it can be concluded that if an attempt to introduce a new technology impacts negatively on the community the repercussions are severe and difficult to reverse.

In this context the conceptual framework of this study does not conform to the ideal model (refer to chapter 2, figure 1 and section 2.6) as presented. Participatory mapping can have a negative impact on the institutional set up because of the way it was introduced in the community. Because the local community did not have an input in this exercise they have no sense of ownership feeling for the product, which is a sketch map (fig.4) on the utilisation zones. If this level is not properly accomplished in the participatory mapping it has an influence on the actor group. They develop mistrust in their leadership who in this case participated in the mapping with the conservators. The elite use this opportunity to enhance their opportunistic behaviour thus there is an imbalance in power sharing. Although the actor group are aware of the problem (section 4.2 and 4.2.2) their action towards forest management is detrimental. However, participatory mapping may still have an influence on the resource conceptualisation, which is displayed in the walk undertaken in the forest. Therefore, this study leads to a conceptual framework in which the institutional and actor group has a negative effect on participatory mapping.

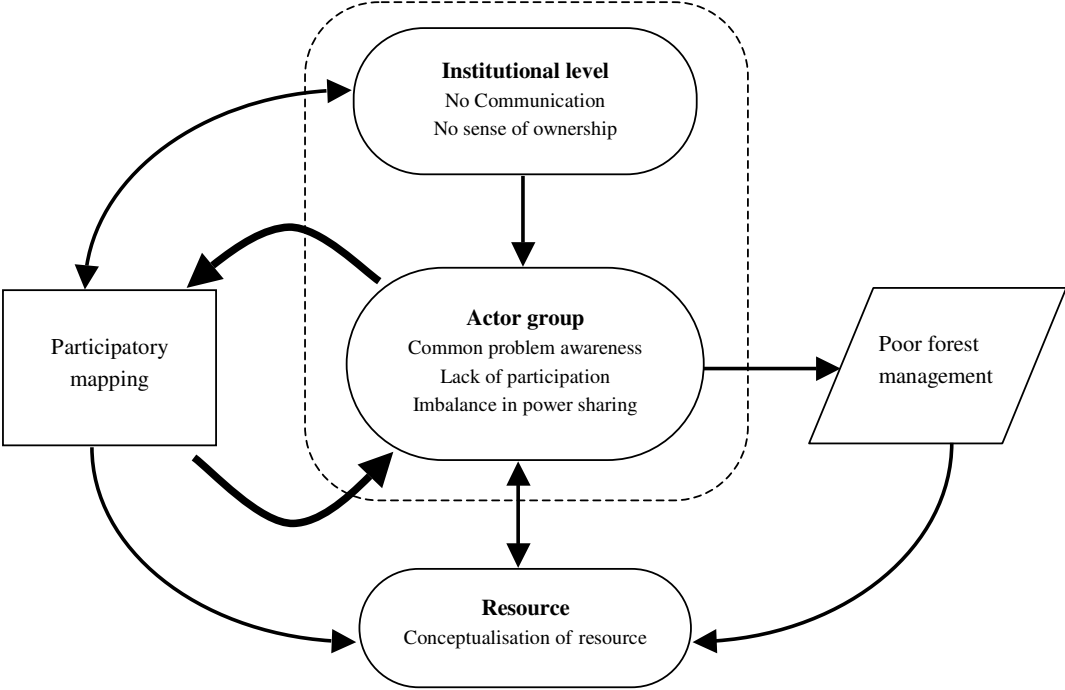


Figure 6 Revised Conceptual Framework

6 Conclusions and recommendations

6.1 Conclusion: Conditions and impact of participatory mapping

As this has been mentioned in the introduction, the main objective of the study is to explore why and how the use of participatory mapping would have effects on sustainable forest management. During the fieldwork, however, it became necessary to focus the study on barriers why a local community did not want to cooperate in participatory mapping.

