The Impacts of Joint Forest Management on Forest Condition, Livelihoods and Governance:

Case studies from Morogoro Region in Tanzania

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Abstract

This study of six lower altitude Eastern Arc forest and *miombo* woodland reserves around the Uluguru Mountains in Tanzania investigates the impacts of Joint Forest Management (JFM) on forest quality, household livelihoods and forest governance.

In terms of forest quality, comparative analysis of 659 forest plots showed significant signs of improved forest quality in the three forests jointly managed between communities and state, compared to the three forests under sole state management (control group). This was measured through an increased frequency of trees, poles and withies, as well as seedling coverage and canopy density. There were significantly less incidences of fire in the JFM forests compared to the control group.

In terms of livelihoods and resource access, JFM essentially provides preferential forest access to village leaders and forestry committee members, at the expense of the rest of the community. For village families who own land, this causes a greater reliance on their home gardens and farms, as well as diversion in the extraction of forest products to areas not covered by the JFM regime. For poor families with limited land, forest closure due to JFM limits their ability to maintain diversified livelihoods.

The local forest committees do not follow good governance principles in regard to record keeping and information sharing with villagers. The disjuncture between externally created village forest committees and established village governance bodies prevents accountability and transparency with regard to forestry matters, allowing those who benefit to reinforce a regime that keeps them in control and avoids them being questioned. In summary JFM has led neither to improved livelihood opportunities for the majority of villagers nor improved forest governance.

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List of Abbreviations and Acronyms

CBFM	Community Based Forest Management
CBNRM	Community Based Natural Resources Management
CF	Community Forestry
CFM	Community Forest Management
CPR	Common Property Regimes
FAO	Food and Agricultural Organization
FBD	Forestry and Beekeeping Division
FD	Forest Department
FUG	Forest User Group
GPS	Global Positioning System
JFM	Joint Forest Management
LAFR	Local Authority Forest Reserve
LGRP	Local Government Reform Programme
NFR	National Forest Reserves
NGO	Non Governmental Organization
NTFP	Non Timber Forest Product
OECD	Organisation for Economic Cooperation and Development
PFM	Participatory Forest Management
PRA	Participatory Rural Appraisal
PMO-RALG	Prime Minister's Office, Regional Administration and Local Government
PRSP	Poverty Reduction Strategy Paper
REED	Reducing Emissions through Deforestation and Forest Degradation
SAP	Structural Adjustment Programme
SUA	Sokoine University of Agriculture
SSA	Sub Saharan Africa
UNFCCC	United National Framework for Climate Change Convention
URT	United Republic of Tanzania
VEO	Village Executive Officer
VFC	Village Forest Committee
VNRC	Village Natural Resources Committee

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1. Introduction

The objective of this thesis is to assess whether and to what extent Participatory Forest Management (PFM) fulfils its own policy goals of improving the condition of forests and the livelihoods of forest adjacent communities. It is with these two assumptions that PFM has been promoted by the Tanzanian Forest Administration over the past 15 years as a major strategy for managing natural forests for sustainable use and conservation. The relationships between management regime, forests and people were examined through a social-ecological study, comparing forests under joint management by communities and the state with forests solely managed by the state. The comparative study focused on Joint Forest Management (JFM) in National Forest Reserves (NFRs) and Local Authority Forest Reserves (LAFRs) in and around the Uluguru Mountains in Tanzania. All forests are of high biodiversity value and are protected as Catchment Forest Reserves, which provide Tanzania with a source of water supply. This protection status means no productive use or harvesting of wood-based forest products for subsistence use is legally allowed.

1.1. Background and context of the study

PFM has been introduced in many areas of Asia, Latin America and more recently Africa as a form of Community Based Natural Resources Management (CBNRM), devolving resource management responsibilities from the state to rural communities under the assumption that its impacts on forest conservation and household livelihoods are positive. However, in Africa in particular, scientific data to test this assumption is only slowly emerging, and it is an open question as to which of the different PFM approaches currently being applied achieve the best results. Strong opinions and propagation of PFM do not automatically mean that PFM is good for forests and good for people under all circumstances.

Reform of Tanzania's forest policy in the late 1990s introduced PFM as a key element, now implemented nationwide. PFM is currently either operational or in the process of being established in 3.6 million ha of forest land and in 1,800 villages (Blomley *et al.* 2008), and includes two approaches: Joint Forest Management (JFM) and Community-Based Forest Management (CBFM). Thus, PFM has become the favoured method of

forest policy implementation in the country, and the most recent policy debate focuses heavily on how PFM can be used as the main vehicle for REED (Reducing Emissions through Deforestation and Forest Degradation) in Tanzania under the United Nations Framework Convention on Climate Change (UNFCCC).

According to Tanzanian Forest Policy, PFM is meant to achieve three objectives: i) improved forest quality through sustainable management practices; ii) improved livelihoods through increased forest revenues and secure supply of subsistence forest products; and iii) improved forest governance at village and district levels through effective and accountable natural resource management institutions (United Republic of Tanzania 2003). Despite millions of dollars being invested in the development of PFM across Tanzania, there have so far been few attempts to evaluate whether PFM is achieving these objectives.

Several authors have pointed to the emerging distinction between CBFM and JFM in terms of their equity, costs and benefits when seen from a community perspective (Blomley and Ramadhani 2006, Lund and Nielsen 2006). While CBFM includes legal transfer of rights, responsibilities for management and returns to the villagers, JFM divides responsibility and returns between the forest owner (usually central or local government) and forest adjacent communities without a legal transfer of property rights. JFM has been criticized for its lack of 'jointness' due to the unequal power relationships between the forest administration and the forest communities. It allows government to shed its responsibilities in forest management by co-opting communities for minimal tangible returns. The protection status of the concerned forests severely restricts local use beyond a few non-wood forest products. It has therefore been suggested that JFM is not viable in the long term, and declining interest from communities will inevitably lead to its collapse (Koppers *et al.* 2004). Nevertheless PFM, including JFM, remains a popular policy promoted by state forest and international development agents.

Another important question is whether and to what extent villagers resort to alternative forests if access to one forest is restricted through JFM. Although some variables that may influence decisions about forest resource use exist, this question seems to have been ignored in much of the existing research. In order to understand the impact of changes in forest policy on the rural population, it is first critical to understand the

decision processes that villagers undertake when they extract from a nearby forest. Changes in forest access will have different effects on people and resources depending on which decision rules villagers are using. For example, to what extent do (*de facto* or *de jure*) property rights, wealth or gender affect extraction decisions? The introduction of JFM may well increase poverty and inequality between the villagers. This is influenced by a loss of access compared to a formerly open access regime and unequal distribution of JFM benefits and costs. This research study will therefore investigate the impacts of the introduction of joint management on villagers' decision making about forest access and use. The study will investigate the wealth and gender disaggregated effect of JFM, and whether the introduced local institutional changes provide incentives for sustainable management so that household livelihoods can be secured for all villagers.

1.2. Study objectives and research questions

The objective of the research study is to investigate to what extent the implementation of JFM makes a difference to the physical condition of the forests, the livelihoods of forest adjacent communities and local forest governance, when compared to protection forests under exclusive state control.

Through experimental study design, three forests under JFM and three forests under exclusive state management ('non JFM' in this study) were compared in matched pairs across three different sites in Morogoro Region. A total of six villages and 401 households were included in the study. One village adjacent to each forest was selected to compare outcomes for households and communities engaged in a JFM process with communities not engaged in a JFM process. The study used a combination of methods, comprising forest disturbance transects, household surveys, personal observation and participatory methods of rural appraisal, to answer the following three main research questions:

1. Does JFM influence the physical condition of the forest and forest use patterns?
2. How does JFM impact on households' forest access, forest related livelihoods and equity?
3. Has JFM created sustainable forest governance institutions at the village level?

More specific hypotheses were developed to examine each of the three broader questions in more detail. These hypotheses are elaborated in the respective data chapters (Chapters 6 to 8).

A multidisciplinary approach was adopted, combining social science and natural sciences research methods. In-depth ecological fieldwork was beyond the scope of this study. Hence, the ecological implications of human activities in the forest reserves focused on the analysis of forest disturbance transects. The combination of disciplines and methods allowed the author to triangulate data and examine different aspects of forest access and resource use in a scenario where entry into and use of forest reserves is largely illegal. This combination of methods is elaborated further in Chapter 5, Section 5.2.1, below.

1.3. Choice of the Morogoro research site

Morogoro Region was chosen for this study because it was among the first regions in which JFM was piloted in Tanzania by the Central Forest Administration in the 1990s. Morogoro Region hosts the Uluguru Mountains of the Eastern Arc Mountain Range, an arc of ancient mountains that dates back at least 30 million years and hosts forests of unique biodiversity and high water catchment value. The greater Ulugurus include a number of isolated massifs and outlying hillocks. This research on the impacts of JFM deliberately chose these smaller forest reserves on the foothills and outlying hills of the main Uluguru Mountain Ridge, as this is where JFM was first introduced in the late 1990s by the Forestry and Beekeeping Division (FBD). They were considered as 'test sites' of PFM prior to developing the new Forest Policy. Due to their smaller size and perceived lower catchment and biodiversity values they were regarded by the FBD to present a lower risk for the introduction of this new form of management than the main mountain block reserves.

Comparable conditions in these outlying forests to the main mountain reserves were expected to generate transferable experiences (Moshi *et al.* 2001). The introduction of JFM in these sites provided for a time period of 4 to 5 years of implementation compared to the time of study (2005–2006), which enabled assessing the process and sustainability of the local forest management institutions created in the late 1990s. The

particular forest reserves included in this study were also chosen due to the similar ecological and socio-economic conditions in the surrounding communities. Human population pressure around these reserves is high and the forests are surrounded by areas of intensive cultivation[1]. All six forest reserves are used to varying degrees for charcoal making, timber cutting, the supply of poles and whities as building materials, mining and the use of non-timber forest products. Hence, the daily interaction between local communities and forests and dependence on forest resources for livelihoods is evident in all six fieldwork locations.

1.4. Structure of the dissertation

Following this introductory chapter, Chapter 2 describes the theoretical context of PFM and Chapter 3 provides an overview of the lessons learned about PFM based on a literature review. Chapter 4 describes briefly the historical background of forest management in Tanzania. Chapter 5 explains the study design, the methods used and the sites selected for this study. Chapter 6 assesses the impact of JFM on forest condition, while Chapter 7 focuses on the impact on household livelihoods and equity. Chapter 8 investigates the question of sustainability and effectiveness of local forest management institutions. A summary of the main findings and conclusions is presented in Chapter 9.

[1] Contextual information about the study sites is available at the website: www.york.ac.uk/res/celp.

2. PFM – emergence and theory

2.1. The emergence of PFM

Early forest policies in many developing countries date back to colonial administration. They emphasized technical knowledge, focused on the commercial utilization of forests and ignored forest interests of rural people. This is believed to have exacerbated two major problems of developing nations: deforestation and rural poverty. The protected areas approach of the 1970s and 1980s intended to halt deforestation and conserve biodiversity by creating closed reserves, but ignored local people's needs and thus became controversial due to arising conflicts of interests (e.g. Wells *et al.* 1992). These experiences triggered a new, more socially responsible, approach to forest management called Participatory Forest Management (PFM), with simultaneous focus on rural livelihoods and biodiversity conservation through participation of local communities.

A wide variety of approaches in different countries is encompassed under the term PFM (Poffenberger 1990; Hobley 1996). The main distinction is made between forms of co- or joint forest management (JFM), in which communities engage in a partnership with the state forest administration or the private sector, and community forestry (CF, e.g. in Nepal), community forest management (CFM, e.g. in India) or community based forest management (CBFM, e.g. in Tanzania). These latter forms describe single-handed management by forested communities (Vyamana 2009; Blomley *et al.* 2007; Blomley and Ramadhani 2006a). A further distinction can be made as PFM initiatives are either product or protection oriented, and thus centred around either use or conservation management issues. In the former case, the management agreement is more like a license to use the forest, as with CF in Nepal (Adhikari *et al.* 2004; Acharya 2002; Wily 2002).

In Africa, where PFM implementation started during the 1990s, it is a much younger and still evolving process compared to India and Nepal, where it emerged during the 70s and from where the African process drew lessons (Wily 2002). In Tanzania, PFM gained momentum between the endorsement of the Forest Policy in 1998 and the Forest Act of 2002 as a forest management strategy to address the ongoing degradation problem on a national scale (Blomley and Rhamadhani 2006). The policy shift in the

forest sector was influenced by a broader discourse about decentralization of natural resources management during the sustainable development debate in the 1970s and 1980s. Recognition emerged that communities need to be enabled to care for their own environments, which was manifested in Principle 22 of Agenda 21 (Hobley 1996). Subsequently, Community Based Natural Resources Management (CBNRM) was perceived as a panacea for developing countries (Agrawal *et al.* 1999). Decentralized forms of natural resources governance since then were increasingly being encouraged across the world – at least on paper (Ribot 2004). The adoption of Poverty Reduction Strategies (PRSPs) in the 1990s as major national development agendas, in particular throughout Africa, once again shifted focus in the forest sector on demonstrating its contribution to poverty reduction. Many PRSPs are silent about forestry (Sunderlin *et al.* 2005) and they have been considered as failures in creating institutional environments that support people's self-initiative to reduce poverty (Ellis and Freeman 2005). Nevertheless, in Tanzania the PRSP process has further increased the momentum for PFM and led to the inclusion of forestry into the National Poverty Monitoring System[2]. Achieving local social situations that can ensure both ecological sustainability of the forest as well as improved livelihoods has become a key challenge of forest management.

PFM is currently promoted by governments and development partners in many countries as it seems a perfect fit with strategies aiming at poverty alleviation, livelihood improvement, conservation, participation and decentralization. So far there is no consistent view on whether the 'win-win' scenario claimed for PFM is realistic or just promotional rhetoric. Described by some as a 'global paradigm shift' (Chambers and Leach 1989, Sundar *et al.* 2001) or a 'new orthodoxy' or 'philosophy' (Hobley 1996), other, more critical voices question if the shift to PFM is just a marginal addition to existing practice or "another development bandwagon" with limited impacts beyond the life of projects and programmes (Hobley and Wollenberg 1996). Again others argue that PFM is not at all a new feature of forest policy given that community management has historically been as much a part of state management of resources as centralization (Sundar 2000). The popularity of PFM hints at a recognition of past traditions of local

[2] For example the link between PFM and poverty reduction was a core topic during the 2002 African PFM workshop in Arusha, Tanzania, 18–22 February 2003, 2nd International Workshop on PFM in Africa, Arusha.

management of forests as common property. Although sometimes presented as recent innovation, a history of community resource management existed in many developing countries from pre-colonial times, including Tanzania (see Chapter 3 below).

As experience with PFM schemes throughout the world is growing, critical voices are increasing, doubting that the multiple goals of PFM are being met. At the heart of PFM lies a fight over property rights of forest land. The extent to which state forest departments (FDs) are prepared to give up their monopoly on forest ownership and control is emerging as a critical factor in determining the success of PFM. Criticism is often raised against JFM in particular, due to the inherent imbalance of power between the two management partners; state (or private sector) and community. Sundar *et al.* summarize the experience of JFM in India as follows:

"JFM was perceived by a variety of actors, international agencies, FDs, NGOs and activists, academics, and villagers, as some sort of solution, however partial, to forest problems as they defined them. However, the problems that JFM is set out to address and the objectives it was meant to fulfil have been deeply contested." (Sundar *et al.* 2001:235)

As Lele (2000) notes, participatory management involves devolution of powers but the state is by nature interested in maintaining control and accumulating power. He concludes that JFM must be a 'sleight of hand' carried out by the state to co-opt activities and placate donors while retaining control and even expanding it in new ways. Ribot *et al.* (2006) describe various strategies used by central government to obstruct democratic decentralization of natural resources management to retain central control. It is argued that participation may be promoted by forest departments based on pragmatic reasons, using it as a vehicle to attain forest closure and regeneration with the least possible investment. Kajembe and Monela describe how Tanzanian government officials have mixed feelings about community actions, but have increasingly realized that it can substitute for the expensive need to put government officials into the field (Kajembe and Monela 2000: 151). Blaikie describes PFM as a "negotiation process to pass on the cost of policing forests to local communities, which the state finds impossible to meet" (Blaikie 2005:307).

This critique is not unique to PFM but applies also to the broader CBNRM approach. The main flaws are considered to be its hypothesis of homogeneous communities, the ambivalent motivations of donor support (i.e. reducing central government regulatory cost), the trend to impose external institutional models that do not fit with the pre-existing social mechanisms, norms and behaviours for managing communal resources and resolving conflict (Freeman and Ellis 2005, Blaikie 2005, Cleaver 2000). Thus, its outcomes – influenced by patronage and politics – may exclude the intended beneficiaries of the process (poor, women) rather than include them (Freeman and Ellis 2005, Homewood 2005).

Notwithstanding this critique there is empirical evidence of the potential for communities to successfully manage forests and to encourage protection and regeneration when provided with suitable conditions (Nagendra and Gokhale 2008, Topp-Jørgensen *et al.* 2005, Blomley *et al*. 2008). Thus, before condemning PFM and without having a better solution, it is important to learn from both successful and unsuccessful cases what factors tend to account for successful development of local institutions that enhance both forest condition and livelihoods (Gibson *et al.* 2000).

This chapter reviews the assumptions behind the objectives of PFM (Section 2.2.), clarifies key concepts behind them (Section 2.3.) and reflects on the debate about property regimes (Section 2.4.) as a theoretical background for PFM analysis in later chapters. Subsequently, the key impacts emerging from the current application of PFM in Southeast Asia and Africa are summarized, and crucial emerging issues identified in Chapter 3.

2.2. The rationale for PFM

The expected outcomes of PFM strategies that are perceived to make them superior over conventional, non-participatory forest management relate to improvements in three areas: Forest resource management, livelihoods and governance. These expectations are mirrored in the three stated policy objectives of PFM in Tanzania (see Section 1.1 above). The assumptions or claims behind these expected outcomes of PFM (which are then turned into policy objectives) are explained below.

The first expected outcome of PFM is to instil more sustainable forest resource management practices leading to improved forest quality. This is based on the assumption that village residents have more interest in conserving a natural resource that is near them, than central government or private institutions (Uphoff 1993, Nugent 1990, Ostrom 1990, Tsing *et al.* 1999, Bardhan 1993, Brown *et al.* 2002). Since, so it is argued, forest adjacent people are primary users of forest products, and create rules that significantly affect forest quality, their inclusion in forestry management schemes is essential (Arnold 1992 quoted in Gibson *et al.* 2000:3). It is further assumed that villagers have a greater understanding of the prevailing conditions in their area that affect the forests and can thus adapt their management procedures more effectively than a centrally controlled management plan (Agrawal 2001, Twyman 2000, Agrawal and Gibson 1999).

The blending of traditional indigenous knowledge of forest dependent people with technical scientific knowledge of state foresters, in particular under JFM, is considered an ideal and pragmatic approach to sustainable forest management (Wily 2002, Appiah 2001). Furthermore, it is argued that multiple purpose management of forests by communities is expected to lead to better conservation of biodiversity than the single interests of industrial consumers and forest departments (Brown *et al.* 2002). Hence, providing local people with tenure rights and entitlements in the forest will provide an incentive to manage the resource sustainably, as they are more likely to receive the benefits in the future from restraint in the present. Another line of argument is that local management may be a way of cutting cost to the state (Brown *et al.* 2002). Lastly, wider environmental benefits are expected, such as improved soil conservation and watershed protection. Field activities of sustainable forest development under PFM usually encompass the identification and surveying of the productive potentials and biodiversity, boundary verification, drafting of a specific (joint) management plan and agreement where necessary, management inputs such as planting and thinning, as well as patrol and regulation of product extraction where applicable.

The second objective is for PFM to improve the livelihoods of local forest dependent people, in particular the poor. This is based on empirical research showing that: i) the income portfolio of poorer segments in rural villages depends disproportionately on forest products (Cavendish 1999); ii) trees provide a source of savings and security for

the poor (Chambers and Leach 1989); iii) forests offer opportunities for livelihood diversification (Ellis 2000); and iv) even apparently unproductive village wastelands are an important source of livelihood for poor people in rural communities (Jodha 1986). PFM, it is argued, can by turn of improving the forest resource, be expected to increase the sustainable (regulated) flows of forest products to the local people and thus increase incomes and decrease poverty (Brown *et al.* 2002). Commercially oriented single-purpose forest management damages local forest-dependent livelihoods by reducing the availability of diverse non-timber forest products (NTFPs), reducing the benefits to the poor (Brown *et al.* 2002). Community involvement in forest management on the other hand can safeguard and enhance multiple livelihood benefits from the forest, and enhance their role as a safety net. PFM interventions in practice often include direct efforts to improve people's livelihood from forests, e.g. through micro-enterprise development or income-generating activities such as eco-tourism, honey or butterfly farming, establishing tree nurseries or fish ponds. They are introduced through PFM projects with the aim to make local communities less dependent on forest resources while at the same time attempting to engage them in active forest protection. However often these activities are not forest based and it is not clear why people if they are supported in establishing fish ponds should become more interested in patrolling a forest under PFM and stop hunting for bush meat.