The study revealed three ‘clusters’ of conditions and factors that would link participatory mapping to sustainable forest management:

6.1.1 *Conditions of the forest and how the community perceives these.*

Basically the question here is whether the forest has any perceived value to the community.

This study was able to show the importance the community of Mgambo village attaches to Handei Village Forest Reserve. It has revealed that they obtain different kinds of products from this forest. The varieties of products that they collect assist in their daily running of household like firewood and they are used mostly for building purposes (table 3, section 4.1.1). Apart from these consumption products, the local community attached other non-consumption values such as storage and conservation of rainfall (table 4). All the groups that took part in the discussions and questionnaire interview appreciate this. Although spiritual rituals are no longer conducted in the forest, the people still attach value to the forest in this regard. In eliciting benefits from the forest the study has also shown that stakeholders’ values and perceptions vary within this community. Thus the study was able to prove that the community had reason to desire to manage the forest in a way that they can maintain future benefits.

From the responses obtained it can also be concluded that the local community harvested and collected their products wherever available (table 6 refers). There was no systematic method used, although the management plan actually stipulates where each activity was to be done.

The above provides sufficient evidence that the community has value and benefit from the forest. This then answers objective one which sought to establish what tangible/non tangible products are obtained from the forest as perceived by the community.

Although they use their own perceptions to show or describe change to the forest the local people of Mgambo village realise that the forest is reducing (table 7 section 4.2.1). This indicates that the people have seen the signal to desire to partake in forest management. They mention the most depleted tree species and attribute the changes to firewood collection, building materials and illegal pit sawing have been the major problems in the community. The study was able to show that the local people as having some knowledge about conservation methods but that this is not helpful if not put to positive use.

The study was able to prove that the forest was used for various other activities. Amongst the activities found to be present include pit sawing, cultivation, settlement these are activities that were also mentioned in-group discussions (section 4.4 and section 5.7). Thus, the transect walk presented tangible evidence to the claims of the local people's allegations that some forest committee members were the major culprits, secondary data provide enough such backing to this effect.

From the foregoing, it is clear that the local community is able to identify and describe the key threats to the forest resource. In addition, the section also answers the sub-objective, which elicited to determine the conservation knowledge of the local community.

6.1.2 Conditions of participatory mapping as a technique.

Here the question is whether participatory mapping is a relevant technique to be applied by the community.

The use of a GPS as a participatory mapping tool in this study was useful in creating a more representative map (fig.5) of what is in the forest. The outcome, a point map helped identify what other activities were present in the forest and was able to elaborate more what was not previously discussed. Thus it acted as a tool for further participation and communication. Apart from these the participatory walk was used as a learning tool within the community members as they were able to verify what they had heard about the forest. In addition the map was able to present a comparison with what is really on the ground in this respect the management team can use this map for monitoring purposes. Therefore, although the actual participatory mapping did not take the usual channel of mapping to produce a sketch map, the walk to get the points with the GPS proved just as important and in this context was able to meet some of the advantages like facilitating communication and including problem perceptions e.g. the proposed hotel site.

The use of a GPS in the field assisted in identifying and locating other activities that are in the forest. Thus, it shows how geo-information can be used to establish the different land utilisations in the forest.

6.1.3 Conditions within the community.

On the one hand, participatory mapping is supposed to have an impact on conditions within the community - specifically on common problem perceptions concerning the forest – that will bring about sustainable forest management, concerted actions to manage the forest sustainably. On the other hand, participatory mapping will be facilitated by certain conditions within the community. Incidentally, people were willing and accompanied the walk into the forest although they did not want to participate in the mapping exercise. Two conclusions can be drawn from such change in action. First, the community wanted to use the research as an avenue to air their grievances about their leaders with on ground evidence. They only benefit from their status and this leads to a ‘silent rebellion’ by the community (section 5.5), which may have detrimental effects to the forest. Secondly, they wanted to show how degraded their forest was and needed assistance from the conservators who are in charge of facilitating conservation efforts, on the other hand they might have wanted to show how the forest committee has failed in their duties.

Although this study did not make an inventory of the forest *per se* the points shown (fig.4) verify the discussions. And from a physical check it can be concluded that the forest is severely degraded. The people are happy about the boundary that was made to the forest because they had an input into it. They explain that they were consulted (section 5.7). This then answers the final objective, which sought to identify conditions/barriers in the community that may have an effect on participatory mapping.

A conclusion may be drawn that despite the local people’s awareness of the threats to the forest, importance and value attached to the forest they still continue to use it in a sparingly manner. Most especially they are not willing to do a mapping exercise, which can assist them in management of their forest resource. This study has shown that their unwillingness is not only because they fail to do the mapping but that there are other undermining barriers to this effect. The barriers are identified as mistrust, imbalance in power sharing, lack of enforcement of rules and information asymmetry. In this community the advantages that come with participatory mapping (see section 2.4.2) were not achieved in the exercise used in the management plan. As a result the community is not cooperative in all actions that are initiated later.

The leaders have used their positions for their own benefit and are not able to enforce the rules. The community is aware of this leading them to act in a rebellious manner, which has adverse effects to the forest. From their behaviour of the leaders, it also shows that they are able to perpetuate their opportunistic behaviour through keeping information only to themselves. But much as it may have benefited the elite the consequences are reflected in the forest.

6.1.4 Summary

In summing up, the study has shown that only under certain conditions will local people cooperate in forest management, a resource that they benefit from. Participatory mapping if used in management efforts may encounter barriers in a community that has low social capital. When participatory mapping is to be done it should involve all the people otherwise they do not consider the products, which are sketch maps, as an input to management efforts. When introducing participatory mapping as a management tool in a community other social and institutional aspects should be identified to establish why it might be successful or unsuccessful. In this community their failure to participate in the participatory mapping exercise was because of other underlying factors/barriers.

The study should help identify that participatory mapping is not a panacea to forest management but that other conditions in the community need to be achieved for it to work effectively.

6.2 Recommendations

Based on the above conclusions, the following recommendations can be drawn:

- Before introducing a new technique to the local community to use the facilitators should also examine the institutional set up of the community.
- Participatory mapping with all its advantages is not a panacea to resource management if people do not participate from the very beginning. Ensuring their participation from the beginning would enable them to include their interests.
- The facilitators of conservation efforts need to continue monitoring how the forest committee is disseminating the information that they train them in to the rest of the forest.
- Considering the advantages attached to participatory mapping it is important that training is used with the entire community and not just to a minority in the community, as they may not adequately disseminate the information.

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APPENDICES

Appendix 1

MANAGEMENT PLAN OF HANDEI FOREST – MGAMBO, 2002

1. Introduction

Handei forest is located in the Mgambo village, Muheza District, Tanga Region. The idea to conserve this forest was introduced by the village government in 1986. The village started to worry about the changes in the climate and the reduction of the forest. Their people saw the need to conserve.

In order to have sustainable conservation, a team was formed to prepare this forest management plan. The general village assembly of Mgambo elected this team. The team was elected to represent the following: every sub-village, religious institutions, the clan using the forest for ritual and spiritual services, gender (men, women), traditional healers and the youth. The number of members of the team was 14 (9men, 5 women). The team started its work in October 2001 and had the first draft ready by March 2002.

2. History of Handei forest

Handei forest was named after the settlers who came in the 19th century from Handeni, a lowland area in the South Western Tanga Region. They settled in the forest in Amani, in locations today belonging to the Kazita and Mgambo Miembeni villages. These people belonging to the Kilindi clan of the Shambaa tribe, continued with their rituals, norms, farming and grazing practices. The first leader of the settlers was called Mbega, then Kimweri and Mnkande. Planting *Dracaena usambarensis*, used as a defensive fence in that time marked the grave of the leaders. These palm-like trees can still be found in the forest in that was also used for different rituals such as praying for rain, fertility and protection against disasters and diseases. The forest was very famous for conducting the rituals.