The third expected outcome of PFM relates to improved governance "by promoting transparency, accountability and the representation of a diversity of interests" (Dfid 1999). In theory, under PFM, local institutions managing forests as common pool resources fit within renegotiated power-sharing arrangements, whereby the FD retains a monitoring, support and supervisory role, rather than formal control. Implied in PFM is the broader principle of subsidiarity entailed in decentralization reforms, that PFM is a "power sharing paradigm" intended to "relocate management as near to the resource as possible and to place jurisdiction in the hands of those perceived as having the most lasting vested interest in the forests survival" (Wily 2002). Furthermore, community involvement is perceived to introduce important checks and balances in relation to state services, which tend to be mismanaged (Brown *et al.* 2002), assuming a countervailing influence against the power of state forest departments, arbitrary exercise of authority, and corrupt practices. Local participation, decentralization and subsidiarity may in themselves be considered as important ends of development (Brown *et al.* 2002). At the

local level of governance, the institution managing common property needs to harmonize both management inputs and product extraction in a transparent and equitable manner. Local collective action is perceived as instrumental in finding rules for allocation of the resource between different users in a way that is seen as equitable by the users themselves (Adhikari *et al.* 2007). Capacity building exercises on record keeping and accounting are thus often included in PFM projects in the field (Lund and Nielsen 2006).

These three objectives of PFM are interdependent, which gives the forest-people nexus a certain complexity: institutional aspects influence the level of human forest use, which impacts on the forest condition, which in turn can influence patterns of participation in forest management, and benefit flows to the community. Whether simultaneous improvements in forest quality and livelihoods are divergent or convergent goals is debated. Forest conservation which serves to protect forest functions and services to benefit nearby or far away people (e.g. water supply, climate regulation), or to protect biodiversity is controversial in the context of livelihood improvement because of diverging interests of forest stakeholders (Ostrom and Nagendra 2006). In such cases PFM may not be a viable management option due to the lack of economic benefits to local forest managers (Ostrom and Nagendra, Lund and Nielsen 2006, Topp-Jørgensen *et al.* 2005). However, the involvement of forested communities in deriving protection rules has led to more efficient outcomes than the creation of closed reserves (Ostrom and Nagendra 2006). The claim of convergent outcomes of improved forest quality and livelihoods simplifies intricate land use choices implied by PFM, i.e. agriculture versus forestry, conservation versus timber production (Chakraborty 2001). The allocation of forest area to particular uses has to strike a compromise between the basic needs of the rural poor and other objectives and the objective to increase the availability of forest products to the poor may compromise conservation goals (Chakraborty 2001).

PFM programmes across the world, geared to meet the above objectives, apply a three-tiered approach more or less, including activities that focus at the sustainable development of: i) the forest itself; ii) rural livelihoods; and iii) local institutions that balance resource and livelihood development. In order to review the practical results of PFM and if it is meeting its intended objectives, impacts need to be assessed at all three levels: forest, livelihoods and institutions. In Chapter 3 below the existing empirical

evidence regarding these three impacts levels will be reviewed for Southeast Asia and Africa. However, there is first a need to take a closer look at some of the theoretical concepts underlying the claims of PFM, which will be beneficial for the subsequent review of empirical literature.

2.3. Concepts entailed in PFM

2.3.1. Forest condition

Forest quality or the condition of a particular forest is described through vegetation ecology, which comprises a variety of techniques and methods to study plant communities (Mueller-Dombois and Ellenberg 1974, Frey and Lösch 2004, Tremp 2005). Key bio-physical indicators appearing in PFM relevant literature include, among others, the number and density of trees, diameter of trees at breast height (DBH), basal area, canopy density and species variety. Disturbance is measured through the number of cuttings of trees found in the forest. This dimension has been given attention in this research study by adding variables that measure other forms of human forest use, e.g. traps, fire, debarking, mining etc. (see Chapter 4). I prefer the term 'human use' over 'disturbance' since the latter implies a conservation focus and a perception of people primarily as a threat to the forest.

Obviously, the definition of forest quality depends on the perspective that one takes. From the perspective of a local forest user, it may entail a variety of characteristics comprising besides the trees and the forest canopy elements of the forest floor and NTFPs as well as environmental service, ritual and spiritual functions. A woman may respond differently from a man, and an old person concerned about collecting medicines may respond differently from a young person with interest in the forest as a source of mining resources. In her book 'The Social Life of Trees', Rival (2001) presents a variety of symbolic and morphological classifications of trees and woods from around the world which are not usually included in forest scientific perspectives but show the magnitude of meanings that forests have to people's lives.

In conservation sciences, the explanatory variables for variations in forest quality are often based on assumptions about causes of deforestation. Evidence on these

assumptions is contradictory, which is partly attributed to disparate definitions and measurements in deforestation studies (Gibson *et al* 2000). Some of the most frequently mentioned causes are: population growth (Rudel 1994, Agrawal 1995), population density (Burgess 1992), forest accessibility (Kummer 1992), distance to markets (Becker and Leon 2000), government policy (Repetto and Gillis 1988) and individual wealth (Shafik 1994). Slope steepness and elevation can determine the location of valuable tree species (Schweik 2000). This is consistent with the optimal foraging theory, which argues that individuals seek the easiest source for their resources: climbing hills to gather trees makes them more difficult to acquire, and thus fewer trees are taken at higher elevation. Optimal foraging is influenced by the effectiveness of monitoring, highlighting the importance of local institutions (Schweik 2000).

The assumption that local population increase drives deforestation is challenged by a number of studies (Abbot 2005, Varughese 2000, Hampshire and Randall 2005). Varughese (2000) found no supporting evidence for population factors in the variation of forest condition in case studies in Nepal; however, the communities with a higher level of organization regarding the forest tended to have forests in better conditions. This is consistent with other studies and the guiding assumption of the common property literature that at the core of the explanation of forest condition are the institutions at the local level, together with the incentives and behaviours they generate (Chhatre and Agrawal 2008, Ostrom 2005, Gibson *et al.* 2000). Empirical evidence from social sciences shows that even within relatively small, ecologically similar areas under the same set of national laws, numerous non-physical and non-biological factors help to explain variations in forest condition. Different systems of property rights can produce particular patterns of forest use and forest condition, which is at the core of the debate on common property management (see Section 2.4.).

2.3.2. Livelihoods and poverty

There are many definitions of poverty, with either a narrow focus on income or a wider focus on well-being composed of income or consumption, education or health, vulnerability and risk exposure, lack of opportunity to be heard and powerlessness (World Bank 2001). Poverty alleviation is the reduction of these depriving factors. Forest based poverty alleviation is then the "use of forest resources for the purpose of lessening deprivation of well-being on either a temporary or lasting basis" (Sunderlin *et*

al. 2005:1386). Forest based poverty alleviation can be achieved, among others, by ensuring access to forest resources and protecting the existing forest benefits to rural people, by redistributing access to and benefits from forest resources, or by making transfer payments to villagers protecting forest functions (Sunderlin *et al.* 2005).

According to Chakraborty (2004), poverty reduction through PFM requires expansion of the per capita quantity or the range of forest products accessible to the poor compared to a historic point of reference or to an alternative forest management institution. It may also be achieved through rising economic opportunities for the poor due to PFM, e.g. employment for the poor if labour demand from the non-poor is increased (Chakraborty 2004). Poverty mitigation requires use of forest resources to meet household subsistence needs, to fulfil a safety net function or to serve as a gap filler in seasonal periods of low income. Forest based poverty alleviation would require asset building and lasting increase in income and well being through forestry (Sunderlin *et al.* 2005). Sunderlin *et al.* 2005 stress that forest based poverty alleviation is never a stand-alone process, but arises from a fusion of livelihood activities, such as forest resource use, non-farm employment, agriculture, pastoralism and so on. The safety net function of forests has been acknowledged to include seasonal employment in the agricultural off season, food supply, consumption to reduce needs for cash, sources of emergency cash incomes for households and at community level, and savings for old age (Chambers and Leach 1989).

While poverty is an outcome based measure of livelihood performance (e.g. income-poverty, food-poverty, wealth and well-being), the livelihoods approach stresses both the means and the outcomes (Sunderlin *et al.* 2005). The livelihoods approach was developed to provide a comprehensive framework of analysis of how people make a living under changing socio-economic, institutional, political and environmental circumstances (Ellis 2000). Livelihood systems at the local level are complex and dynamic and are shaped by wider political and economic factors occurring at a broader scale (Ellis 2000), such as a change in national forest policies and the resulting introduction of PFM. As Blaikie *et al.* (1998) state "the only way to trace the impact of wider socio-economic changes upon specific groups is to look at the way in which livelihood strategies are negotiated at the micro-level" (Blaikie *et al.* 1998: 9).

This study adopts the definition of livelihoods according to Ellis and Freeman (2005) as "encompassing the resources that provide people with the capability to build a satisfactory living, the risk factors that they must consider in managing their resources, and the institutional and policy context that either helps or hinders them in their pursuit of a viable or improved living" (Ellis and Freeman 2005:4). The resources, also referred to as assets or capitals, are categorized into: Human capital (skills, education, and health), physical capital (produced investment goods), financial capital (money, savings, and loans), natural capital (land, water, trees, etc.) and social capital (networks and associations) (Ellis 2000, Ellis and Freeman 2005). The activities are things that people do to make a living and include nearby (e.g. crop production) as well as remotely (e.g. remittances) from the household executed activities.

Livelihoods can entail three income categories: off-farm income, which can be obtained from local natural resources, e.g. firewood, charcoal etc., farm income and non-farm income (Ellis 2000). Livelihood analysis includes the vulnerability, the institutional and policy context of the household as well as social relations which mediate access to the assets and activities (Ellis 2000). The livelihoods framework focuses on outcomes of people's efforts to have a satisfactory livelihood, e.g. their material wealth, their extent of vulnerability, or the impact of their livelihood activities on environmental resources. A sustainable livelihood is one "that can cope with stress and shocks, and displays resilience when faced with adverse effects" (Ellis 2000:128). Ellis and Freeman (2005a) conclude from comparative livelihoods analysis that excessive reliance on subsistence food products coupled with low wage seasonal work on other farms is the most vulnerable position for a rural family to be in – a reality for many of the households in the villages of this study.

The basic approach to poverty reduction assumed by the livelihoods framework is to increase asset levels, substitute assets, or to diversify assets and activities to reduce vulnerability (Lynam 2005, Bird and Shinyekwa 2005). On the other hand, a reduction in assets can also cause or aggravate poverty. Ellis (2000) notes that rural livelihoods depend on access to natural resources as well as on the management regimes that regulate such access. Changes in livelihoods outcomes resulting from specific mechanisms of access (i.e. PFM) may result in increased or decreased access to existing resources and/or access to new resources. Asset substitution is important as access to "a

renewable natural resource, e.g. firewood, could be converted via the market into land or education, and then reliance on the first asset would reduce over time. If no such conversion opportunity exists, reliance on the original asset will be intensified over time" (Ellis 2000:122). The empirical evidence in Chapters 7 and 8 below will show that PFM often leads to restricted forest access, thus reducing opportunities for acquiring natural assets (i.e. forest products, grazing or farming in the forest) or substituting assets.

A core feature of the livelihoods framework is the diversity of strategies to maintain household welfare. These strategies consist of a mix of agricultural, home processing, marketing and off-farm labour activities together with reciprocity relations with other households (Lynam 2005). Diversification is considered a key element of people's own initiatives to reduce poverty (Ellis 2000). Ellis (2000:15) defines rural livelihoods diversification as the "process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living". Diversification provides an interim solution to poverty and vulnerability. Diversification away from subsistence crop production into non-farm activities that can generate cash is considered to play an important role as an exit strategy from poverty (Freeman and Ellis 2005). Seppälä (1998a) describes economic diversification as a reaction to structural change, undertaken by the poor as a matter of survival, by middle-class households for risk minimization and often by wealthy households to capture niches with profit potential. Diversification provides flexibility to adjust for catastrophes and shocks (Seppälä 1998a), which in the recent debate about adaptation to climate change gains new importance. Against this background forest-based off-farm activities, such as charcoal making, should be seen as positive ways of allowing rural households to adapt.

Several authors stress the 'extraordinary' diversity of rural livelihood strategies in African rural economies (Lynam 2005, Bryceson 2005). Rural households in Africa must have the flexibility to source multiple income streams virtually to survive. Bryceson (2005) describes the trend of diminishing reliance on agriculture and increasing dependency on non-farm earnings as 'deagrarianization'. Forest based off-farm activities are important in the villages of the present study.

There can be barriers in the transition process out of poverty that people must overcome. These include, for example, asset deficits (e.g. lack of land, no education), social exclusion (e.g. disability, widowhood) or institutional factors (Barrett and Swallow 2005). The better off can more easily influence such barriers than the poor. Land, or the lack thereof, is considered a key asset explaining poverty induced resource degradation. Ellis (2000) argues that lack of land forces poorer people to rely more strongly on gathering things from the environment (e.g. forests), and they tend to move more into areas with open access resources. The collective effect of each individual effort to survive then results in overall unsustainable use of the resource in question. The lack of land without legal title or tenancy reinforces the prioritization of a short-term extractive rather than long-term investment viewpoint. The lack of clarity around land tenure in most African rural settings works against the poor (Freeman and Ellis 2005, Cross and Kutengule 2005) and is a key concern in PFM practice.

The institutional framework is considered to play a key role in opening up opportunities or hampering people's own efforts to move out of poverty. As Freeman and Ellis (2005) state, in Sub-Saharan Africa holders of power or authority tend to interpret their roles as "blockers and gatekeepers rather than facilitators", so that aiding individuals and families to improve their restraining life conditions is an uncommon occurrence (Freeman and Ellis 2005: 369). This is consistent with other scholars who claim that African states often operate to turn development inputs to the advantage of the elite few and to further dispossess rural populations (Bayart 1993, De Waal 1997, Schatzberg 1988). This is in agreement with the political theory of the neo-patrimonial state.

Social capital is perceived as having a beneficial effect on the capacity of individuals to organise themselves effectively. Social capital is a more elusive category than the other asset types, because, in addition to formal manifestations of community organization, (e.g. committees, cooperatives etc.), it also refers to informal and less visible norms, rights, traditions, personal networks and kinship ties (Ellis 2000, Ellis 2005). Together with leadership social capital is considered a key aspect for management at community level (Pretty and Smith 2004, Ostrom 2005, Bodin and Crona 2008). Bodin and Crona (2008) found a correlation between high level of social capital and low willingness to report rule breaking, which may hint at community cohesion. Communities with low social capital, on the other hand, are predicted to experience weak management of

common property resources (Ellis 2000). In a study of social capital and agency in Kenyan rural fishing communities, Bodin and Crona (2008) show that structural characteristics of the social network can reduce the communities' ability to access information and to adapt to change.

The central unit of analysis of the livelihoods approach is the household, while the entry point of PFM interventions is usually the 'community'. In order to understand the outcomes of PFM processes and how institutional changes introduced at communal level impact upon the livelihoods of forest dependent households, it is important to keep in mind that the community may enable or hinder households in their efforts to improve livelihoods and well-being. The following section takes a look at the term community and how it is conceptualized in the PFM approach and the literature.

2.3.3. Community

The term community and its conceptualization in CBNRM in general is contested and poses methodological problems. Scholars argue that the 'myth of community' underlying participatory institution building as being a homogeneous, static and harmonious group with common interests is a simplistic understanding that conceals power relations and masks biases in interests and needs (Guijt and Shah 1998, Cooke and Kothari 2001, Blaikie 2005, Homewood 2005). As Lasch (1988:178) notes, "a community of shared values does not equal a community of conformity". Thus, alternative definitions of the term community may better reflect the complex reality, such as, for example, communities are an "inherited network of social obligations" (Chatterjee 1998:278), or "members in a community are engaged in the same argument, the same discourse, in which alternative strategies, misunderstandings, conflicting goals and values are thrashed out" (Sabean 1988: 28). PFM approaches usually define communities based on a territorial dimension in relation to the forest – e.g. forest adjacent community, forest-dependent community – or in relation to administrative boundaries, like, for example, the village in Tanzania. Therefore in this study, the term community refers to a forest adjacent village.

There are definitions of community in the literature which include both relational and territorial dimensions (Gusfield 1975, Selznick 1992, Hillery 1955, Kusel 2001). The relational dimension describes the quality and character of human relationships

(Gusfield 1975), which includes a sense of belonging created through shared beliefs, interests, and commitments that unite diverse groups and activities (Selznick 1992). The territorial dimension includes what people have in common at their location, these can be institutional elements (governments, laws, schools, districts, churches) or natural resources (a forest, a river, grazing land) (Selznick 1992). Cleaver takes a wider perspective of communities with emphasis on social identities and norms that frame collective behaviour (Cleaver 2002).

It is also important to acknowledge that institutional and social relationships extend beyond the boundaries of a community (Strathern 1984). The livelihoods framework embraces this wider context by including labour or income related ties outside the community of residence (e.g. through remittances, off-farm labour) and institutions at the micro- and macro level. This perspective broadens the concept of resource dependence, which is important for the analysis of PFM outcomes. Households do not necessarily make forest resource use decisions based on community bound geographical or administrative boundaries, and households outside the territorial boundary of the forest adjacent community may utilize a particular forest but may be excluded from the PFM institutions if community is narrowly defined.

Forest dependence is often defined by economic measures, such as percentage of total income derived from forest products, non-timber forest products collected and sold, and so on. However, besides economic importance, forest dependence is characterized by a social structure that permits and demands particular uses of the forest resource (Kusel 2001). Forest dependence can be based on symbolic and locality based meanings. Relph notes that the forest in forest-dependent communities "represents an expression of communally held beliefs and values and of interpersonal involvements" (Relph 1986:34). In African rural settings such values are often of religious, ritual or spiritual nature. As such, forests are places that reinforce and help define the community living tradition. A meaningful tradition is considered to be an important part of life in a stable community and portrays the relationship of forest and people (Kaufman and Kaufman 1946 quoted in Kusel 2001).

Communities are composed of and sustained by individuals, and individuals are shaped by their community (McIntyre 1984). Thus, there is an interdependent relationship

between the forest related behaviour of individuals and the community they reside in. Kusel notes that people are constituted by social relationships found in their community, which implies that a collective good exists and "well-being may be improved by residents working on community projects when, narrowly conceived, are of no benefit to them personally" (Kusel 2001:373). This may explain why people participate in communal activities such as PFM even though they may not carry direct economic gains. Selznick defines a 'flourishing community' as one with a high level of participation: "people are appropriately present, and expected to be present, on many different occasions and in many different roles and aspects" (Selznick 1992:360, 364). Kusel further argues that the sense of being part of a community generates a category of individual behaviour termed 'commitments' which is derived from 'relatedness', or also termed 'civic responsiveness' (Kusel 2001:373). The political theory of neo-patrimonialism provides explanation of why and how such 'civic responsiveness' and commitments to collective good can be constrained in African rural communities. In the Tanzanian context the history of disempowerment of the rural population still influences civic responsiveness and commitment to current state initiatives such as PFM (see Chapter 4 below).

2.3.4. Gender

There is recognition that the burden of rural poverty falls more heavily on women than on men (Agrawal 1986) and that the quality of female life may not have the same constituents as the quality of male life (Nussbaum and Sen 1993). Lack of access to natural resources and land is considered a strong contributing factor to female poverty. As Agrawal concludes from her analysis of gender and land ownership in India, "the gender gap in the ownership and control of property is the single most critical contributor to the gender gap in economic well-being, social status and empowerment" (Agrawal 1994:1455). Increased focus on formalization and privatization in land tenure legislation in Sub-Saharan African countries is more exclusive than inclusive for women and poorer people who are in a better position when land negotiation is taking place based on customary rules (Cross 2005, Odgaard 2002). Formalization of title deeds is biasing the ability to create freehold land registration towards better-off and men (Cross 2005, Odgaard 2002). Women's land rights are inadequately addressed in new laws (e.g. 1999 Land Acts in Tanzania), so that previous customary rights are

eroded rather than strengthened. Keeping weaker forms of customary tenure under a framework of state ownership maintains the power and patronage of state authorities.