3. Area, border mapping and forest resources

Handei forest is located near Mgambo village, Muheza District Tanga Region. Within the Mgambo village are seven sub villages. The area of the Handei forest is 156 hectares.

The demarcation of the forest was done with the approval of the village assembly. The border of the Handei forest was officially surveyed by a surveyor from the EUCAMP with the participation of the villagers. The villagers had their own points of identification to which everyone agreed. After border survey the sketched their own map and included the various use zones. Before the official survey the planning team made a participatory map in order to be able to locate and assess the resources from the forest (Annex A).

The resources of the forest include trees, plants, flowers, climbers, animals, insects, birds and reptiles.

4. Objectives

The Handei forest will be managed in order to conserve it. The main objective is to protect biodiversity in the forest including trees/plants, living organisms and to protect ritual areas in the forest for the present and future generations. In order to achieve this, it is necessary to have specific objectives and indicators to measure the activities. The following are the specific objectives are:

Specific objectives	Indicators
To minimise the use of forest products so as to decrease the rate of forest destruction	<ul style="list-style-type: none"> • Use of improved stoves • Zero grazing should be practiced • Fodder planting should be seen in the village
To protect biodiversity found in the forest	<ul style="list-style-type: none"> • Number of illegal events will be few • Number of biodiversity increased • Increased number of tourist and researchers • Increased village revenue through village forest
To advertise and connect village forest reserve to East Usambara tourism network	<ul style="list-style-type: none"> • Number of tourist will increase • Increased revenue through tourists and researchers • Employment to the youth available
To improve environmental conservation to Mgambo society or nearby villages by collaboration with technicians	<ul style="list-style-type: none"> • Alternatives available in village -Use of improved stoves -Practice of zero grazing -Fodder planting -Planting of woodlot in the village practiced
To encourage creation of other resources identified by other people	<ul style="list-style-type: none"> • Many attractions in village not only in forest but in village e.g. handicrafts and others
To involve elders with indigenous knowledge and youth knowledge in conservation	<ul style="list-style-type: none"> • Traditional and customs strengthened (to continue existing) • Education through elders group will be conducted to the youth

5. Forest Management Procedures

The forest management procedures will be according to this management plan and a forest committee will be selected.

Forest Committee

The forest Committee is the manager of activities concerning the forest. A general village assembly of Mgambo will elect the forest Committee. The number of all members is 12 including the chairperson, the secretary and the treasurer, who will be elected in front of the village assembly.

When the committee is elected, the following representation will be considered in order to improve the work performance of the committee. When selecting the representatives of the sub-villages the following factors will be considered: representation of traditional healers, youth, and education of the member. The total number of committee members is 12 (7men, 5 women).

The committee will be in power for three years. The cooperation between the forest committee and the village government should be transparent. The committee will submit a report to the village government after every two months, and the village government will take these reports to the village assembly after every six months. The reports of the forest committee will also be sent for information to the Conservator's office and to the District Forest Office.

According to this plan the chairperson of the committee is the main supervisor of the activities of the committee. It is the responsibility of the committee secretary to convene meetings and keep all records, while the treasurer is responsible for accounts and book keeping.

The committee will meet twice a month. If a member of the committee fails to attend three meetings without prior information he/she will lose his/her membership in the committee. If members of the village government or members of the forest committee will conduct illegalities in the forest they will lose the membership in the village government or the forest committee.

Responsibilities of other stakeholders

Villagers

-Villagers will be involved in the activities of the Handei forest.

Village government

- To sensitise villagers concerning the activities of the Handei forest
- To supervise the by-law of the forest
- To guide the committee of the forest.

Central government

- To provide technical support to Mgambo village

District Council

- To approve by-laws
- To provide technicians
- To receive reports from the forest

6. Uses of forest products

Prohibited uses

- i. Charcoal burning
- ii. Tree cutting for any use
- iii. Collection from water sources and sacred areas
- iv. Cultivating in the forest
- v. Harvesting of wild honey and bee wax
- vi. Pit sawing
- vii. Hunting
- viii. Collecting insects and fishing
- ix. Slashing for cultivation and settlement
- x. Grazing
- xi. Setting fire except during worship
- xii. To open new foot paths

Uses with permission or licensed

- i. Collecting forest products like medicinal plants, vegetables, mushroom
- ii. Cutting material to make handicrafts
- iii. Collection of stone and sand need permission from the committee and district council
- iv. Bee keeping
- v. Maintenance of traditional forest path
- vi. Forest guide need to get a permission to guide tourists and researchers
- vii. Fodder cutting

7. Forest utilisation for villagers

Fetching water from sources from identified sources

Collecting dried and dropped firewood for home use

- Collecting vegetables and mushroom for home use
- Conduct ritual activities from specified areas – for specific tribes
- To use traditional foot path within the forest

8. Zones

8.1. Scared Zone

Situated on the hill the zone is for ritual or sacred and cultural activities. In this area nobody is allowed cut trees. Those who use the place should ensure that no form of fire is left behind.

8.2 Biodiversity and research zone

The protection of biodiversity in the forest this area starts 50m from the border of the forest all round. In this area research in to the conservation of biodiversity is allowed as long as it does not destroy biodiversity. The most attractive biodiversity are found here like Kwelasi caves and rock faces, giant rats and other small mammals are found here, the African violet, black tortoise, snakes etc.

8.3 Eco tourism zone (Beacon 3-7)

This is an attractive zone for bird viewing. Trees found here are peculiar to East Usambara and there are plants that are mostly used for making handicrafts. Other attraction included plants that where used in female circumcision and wild bananas.

8.4 Utilisation zone i.e. 0-50m from the border

The local community is allowed to collect firewood for home use and to practice bee keeping using hives. Permission can also be sort from the forest committee to harvest, not hunt, honey. Nobody is allowed to cut trees.

8.5 Water source zone

Nobody is allowed to conduct any activities in this zone. The community is expected to rehabilitate this zone by planting ‘ficus’ which preserves water. These places include Kwemsambu, Magana and Hanona Valley.

Rehabilitation Zone

These would include all open zones and the community was to plant trees.

9. Sources of Revenue

- Researchers
- Fine
- Tourism
- Auction of confiscated materials from illegal activities
- Donors
- Sale of handicrafts

10. Use of income from the forest can be as follows:

- Allowances to forest guards
- Stationery for forest office use
- Establishment of tree nurseries
- Travel allowances to attend meeting, study tours or seminars
- Assistance to victims e.g. village fires

11. Dealing with illegalities

According to the forest by-law, any offender who will be caught for breaking the law will be taken to the forest committee. The village council will sort out the issue. If the case cannot be settled, it will be taken to the primary court as explained in the forest by-law.

Appendix 2

CHECKLIST FOR DISCUSSIONS/MAPPING WITH THE COMMUNITY

1. What forest products are obtained?
2. Who can collect or harvest the products?
3. When can it be collected? When is collection forbidden?
4. How are they harvested is there a system? (E.g. for firewood may be once a week)
5. Where is the harvest done? (Near or far has the distance changed with time?)
6. Are there areas where collection is restricted?
7. How much can be collected?
8. Are there restrictions on the amount? (Get this information for different types of products)
9. Are there fees for collection of these products? Especially on commercial products.
10. Are there any rules governing the resource use?
11. Who in the community is in charge of monitoring local use of the resource? Who appoints them?
12. Is there a fine for those who break the collection rules? How much; Where do the fines go; how are they used?
13. Has the forest always been like that or what changes have been observed?
14. What do they think caused the changes?
15. Can they specify which species have most depleted? Or is the trend identical to all species?
16. Has there been a change since the conservation initiative was introduced?
17. Does the community agree that they should conserve? Why and how?
18. Does the community know the conservation methods used by the conservationists? (i.e. the DFO)
19. Is the community agreeable with these methods if not what changes would they like to introduce?