Scholars argue that gender also influences the capacity to exercise agency, women are not able to develop the same level of political voice in local institutions, despite quotas on village committees (Kabeer 2000, Odgaard 2002). Furthermore, opportunities for livelihoods diversification are strongly gender differentiated (Dolan 2005). In their study in Cameroon, Brown and Layuyade (2001) found that men have been better able than women to diversify their sources of livelihood following changes in forest access and availability of forest products. Women had fewer opportunities for diversification and depended more on Non Timber Forest Products (NTFPs) than men for cash and in order to meet livelihoods needs (Brown and Lapuyade 2001). Men have broader options than women, which as Freeman and Ellis (2005) argue may be particularly so in Sub-Saharan Africa where no manufacturing growth has occurred to generate labour markets for women such as in Southeast Asia.

The PFM literature, similar to conceiving community as a uniform entity, often categorized segments of the community as bound units with similar interests, i.e. the women, the poor, the landless etc. (Cornwall 2008, Sundar *et al.* 2001). However, these are not homogenous groups (Sundar *et al.* 2001) which do not exist in social isolation (Cornwall 2008). Treating them as discrete social groups can undermine economically significant relationships that exist between men and women (or the poor and the better off). This calls for a "dynamic understanding of people's social networks and the institutions and dimensions of difference that matter in the pursuit of their livelihoods, as naive efforts to bring about inclusive development may simply make things worse" (Cornwall 2008: 278).

There is a gendered pattern to forest access and participation in forest governance institutions (2007, Franks and Cleaver 2007, Ravindranath *et al.* 2004, Brown and Layuyade 2001). Narrow focus on one household member that pertains to natural resources committees often leads to the exclusion of women (Alderman *et al.* 1997). The extent to which PFM literature is investigating gender aspects is usually limited to a focus on inequity situations generated by local forest management institutions. Such institutions arguably reinforce existing gender hierarchies (Cleaver 2007, Franks and

Cleaver 2007). However, social science research on gender relations shows that for women to gain effective rights on resources will involve contestation and struggle at every level – the household, the community and the state – and on both economic and noneconomic fronts (Agrawal 1994:1469). It is assumed that a gender related situation of inequality arises because the local forest institutions are dominated by elite groups. However, an engendered analysis of inequality with regard to forest resources access and use must go beyond the level of forest users groups and committees. As Brown and Lapuyade 2001 note "economic, political and ecological changes are mediated through intra-household negotiations and a complex set of social rules and values which shape access to livelihood options". Adaptation strategies to external change differ between men and women and do depend on many factors, such as the local political economy and the power relations within the household (Brown and Layuyade 2001). Odgaard (2002) argues that while women may be marginalized in the local institutions, they may have more voice on negotiating resource allocation at the family level. For example, Cleaver (2002) found evidence of complexity of authority, articulation and participation of women in natural resource management in Usangu in Tanzania. In cattle production women were significant managers in practice and both men and women felt that decisions over natural resource use were made properly by all adult members of the family (Cleaver 2002).

The question of gender equity in PFM points to the importance of intra-household resource allocation and power, and the wider social networks in the generation of norms and practices over forest resource use. However, the PFM process neglects the importance of intra-household resource allocations; i.e. what norms govern the functioning of family units? How are these rules revised as circumstances change? (Alderman *et al.* 1997). In addition to agricultural research showing that in localized settings certain crops emerge as being 'male' crops and others 'female' crops (Alderman *et al.* 1997), this study shows that access to reserved forests and extraction of certain forest resources such as charcoal and timber are regarded as 'male' and not 'female'. This might have arisen out of intra-household level negotiations and deeply rooted norms and traditions in a village.

Sundar (2000) argues that the selection of tree species to be planted under PFM is not just a question of local knowledge but is a gendered question. Commercially valuable

timber species are often associated with male elites whereas fruit and fodder bearing trees are associated with women and lower classes. For poor women sale of NTFPs or firewood is part of subsistence. Unless this is acknowledged, PFM aimed at helping women may actually harm them by controlling access to NTFPs. What is represented as local knowledge to outsiders or what is adopted from outside involves aspects of control, authority and power that are embedded in social relationships (Sundar 2000). Even though PFM committees may try to engage women through formal quotas and the establishment of a project may lead to re-negotiation, this may not change the prevailing gendered pattern of forest resource use. Cleaver (2002) points out that there are limits to negotiation, some norms being so deeply embedded that people would find it almost impossible to be discursively critical about them. The outcome of PFM in terms of impacts on women and their livelihoods does not only depend on their voice in the local forest institutions. It is a factor of power relations within the household and the society.

2.3.5. Governance

The third claim of PFM is to achieve improved forest governance through effective and accountable institutions. This section makes an attempt at defining the two concepts: 'forest governance' and 'effective institutions'.

Governance is becoming increasingly important in debates about forest management with many different interpretations of what the concept entails. Woodhouse (1997) defines governance in environmental management as "the structures and processes of power and authority, cooperation and conflict that govern decision-making and dispute resolution concerning resource allocation and use, through the interaction of organizations and social institutions". Forest governance is then pertaining to "how decisions related to forests and forest dependent people are made, who is responsible, how they wield their power, and how they are held accountable. It encompasses decision-making processes and institutions at local, national, regional and global level" (CIFOR, 2008). Good governance encompasses a set of principles such as participation, transparency, accountability, responsiveness, equity, efficiency and integrity (see, for example, UN-OHRLLS and UNDP, 2006).

Cleaver (2007; Franks and Cleaver 2007) in her definition of governance[3] avoids the dichotomous classification of formal or informal institutions, which she regards as false polarizations. Instead she differentiates between 'bureaucratic' and 'socially embedded' institutions. The former are formalized arrangements based on explicit organizational structures, while the latter are based on social organization and daily practice. She rejects the view of advocates of the institutional perspective that assumes active design and crafting of local institutions by outsiders. Local institutions are rather constructed through a process of 'bricolage', which is the "gathering and applying of analogies and styles of thought already part of existing institutions" (Cleaver 2002:15). Cleaver argues that without this moulding and melting of newly introduced bureaucratic resource management structures into the existing socially embedded institutions for collective action, forest resources governance cannot be effective.

PFM includes two domains of governance, the local dimension of structures and decision-making processes as well as the local-central dimension, where communities share forest management responsibilities with state forest departments. Governance in the local context for PFM further needs to encompass ways in which social relationships, norms and daily practices interact with forest management systems and shared access to forests. Transferring Franks and Cleaver's (2007) governance definition to forestry, forest governance is "conducted through bureaucratic and socially-embedded institutions, social relationships and through the rules in practice of everyday forest use". Franks and Cleaver (2007) suggest that actors construct mechanisms of (forest) governance both consciously and non-consciously; through the processes of management and through the practices of their daily lives. Hence, forest governance and its outcomes occur through both purposive action resulting from collective behaviour articulated through processes of forest management, e.g. forest user groups or village forest committees, and non-conscious everyday practice. Daily practices are not easily defined but are equally important for PFM impacts. The design of forest governance systems through bureaucratic institutions may lead to unintended outcomes as the daily practices of agents' lives may shape forest access around different principles and priorities (Cleaver 2002). Similarly as Cleaver points out for the water sector, socially

[3] 'Governance is a way of conceptualizing how society orders its affairs, encompassing the range of relationships between the different stakeholders: government, public and private sectors, NGOs and community groups, and individual citizens' (Cleaver 2007, Franks and Cleaver 2007).

embedded mechanisms of forest access and governance can appear to have little to do with forests.

Outcomes of the system of forest governance occur at the sphere of access, livelihoods, social cohesion and political voice. They cover basic access to forests and forest products, and livelihoods, and how the poor can use forest products to support and improve their status. The mechanisms which are put in place to mediate forest access have a strong influence on social structures and institutions as groups form and negotiate to protect or increase access. Outcomes also evolve in the political domain, as structures of power and influence are changed through the working out of these processes, and poor people can gain political voice (Cleaver 2007). Outcomes with regard to political voice must include not only the ability to speak but also to be heard in public. As Cornwall (2008) points out voice includes that "people feel able to express themselves without fear of reprisals or the expectation of not being listened to or taken seriously" (Cornwall 2008: 278). Improved forest governance would then mean that the network of relationships between different actors and institutions involved in PFM leads to outcomes that bring improvements in access, livelihoods, social cohesion and political voice in particular for poorer people compared to the status quo.

While effective and accountable institutions are considered important to rural poverty alleviation in Africa (Lynam 2005), transparency and accountability are at the same time key challenges of CBNRM in most of the developing world (Blair 2000, Ellis and Mdoe 2003, Petersen and Sandhövel 2001). Effective and accountable institutions for PFM are closely linked to decentralization, which in turn has to do with the local-central dimension of governance and devolution of power and control.

Ribot (1999) defines decentralization as the devolution of central state assets and powers to local or private decision-making bodies (Ribot 1999). Under the heading of decentralization the terms deconcentration and devolution are differentiated. While deconcentration simply involves the transfer of selected functions through the shifting of workload from central ministries to field agencies that are part of central government, devolution must involve the transfer of discretionary authority to legally constituted local governments (OECD 1997). Following this definition, the formation of forest user groups or village forest committees under PFM schemes cannot be called

decentralization unless these bodies have legal constitution. This is consistent with Blaikie's view that there is a "confusing variability in CBNRM and related administrative and legal reforms, such as decentralization" (Blaikie 2005: 307). As Smoke (2003) states, definitions of the term decentralization are often blurred and it is difficult to measure. However, the level of autonomy and degree of accountability are key aspects of decentralization.

Common goals of decentralization are improvements in the areas of efficiency, governance, equity, development and poverty reduction (Smoke 2003). Ribot (2005) argues that local institutions chosen for PFM are often not accountable to the local populations. Even where elected local governments exist, central government and donors avoid them in favour of other local groups that are empowered in the name of PFM, e.g. forest user groups, forest management committees etc. These single-purpose, non-elected committees are empowered as if they are themselves representative or democratic, which they are often not, which Ribot considers 'anti- democratic' (Ribot 2005:91). For democratic decentralization to be achieved, accountability should run from these groups managing public resources such as forests through elected local bodies to the people (Blair 2000). Even though local governments may not always be democratic, these alternative institutions have even less systematic accountability to the public at large. Choosing non-democratic authorities may subject local people to arbitrary authority without representation and is comparable to 'indirect rule under colonial policies'. Selecting alternative representative bodies instead of giving public decision-making powers to elected bodies diminishes the role and authority of elected local government. Similarly, transferring powers to NGOs who are not accountable to or representative of local people, cannot be considered more democratic or representative than privatization, which is not a form of decentralization (Ribot 2005).

Effective decentralization requires representative local institutions that are downwardly accountable and responsive (Ribot 2005). Accountability requires that the local population can sanction the local authorities via systematic and effective mechanisms to avoid rise of self-interest and power concentration. Responsiveness means that local

authorities respond to local demands. Elite capture described in the PFM literature[4] is explained by Ribot with a lack of representation without which local institutions may only serve the hierarchical interests of the best organized and most powerful (Ribot 2002a). Thus, a key question is whether the selected PFM institutions are accountable to the populations for whom they are making decisions. This conforms with Nygren (2005), who notes that political accountability and institutional democratization of forest authorities and community representatives to local populations are essential if decentralized forest governance is to succeed in achieving more equitable distribution of powers and benefits.

As Cross and Kutengule (2005) show through a case study in Malawi, decentralization can exacerbate predatory behaviour of local officials. In the typical patrimonial state where authority, power and wealth originate from loyalty and patronage rather than effectiveness at achieving state government goals, decentralization merely serves to recreate patronage politics at local level. Ribot (2005) defends the view that in the case of public resources, such as forests, the chain of accountability is from the committee to the elected local government and from the local government to the people. Where local forest committees must present themselves to the elected authorities for recognition and the latter in turn allocate management use and powers to the committees, local authorities are strengthened and equipped with the role of balancing interests among users. Notwithstanding the fact that elected local authorities appear to function as implementing agents for central authorities rather than local independent discretionary decision makers, working with them is a first step towards supporting local democracy and strengthening them a second step (Ribot 2005).

With regard to the local-central dimension of forest governance, the principle of subsidiarity calls for decisions to be made at the lowest possible political administrative level. However, this principle is not followed in most environmental decentralizations (Ribot 2005). Forestry agencies transfer use rights with no commercial value while retaining central control over the lucrative aspects of the sector (Ribot 2001, 2002a). Ribot (2005) claims that there are few cases where democratically accountable local institutions are being chosen and given discretionary powers, although the transfer of

[4] See, for example, Kaimowitz *et al* 1998, Topp-Jorgensen 2004, Lund and Nielsen 2006, Larson and Ribot 2004, Ribot 1999.

the latter is critical to enable local authorities to respond flexibly to local needs. Ribot (2005) notes that "whereas power transfers without accountable representation can be dangerous, representation without powers is empty". Ribot (2002a) calls PFM policies a 'masquerade' of political decentralization since they are controlling and administering the local population as subjects to be managed and used, rather than empowering or enabling. Meaningful power transfer to local institutions requires that

- Mandates are matched with sufficient fiscal resources and technical support and should not be the only powers transferred to local authorities.
- Commercially valuable resource use opportunities should be transferred to local authorities in addition to subsistence oriented usufruct rights.
- Technical decisions to be made at central level should not be confused with political decisions concerning use of resources to be made at local level; i.e. who has access to and benefits from them.
- Public resources such as forests should be kept within the public sector and not privatized.
- Means of transfer of powers are secure. Until people believe that the rights they have gained are secure, they are not likely to invest in them. Transfers made by legislative reforms are more secure than those made by ministerial decrees, administrative orders or the discretion of authorities (Ribot 2005).

Several authors point out that certain roles pertain to the central state to support effective decentralization. These include, for example, poverty reduction strategies, as poverty alleviation is not an automatic outcome of decentralized governance as often assumed. On the contrary, local level responsiveness to the poor is quite a rare outcome (Ribot 2005, Kumar 2002, Sundar *et al.* 2001) and it requires strong commitment by a national government or external party (e.g. NGOs) to ensure the interests of the poor are promoted at the local level (Ribot 2005). Ribot lists a number of questions to determine whether a decentralization effort is serious and likely to achieve effective and equitable outcomes, consisting of institutional choice and power choice questions. A sub-set of these questions of relevance to this study is reproduced in Appendix 1.

2.3.6. Participation

Participatory development became an orthodoxy at the end of the 1980s, influenced by the work of Robert Chambers with the aim to "increase the involvement of socially and economically marginalized people in decision making over their own lives" (Guijt and Shah 1998). It is justified on the basis of sustainability and empowerment. With increasing practice, strong critique arose that "participatory development facilitates illegitimate exercise of power and can both conceal and reinforce oppressions and injustices in their various manifestations", as Cooke and Kothari (2001:14) state in their book titled 'Participation: the new Tyranny?'. The emphasis on the micro level is perceived to hide and reinforce systemic macro-level inequalities and injustice (Cooke and Kothari 2001), so that the rhetoric in participation becomes a 'masquerade' of continued centralization in the name of decentralization (Biggs and Smith 1998, Mosse 1994). Furthermore, Chambers (1997), in 'Whose Reality Counts', suggests that participatory development approaches construct a particular reality, which may not truly represent the local situation.

Participation is a buzz word that can label almost any practice that involves people. Hence, Cornwall calls for "clarity through specificity", by spelling out exactly what people participate in, for what purpose and who is involved and who is absent (Cornwall 2008:281). Cleaver (2001) adds the why dimension to these specifications by claiming that participatory approaches overlook individual motivations to participate and how the multiple identities of individuals impact upon their choices whether and how to participate.

At a theoretical level, typologies of participation can be useful in differentiating degrees of participation. In practice these differences are less distinct and the forms can all be found in one single intervention at different times (Cornwall 2008). The forms of participation are usually placed along an axis of 'good' to 'bad' with a focus on the intention of those who initiate participation (Cornwall 2008). Arnstein (1969), in her three-tiered ladder of participation, places 'citizen control' – which includes delegated power – at the top of the ladder, and 'non-participation'– which is based on manipulation – at the bottom. She places 'tokenism' in the middle, in which category she includes consultation and informing, which is similar to definitions of development

organizations claiming to promote participation. As Cornwall points out, consultation is widely used as a means of legitimizing already-taken decisions, providing a thin coating of participation to lend the process moral authority (Cornwall 2008). Rarely are there any guarantees that what is said will be responded to or taken into account. Arnstein's typology is a reminder that participation is ultimately about power and control (Cornwall 2008), which is in line with Ribot's (1999) view that participation means power sharing in decision making and must include real devolution of significant powers.

Pretty's (1995) typology of participation puts emphasis on the motives of users of participatory approaches as being an important factor in shaping the outcome (Cornwall 2008). His typology equally ranges from 'lesser' forms of 'manipulative participation' and 'passive participation' to 'better' forms of participation including 'participation by consultation' and 'for material incentives'. Manipulative participation is simply pretence with people's representatives on official committees who are not elected and have no power. Lack of representativeness and delegated power are characteristics that match Ribot's 2005 description of local PFM institutions. Passive participation in Pretty's typology involves unilateral announcements by external agents without listening to people's responses. Participation by consultation allows people to express their views on pre-defined problems, which external agents may or may not take on board in their pre-defined information gathering and analysis process. Participation for material incentives enlists people by contributing resources, for example their labour in return for promised incentives. 'Functional participation' is often associated with efficiency arguments: people participate to meet project objectives more effectively and to reduce cost, after the main decisions have been made by external agents. This is the most frequent type applied in development. 'Interactive participation' uses interdisciplinary methodologies and involves people in joint analysis to search for multiple perspectives and apply a systematic learning process. The 'best' type of participation is 'self-mobilization', where people take initiatives independently of external agents to change situations and then develop contact with external institutions for resources and technical advice while keeping control over how resources are used. This last form of participation may challenge existing distributions of wealth and power (Pretty 1995). Arnstein's and Pretty's typologies describe a spectrum defined by a shift from control by authorities to control by the people (Cornwall 2008).

White's (1996) description of different interests in various forms of participation can be useful to analyse why or how participation is being used at any particular stage in the process. 'Nominal participation' is simply used by the implementing agency to legitimate that they are doing something, which for people at the receiving end means inclusion to ensure they retain some access to potential benefits. In this case participation is simply for 'display'. The second form is 'instrumental participation' where it is used as a means of achieving cost effectiveness. 'Representative participation' is intended to give people voice and to create sustainability, which in turn means for those on the receiving end leverage to influence the shape of the intervention. The last form, 'transformative participation' stands for empowerment both at the implementing and the receiving end and represents a continuing dynamic to enable people to derive at their own decisions (White 1996).

As Cornwall points out, these typologies of participation show that a process that simply enlists a small group of articulate elite community members is very different to one in which community members themselves delegate power to such a group to engage with the authorities, remaining content to receive information and be consulted on key issues (Cornwall 2008). The latter process is then more likely to create what Ribot describes as democratic institutions, which are elected and representative. Farrington and Bebbington (1993) differentiate between depth and breadth of participation. A deep process includes a process from identification to decision making while a wide process must go beyond a particular interest group. This emphasizes the intersections between inclusion and exclusion and degrees of involvement.

While a deep and wide process might be ideal, in practice it can prove to be impossible and time-consuming (Cornwall 2008). Participatory processes can also serve to deepen the exclusion of particular groups unless explicit efforts are made to include them (Cornwall 2008). Participatory forest management implies changes in tenure conditions and management responsibilities to include local people, although it does not usually imply a change of ownership of forest resources, which remain with the state. Thus, in Arnstein's typology this is manipulation or at best consultation but due to the lack of power delegation is it not the highest category of citizen power. Li (2007) argues that in PFM rights to resources are often made conditional on performance, adding a coercive

element to governmental strategies, which could then be compared to functional participation in Pretty's typology. Often participation in forest management is introduced to achieve predetermined project goals at given conditions to reduce cost. The typologies will be useful in examining the nature of participation applied in the JFM process at the research sites of this study.

Cleaver (2001) highlights the neglected role of social structure and individual agency in shaping participation. Participatory approaches often assume that people have overriding productive identities ('irrigators', farmers) and clear social roles (leaders, women). The emphasis on such participators is problematic as formal institutions formed on this basis often reproduce patterns of inequity and may serve to shape and reinforce other differences. The prioritizing of single aspects of people's identities while forming institutions of participatory resource management ill reflects complex social and livelihood identities and multiple motivations. People's identities are dynamic, and social norms that shape institutions are difficult to categorize. Norms and practices and the relationships of trust and cooperation that underlie them are often generated and negotiated outside the formal institutions.

It is further noted that the participatory discourse and approaches have been naive about the complexities of power (Cooke and Kothari 2001, Cleaver 2001). Power relations are exercised in diverse often less visible ways embedded in social practices. Participatory practitioners need to acquire a deeper understanding of the concept of power and to reconsider the claims of empowerment that are rooted in power (Cooke and Kothari 2001).