Checklist – transect

1. How does the community perceive the boundary of their forestland?
2. Is it the same as was demarcated by the conservationists? If not what are the effects of this boundary?
3. Did they ask for the local community's input before making the boundaries?
4. What other activities does the community use the forestland? (Agriculture, grazing animals, scared land etc)
5. Have these land use boundaries being there always? Or have they shifted due to the new plans?
6. Do you feel that the introduction of the protected forestland disturbed your previous activities?

Appendix 3

Checklist questionnaire

1. Why do you think a natural forest is important to your livelihood?
.....
.....
2. What do you think are the most destructive activities to the forest?.....
.....
3. In your own opinion what conservation methods would you like to be pursued in order to prevent the forest from destruction?.....
.....
.....
4. How was the forest managed before the introduction of the forest committee?
.....
.....
5. Do you know any places in the forest that are special for certain activities?
.....
.....
6. Are there any traditional rules preventing entrance into the forest?
.....
.....
.....
7. What rules regarding the management of the resource are you aware of?
.....
.....
.....
8. Are you satisfied with the current rules regarding managing the forest? Why?
.....
.....
9. Have you ever been involved in making suggestions or decisions towards forest management?
.....
.....
10. How best do you think you could participate in forest management activities?
.....
.....
.....

Appendix 4

(Raw data used in the data processing and analysis)

Kwamsambu

Firewood

Vegetables

Can collect anytime

Collect anywhere

No specific areas for collection

Not allowed to cut down trees but to collect only dead or fallen wood

Village government should introduce a forest guard

Village should arrange a day for firewood collection

Need for more seeds to plant

Grazing of animals still on going

Distance to get firewood much longer

Agree to boundary we were asked

Minyasa-firewood

Mukondo ngogo-firewood

Mihesi-timber

No other activities by women in the forest

No farms in the forest due to destruction by the animals

Madukani

Good climatic conditions

Aware of African violet for ecotourism

Building materials with permission

Not allowed to cut down trees

Not allowed to keep bees in the forest

Not allowed to graze animals

Some people do not surrender some fees

Planting more trees

Everyone should follow the rules

It brings in money from the visitors to the forest

Less rainfall because of depleted forest

Forest looks better because of the rules

Change is good because now the forest brings money that is used for development purposes of the village

Minyasa

The village agreed upon the demarcation of the boundary a meeting was called for this purpose.

People live in the forest and have always done so

There is a proposed hotel site in the forest to which the village forest committee have forwarded the application to the District Office for approval. This is *not* a good idea because it will set precedence for others and they will cause disturbance in the forest. Hotel bad idea because they will pay tax to the government and the government will not give the village money.

In return the investor is promising to build a school and clinic for the community

Kivumo

Products

Firewood, vegetables, medicines-roots and leaves

Good climate in terms of rainfall, source of rivers

Any village member can collect the products any time so long one does not cause destruction

These products can be collected anywhere in the forest

There are no fees to collecting these products

Rules

Not allowed to cut down trees collect only dead wood

They are not aware of any fees that go to the community paid by visitors to the forest

Agreeable to conservation efforts so that they can get more rain

There is good change in terms of rainfall

Most depleted tree species- minyasa

Boundary – before boundary demarcation the villagers were asked so they agree with it

In 2000 someone started to cultivate in the forest but now they have stopped

There is disturbance in the forest because some people have ‘shamba’ in the forest

Kwemukashi

Products

Water sources

Building materials for community development after permission from Amani

No one gets permission for his or her own use

For worshipping – some people still go there

Fees from different people who visit the forest

African violet attraction to tourists

Mushrooms

Firewood and there is a special place for this purpose

All women are allowed to collect firewood and they can collect as much as possible for home use only