2.4. Common property regimes

Common property (or pool) resources, such as grazing land, fisheries and some forests are characterized as hard to sustain and easy to deplete. Access to them and the rate at which they are consumed is difficult to control. They are contrasted to private property resources (or goods) with clearly specified and secure property rights, exclusive to the owner of the right. Private property rights can encourage protection and investment in the resource (or good) to which they attach, provided there is security to enforce the right and a long-term horizon. Rights that are vague, tenuous, or nonexclusive are not

fully private (McKean 2000). Property rights to resources have been defined as human institutions or sets of mutually recognized claims, and decision making powers over those resources (Gibson *et al.* 2000). Shepherd *et al.* (1995) emphasize that property regimes with regard to forest land are socially defined, and as such may be either legally codified (*de jure*) or unwritten but commonly understood (*de facto*); they are never absolutely secure, but are subject to revision. This division of rights between the legitimating body (i.e. nation-state, local government, community or clan) and the designated users reflects the prevailing balance of power, and may be reason for conflict and subject to change.

Hardin started a critical debate about common pool resources, claiming that common property resource (CPR) management regimes inevitably lead to over-extraction to the point of exhaustion, described as the 'tragedy of the commons' (Hardin 1968, Gordon 1954). The resulting policy recommendation was to place all natural resources under public or private ownership. However, the hypothesis of the tragedy of the commons was criticized for its underlying utilitarian world view typical to neo-classical economic theory. It is based on game theory models of individuals' self-seeking behaviour that assume that natural resources yields could be individually maximized (Berkes and Folke 1999). Scholars critical of the conventional natural resources theory call for a multi-disciplinary, multi-method, comparative research design to develop a coherent theory of the commons (Agrawal 2001; Ostrom and Nagendra 2006). They explain Hardin's 'tragedy of the commons' as 'institutional failure', meaning the breakdown of local institutional mechanism for the regulation of common use, ascribed to changes in the legal framework and tenure structures. This breakdown is believed to result in the *de facto* open access situation described by Hardin. Hardin himself later recognized that his famous 1968 article should have been titled "The Tragedy of the Unmanaged Commons" (Hardin 1998).

Many forests in developing countries, once managed under customary arrangements as common pool resources during pre-colonial times (see Chapter 4 below) and then placed under state ownership through nationalization, are presently facing this *de facto* open access situation. These government owned forest reserves, although *de jure* public property, have become *de facto* common pool resources, because the property rights are not enforced and an open access regime has established in practice over time in the

dearth of monitoring and rule enforcement. This is the case with the six state forests included in the present research study. PFM, in contrast, has been compared to putting these *de facto* common pool resources under a common property (of the community institution) regime acting as an incentive for protection (Ostrom and Nagendra 2006).

A vast number of theoretical and empirical contributions emphasize that decentralized collective management of common property resources by their users could overcome the 'tragedy of the commons', lead to ecological sustainability, greater long-term productivity and reduced administrative cost (Berkes 1989, Poffenberger 1990, Ostrom 1990, Larson and Bromley 1990, Bromley 1992, Ostrom 1990, Ostrom *et al.* 1994, Baland and Plateau 1996, Chakraborty 2001, Agrawal 2001, Adhikari *et al.* 2005, Ostrom and Nagendra 2006). McKean (2000) argues that forests make good candidates for common property regimes, or for vesting clear, secure, exclusive rights to managing a resource in nearby communities.

Forest adjacent communities have shown to be able to create robust institutional arrangements for governing the commons sustainably (Berkes and Folke 1998, National Research Council 2002, Ostrom 2005, Bray and Klepeis 2005). This trend led to proposing CBNRM or PFM respectively as a cure all approach to conservation in the form of a blueprint approach (Pritchett and Woolcock 2003). However, some authors are concerned about inequality with negative effects on the ability of community groups to undertake successful collective action (Baland and Plateau 1999, Agrawal and Gibson 1999, Guijt and Shah 1998). Wealthier users contribute more to collective action as they have more incentives to cooperate, while poorer users capture less benefit and are hence less declined to participate in the collective action (Baland and Plateau 1999). Increasing inequality between users redistributes incentives in different directions and has ambiguous effects on the ability of users to conserve their resources and towards setting up the required mechanisms. Hence, CBNRM generates little community involvement and leads to elite capture of benefits (Plateau 2004).

Despite this critique, Ostrom and Nagendra (2006) consider PFM more effective than publicly protected areas (Bray *et al.* 2005 and Nagendra *et al.* 2005 quoted in Ostrom and Nagendra 2006). From a comparative study, Ostrom and Nagendra (2006: 19230) conclude that "without substantial investment in fences and official guards to patrol

boundaries to prevent illegal harvesting, government owned 'protected' forests may not be protected in practice". However, if users have a role in designing rules, or consider the rules legitimate, they are often willing to monitor and sanction uses considered illegal, even of public property (Ostrom and Nagendra 2006). The existence of a set of agreed rules, specifying access to and extraction from the resource is a key feature of successful common property regimes. The rules can be designed, enacted, and enforced by the group of individuals who jointly own the resource (Chakraborty 2001). This corresponds to the concept of 'regulated common property' used by Baland and Plateau (1996). The lack of such rules, monitoring arrangements, and sanctions is according to Ostrom *et al.* (1999) an explanatory variable of forest degradation.

Other authors confirm that more important than the particular ownership form is whether boundaries of linked social-ecological systems have been established as legitimate in the field and whether regular monitoring and enforcement of rules related to entry and use exist (Dietz *et al.* 2003, Banana and Gombya-Ssembajjwe 2000, Pagree *et al.* 2006). Effective systems to curb over-extraction of natural resources need time to evolve and effort to design so as to fit both the local ecology and the social structure of the users and the officials involved, and to avoid crowding out intrinsic motivation (Berkes 2004, Berkes and Folke 1998, Frey 1997). Thus, simple formulas on formal ownership of common pool resources, particularly if based solely on public ownership of forest lands, will not solve the problems of over-extraction (Ostrom and Nagendra 2006).

2.4.1. Categories of property rights

Agrawal and Ostrom (2001) identify four categories of property rights that are crucial to understand common pool resource management: withdrawal, management, exclusion and alienation. These categories allow scaling up local forest management institutions regarding their independence from government forest departments. Nagendra and Gokhale (2008) apply these rights to forest resources as follows:

- Withdrawal: The right to withdraw specified forest products from a defined physical area;
- Management: The right to manage a forest area and regulate use;

- Exclusion: The right to determine who has the right to harvest forest products and how the right can be transferred;
- Alienation: The right to sell or lease the rights of withdrawal, management and exclusion.

Schlager and Ostrom 1999 define four categories of property rights holders depending on the *de facto* rights to the forest. Owners, such as the state forest departments and local rulers in pre-colonial times, have rights of withdrawal, management, exclusion and alienation. Proprietors, such as forest industries, hold rights of withdrawal, management and exclusion but lack authority to alienate these rights. Authorized claimants, such as the village forest committees in India, can withdraw forest products and manage the land, but they lack the authority to exclusion and to alienation. Authorized users, such as the most marginalized communities, have the most limited rights, with only the right to withdraw specific forest products in practice, even though they may hold *de jure* rights to withdrawal.

2.4.2. Attributes of successful common property institutions

Success factors identified for effective local common property institutions include certain characteristics of the community and the existence and enforcement of rules (Ostrom 1990, Baland and Platteau 1996, Agrawal 2001). Agrawal (2001) lists 36 such factors conducive to collective action, including small area extent of natural resource, well-defined boundaries, small group size, shared norms and cohesiveness, homogeneity of identities and interests. In a different study Agraval (2000) provided evidence that smaller councils were disadvantaged in their efforts to generate sufficient human and other resources to monitor and enforce local rules, which challenged the earlier 'smaller is better view'. Varughese and Ostrom (2001) discuss heterogeneity instead of homogeneity as a criterion in collective community action. This debate about general institutional characteristics conducive to the success of CPRs is on-going, while at the same time it is becoming evident that PFM outcomes depend on the specific circumstances of each site (Sundar *et al.* 2001, Woodcock 2002). This research study shows that there is a large variance between the site-specific cases, which can each generate lessons but they also offer common insights.

Attributes identified as key for successful common property institutions can serve as guiding criteria during the analysis of PFM case studies. Amongst these are:

- Clearly defined resource boundaries and group membership criteria.
- No interference to the user groups' attempt to organize.
- Clear and easily enforceable rules. Restrictions on equipment a user takes into the forest may be easier to enforce than quantitative extraction limits (McKean 2000).
- Infractions of use rules are monitored and punished. Evidence shows that communities with healthy forests reinvest fines collected into paying their guards. Communities with degraded forests enforce rules less, have fewer guards, collect fewer fines, and put the fines into a general village budget rather than into enforcement (Agrawal 1992).
- Users have the right to modify the use rules to allow for the ability to adjust to ecological changes and new economic opportunities by, for example, lengthening the period of closure on a forest, altering distribution of forest products, and so on.
- Fair distribution of decision making and access rights with acceptable balance of cost and benefits. If any subgroup feels cheated, it may become unwilling to invest in protecting the commons. Rules that award more benefits to those who invest more and no benefits to those unwilling to invest, seem to have the best chance of winning the allegiance of both rich and poor (McKean 2000).
- Methods of conflict resolution exist. Possibilities to air grievances need to be provided, for example through regular committee meetings.

Agreement on rules is considered a prerequisite for successful enforcement. Lack of agreement about rules would achieve a lower level of rule compliance and efforts to guard effectively, resulting either in corruption between government guards and local forest users (especially bribery) or high levels of conflict (Gibson *et al.* 2000). Once some common agreement is achieved, the investment in monitoring has a high return by ensuring that the temptations that face all users do not grow into consistent rule breaking behaviour (Gibson *et al.* 2000). There is theoretical consensus that without common understanding and resources sufficient to monitor and sanction rule breakers, rules restricting activities that generate high private benefits are doubtful, whether made and enforced by the national government or by the local community (Gibson *et al.* 2000). Financial support to local common property regimes is considered to undermine local cooperation and forest committees should be self-sustaining institutions (McKean 2000).

Ostrom (1990) defines three factors that can support the stability of common property institutions. First, each actor has to make a commitment to comply with credible rules. Chakraborty (2001) argues that this is difficult to achieve as incentives for individual resource users to deviate from their commitments are always present as long as it remains unnoticed. Second, monitoring mechanisms are in place to detect violators and enforcement mechanisms that increase the cost violators incur for their infringements. The existence for these mechanisms works as an additional incentive to make a commitment. Third, external factors of the legal and political environment support or erode the stability of an institution. Chakraborty (2001) found that external support in the enforcement of rules by the FD stabilized common property institutions in Nepal. Credible commitment to protection rules was facilitated by the fact that state managed forests nearby offered a reserve that could be exploited to satisfy subsistence needs, indicating a replacement effect. An institution is unstable if compliance to informal constraints and formal rules is low and rules are changed frequently (Chakraborty 2001).

Cleaver argues that formal or 'bureaucratic' institutions of forest management are often superimposed on the existing social structures. These mediate the residents' access to forest benefits. In contrast to the orthodox view of the common property literature, Cleaver claims that "collective decision-making institutions may not be the process of conscious selection of mechanisms fit for the collective action task, but rather a messier process of piecing together shaped by individuals acting within the bounds of circumstantial constraint" (Cleaver 2002:17). These processes of 'bricolage', which shape institutions, are embedded in networks of social relations and norms. Maintaining social consensus may be equally as important as optimum resource management outcomes (Cleaver 2002:17). Cleaver's concept helps to understand the complex and dynamic nature of natural resources management and the 'fit' between (newly created, formal) institutions and the (existing) web of livelihoods networks and practices in which they are embedded. Formal institutions often reproduce existing patterns of inequity and may serve to shape and reinforce other differences (Cleaver 2002).

Property regimes and tenure systems remain crucial issues in the debate over sustainable forest management. Real-world property regimes and institutions are highly complex and location-specific. The evidence that public protection is the only effective way to conserve forests is not clear. Neither is the evidence that handing forest over to

local users is a secure way to achieve conservation. Some communities manage their forests better than others. Some conditions are more conducive than others (Gibson *et al.* 2000; Andersson 2004, Berkes 2004). Many forest dependent communities have failed to conserve all components of their resources even under well-defined property rights regimes (Schlager and Ostrom 1992). Sundar *et al.* (2001:233) conclude their review of JFM in India: "JFM is too diverse to allow generalized conclusions about whether it is successful or replicable". Thus, PFM is location-specific and there is no 'blueprint' for it. The following chapter summarizes some of the experiences with PFM in India and Nepal and the lessons that have emerged.

3. Lessons of PFM

3.1. Experiences in Asia

While PFM has been implemented worldwide, this review of experiences focuses on India and Nepal. The PFM programmes in both countries have generated a wealth of lessons, among others through long-term research programmes[5]. These have to some degree informed the African PFM process. The Indian JFM programme and the Nepalese Community Forest (CF) programme are among the largest programmes in the world (Kumar 2002).[6]

3.1.1. Background

Since the 1970s the PFM experiments in both India and Nepal have generated similar lessons despite their different implementation approach (Hobley 1996; Nagendra and Gokhale 2008). Nepal's CF policies are described as the most innovative among developing nations, while India has implemented a JFM programme on a wider scale but with less devolution of power (Sundar *et al.* 2001). While in both countries land tenure remains in principle with government who retains the right to reclaim forests if misused by local people there is a significant difference in the PFM property regime.

In India, based on the 1990 JFM resolution the rights of Village Forest Committees (VFCs) to share forest products are only granted administratively and are not a legal right with the exception of some states (Hobley 1996). In contrast in Nepal, the 1993 Forest Act foresees legally registered Forest User Groups (FUGs) with clear property rights over the forest (Tachibana and Adhikari 2009). In India 97% of the forest land is owned and managed by the state Forest Department (FD) and has been under extensive management for the last 100 years (Nagendra and Gokhale 2008). By contrast, in Nepal most of the forests were under community control prior to the mid 1950s but were

[5] Such as the Ecological and Economics Research Network (EERN) of the Centre for Ecological Sciences, Indian Institute of Sciences, the Nepal Forest Resources and Institutions Research Programme and the International Forestry Resources and Institutions (IFRI) research programme of Indiana University.
[6] Launched in 1990, the Indian JFM Programme covered all 28 states, encompassing 22 million ha of forest land and involving 106,482 villages by 2006 (Nayak and Berkes 2008, Murthy *et al.* 2004; Ravindranath *et al.* 2004; Kumar 2002). In Nepal, by 2005/2006, over one million ha of forest area had been handed over to 14,227 forest user groups (FUGs) in the Nepali hills and plains, and the programme covered over 1.6 million families in 74 districts (Nagendra and Gokhale 2008).

brought under government ownership through the Nationalization Act of 1957 (Nagendra and Gokhale, 2008).

In both countries, the nationalization of forests, which replaced traditional systems of forest management, is believed to have led to the alienation of local communities from the forest (Nagendra and Gokhale, 2008, Sundar 2000, Hobley 1996). They have created *de facto* open-access forests, which were previously limited in access through customary rules (Ostrom 2005). The large areas of forest subsequently under public property were difficult to control by the FDs in both countries due to limited manpower and finances (Nagendra and Gokhale 2008, Sudha and Ravindranath 2004). Community management was assumed to be a step towards reversing the alienation introduced by the state (Sundar 2000). This is similar to the Tanzanian history (see Chapter 4). The Nepali CF programme drew on traditional systems of community management, which had existed since 1952 (Hobley 1996). The Indian programme built on self-initiated Community Forest Management (CFM) experiments dating back to 1936 in West Orissa and West Bengal (Human and Pattanaik 2000). These early experiences provided proof that communities had the capacity to undertake forest management without the assistance of FDs (Human and Patt 2000). The formal expansion of the national scale programmes was then largely externally driven and funded, designed as top-down approaches in which communities lack control over planning and implementation (Sundar 2000, Ribot 2004, Ravindranath N H *et al.* 2004, Sundar *et al.* 2001). India's JFM programme was perceived by community groups as an intention of the FD to re-gain gradual control over forest resources that had previously been handed over to villagers for management and which had been successfully regenerated and protected by the villages under CFM (Human and Pattanaik, 2000). Many communities were reluctant to engage in JFM due to a long history of distrust of the FD and due to their belief that JFM is a one-sided affair where the FD holds the real power.

3.1.2. Impacts on forest quality

PFM in India and Nepal is considered successful in terms of forest protection and regeneration (Iversen *et al.* 2006, Yadav *et al.* 2003, Dev *et al.* 2003, Richards *et al.* 2003, Chakraborty 2001, Kumar 2002, Sundar *et al.* 2001). While most FUGs in Nepal initially put their forests under closed access to allow for regeneration, over time the protection practice was adjusted, harvesting controlled and planting practiced. This

combined led to sustainable management of the forests (Springate-Baginski *et al*. 1999, Adhikari *et al.* 2007, Dev *et al.* 2003). However, Lund *et al.* (2009) document that the apparent consistency in research about PFM leading to improved forest quality in India and Nepal actually build on a number of methodological weaknesses which means that the observed and perceived positive developments in forest quality over a certain time span cannot be clearly linked to PFM (other potential causal factors cannot be ruled out).

In India the main positive impacts from a community perspective were that JFM forests had improved tree density and canopy cover (Ravindranath *et al.* 2004). The diversity, quality and quantity of forest products available for collection had increased in some states. There had been a reduction of illegal forest product extraction and other environmental benefits were noticeable. Rishi (2006) found that VFCs had a clear positive attitude towards forest protection and management. Murthy *et al*. (2004) in contrast document that the majority of VFCs in Karnataka reported increased tree density and canopy cover of naturally regenerating forests, however the impact on the availability of fuelwood, grass and NTFPs differed considerably between sites. Based on a long-term vegetation study a positive correlation between the length of the protection period and regeneration of natural forests was established (Murthy *et al.* 2004). The natural regeneration approach promoted in the Indian model in degraded forests with suitable rootstock combined with protection from grazing and extraction proved to be a successful low-cost approach to restoring biodiversity (Murthy *et al.* 2004).

Ravindranath *et al.* (2004) found that there are positive synergies between promoting biodiversity and meeting the diverse biomass needs of the community for fodder, NTFPs, fuelwood and timber. In the Middle Hills of Nepal, CF has encouraged the regeneration of forest cover with an improvement in forest biomass and biodiversity levels in several sites (Nagendra 2002). In the Terai Plains, results have been mixed, with the FD handing over poor quality forests to the local communities, and retaining the better quality forests as national forests. However, even in these cases the community forests are reported to regenerate. Tachibana and Adhikari (2009) found that improved forest condition in CF forests was due to rotational use of the forest area leading to regeneration of saplings, as well as due to tree planting.

In addition to natural regeneration of forests, the Indian JFM programme included the establishment of plantations on degraded forest land. While in India the JFM plantations tend to be monocultures of exotic water hungry species such as Acacia and Eucalyptus, in Nepal, at least a mixture of local useful species of trees is often planted to restore degraded lands (Nagendra and Gokhale 2008). While there is consistency in the research on India and Nepal that PFM leads to improvements in forest quality, several studies raise equity and distributional problems affecting the outcomes for the livelihoods of the poor (Kumar 2002, Adhikari and Lovett 2006, Adhikari 2005, Malla 2009, Yadav *et al*. 2003, Chakraborty 2001). As Kumar (2002:764) notes "JFM is well suited to the promotion of sustainable forest regeneration, but such regeneration is currently being achieved at the expense of the poor". However, Lund *et al.* (2009) even question this cause – effect relation between forest quality and PFM.

3.1.3. Impacts on livelihoods and poverty

Impact studies on livelihoods show both positive and negative results. JFM committees in several Indian states had greater legitimate access to forest benefits, which enhanced their livelihoods and enabled them to create village funds for development activities. The protection of the forest had a direct impact on the productivity of NTFPs and grass, which resulted in larger populations of milk cattle in the JFM villages. Initially employment was created by the FD through paying local people as guards and for planting activities. However this effect declined over time (Ravindranath *et al.* 2004). Negative livelihoods impacts are reported from Nepal due to the closed access regimes that were introduced in the initial years of CF. This led to lower amounts of forest products collected (Springate-Baginski 1999).The cash income from CF in Nepal as well as from JFM in India has to date been marginal and barely enough to cover the salaries of the local forest guards and did not justify the transaction and opportunity cost[7] over a long protection period (Malla 2009; Kumar 2002).

Wealth disaggregated studies show that for poor households negative outcomes outweigh the positive ones. This is due to several reasons. First, due to their limited land ownership, poor households are particularly affected by the restricted access as they are

[7] Transaction cost includes, for example, the time spent in meetings, while opportunity cost includes time spent collecting forest products from elsewhere, or time spent on patrol that cannot be used for other activities.

unable to replace forest resources from private land (Pokharel and Nurse 2004). At the same time poorer people have higher forest resource dependency: the share of forest income to total household income is significantly higher for landless poor households compared to cultivating non-poor households (Kumar 2002). Thus, while the potential income from community forests may be insignificant to the well-off, it is substantial for poorer households (Malla 2009).