No fixed time to collect products from the forest

Rules

Not allowed to graze animals – fine to breaking this rule is 5000 shillings

Not allowed to cut down trees – fine for breaking this rule is 20,000 shillings

The fines and fees are paid to the chairman or the secretary of the committee

Changes in the forest is good and the number of trees has increased

No more farming in the forest

Changes because of rules to the forest management

Depleted trees

Minyasa – cut to pave way for cultivation

Mikondo ngogo- cut for timber

Methods

Agree with conservation efforts so that they can get more water after the rains

Agree some people moved out of the forest without compensation

Boundary – a meeting was called before boundary was made so they agree with it

Miembeni

Products

Rainfall and good weather

Medicines – can collect leaves and roots but ensure that the trees survive

Tourist attraction of some animals like the blue monkey

Firewood vegetables

Any member of the family can harvest the products they need

No fixed day for harvest e.g. firewood

Can collect as much as possible

Rules

Don't know any rules pertaining to the forest

There are disturbances in the forest because of grazing of animals, collection of building materials like timber and mining of stones and cutting down trees for firewood collection.

Most depleted trees species – minyasa for timber and musambu for ropes

Changes – seen in bad weather in terms of rainfall, forest in bad condition because people just harvest anyhow.

They do not know of any conservation methods there is need for education in this area

The boundary was demarcated with the concert of the village members so they are happy with it.

The fees that are paid are not known how it is spent.

There is mismanagement by the forest committee

Happy to have attended this meeting it is the first ever for most of the group

Mhomboni

Products

Good weather conditions in terms of rainfall

Source of water sources

Firewood vegetables

No one in this village gets medicine (consult the medicine woman in another village)

Rules

They don't know any rules regarding the forest

Forest used badly because some leaders harvest timber from it

A lot of disturbances, which has an effect to the forest (if not careful we shall have a desert in the next 10 years)

Leaders permit people to harvest and they benefit from it

They know nothing about the management plan just hear about it from others (never participated in its formation)

Why don't you elect other leaders?

Sub village made recommendations to change the leaders but to date there is no reply

This village does not benefit from the money that is raised had asked the village government to grade a road but there is no reply

Changes – the changes in the forest are bad e.g. a long time ago the forest was thick and even from the village we could not see the stones but now they are very visible

Most depleted trees – mitambaa and minyasa both are good for timber

The mismanagement of the village government has caused all the problems even after conservation efforts the leaders continue to harvest. The fees are not fairly distributed. The timber asked for may not have benefited the school. The community may harvest for community development but the experience about the school timber is that the leaders got more than what was asked for.

Known conservation methods

Not supposed to pass in the forest because it causes erosion

Plant trees and

Change the leaders of the forest so that they get better leaders

Introduce a watchman to the forest

They were asked before the boundary was made and advice was given from Tanga office.

They feel they lost crops, which they left in the forest and no compensation was given.

Kwamusoso

Products

Firewood, vegetables, medicine either leaves or roots

Good rainfall and it is a source of the rivers

Anyone can collect products from the forest without any restrictions from anyone

One can collect as much as they need on any day

Changes – firewood has become more difficult to get

Less rainfall is being experienced because the forest is degraded.

Most depleted trees – minyasa for timber, Mihesi for firewood, mukondo ngogo for firewood

Conservation methods – they should introduce a day for firewood collection and give the people seeds to plant more trees.

The boundary is fine because we were asked before it was made.

Appendix 5

Boundary coordinates of Handei Village Forest Reserve

Beacon	Easting	Northing
1	457148	9445100
2	457120	9444982
3	457068	9444837
4	456784	9444768
5	456748	9444696
6	456669	9444705
7	456537	9444651
8	456007	9444233
9	456014	9444183
10	456004	9444179
11	455998	9444157
12	455952	9444144
13	455872	9444197
14	455885	9444273
15	455420	9444823
16	456791	9445194
17	456935	9446496
18	457096	9445509
19	457148	9445100

Source: Ministry of Natural Resources and Tourism.
Forest and Beekeeping District Office