Second, poor households have a more restricted access to benefits due to their lack of participation in decision making (Malla 2009, Adhikari *et al.* 2004, Malla *et al.* 2003, Hobley 1996, Kuechli 1997, Kumar 2002, Hobley and Wollenberg 1996, Yadav *et al.* 2003). PFM regimes in India and Nepal, it is claimed, have been built on alliances between the state and village elites, which dominate decision making. The inadequate participation of marginalized sections of communities – e.g. women, landless, artisans – reinforce inequity and poverty (Nagendra and Gokhale 2008; Ravindranath *et al.* 2004; Murthy *et al.* 2004; Hobley 1996).

Several studies state that decisions in FUGs are dominated by large landholders who have little incentive to use community forests for commercial purposes but at the same time siphon off most of the benefits generated by the forest (Malla 2009, Sundar 2000, Iversen *et al.* 2006). Interests of poorer households in terms of rules of forest product harvesting are not properly represented in the forest operational plans (Adhikari and Lovett 2006) so that procedures for distribution of forest products harvested (Malla 2009) and FUG price and payment policies (Iversen *et al.* 2006) favour wealthier households. In many sites the VFCs open the forest only for certain days in a year and the forest grows mainly in terms of timber under the protection regime. This mirrors the preference of wealthier members for timber, while poorer sections of the village are more dependent on NTFP for subsistence and income. Not only do poorer households benefit less due to restrictions imposed on collecting forest products, they also bear a higher proportion of transaction cost[8] relative to their resource benefits if compared to wealthier households (Adhikari and Lovett 2006, Hobley and Wollenberg 1996).

[8] Iversen *et al.* (2006) found that in the Terai in Nepal, the transaction cost amounted to 10% of the total cost.

Kumar 2002 argues that the assumption inherent in PFM that direct benefit sharing between state and village committees will tackle equity issues and contribute to poverty alleviation is ignoring the fact that village communities are highly stratified in terms of assets and patterns of social exclusion. None of the state JFM resolutions specifies suitable mechanisms to ensure increased access of landless households or marginal farmers to the forest and forest benefits (Kumar 2002). Gender equality principles entailed in the Indian JFM policy framework were largely ignored at field level (Ravindranath *et al.* 2004; Murthy *et al.* 2004). Women were found to either not participate in committee meetings at all or register their physical presence with no participation in the discussions. The 'one person per household' rule for committee membership led to a systematic exclusion of women (Alderman *et al.* 1997). Even the introduction of 'all women' forest committees in India did not change this situation (Bingemann *et al.* 2004, Nayak and Berkes 2008, Ravindranath *et al.* 2004; Murthy *et al.* 2004). Agrawal (1994) in contrast suggests that all-women panels in village panchayats are more responsive to women's concerns and that women are more likely to take their grievances to women representatives. Several authors argue that the JFM regime itself aggravates gender disparity (Cleaver 2002; Sundar 2000). Cases are reported of women coming into confrontation with members of the control committee and suffering severe deprivation due to closure of forests (Sarin *et al.* 1998 in Sundar 2000). Disputes over boundary issues contribute to inequitable outcomes and exclusion in both India and Nepal (Hobley 1996).

Second generation impacts are emerging in Nepal with positive livelihood outcomes also for poorer people. Several studies report that although there are short-term adverse effects on the poor by curtailing access to forests, over time improved forest condition is leading to increased collection rates of forest products (Adhikari *et al.* 2007, Iversen *et al.* 2006, Dev *et al.* 2003 and Springate-Baginski *et al.* 2003). As the forests are regenerating, FUGs are putting in place more permeable access regimes and more equitable distribution rules. Adhikari *et al.* (2007) conclude that CF has not adversely affected livelihoods as there has been an increase in fuelwood collection rates and people have adjusted to the new institutional arrangements. Long-term studies show that households are adapting their livelihoods to the change introduced through PFM. For example, in India, villagers have changed their livestock herds to a different type of cattle that needs less grass (Murthy *et al.* 2004,) and in Nepal, households have shifted

livelihood strategies, reallocated activities or shifted membership to other forest user groups (Iversen *et al.* 2006). Chakraborty (2001) identified as an impact of JFM a shift of forest resources demand to state managed forests without community involvement, indicating a replacement effect leading to stronger degradation of these other forests.

Thus, the timeframe is emerging as an important aspect when considering livelihood impacts of PFM. While there might be trade-offs in the short-run, there is a potential for positive outcomes in the longer term provided equitable access and distribution rules are put into place once the forests have regenerated (Chakraborty 2001). However, Kumar (2001) claims that even over a long-term (40 year) horizon, JFM reflects a social preference of the rural non-poor and the poor are net losers in comparison to state managed forests. Thus, although the Indian JFM programme succeeded in halting forest degradation, its poverty reduction objective has not been met (Kumar 2002, Sundar *et al*. 2001).

3.1.4. Impacts on governance and decentralization

Even if there was equitable forest access, it may not lead to sustainable resource use unless local institutions of resources management provide a suitably accountable framework for local participation (Lele 1991). Several aspects have not been conducive for the establishment of sustainable local forest institutions in India and Nepal.

First, the lack of clear property rights is considered to have maintained the power and control of FDs over forest resources. Indian VFCs, although meant to be registered as legal entities under the Societies Act, were in practice registered with the respective Deputy Conservator of Forests, thus increasing state authority (Nagendra and Gokhale 2008, Murthy *et al*. 2004). The FD reserves the right to dissolve committees if they perform unsatisfactorily or denies them the benefits expected (Sundar 2000, Nagendra and Gokhale 2008). There have been cases in which the FD refused to register committees, if forests under their protection have changed from degraded into good forests (Sundar 2000). In other situations, the FD has made use of existing committees while denying the legitimacy of earlier rules which did not fit into state resolutions or replaced the leadership or members in place of the existing ones (Sundar 2000). This demonstrates the high level of interference and control. Based on the categories of property rights described in Section 2.4.1 above, VFCs are authorized proprietors or

authorized claimants to the forest as tenure can be changed or withdrawn at anytime (Nagendra and Gokhale 2008, Murthy *et al*. 2004, Behera and Engel 2006). In Nepal the state retains the right to dissolve and deregister the community groups at any time, as with all state initiated programmes (Nagendra and Gokhale 2008). The ownership of forest land as well as high value timber trees on the land remains vested with the state (Nagendra and Gokhale 2008).

Second, the VFCs remained dependent on higher authorities for decision making (Springate-Baginski *et al.* 2003, Ravindranath *et al.* 2004). Ravindranath *et al*. (2004:318) state that "the most important and hazardous duty of protection have been given to the people, while all the other responsibilities such as planning, implementation of plans, collecting revenue, allocating funds and decisions on forest management have remained with the FD". In India, the FD largely controls all decisions so that often apprehending offenders and confiscating material has led to legal complications (Ravindranath *et al.* 2004).The FD limits and undermines the scope of the VFCs to set and enforce rules. In some cases FD officials even supported the violation of VFC rules (Behera and Engel 2006). In Nepal management interventions proposed as relevant by the villagers were often not implemented due to the requirement of requesting district approval for changes related to management agreement regulations (Springate-Baginski *et al.* 2003).

The imbalance of power between the FD and the communities is also visible in the planning process. Although in Nepal there is reportedly considerable scope to design the work plans according to local needs, the FD retains the right to approve the plans (Chakraborty 2001). In India, plans were often written and executed by the FD staff and the villagers were not aware of the contents and the budget (Ravindranath *et al.* 2004, Sundar 2000, Murthy *et al.* 2000). Resource inventories were not adequately dealt with. Insufficient capacity building in skills to plan, implement and manage JFM aggravates the weaker situation of the communities (Murthy *et al.* 2004). Joint forest committees have performed better where NGOs have played an active role as they have helped to resolve conflicts (Ravindranath *et al.* 2004). Further, federations of forest committees and forest user groups[9] have helped to resolve conflict, enhance negotiation power

[9] For example FECOFUN is a powerful network of Forest Users in Nepal (Brown *et al.* 2002).

towards the state, and exchange information (Ravindranath *et al.* 2004, Human and Puttanaik 2000, Brown *et al.* 2002).

Third, PFM offers only limited types of participation. The programmes were initiated by the FDs who mobilized villagers for a set agenda (i.e. afforestation of degraded land) and not for a self-defined purpose, such as getting more timber for local needs. Sundar (2000) argues that JFM makes villagers responsible for afforestation although they have not been responsible for deforestation in the first place. The granting of benefits is limited to the share of the committee in the final harvest which is dependent on its performance. In the absence of a benchmark, the assessment of performance depends on goodwill of the FD. The FD can change membership rules any time making participation a rule bound exercise being used in different measures for different purposes according to the different rule.

The question of who participates is also specified by the state resolutions in terms of the selection of participating villages and the 'one person per household' rule in India. Targets, funding and the manpower in the FD limit the number of village committees that can be set up and the selection is made by forest staff based on their perception of which would be good, responsive villages on the basis of visibility and accessibility. Villagers cannot exercise their opinion on this choice, such as, for example, through a district council meeting. Villagers have their own opinion as to why a village was chosen over another including allegations of corruption, which may spark inter village tensions (Sundar 2000). Sundar (2000:270) notes that the "membership and selection process show how the non participatory nature of the programme affects the ability of different sections to participate within the community in terms of access to resources or their ability to negotiate in future government programmes. The contours of the community become refashioned along with the balance of power between different communities".

It is argued that JFM distorts agency and reduces the ability of the community to manage its own affairs (Sundar 2000). By retaining a leading role, and specifying who has what rights and how resources are to be managed, communities have been reshaped and committees have become susceptible to the overall imperatives of the FD, turning PFM into a vehicle of control. There have been examples where in the name of JFM the

FD superimposed new committees on existing informal village committees and replaced members that were perceived not to be in line with state principles. Thus, JFM offers the state "the ability to appear flexible and participatory while retaining the deciding vote" (Sundar 2000: 257). In addition, institutional linkages between village and outside agencies such as other villages have been abandoned in favour of a close relationship with the FD, and the administration of the forestry resource has become politicized.

PFM has changed the role of the foresters from protecting and policing to supporting and advising local forest managers (Springate-Baginski *et al.* 2003). This has been observed with mistrust by the villagers (Sundar 2000) and often interpreted as a loss of power by foresters (Nagendra and Gokhale 2008, Kuechli 1997). The hierarchical structure of FDs may not provide a supportive environment for the change in roles. In Rishi's (2006) attitudinal survey, forest officers expressed a negative attitude towards the FD in terms of limiting freedom of their work and using a participatory approach. On the other hand, attitudinal surveys also show improvements in the relationship between forest officers and community managers (Ravindranath *et al.* 2004, Rishi 2006).

A fourth factor that impedes sustainability of the local forest management institutions is an observed lack of good governance in terms of low accountability of both FD and VFC leaders (Behera and Engel 2006) and corruption (Iversen *et al.* 2006). Hidden transactions have been increasing over the last few years as "new loopholes to take part in illicit actions have surfaced" and the forest value has increased as forests have been regenerating (Iversen *et al.* 2006:29).

High forest value adds new problems and challenges to PFM in Nepal Terai (Iversen *et al.* 2006). There is a prevalence of illicit acts, such as illegal harvesting of timber, accepting bribes or engagement in other types of embezzlement, such as theft from the FUG fund (Iversen *et al.* 2006). FUG members are reported to exempt themselves from obtaining permits to collect NTFPs and a few influential members were reported to graze their livestock in forests adjacent to their farms or settlements – benefitting from the exclusion of others (Pandit and Thapa 2004). Members prioritize direct personal gains over ensuring regular income of the FUG since all revenues generated by FUG must be deposited in the group's bank account and can only be used for community development or forest management purposes (Pandit and Thapa 2004). Petty corruption

was identified as the most common reason why elected office holders were forced to step down prematurely (Iversen *et al.* 2006).

Institutional aspects contribute to explain corrupt practices. There is a reported selectivity of candidates into leadership positions, attracting candidates motivated primarily by private economic gains. Frequent turnover of committee members and problems in finding good leaders prepared to stay in the job have been identified as problematic (Iversen *et al.* 2006, Messerschmidt *et al*. 1994). High fluctuation of membership is an indicator of strong disharmony and distrust, resulting in lack of communication and clarity about forest management rules (Messerschmidt *et al*. 1994). Leaders of FUG who want to bring change are caught between a rock and a hard place: corruption works from within the FUGs and attempts at changing the status quo may have personal repercussions as well as vigorous external response from forest officers who benefit from the present situation (Iversen *et al.* 2006). This confirms the opinion of Chakraborty (2001) that meaningful participation is difficult to achieve in complex local institutions and set ups as existing structures of authority in Nepalese villages limit participation in decision making on PFM rules. Village leaders, who belong to the wealthy strata of the community (large farmers), support PFM and determine the rules for the FUG together with the FD. The mutual alliance is evident from the fact that the actual process of the formation of the FUG remains unclear. FUG members are not elected in a true sense but presented to the general users meeting and assigned their positions by an act of retroactive general consent (Chakraborty 2001). While some authors argue that strong leadership and external support are required for common property institutions to work (Chakraborty 2001), others advocate based on evidence that community management without external support functions better (Tachibana and Adhikari 2009).

Finally, doubts about the sustainability of the local institutions arise from the large amounts of external funding spent for their implementation. In India external funding accounts for 30% of the JFM budget (Ravindranath *et al.* 2004). Emphasis was on meeting physical and financial targets rather than institution building and preparing the community to take over JFM (Ravindranath *et al.* 2004, Nagendra and Gokhale 2008). Kumar (2002) raises the concern that the improved tree cover in Indian JFM forests is in

many cases the result of significant direct investments of the FD[10]. Foresters fear that many VFCs will be unable to sustain their activities once the external funding dries up.

3.1.5. State managed forests

Views of scholars differ about which management regime – PFM or sole state management – achieves better outcomes. Sunderlin *et al.* (2005) emphasize that the open access, low barriers of entry characteristic of state forests is a pro poor feature that makes them a means of survival and a magnet of economic opportunity for people with limited options. PFM instead has led to a privatization of common property resources in a non-equitable manner and in the case of JFM in India is believed to have increased rural poverty (Sundar *et al.* 2001, Kumar 2002): "The basic reason for rural poverty … is the privatisation of common property resources in a non-equitable manner" (Singh 1986). State ownership without PFM may act as a *de facto* open access, which makes resources commonly available to many people, including those who were already utilising the resources. This may lead in practice to a more equitable outcome than PFM, which puts ownership or access rights into hands of elite groups (Kumar 2002).

However, the literature shows consistently that state forests are subject to severe degradation (Chakraborty 2001: 346, Pandit and Thapa 2004, Sundar *et al.* 2001, Kumar 2002). Hence, state property regimes neither achieve ecological sustainability nor contribute to poverty alleviation (Chakraborty 2001). The reasons for the continuing non-compliance with state property rules are a combination of: i) high monitoring cost, due to the difficulty of collecting information on the state of the forest and the behaviour of the rural population; ii) a lack of credible commitment by the rural population to state property rules as the exclusive use right of the state to the forest is not considered as legitimate; and iii) ineffective enforcement due to corruption within the forest administration (Chakraborty 2001: 346). Chakraborty notes that illegal forest use is tolerated as long as it presents a source of income for forest officials. Bribes paid by the local population for covering subsistence needs from state forests are an important source of income to the lower levels of the forest administration (Chakraborty 2001: 350). Also, the forest use by outsiders has raised frustrations of local villagers as they could not prevent their entry to the forest due to the lack of legal rights and the lack

[10] These are ranging, for example, from USD 56.23 per ha in West Bengal to USD 714 per ha in Kerela (Ravindranath *et al.* 2004).

of monitoring and supervision of the forests by government (Pandit and Thapa 2004). Thus, state management, in the way it is practiced (or not practiced) it not an alternative.

Chakraborty 2001 defends PFM with the argument that common property serves well to protect forests locally. In the long term every member of a FUG benefits from community forestry because without it the forest area would further decrease. Negative impacts for poorer landless villagers arise only in the short term due to the temporary closure of community forests, which does not affect land owners with trees on private land as alternatives. While the use rules applied by most FUGs reinforce existing inequalities of female and landless members, this should not be an argument against CF. This is because the benefits of the poor must be compared with the benefits they are likely to obtain from alternative property rights regimes such as state property.

Kumar (2002) argues that in both scenarios common property and state property of forests, there is a trade-off between effective forest protection and the pursuit of a pro poor social agenda. Many of the products of a public forest are private (excludable) goods, which in the absence of a specific mechanism to protect the poor, are often captured by members of a village elite that might under a JFM regime have already been captured by the decentralized village level forest institutions (Kumar 2002). While in state forests in Nepal people harvest freely but degradation for more valuable resources is stronger, in community forests not all components of the forest's resources are protected and priority is given to timber regeneration over NTFP growth (Pandit and Thapa 2004). Hence, irrespective of the property rights regime, some components of the forest resources degrade more than others.

In any case, the impacts of PFM cannot be evaluated without the impacts it has on nearby state forests, as the regeneration of forests under PFM may have intensified degradation in nearby unprotected areas. In Nepal, state forests presented a reserve to satisfy subsistence needs which enabled FUG members to commit to the protection of the community forest (Chakraborty 2001). At the same time the distributive conflict between poorer landless forest users and non poor landed forest users was reduced as the former resorted to utilizing state forests (Chakraborty 2001). Chakraborty notes that "it is doubtful whether the poor will continue to comply with the community forest protection rules in a situation where they cannot satisfy their basic fuelwood needs and

at the same time do not have access to fuelwood substitutes" (Chakraborty 2001:352). Hence, the test for PFM in Nepal will come when nearby state managed forests cannot provide a back-up anymore, either due to stricter enforcement or because they have become too degraded (Chakraborty 2001). While villagers may be active in protecting their degraded forest patch, their needs do not disappear and pressure to fulfil these needs is often merely shifted to alternative, good forest land. Robinson *et al.* (2005) suggests that the increased resource extraction and degradation outside an exclusion zone (generated through PFM) can be worse than the environmental benefits of keeping an area of forest pristine.

3.2. Experiences in Africa

3.2.1. Background and overview

Similar to Southeast Asia, the depletion of forest resources in Africa is often blamed on its colonial past, which is assumed to have undermined people's authority over natural resources. The strong concentration of power over forest resources in the central state, the collapse of traditional institutions and lack of local participation in forest management after independence led to an institutional vacuum in many African nations (Watts 2003; Banana and Gombya-Ssembajjwe 2000).

Deforestation combined with international pressure for CBNRM and the wider, ongoing decentralization reforms in most African nations are considered to be the drivers towards PFM (FAO 2007, Alden Wily 2002). The loss of forest on the continent is accounting for around 55% of global forest loss. Tanzania, with over 400,000 ha lost between 2000 and 2005, is among the countries with the highest forest loss (FAO 2007). Additional driving forces were changes in forest legislations in parallel with broader trends towards democratization and devolution including wildlife, land and local government laws. Although PFM is currently widespread across the continent, it is still at an earlier process of evolution than in India and Nepal (Wily 2002). By 2002 over 30 nations had a legal provision for PFM in their newly enacted forest legislations, extending over 100 projects in more than 100 forests, involving around 5,000 communities (Wily 2002:4). The area of forests under PFM accounted for less than 1%

of the estimated total forest area across all 56 African states (635 million ha of land[11]) (FAO 2007). Tanzania, where the national Forest Policy (1998) and the Forest Act (2002) make PFM a main focus, is considered the most progressive country (Wily 2002) in its approach and implementation.

PFM is implemented across a range of natural forest types (moist, dry and coastal) and under a variety of land tenure arrangements, from cropping and renting (e.g. Ghana), to traditional customary systems of ownership (e.g. Ghana), and state-owned land to community owned land (Tanzania). The range of focus in the PFM initiatives across African nations can vary from fuelwood extraction (e.g. Niger, Mali, Senegal), timber harvesting (Cameroon) and grazing management (e.g. Mauritania, Mali, Niger), to employment creation in the francophone Sahel (Wily 2002). Despite these differences, broad commonalities exist (Wily 2002). African PFM shares the worldwide focus on the rural poor. Policy justification that local involvement in management is essential for livelihood purposes is widespread, despite the weak exploration of this linkage in the national poverty reduction strategies (Ellis and Freeman 2005, Wily 2002). PFM has begun in both reserved and unreserved forests with different processes. In India most of the shift towards granting local management responsibility takes place in unreserved or poor quality forests with the difference that they have not been formally under government tenure (e.g. Zambia, Cameroon, Burkina Faso). In Nepal where practically all forest was nationalized in 1957, community and leasehold forest takes places in forests under formal government ownership where the management authority is delegated to local communities.

PFM is still contested, considered innovative and sometimes risky among government foresters. Early projects are referred to as pilots to pre-empt them forcing permanent changes (Wily 2002). In several African states there was considerable resistance to legal reform, for example in Kenya (Wily 2002) and Cameroon (Brown *et al.* 2002). In Cameroon, the first community forest was legally created in 2002 in high-value tropical forests with only reluctant, donor imposed government support and resistance from the logging industry (Brown *et al*. 2002). While PFM in Southeast Asia is supported by a strong civil society, in Africa civil society is comparatively weak and externally

[11] 16% of this area is plantations (FAO 2007).

dependent. Forest extension agents are few and focus on policing rather than facilitation (Brown *et al.* 2002).

PFM in Africa draws on the earlier experiences of Nepal and India, while maintaining its own momentum. Advances beyond the South Asian approaches are perceived in the promotion of local roles and attention given to forest tenure (Wily 2002). In some African nations, such as Tanzania, for example, PFM was sparked by catalytic projects in which local people gained jurisdiction over non-reserved forest land, based on traditional custodianship (Lund and Nielsen 2006, Wily 2002). These projects were like the early CFM experiments in India based on bottom-up initiative rather than on national top-down strategies for PFM.

The flagship of PFM in Africa, the Community Forest, where devolution includes local forest ownership, is the most developed in The Gambia, Cameroon and Tanzania (Wily 2002). Just like in India and Nepal, the primary construct of PFM in Africa is a management agreement with the state through the traditionally dominant forest authority. Rarely, do communities declare management regimes autonomously. An exception is Tanzania, where most of the unreserved forest estate is within lands broadly acknowledged as locally owned. Village governments can establish Village Land Forest Reserves by informing the district local government with or without formal support. District approval is required for village made by-laws to add legal force to their decisions. Support from the central state is only required for National Forest Reserves. In The Gambia, the process of formalizing community ownership over the forest is also well developed (Wily 2002). The local right to determine if and how the forest will or will not be utilized is also legally provided for in Uganda. In most other nations, management plans are either strictly dependent upon official approval or formulated by officials with local inputs. The readiness of FDs to empower local people in reserved forests with high biodiversity or commercial value is much lower. In such cases, communities have at best become cooperating forest users, such as under JFM.

Despite its wide spread use, there are few impact studies on African PFM. As Appiah (2001) notes, “there are few formal analyses of the success of co-management regimes because they are new initiatives”. With regard to assessing impacts of PFM in Africa, there are no national level long-term research studies, with the exception of one in

initial stages in Tanzania (United Republic of Tanzania 2009). The evidence on impact so far is thus limited to site-specific project experiences. Systematic information about institutional variables at a micro level is not available in any existing data set (Appiah 2001).

3.2.2. Impact on forest quality

Until recently empirical evidence from Africa that PFM results in improved forest quality was anecdotal and consisted mainly of community perception data that forests are improving and wildlife encounters are increasing (Blomley and Ramadhani 2004, Topp-Jørgensen *et al.* 2005). Blomley *et al.* (2008) assessed the impact of PFM on forest condition in Tanzania through three different case studies covering different areas, forest types and PFM regimes. They found increasing basal area and tree volume per ha in *miombo* woodlands and coastal forests under PFM. There was also a greater number of trees per ha, mean height and diameter of trees in sub-montane and coastal Eastern Arc forests as well as a decline in cutting in coastal forests since the introduction of PFM.

Persha and Blomley (2009), in a study in the West Usambara mountains in Tanzania, found an improvement of JFM over state-managed forests. However, long-evolving community-driven initiatives showed even better forest condition due to stronger protection and more effective local institutions than the state-initiated PFM sites. These results are similar to the findings of Banana and Gombya-Ssembajjwe (2000) in a comparative study of five forests in Uganda where secure tenure and local rights to forest products and clear and well enforced access rules were correlated with better condition of the forests. The same authors also found that the physical structure of forests reduces the time and effort needed to achieve higher levels of rule conformance. This confirms Agrawal's (2000) findings that physical variables and locally understood and enforced rules and norms jointly affect incentives and behaviour. In this context, the choice of the village as administrative unit for PFM in Tanzania is considered problematic because large forest areas are managed by large, heterogeneous, and geographically dispersed communities (Topp-Jørgensen *et al.* 2005, Boiesen and Lund 2003 quoted in Lund and Nielsen 2006). Institutional theory of collective action regards such settings as problematic (Ostrom 1998). Evidence shows that forest managers had problems monitoring users in remote sub-villages close to the resource but far away

from the main village. Poor transport and communication pose additional problems for monitoring and rule enforcement (Lund and Nielsen 2006).

Further impediments to forest quality monitoring by local forest managers are the lack of simple and user-friendly monitoring techniques in PFM implementations (Topp-Jørgensen *et al.* 2005). Even where they exist they may not be suitable to evaluate changes in the biodiversity status of montane forests (Topp-Jørgensen *et al.* 2005). Some authors raise concern about the ecological sustainability of current PFM management practices due to the fact that few villages monitor wood resource extraction levels in relation to assigned quota (Koppers and Vignon 2004, Topp-Jørgensen *et al.* 2005). Lund und Treue (2008) found that CBFM in a village in Iringa improved the control of forest utilization. Extraction was managed within the forest's reproductive capacity. Monitoring and management interventions by Village Natural Resources Committees (VNRCs) are considered successful in reducing threats to the forest. Flexible and immediate response of villages to resource decrease, e.g. by stopping to sell a specific timber species, was conducive to prevent forest degradation in woodlands (Topp-Jørgensen *et al.* 2005).

3.2.3. Impact on livelihoods and poverty

Like in India and Nepal, the importance of forest resources for rural households in Africa has been demonstrated through empirical studies (Cavendish 1999, Campbell *et al.* 2002, Meshack *et al.* 2002, Kaale *et al.* 2002, Roe *et al.* 2002). While poor households are more resource dependent than richer ones, aggregated total resource demands increase with income, indicating that rich households use greater quantities of environmental resources in total (Cavendish 1999). A significant share of household income (35%) originates from freely provided environmental goods and especially poorer households depend on communally held resources (Cavendish 1999). Similar trends have been observed for forest resources in particular (Campbell *et al.* 2002, Lund and Treue 2008). Where food production from subsistence agriculture cannot cover the annual food demand, forests reduce vulnerability through sale and direct consumption of forest products (Meshack *et al.* 2002). On the other hand, households experiencing increasing cash incomes from alternative sources tend to move away from low-income activities such as forestry (Fisher and Shiverly 2005). Just like in Southeast Asia, restricting forest access and use is often the consequence of PFM in Africa.

For example, in Iringa in Tanzania, village councils managing *miombo* woodlands set annual quotas for charcoal production (Lund and Treue 2008). Charcoal production is providing supplementary income to farming, especially in periods of drought when the demand for charcoal licenses rises steeply. While setting a quota and license fee made charcoal production legal and increased the villagers market power, at the same time, procuring the permits provided an entry-barrier and made this livelihood diversification more difficult for the charcoal producing households (Fisher 2004, Lund and Nielsen 2006, Lund and Treue 2008). The closure of the forest between December and May to induce people to concentrate on farming deprived people of alternative income sources during the dry season (Lund and Nielsen 2006). On the other hand, there are also positive examples of increased revenue gains from both CBFM and JFM in Iringa, Tanzania (Topp-Jørgensen *et al.* 2005, Lund and Treue 2008).

Boundary issues contribute to access restrictions under African PFM. Lund and Nielsen (2006) report that disputed village land boundaries had negative impacts in Iringa and Lindi regions where remote forest dependent sub-villages were deprived of their access to forest resources near their homes and to land for agricultural expansion due to inconsiderate demarcation of protection zones.

Evidence in relation to distributional effects of PFM in Africa is scarce and the need for further research is pointed out (Lund and Nielsen 2006). Where data exists, it indicates cases of inequity just like in India and Nepal. Cost/benefit comparison of PFM in African initiatives show, similar to India and Nepal, that transaction cost (i.e. attending meetings, forest monitoring and patrol), relative to benefits are higher for poorer households compared to medium income and richer households (Meshack *et al.* 2006, Veltheim and Kijazi 2002). Poor users gather more low value products such as fuelwood and place emphasis on selling NTFPs to obtain income. The relatively higher net benefits of the rich and middle groups were attributed by Meshak *et al.* (2006) to the possession of livestock by these households, which makes them higher users of forest products, in particular fodder grass. While PFM may lower the government cost, a large proportion of these cost are borne by poorer members of the community (Meshak *et al.* 2006). PFM in productive woodlands areas can work on a cost covering basis and compensate guards and committee members for their transaction cost incurred.

However, this is rarely the case in PFM in protection forests (Meshak *et al.* 2006, Topp-Jørgensen *et al.* 2005). For example in Iringa, guards and committee members spent 300 man-days per year on management and monitoring activities and members were paid sitting allowances of approx. 1 USD per day, comparable to the prevailing daily rate of unskilled labour (Topp-Jørgensen *et al.* 2005).

The average annual revenue per village generated through PFM is low (USD 604 per CBFM village and USD 107 per JFM village), which is consistent with findings in Nepal (Malla 2009, Kumar 2002). While in most woodland villages only 4% of registered expenditures were used to finance community projects, the forest revenue was spent mainly on manager compensation or was deposited in bank accounts (Topp-Jørgensen *et al.* 2005). In contrast, Lund and Nielsen (2006) report that the majority of the revenue was distributed to village leaders, leading to decreasing appreciation of PFM in the perception of forest users. In contrast to India and Nepal, village forest committees in Iringa, Tanzania, do not charge for NTFP extraction if it is not for commercial use (Lund and Nielsen 2006, Topp-Jørgensen *et al.* 2005). There are large variations in the amount of revenue generated between different woodland villages and between montane forest JFM villages. Closeness to local markets for wood products or to local production using wood – e.g. tobacco curing, fish processing – was positively correlated to the revenue base in woodland villages (Topp-Jørgensen *et al.* 2005).

Revenue sharing and economic incentives have been recognized as a critical success factor of PFM (Petersen and Sandhoevel 2001, Topp-Jørgensen *et al.* 2005, Iddi 2000). Experiences from the wildlife sector in Zimbabwe and Namibia have contributed to the increasing body of knowledge on this issue (Barnes and McGregor 2001). Furthermore, land ownership has been identified as an important incentive for communities to actively engage in PFM (Wily 1997; Poffenberger 1996). Both parameters – economic incentives and tenure – are usually lacking in the JFM scenario (Topp-Jørgensen *et al.* 2005, Lund and Nielsen 2006, Wily 1997, 2002). Montane forests are rich in biodiversity and restrictions are usually placed on resource extraction to protect national and international interests. Other non-economic incentives, such as appreciation of the water catchment value of montane forests, exemption from village labour days and increased prestige associated with being a committee member, were found to keep up the commitment of villagers in Iringa, Tanzania. However, it is questioned if these can

sustain long-term commitment (Topp-Jørgensen *et al.* 2005). In contrast, woodland areas provide better revenue opportunities for the managing villages derived from, for example, charcoal burning, firewood collection and timber pit sawing (Anthon *et al.* 2008, Topp-Jørgensen *et al.* 2005). Opportunities for benefits are very limited in montane forests (Topp-Jørgensen *et al.* 2005, Lund and Nielsen 2006). Veltheim and Kijazi (2002) suggest that, because the Eastern Arc forests are important for biodiversity conservation, government should continue paying for the intensive labour activities by casually employing community members. This would be a tangible benefit and could help provide the poor with income to overcome food shortages.

3.2.4. Impact on governance and decentralization

Symptoms of poor local governance are common in African countries (Brockington 2004, Brockington 2005, Ellis and Mdoe 2003, Fjeldstad and Semboja 2001) and institutional issues are emerging as concerns in PFM implementation. There is evidence of uneven power and benefit sharing between state and communities in JFM and lack of accountability of local forest managers to the wider community (Wily 2002, Topp-Jørgensen *et al.* 2005, Lund and Nielsen 2006).

In certain cases, such as in some Tanzanian sites, PFM has reportedly contributed to improved governance. There, the formation of effective forest management committees resulted in calls for new elections of lethargic village chairmen (Wily 2000) and questionable revenue records of forest committees led to stronger reporting regimes and firmer measures of transparency (Topp-Jørgensen *et al.* 2005). Topp-Jørgensen *et al.* (2005) report a case where village forest committees needed to report their management and economic transaction to the Village Council and Village General Assembly, which increased transparency and allowed villagers to influence the forest management. The village forest committee was monitored by the district authorities and an annual visit from the auditing department ensured accountability and transparency of the accounts. Power struggles between the Village Council and the VNRC were reported due to the introduction of PFM as the VNRC reduced the possibilities for the village leaders to receive bribes and informal payments for permitting illegal resource extraction (Topp-Jørgensen *et al.* 2005).

CBFM in Tanzania is perceived as a positive example of decentralization and benefit sharing. The devolution of management rights and responsibilities is vested in management plans and village by-laws that provide for natural resources management on village lands, including rights to issue permits as well as to collect and retain revenue from forest use (Topp-Jørgensen *et al.* 2005). Influenced by the Tanzanian experience with CBFM in woodlands, Wily (2002) represents the very positive view that "beyond gains in forest conservation and livelihoods improvements ... PFM has been part of social transformations of societies in Africa towards more inclusive and effective management of society" (Wily 2002:3). She further states that "participation as a whole is visibly moving from consultative to more collaborative norms into those where partnerships between state and communities are being forged and in a growing number of cases for the purpose of enabling communities to operate as effective autonomous forest authorities" (Wily 2002:2).

However, not all accounts of PFM in Africa are that optimistic, and there are examples that show the uneven power relationship between state and communities prevails, in particular in JFM. Appiah (2001) in his study of JFM in Ghana between communities and timber companies shows that a project remains a main decision maker and gives advice to famers on what to do. However, reportedly due to the "unique exchange of ideas and knowledge, people's feeling of shared responsibility was enhanced" (Appiah 2001:354). Such statements raise serious doubts about JFM and the extent to which it is pretence rather than genuine government commitment to shared decision making. Similarly, Matose (2006) highlights the example of a pilot initiative for JFM in Zimbabwe to emphasize that co-management may not offer any partnerships between state and local people.

Incentives are sometimes provided to persuade farmers to buy into participation in forest management but do not provide genuine benefit sharing. A JFM project in Ghana between two timber companies and local communities provided infrastructure development and free tree seedlings to make farmers put their land under tree cover instead of cropping (Appiah 2001). The decrease in arable land resulted in decreased income for the farmers until the trees matured. At the same time, the sums provided by the company for social projects were modest compared to their revenue from timber harvest. Given the high trade-off for the farmers it is not surprising that one of the

shortfalls of the project was “its inability to reach its anticipated quota of participants, a shortage of around 50%” (Appiah 2001: 357). Such remarks show rather naive assumptions about the willingness of farmers to be co-opted into unfair deals.

The prevailing uneven power relationship between state forest institutions and local people is also evident in the fact that there is “much hesitancy across Africa in empowering communities to take licensing and enforcement functions” (Wily 2002). While communities are allowed to make rules about use, protection or managerial aspects of the forest, the legal weight of these rules is limited and courts are unable to uphold the rules when challenged (Wily 2002). Thus, the possibility of local forest managers to enforce compliance beyond the managing community is restricted. Where the rules are by-laws their litigation is limited to certain functions, for example often the community has the legal right to protect the forest but must bring offenders to the government partner to deal with (Wily 2002).

Confidence of FDs in local capacities to manage is rarely strong and much attention is devoted to establishing conditions and requirements that both test and bind the local level management authority to certain practices. Nigeria, Botswana and Kenya are examples where FDs are wary of the growing involvement of non state actors and delay, restrict or control this through bureaucratic measures (Wily 2002). Cameroon and Ghana are examples of countries where PFM policy and practice suffer from overcomplicated procedure in the establishment of local roles, responsibilities and rights. Demands upon communities to conduct surveys, plan and implement boundary demarcation, zoning, etc. often go beyond the requirements administrations have placed upon themselves or demand private sector managers to do. In The Gambia, the final step of handover of forests to communities is being delayed by unduly sophisticated survey, mapping and authentication procedures (Wily 2002).

Similar to Nepal, where the importance of requesting extension assistance for conflict mediation was highlighted (Springate-Baginski *et al.* 2003), the need for extension support is emphasized in African PFM, not only for technical advice but also to assist with conflict resolution (Topp-Jørgensen *et al.* 2005). However, although close collaboration may be envisaged, lack of incentives at the district level can lead to a high degree of village autonomy (Topp-Jørgensen *et al.* 2005). Although, as in Nepal, this

may limit the chances of some VNRCs to become self-supportive as it takes time to develop capacities within the village level management (Springate-Baginski 2003) it gives the villages a greater degree of autonomy. In Tanzania, where village committees cannot take decisions single-handedly and need approval of higher authorities, it led to delay or presented the main obstacle for the implementation of forest management interventions. The revision of forest management agreements had been requested to allow for greater decision making power of the villages, but a year later no decision had been made (Topp-Jørgensen *et al.* 200).

In Tanzania, rent seeking behaviour of local forest managers and forest users was counterproductive for village level cooperation and local decision making was dominated by richer groups (Topp-Jørgensen *et al.* 2005). Similar to the findings in Nepal, systems of informal payments by VNRCs have been found in Iringa, Tanzania. Committee members and guards were accused by the Village Council of receiving bribes instead of bringing offenders to the village council or to waive permit fees, or of exempting themselves or their kin from paying fees for resource extraction permits (Topp-Jørgensen *et al.* 2005). Topp-Jørgensen *et al.* (2005) indicate a positive correlation between revenue collected and level of corruption of local committees, which confirms Ostrom's theoretical predictions (Ostrom 1998). CF in Cameroon also shows cases of elite capture (Wily 2002). However, a more inclusive approach may reduce the direct influence of forest users on forest management decisions where they are a minority in the village assembly (Lund and Nielsen 2006). On a positive note, embezzlement and elite capture, where it exists, has in some cases led to higher levels of transparency as villagers force their leaders to step back or adhere to democratic practices (Topp-Jørgensen *et al.* 2005,), leading to a restructuring of community norms towards more democracy and accountability (Wily 2002). There is the limitation that in some cases, this had more the nature of horizontal accountability – i.e. leaders questioning leaders – rather than downward accountability towards ordinary villagers (Lund and Treue 2008). However, it is this downward accountability of forest committees that controls the effects of restrictions on forest use and ensures true decentralization as described by Ribot (2005).

A more recent study by Lund and Treue (2008) showed signs of good governance in terms of well-documented public finance and disciplinary measures for committee

members involved in embezzlement combined with harassment of forest users and corrupt practices. They conclude that PFM has created a new arena of political struggle at the village level.

3.2.5. Emerging issues

3.2.5.1. Gender, poverty and elite capture

Empirical evidence shows that PFM can be an effective tool for the regeneration of degraded forests but it bears trade-off for villagers' livelihoods. Regeneration focused closure of forests as a short-term response to handing over forests for local management affects the poorest people the worst. They are the most dependent on common property resources and more vulnerable to reductions in forest product flows due to limited opportunities for livelihoods diversification. In cases where no favourable rules have been negotiated, poorer villagers are likely to be worse off in comparison to state forests under *de facto* open access, at least in the short term.

Poor, landless villagers and women are considered as the net losers of PFM regimes, which are skewed in favour of existing village elites, usually composed of wealthier male. If the poor are the net losers of PFM, why do (poor) forest users comply with the protection rules as some of the evidence suggests they do? What motivates villagers to engage in a process that has no obvious advantages for them? Are there livelihood benefits as a result of JFM? If yes, how are the benefits spread across the local community? If there are negative outcomes on the livelihood side through introduction of JFM how does the situation compare to villages nearby the solely state controlled forests? Are these latter forests indeed *de facto* open access or do other actors possess enough agency to control some control over access to the forests?

There are indications that the support by the villagers rests on expectations of increased access to timber resources in the future (Koppers *et al.* 2004; Chakraborty 2001). Others assume that the forest is protected by more powerful village members and people may comply out of fear of being caught or because the prevailing power structure in the village is not questioned (Chakraborty 2001, Kumar 2002). The poor depend on the non-poor for a variety of reasons other than forestry – e.g. employment during the harvest season – which inhibits the poor from articulating their demands too strongly.

The same is likely to be true for female members who are bound to the existing gender hierarchy (Chakraborty 2001). In cases where the approval of local forest management institutions has been subject to the inclusion of female or landless members based on donor pressure, these members did not play an active role in the committees, which reflects the fact that the traditional class and gender hierarchy have high legitimacy in the villages.

Inequity and elite capture are to some extent inherent characteristics of village communities formed through norms and traditions. It is argued that PFM reinforces or alters the existing systems of authority in the villages. This happens as powerful community members increase their influence through the control over the forest as a resource that is of central importance to rural livelihoods (Cleaver 2002, Chakraborty 2001, Sundar 2000, Kumar 2002). While some authors believe that these social rules are sufficiently strong to ensure compliance with protection rules and to suppress objection (Chakraborty 2001), others worry that with a lack of trust in the FD and the village leaders, villagers will start to ignore the forest protection rules despite the consequences of being caught (Kumar 2002). Rishi (2006) points out that more research is needed on the behavioural dimensions and their relevance for JFM.

3.2.5.2. Incentives

Financial incentives are a necessary prerequisite to starting JFM in a village in order to motivate villagers to participate and to sustain their participation (Ravindranath *et al.* 2004, Topp-Jørgensen *et al.* 2005). So far there is no evidence of forest committees harvesting forest products for purposes beyond subsistence needs (Malla 2009, Sundar *et al.* 2001). Incentives are particularly important in areas where restrictions on resource use have been imposed due to a deprived resource base or outside interest, such as, for example, in montane forests with watershed or biodiversity value. JFM in montane forests restricts forest use and does not generate income from forest management, which impedes the incentives for both managers and users to sustain the regime. Different options for providing incentives to local users and managers have been forwarded, such as controlled timber and wildlife harvesting, water taxes in the case of catchment forest reserves, and tourism (Koppers *et al.* 2004). The potential for non-extractive income generating activities or ecotourism exists in only few montane forests in Tanzania (Lund and Nielsen 2006). Therefore, it has been argued that protection forests should

not be subject to JFM unless communities are paid by the government for their management services (Koppers *et al*. 2004).

How can any improvements in forest quality through JFM be explained given that JFM in montane forests does not provide direct economic incentives to the local communities? Do communities engage in protecting the forest despite unfavourable tenure and benefits? If yes, what motivates village forest managers to engage in a process that has no economic incentives and no obvious advantages for them but bears high opportunity cost? While non-economic incentives have been identified to be effective to enlist the villagers in protecting the forest in instances (Topp-Jørgensen *et al.* 2005), will they be sufficiently strong to last? Assumptions are that committee membership builds up the stock of social capital. This is because it gives leverage in village politics and ensures influence through at least some village institutions.

3.2.5.3. Imbalance of power between state and community

JFM is characterized by new partnerships between forest agencies and local communities, which are a complex outcome of debates, policies and practices. However, existing evidence shows that through JFM local institutions are created without transferring equal rights for participation in decision making. Experience in Asia has shown that forest bureaucracies took on JFM without the necessary changes to traditional views and while retaining control (Sivaramakrishnan 1998, Matose 2006, Appiah 2001). In India JFM provided an excuse for the state to reassert control at the expense of community management in cases where the community had rehabilitated forest through self-initiative. Thus, JFM is a new way for the state to expand its control (Lele 2000, Matose 2006, Appiah 2001, Nayak and Berkes 2008).
As long as control, cost and benefits are not shared between the two partners there is no 'jointness' in JFM (Sundar *et al.* 2001). The incomplete transfer of property rights from FD to communities has created uncertainty and providing legal rights is regarded as an important incentive to make PFM successful (Behera and Engel 2006, Wily 1998). Hence, "without the political will to initiate the necessary policy changes, co-management is unlikely to succeed" (Appiah 2001: 355).

Therefore, for this research study the question emerges if JFM leads to the establishment of local forest management institutions that are democratic, representative

and effective? How reliable are the two main partner stakeholders: The FD and the local forest users in fulfilling their sides of the deal? Do FDs share control of forests or just co-opt forest users into regeneration schemes 'on the cheap'? Are the types of participation rather 'manipulative and functional' or 'interactive and mobilising' in practice?

3.2.5.4. Appropriate extent of state involvement

The appropriate extent of government intervention in communal management is debated. While some scholars argue that there has been too much interference (Tachibana and Adhikari 2009, Murthy *et al.* 2004), others state that strong external support by the FD helps to achieve stability of local institutions, to ensure that natural resources are not over-exploited and that equity is not compromised (Ribot 2005, Chakraborty 2001). NGOs have played a role conducive to the PFM process with regard to facilitation, resolving conflicts and building capacity. However, their involvement has not altered the underlying power asymmetry between state and people (Hobley and Wollenberg 1996).

A few recent studies hint at evidence that government intervention in the form of co-management can distort agency of the communities compared to self-initiated forest management by local communities without any external control (Tachibana and Adhikari 2009, Nayak and Berkes 2008, Persha and Blomley forthcoming). This supports the earlier argument that community based rules tend to break down when the state intervenes or disrupts these systems (Baland and Plateau 1996). There is evidence that in sites of self-initiated forest management forest condition and governance improved more significantly than in sites under state initiated PFM programmes (Tachibana and Adhikari 2009, Persha and Blomley forthcoming).

3.2.5.5. Lack of fit with true local organization

How do local forest management institutions fit with other governance structures at village level? Often village committees set up through PFM initiatives lack the fit with true local organizations. They are not formed based on self-initiative but by instruction of state forest departments, including in certain cases even membership conditions. Frequent interference with decision making and lack of control over forest management and financial decisions indicate that the local JFM institutions are not autonomous from

the state. Several authors point at the fact that PFM is context-bound and site specific and that one size fit all approaches do not work (Ravindranath *et al.* 2004, Sundar *et al.* 2001, Matose 2006, Woodcock 2002, Nayak and Berkes 2008).

Local forest committees are often superimposed on existing traditional institutions and Cleaver (2002) argues that rules need to be melted with the prevailing norms and traditions through a process of 'bricolage'. Local communities both filter and ignore the central government's rules, add their own rules, generating local institutions, rules in use, and patterns of activity that can diverge widely from legislators' and bureaucrats' expectations (Gibson *et al.* 2000). In set ups where PFM is biased towards a stronger, often elite dominated forest committees and a weaker general village assembly it erodes the power of locally elected institutions (Nayak and Berkes 2008, Ribot 2005). This may hinder the future ability of the village to solve its own problems. In self initiated community forest management schemes, where the village general assembly played a stronger role, a more equitable distribution of benefits resulted (Nayak and Berkes 2008). This supports Ribot's argument that in order to achieve effective local PFM governance arrangements, the common property institutions need to be embedded in democratic institutions of local government at village level. Ribot (2005) notes that research will need to determine whether decentralization is being achieved through PFM.

3.2.5.6. The nature of participation

JFM has only opened up limited spheres of participation (Sundar 2000, Nayak and Berkes 2004, Agarwal 2001). Even where villagers do exercise initiative, it is under terms dictated by an agenda set by the government rules, which in some sense distorts their agency (Sundar 2000, Mosse 1996). Participation is often limited to patrol forests and cannot resolve the bigger issues of forest degradation, which often lie outside the forest sector. The basic structural problem remains: participation is necessary not only in small scale sectoral units but in influencing the entire direction of the political process. Presently ordinary people have little or no say in a whole range of important policies. They are limited to voting for politicians imposed from above by undemocratic centralized party structures. Rather than asking how the entire system of representative democracy can be transformed to give more power to people, donor institutions, by focusing on village participatory committees, helped to create a discourse that diverts

attention from the real issues. Participation in JFM has been defined, shaped and limited while a system of centralized governance and the basic structural problem prevails and there is no genuine partnership between state and people in forest management (Sundar 2000, Gadgil and Guha 1995).

3.2.5.7. Sustainability

Due to the lack of secure property rights, a consistent flow of economic benefits, and a flexible, adaptive management approach, the local institutions created through PFM are not regarded as sustainable (Ravindranath *et al.* 2004, Murthy *et al.* 2004).

Expectations that PFM would be a way for governments to cheaply achieve forest regeneration have not proven to be realistic. PFM is knowledge and cost intensive, which created constraints to continuation of project activities after ending of donor support (Meshack 2006, Brown 2002, Lund and Nielsen 2006). In Africa, the scaling up from often cost and time intensive donor-funded projects with limited time horizon to national PFM strategies is still a challenge. Involved foresters, who have proven themselves competent, may leave and as PFM enters the mainstream, foresters who have played little role in its development or who do not approve the direction in which participation is moving, often hinder widespread entrenchment of new norms (Wily 2002, Kumar 2000).

For example, in Iringa, Tanzania, PFM villagers turned to higher level authorities to assist in resolving conflict or in supporting new forest managers as previous ones moved on to greener pastures after the project's ending. However, the district office was either unaware as information was not passed on or unable to send assistance. The lack of oversight from districts destroys the villagers' trust in the PFM idea (Lund and Nielsen 2006). However, it may not always be unavailability of resources but rather commitment at district leadership and higher levels to support village level PFM. Comparable to the resentment of local PFM successes recorded in India and Nepal, sometimes African forestry administrations appear to regret the rights or powers they permit local actors and seek to retrieve these.

Finally, the sustainability of PFM is being questioned on the basis of a displacement effect of forest use. Forest closure under PFM may have exacerbated the exploitation of

nearby state forests not included in the PFM scheme with a more permeable access regime. In the long run, this may threaten the commitment to abstinence in the protected forests as alternatives can no longer be provided from open areas due to over-extraction. On a global level it may neutralize a positive effect of PFM on forest quality.

3.2.5.8. Rhetoric and construction of communities

The incorrect perception of communities in PFM as being small, homogeneous and cohesive groups within which distributional conflicts are absent, leads to a design based on wrong realities (Agrawal 1999, Kiss 1990, Kumar 2002). Ex ante assessments of socio-economic village structures, although a prerequisite for designing equitable management regimes, have been absent in practice (Adhikari and Lovett 2006, Sundar *et al.* 2001). Scholars raise the need to translate community into a workable entity (Brown *et al.* 2002) but disagree if a user group focus or a more encompassing village focus is preferable. Vesting PFM in existing local administrative systems is considered to create more effective, democratic and representative institutions (Ribot 2005). However, it may create structures that are weak and that do not necessarily coincide with forest user groups, the preferences of which the management decision should reflect (Matose 2001, Hobley 1996, Lund and Nielsen 2006). Rights to forest resources become resident based. This can lead to exclusion of forest users who do not reside within the administrative boundaries of the particular village selected for PFM by external parties. Kumar (2000) emphasizes that instead of expecting to find ready-made communities which can be mobilized for a defined purpose (i.e. PFM), communities are often constructed for specific purposes. Communities that have been settled by the state, such as the 'resettlement villages in Tanzania', or which have their rules framed by government intervention, eventually solidify into seemingly natural associations and then contrasted to the state (Kumar 2002). This is consistent with Sundar's view that the attributes of communities that PFM policies assume are partial products of the PFM procedures themselves, rather than inherent characteristics of the people and the place. As the PFM initiative takes root, people acquire stakes in the new privileges and the artificially created attributes of the community begin to take on a life of their own (Sundar 2000). Nayak and Berkes (2008) point out that JFM analysis requires attention to the historical context of community forest management. The following chapter provides an overview of the changing political economy of the Tanzanian Forestry Sector and the historical context of PFM.

4. History and political context of PFM in Tanzania

4.1. Introduction

The history of forest management in Tanzania follows a trend starting from locally managed to increasingly centralized, distanced management of forests (Woodcock 2002). The forest sector is not unique in this sense, as there is a tradition in Tanzania of the state exercising politics of central control of the rural peasantry with negative and inhibiting consequences. The introduction of scientific forestry, the villagization campaign, and the continuous curtailing and control of local government are examples of centralization. The Tanzanian rural population was subjected to excessive control and coercion by an authoritarian state to realize modernist ideologies adopted from the West (Scott 1989).

The aim of this chapter is to show how Tanzania's colonial history and continued policies of disempowerment during independence influenced the relationship between the rural population and state actors. It is argued by the author of this study that this history influences the outcomes of community based approaches to manage natural resources owned by the state, such as JFM. This is of relevance with regard to three aspects:

- There is a historically ingrained mistrust of the rural population towards the state.
- Modernist, technocratic views combined with a depreciation of local traditional knowledge still persist in Tanzania's sector ministries today, precluding real delegation of authority and sharing of power.
- Behavioural strategies of evasion of state control can be observed in participatory projects and do in many cases influence the outcome of such initiatives. While outright opposition is rarely seen in Tanzania, disapproval is concealed by altering the system to fulfil more selfish motives.

The following section presents in brief the history of the Tanzanian Forest Sector from pre-colonial times through to independence (Section 4.2). Section 4.3 describes the political framework of the post-independence era which influences the framework of

PFM implementation in Tanzania. Section 4.4 summarizes selected historical events in the Uluguru mountains of relevance to this research study.

4.2. History of Tanzanian Forestry

The history of forest management in Tanzania between the pre-colonial era and present times is marked by some fundamental changes. Just like in India and Nepal (see Section 3.1. above) colonial administration in Tanzania led to an alienation of local communities from forests. Traditional management systems that existed during pre-colonial times were undermined, local leaders disempowered and forest management increasingly centralized. This trend was continued in the post independence years. As Woodcock (2002:150) states, "it is ironic that through time, the stakeholders who are physically closest to the forest – the local community – have become the stakeholders whose official relationship with … the forest is the most distant".

PFM was launched at the beginning of the 21st century by the government of Tanzania, largely donor supported, as a way to reserve this trend. The following sections will describe the changes in the relationships between the main stakeholders of forest management over time, divided into the pre-colonial era, the colonial era, the post independence years and the participatory era. Over time, power to control forest rights has moved from local community based authority in the customary pre-colonial era to district and central government authority in the colonial and post independence eras. This has been largely maintained up to today.

4.2.1. Pre-colonial era

Before 1886, in pre-colonial Tanganyika, chiefdoms and customary laws directed the governance of natural resources management. The effectiveness of these laws was based on social sanctions imposed in the case of infringement (Luoga *et al.* 2005). All land was owned by the local chiefs or kings. Forest tenure regimes were hierarchical, whereby clan leaders held authority in making and upholding forest rules and use rights, which were widely respected. Tenure was held by the clan as a whole, socially defined and secured by being and remaining a member of the clan. Women secured their tenure through their relationships with men, as daughters or wives (Woodcock 2002).

The management of forests was based on both the systems of beliefs and traditions and the political system personified through the elders and leaders. Local communities embodied a philosophy of conservation: "forest resource use was controlled by restricting access and user rights to a one product per person per trip rule" (Woodcock 2002:104). Trees were regarded as hosts of ancestral spirits and could therefore not be felled without permission from clan leaders. The beliefs were embedded in agricultural practices with positive influence on the conservation of forests and woodlands. Shifting cultivation, practiced as the dominant land use form in woodland and savannah areas, had minimal effect on the vegetation due to the sparse population (Lundgren and Lundgren 1983, Kikula 1997). The respected power of the leaders over the forests was connected to their responsibility of carrying out ritual traditions, which were believed to protect the environment. Some ritual forests were for leaders or chiefs only, where other community members were prohibited from entering and would fear the ancestral spirits if they did so. The clan forests were often managed more for local returns and for clan members to customarily obtain agricultural land by clearing forest. In the periods that followed the traditional leadership, the chiefdom was abolished and the authority of local leaders over forests gradually eroded. This resulted in a breakdown of customary institutions that had traditionally been responsible for local resource management. While tenure regimes had been socially defined during pre-colonial times, they have been spatially and economically defined since colonial times (Woodcock 2002).

4.2.2. Colonial era

Centralized state forestry practices were introduced in colonial Tanzania and throughout much of the developing world in the 19th and early 20th century. They were based on principles of territorial control, 'scientific management' (developed from European industry-oriented methods), and regulation of local people's use of the forest (Seppälä 1989). The restrictions imposed on local people's use of forest during colonial times gave rise to mutual resentment and conflict which from thereon characterized forest departments' relations with local forest users in most areas (Scott 1989). Scott 1989 notes that the point of departure for colonial policy was a complete faith in what officials took for 'scientific agriculture' (and 'scientific forestry' respectively) on the one hand and scepticism about the actual agricultural (and forestry) practices of Africans on the other. The detailed local knowledge, acquired over years of experience,

which prevailed and was valued during pre-colonial times, was ignored, devalued and lost its importance (Scott 1989, Woodcock 2002, Seppälä 1989).

4.2.2.1. The German Administration (Deutsch Ost-Afrika 1891-1918)

The German colonial administration first tried to practice centralized control over Tanganyika which began the disintegration of indigenous political forms and left their mark on the institutions of independent Tanzania (Fortman 1980). German rule over Tanzania is described by a policy of 'Schrecklichkeit', or frightfulness, and associated with military rule and the spilling of a lot of blood (Friedland 1966:259 quoted in Fortman 1980). There was free use of coercion, chiefs were publicly beaten for failing to obey orders and the use of forced labour was common (Stephens 1968 quoted in Fortman 1980). It was a centralized system where orders flowed from the top down and labour and taxes flowed upwards (Fortmann 1980).

The German administration first established a state controlled forest estate and introduced scientific forestry in Tanzania around 1897 (Schabel 1990, Seppälä 1989). Scientific forest management included gazetting areas, clearing boundaries to prevent fire encroachment, commercial exploitation and experimental plantations of indigenous and exotic species (Burgess and Mbwana 2000, Wood 1966). The creation of forest reserves, although backed up with ecological arguments, was done mainly because tenure security was associated with spatial aspects and not the belonging to a certain social group or clan like before (Woodcock 2002).The forest tenure regime was hierarchical, like in pre-colonial times, but now control over rights to forest access and use was vested in the colonial state and not the local leaders and elders. Thus, the German forest policy of creating reserves officially broke the customary relationship of local communities with the forest and decreased authority of community leaders (Woodcock 2002). In the non reserved public lands forests, pre-colonial customary relationships were maintained during German and initially also during British administration (Woodcock 2002). Thus, a dualistic tenure regime existed with both statutory and customary tenure regimes coexisting up until the 1950s.

Forests were valued for their commercial worth and were protected against clearance both by settlers and local people. Control over timber resources was exerted through surveying and demarcation of forest reserves which was first pursued in the montane

forests including the Uluguru mountains (Burgess and Mbwana 2000). With the dual aim of protecting the water catchments and securing timber production, by 1914, 231 forest reserves were delineated with a total area of more than 750,000 ha (Lundgren and Lundgren 1983). Although some people were most likely evicted from the forests during this early period of reservation, most forests brought under protection were uninhabited (Lundgren and Lundgren 1983).

During the First World War, forestry activities had come to a standstill and people invaded the mountain forest reserves trying to escape enlistment into the German colonial army (Lundgren and Lundgren 1983, Woodcock 2002).

4.2.2.2. The British Administration (1918-1961)

The new British administration resumed activities again in the early 1920s and established a Forest Department with 11 European foresters and about 100 local guards (Grant 1924, Troup 1936 quoted in Woodcock 2002). The first task was to reinstate all montane forest reserves established by the Germans, such as the Ulugurus, through the 1921 Forest Ordinance (Lundgren and Lundgren 1983, Lovett 2003, Woodcock 2002). The British administration considered the management of valuable natural resources to be the exclusive domain of the colonial state, excluding African forest use. They placed restrictions on access to, and the use of, forest products by the local population. These restrictions were not in the spirit of the 1922 League of Nations Mandate for Tanganyika Territory, which placed paramount importance on the interests of the local inhabitants and stipulated that indirect rule was to lead to independence (Lovett 2003). Although the strict nature of the 1921 Forest Ordinance was modified in 1926 and 1930 to permit local people greater access to forest products, these entitlements were again restricted in a new Forest Ordinance passed in 1933 (Lovett 2003). The Forest Rules of 1933 with later amendments regulated all forest activities for 20 years with the main thrust of maintaining government's monopoly over forest resources (United Republic of Tanzania 1998). The 1957 Forest Ordinance retained the earlier restrictions and prevailed until the late 1980s.

The objectives of forest policy during the remainder of the British Administration were essentially two-fold: First timber production and plantations, and second protection of natural forests for water catchment. It was in pursuance of this latter policy that the

state-controlled forest estate was expanded, particularly during the 1950s, to cover most of the natural closed forests not originally gazetted by the Germans (Lovett 2003). The continuing gazettement led to a doubling of the reserved area by 1942 (Iversen 1991 in Woodcock). At the end of the British time the areas under forest reserves were practically the same as today (Lundgren and Lundgren 1983).Two categories of forest reserves were created and still exist today: Central Government Forest Reserves (CGFR) and Local Government Forest Reserves (LGFR). CGFR became the responsibility of the Forest and Beekeeping Division (FBD) under the Ministry of Lands, Natural Resources and Tourism. Thus LGFRs were managed by district authorities under the guidance of the FBD (Woodcock 2002).

4.2.3. The post-independence years

The independent post ’61 socialist state of Tanzania was ruled largely according to the same principles as the prior colonial regime (Scott 1989, Lovett 2003, Burgess and Mbwana 2000). Most of the state-controlled forest estate and infrastructure were retained and policy and legislation remained the same as laid out in colonial times, until the early 1990s when the new Forest Policy was introduced (Burgess *et al.* 2002, Woodcock 2002, Lundgren and Lundgren 1983, Lovett 2003). The continued use of the 1957 Forest Ordinance maintained the focus on protection of natural forest for catchment and plantations of exotics for production (Lovett 2003, Lundgren and Lundgren 2002).The division of CGFR and LGFR from British times was maintained. In 1976 the category ‘Catchment Forest Reserve’ was created for the protection of water catchments, such as the Ulugurus (Hermansen *et al.* 1985, Lundgren 1985).

The FBD and its staff were in the eyes of local people regarded as representatives of higher authorities with a policing task to prevent people from using land and wood resources (Lundgren and Lundgren 1983). People were not allowed to reside in forest reserves or to use any products from them. However, locally customary rights had developed, whereby people residing near the reserves were allowed to collect firewood or to herd cattle through the reserves along special tracks (Lundgren and Lundgren 1983).

The role and efficiency of the forest division and district authorities as guardians of the forests was ambiguous. Often damaging activity was implemented or supported by the

very agents of state (foresters, local leaders) in whose trust the protection and management of the forests was placed (Wily 1998). Districts were using timber from the forests as a means of relieving financial pressures (Lovett 2003). Local people were often assisted in illegal practices by forest staff after offering bribes (Rodgers *et al.* 1983, Woodcock 2002). The forest division maintained plantations inside reserved forests (such as for example in Kimboza), contributing to forest destruction (Rodgers *et al.* 1983). Logging carried out since German administration continued on an even grander scale after independence, partly supported by some international donors (Woodcock 2002, Lovett 2003). The years post 1961 are thus associated with even greater forest degradation.

During the independence years, the traditional leadership of the chiefdom was officially abolished. The still existing authority of local leaders over non-reserved forests was eroded. This resulted in the final total breakdown of customary institutions that had traditionally been responsible for local resource management (Woodcock 2002). In the outlier forests of the Uluguru North mountains traditionally maintained by the chief for the ancestors of the Luguru tribe, large-scale deforestation has been associated with the loss of chiefly power subsequently to political changes since 1964 (Burgess *et al.* 2002). Forests that had not been reserved or taken as private estates were officially given the status of forests on public lands. Forests, which had been customarily 'closed', with community leaders controlling access and use, had become 'open', leaving the community leaders powerless to control forest access and use. Public forest was the only forest that local communities had statutory access to. Local communities therefore continued as was customary to obtain forest products and land from these areas. Those tree species valued for timber, such as Mvule (*Millicia excelsa*) were reserved by the state as national trees and local people needed permits to fell such species on public and even on farm land. Thus, local communities held statutory access and user rights to these public lands forests but without corresponding responsibilities for management. In increasingly reserving forest on public land, statutory tenure regimes moved from public tenure where rights were held by the public as a whole to public tenure where rights were theoretically held by the state, moving *de jure* tenure of the forests from open to closed access. *De facto*, however, the forests which had been closed under traditional leadership had become open through reservation (Woodcock 2002). By officially removing access and user rights from communities, any responsibilities they

may have felt toward the forest were also removed and all responsibilities placed on the forest guards of the state (Woodcock 2002).

4.2.4. The participatory era

In the 1980s, an early participatory period began. There was an increased recognition of the biodiversity and ecological value of forests on the mountains in the east of the country and the coastal plain. It was acknowledged that communities needed to be more involved in forest management (Lovett 2003, Woodcock 2002). With participation becoming a paradigm, the increased focus on biodiversity conservation still led to further creation of reserves and the extension of existing reserves. Villagers complained that often their fields were incorporated into forest reserves while forest areas sometimes were not (Woodcock 2002). Thus, the management approach of the post independence years was in principle perpetuated during the early participatory era with a hierarchical forest tenure regime where the state controlled rights and responsibilities to forest access and use. Community-based projects that offered alternatives to forest products and educated villagers about the ecological benefits of conserving forest were perceived as the solution to the problem but failed their goal. As Woodcock (2002) notes, villagers often state the advantage of conserving forest for water catchment, a point that has been put across repeatedly in project educational packages. However, villagers feel that the disadvantages in terms of loss of farm land are more important in the short term than the conservation for water catchment.

The Structural Adjustment Programme (SAP) of the International Monetary Fund and the World Bank in the 1980s initiated a process by which Tanzania shifted unevenly and reluctantly from a centralized to a market oriented economy. The transformation of the country under market reforms facilitated an increasing economic diversification into non-farm activities in rural areas (Ponte 2001, Seppälä 1998). These changes of the political economy under the decentralization and SAP called for a review of the old Forest Ordinance of 1957. A new forest policy was launched in March 1998. The two main changes of the new policy framework from previous approaches were the inclusion of biodiversity conservation as a policy objective, and the recognition of the importance of community and private forestry (Lovett 2003).

From the second half of the 1990s onwards PFM type arrangements were developed in a number of places in Tanzania that culminated in the signing of numerous PFM agreements over the last 10 years, all of which predate the current Forest Act. The 1957 Forest Ordinance only provided a narrow legal basis and no guidelines for PFM/JFM existed. All PFM agreements were developed locally, mostly within the framework of donor-sponsored forestry projects, which resulted in the application of different approaches. The three JFM sites that are part of the present study fall within this period of time. The FBD deemed it necessary to legally streamline both existing and future PFM arrangements under the new 2002 Forest Act through a set of clear and concise rules and regulations. In 2006 guidelines for CBFM and JFM implementation were published.

The Forest Policy of 1998 and the Forest Act of 2002 legally introduced PFM as a forest management strategy. Combined with heavy donor support, there was a boost in the country-wide implementation of PFM. The move towards PFM in Tanzania was partly driven by the recognition that neither central government nor local government had the capacity to sustainably manage the country's forest estate without the support of forest adjacent communities. Thus, PFM was perceived as a management strategy to address "the on-going degradation problem on a national scale" (Blomley and Rhamadani 2006). At the same time, the on-going broader local government reform process put pressure on sector ministries for decentralization following the principles of subsidiarity. Other scholars describe that PFM is regarded as an attempt to reverse the alienation of communities from the forests and equip them with increased responsibilities in forest management (Woodcock 2002; Khare 1999). The formation of local institutions called village forest committees, village environmental committees or village natural resource committees was a step towards a decentralized system granting democratic rights to communities (Khare 1999). This is at least the theory. In practice, as this study shows, the village forest committees formed under JFM were neither democratic nor were they equipped with rights towards the forest reserves.

4.3. The post-independence political framework

4.3.1. African socialism and villagization

In 1967, President Julius Nyerere published the Arusha Declaration, his development blueprint for a socialist state, in which he expressed the need for an African model of development. The Tanganyika African National Union (TANU), founded by Nyerere in July 1954, became popular in rural areas mostly due to its endorsement of resistance to the onerous agricultural regulations of the colonial state (Scott 1989). Nyerere created a one party system under the leadership of the *Chama Cha Mapinduzi* (CCM), which succeeded TANU and which is still the ruling party in Tanzania to date. *Ujamaa* was the concept that formed the basis of Nyerere's social and economic development policies until 1985 when Nyerere gave up power to Ali Hassan Mwinyi. *Ujamaa*, derived from the Swahili word for extended family, describes that a person becomes a person through the community. *Ujamaa* had special significance as playing on supposed cooperation and reciprocity in rural communities, and is therefore of relevance for initiatives like JFM. With the concept of *Ujamaa* being based on public ownership and centralized management (Ibhawoh and Dibua 2003), the ownership of all land was transferred to the state, vested in the President on behalf of all citizens (Lundgren and Lundgren 1983, Woodcock 2002). With increasing nationalization, the scope of the state penetrated all key economic sectors. As a result purchasing power declined and essential goods became unavailable. Farmers lost their freedom, and the state took over their lands and claimed their crops. Cumbersome bureaucratic procedures and excessive tax rates created a foundation for systemic corruption. A system of permits (*vibali*) allowed state officials to collect huge bribes in exchange for the *vibali*. The African socialism introduced after independence was a perpetuation of the disempowerment of the rural peasantry that had started during colonial times. Tanganyika was an authoritarian administrative state that routinely used coercion to subject the rural peasantry to its vision of development and modernization (Scott 1989).

The post-independence political culture continued much of the coercion and criminality that rural peasants had experienced during colonial times with the forced villagization of the 1970s being the most far reaching example (Scott 1989; Brockington 2008). It laid the structures that govern villages in rural Tanzania today (Brockington 2008). Implemented with the help and blessing of some international donors (Seppälä 1989),

since 1973 the villagization moved 12 million people into 8,000 villages forcing them onto collective farms (Mnzava 1980 quoted in Lundgren and Lundgren 1983). This greatly disrupted agricultural efficiency and output and turned Tanzania from a nation of sustenance farmers into a nation of starving collective farmers. The result of the villagization was an "alienated, sceptical, demoralized, and uncooperative peasantry for which Tanzania would pay a huge price, both financially and politically" (Scott 1989:237). Thus, the villagization is described as "one of the great human tragedies of the twentieth century in terms of lives lost and irretrievably disrupted" (Scott 1989:237).

The villagization had a threefold aim: The delivery of services, the creation of a more productive modern agriculture and the encouragement of communal, socialist forms of cooperation following *Ujamaa* (Scott 1989). Nyerere's idea was that modernization required physical concentration into standardized units that the state would service and administer. Scott (1989) argues that physical concentration was a way to transform a dispersed, autonomous population that thus far had escaped most of the state policies they found difficult. Thus, villagization meant not simply village formation and communal farming. It largely meant control of Tanzania's peasantry in order to regiment it politically and economically (Scott 1989). The peasants' tactical advantages to escape the force applied are described to include flight, unofficial production and trade, smuggling, and foot-dragging (Scott 1989). It is the opinion of the author of this study that tactical behaviour of similar nature is still influencing the outcome of state initiated projects such as JFM in current times. In situations when the local villagers do not truly see an advantage and mistrust the state, they do not openly show opposition but find tactical ways of evasion.

The villagization campaign had vast negative ecological consequences (Scott 1989, Kikula 1997, Blaikie 1985, Colson 1971, Lundgren and Lundgren 1983). The declaration of public lands through *Ujamaa* , turned 70% of the total forested area into *de facto* 'open access' areas without any protection (Luoga *et al.* 2005:76). This, combined with the fact that the villagization programme within a short time created enormous concentrated pressures on forest and wood resources throughout the country, led to forest degradation. Some *Ujamaa* villages were even declared inside the boundaries of forest reserves (Woodcock 2002). Most of the woodlands had disappeared within five years following villagization due to the increased demand for

wood resources in concentrated areas (Kikula 1997). It also led to changes from traditional shifting to permanent agriculture. The decline in agricultural productivity during the post-villagization period was responded to by more intensive farming systems, further aggravating deforestation (Kikula 1997). Scattered settlement patterns and the traditional methods of land management during the pre-villagization period had an environmental conservation value as rural people seemed to have had an eminently empirical, albeit cautious, outlook on their own practices (Kikula 1997, Scott 1989, Kjekshus 1977). The resettlements reduced the ability of the settlers to adapt to their new environment, resulting in adverse ecological effects as the traditional systems of conservation were eliminated without a sound alternative (Blaikie 1985, Colson 1971, Kikula 1997, Scott 1989).

With the same modernist beliefs as the previous colonizers, Nyerere's planners and specialists claimed a monopoly on useful knowledge. The imposing of their knowledge led to a complete disruption of traditional systems (Scott 1989). At the same time rural peasants were considered as ignorant, an attitude that can still sometimes be encountered when working with central government officials. Scott (1989) argues that just like scientific forestry was a colonial attempt to bring natural forests under aesthetic order, the resettlement scheme during independence replicated this to the human geography.

4.3.2. Village governance

Since the villagization, communities in rural Tanzania are divided into villages. With the introduction of PFM, the village as a legal entity has become increasingly important again in the management of forests. The Forest Act (2002) states that the village government as the lowest level of the government system performs executive and legislative powers together with other responsibilities and duties, including forest management (United Republic of Tanzania 2002a). Under CBFM, villages have been granted ownership and use rights of forest resources and under JFM they have become co-managing parties with central and local government. Villages in Tanzania are registered institutional entities, with discrete and recorded physical boundaries (village area) and are considered well-organized bodies with high degree of cohesion and capability of management (Wily 1997, Lund and Treue 2008). In most cases, villages

that adjoin natural forest areas have longstanding tenurial and user interests in the adjoining forest.

Per the 1975 Villages Act, villages are managed by Village Councils to be elected by the Village Assembly. Village Councils are corporate bodies, answerable and accountable to the Village Assembly, which consists of all adults residing within the village area (Blomley *et al.* 2008). The Village Council consists of 25 councillors elected by the Village Assembly every 5 years. The Council may form sub committees, which may represent the village in any government forum or court of law. The Local Government Act of 1982 provided villages with authority to make village by-laws. Once a village by-law is drafted and approved by the local District Council, it becomes law, upholdable in any court. These by-laws provide communities with a tool for creating statutory land and natural resource management rules at village level (Blomley *et al.* 2008, Wily 1997). Usually such by-laws address issues of natural resource use (forest harvesting, hunting, grazing), enforced by sanctions and fines. Lund and Treue (2008) emphasize that present day villages carry forth the historical elements of fused powers in the village chief as they carry simultaneously legislative, executive and judiciary powers. This is a potential weakness in achieving equity. Villagers at odds with the leadership face the difficulty that appealing to higher levels in the local government system requires a letter from the Village Council.

The history of top-down administration and command policies requiring 'voluntary' contributions, as well as excessive taxation (Ellis and Mdoe 2003) led to withdrawal of villagers from the formal sector and a split between villagers and the local government (Seppälä 1989). Kajembe and Monela (2000) observe that villages tend to be divided between traditionalists, who keep distance from the state, and elites, who dominate and co-opt village government. Several authors describe the state's monopoly for violence, apparent in the tax collection through coercive methods and by violent forms of enforcement (Fjeldstad 2001, Brockington 2008). Brockington (2008:112) describes various forms of 'institutional violence', e.g. extraction of taxation, misappropriation of funds, corruption and failure of accountability that characterized the villagers' experience of local authority. As speaking out in public against abuses by local officials was considered dangerous, silent resistance and non-compliance with state initiated activities became a constant feature of rural life (Brockington 2008, Thompson 1975,

Hopkins 1985). Fjeldstad considers accountability between the state and the citizens in Tanzania as non-existent (Fjedlstad 2001). Therefore attempts to introduce accountability will face challenges if attempting to work within existing political structures and customs. Corrupt practices of local governments will only die slowly and painfully, if at all (Brockington 2008). This has implications on a policy like PFM whose implementation is based on mutual cooperation and trust amongst villagers and between villagers and local and central government bodies. The development of effective local institutions of forest governance will be a long struggle which also has to change the democratic cultures filling them (Brockington 2008). The above concerns about village governance apply to local government in general. Several studies have documented problems of poor governance in Tanzanian local governments (Fjedlstad 2001, Kelsall 2000, Brockington 2007), leading to questioning decentralized forest management (Brockington 2007). Decentralization, it has been argued, creates rent-seeking motivations of inadequately remunerated public servants (Ellis and Mdoe 2003).

4.3.3. Decentralization of local government

The major institutional change that PFM brings about is that FBD is not solely responsible for its implementation (Hamza and Kimwer 2007). Local government has a critical role to play in facilitating planning and implementation of PFM activities (United Republic of Tanzania 1998). District councils provide technical assistance and capacity building for implementing PFM activities at village level. Opinions concerning the capacity of local governments to implement PFM differ. While some authors argue that the shift towards decentralization and devolution of government power to district and village government levels has increased district capacity to support PFM activities (Hamza and Kimwer 2007) others believe that district capacity is low in both human and financial resources (Ngaga *et al.* 2003). However, statements by central or district government representatives of low local capacity are often just signs of reluctance to commit to decentralization (Brockington 2008; Ribot *et al.* 2006).

Tanzania is considered to have one of the strongest frameworks of local government in Sub-Saharan Africa (Wily and Dewees 2001). Local governments existed in Tanzania as separate elected bodies until 1972 and after 1984 with diluted independence. There were several local government reform processes. The first reform of 1972 placed emphasis on regional and district level committees, which were supposed to follow the

party guidelines. The independence years from the 1960s up to the 1980s were marked with a transfer of power to the central level while open politics at the local level were suppressed. The operational independence of districts was curtailed and they were placed under a politically controlled and heavily top-down oriented administrative hierarchy aimed at standardizing and formalizing (Seppälä 1989).

During the villagization scheme in 1972, the district councils were terminated. At the same time central government tried to penetrate the rural areas through establishing and strengthening regional administration and parastatals. The village councils were retained only to receive decisions made by higher government levels and to implement agreed politics (Seppälä 1989, Shivji and Peter 2000). The village level administration was placed between two forces. On the one hand, it tried to please the views of fellow villagers and to play along the lines of the narrow politics. On the other, it was expected as to fulfil the demands from above. The excessive demands from above were watered down and the strict regulations were simply circumvented (Seppälä 1989). The central government interpreted the lack of local initiatives as a matter of lack of technical capacity to plan projects and posted village managers in the villages. However, the villagization had shaken the basic livelihoods of the rural population and people simply did not have the inclination or other resources to implement additional village level economic activities.

The economic inefficiency of the sectoral top-down administration forced the government to start the district councils (local governments) anew in 1984 (Seppälä 1989) through the decentralization programme of 1982. While the new local governments were given a number of tasks and public lands were placed under their jurisdiction, they were administratively still controlled by the regional authorities and ministries. After the reform, a part of the central government was nominally called local administration. However, its manpower and finances were allocated from above. Hence, the key administrators perceived themselves as answerable to higher ministries rather than the elected district councils (Seppälä 1989). The practice of political decision-making was far from the model of a democratic decentralized structure (Ribot 1995, Seppälä 1989). At that time the major aid projects influenced local administration by marginalizing them and placing emphasis on the regional administration as local authority was perceived as a weak arm of central government. Due to their financial

muscle a donor could buy a substantial amount of expertise from local governments using allowances as incentives and a dependency relationship was created.

The new administrative reforms introduced in the 1990s deviated from policies in previous decades, in that they included new donor approaches, multi-party politics, market forces and civic organizations. Donors started to work directly with district authorities who were allocated money for their own development projects (Seppälä 1989). Donor agencies still had a central position in allocative decision making and were involved in intricate political debates. In the late 1990s donors moved towards a coordinated approach to give up the area based programmes, where certain donors would support certain areas only. Instead the funding was pooled and disbursed to qualifying local authorities through a central mechanism established under the Capital Development Grant of Local Government Reform Programme (LGRP). The politically elected district councils were given more economic power as the central government funding was to be allocated as block funding to district councils.

4.3.4. The politics of JFM

Under the overall goal of sustainable development in Tanzania, the Forest Policy of 1998 contains two statements in support of PFM. Policy statement number 5 promotes ownership and management of forests on public lands by villages and private individuals and establishes the right for villages and local governments to demarcate and establish forest reserves. Policy statement number 39 encourages local communities to participate in forest activities and states that clearly defined forestland and tree tenure rights will be instituted for local communities. Central government responsibility is limited to the management of forest reserves of national strategic importance. Emphasis is given to joint forest management (JFM) between central government, specialized agencies, the private sector or the local government. JFM is defined in the Tanzanian Forest Policy as cases where local communities or NGOs are involved in the management and conservation of government forest reserves. It takes place on land reserved for forest management such as National Forest Reserves (NFRs) and Local Authority Forest Reserves (LAFRs). These forests are managed with appropriate user rights and incentives (United Republic of Tanzania 1998). The new balance of power in JFM is laid down in a Joint Management Agreement (JMA) which is signed between the state, represented by the Director of FBD and the people, represented by those

villages that take on management authority over adjacent parts of the forest reserve. Thus, the Forest Act (2002) defines JMAs as tools for the decentralization and devolution process.

Although PFM offers a legally binding institutional framework to formalize a new balance of power away from the state into the hands of village forest management authorities, it is questionable to what extent this is realistic. In practice, the formalization of PFM has been deliberately delayed (Wily 1998). As this study shows, the user rights and incentives that the policy calls for have in practice not always materialized during the JFM process. There are growing doubts in Tanzania as to whether the assumption that PFM improves the livelihoods of forest adjacent communities holds true in the case of JFM. These doubts arise in particular in the context of Catchment Forest Reserves, which are strictly protected and where no exploitation is legally allowed. The potential community benefits of engaging in joint management (e.g. fees, fines, eco-tourism, and forest services) may not be sufficient to outweigh the transaction cost that communities incur through their involvement in JFM.

In JFM, in order to arrive at an equitable process, it is not enough to look at the contents of the JMA. One needs to look as well at the underlying negotiation process. There is no agreement as to what role local communities should play in the management of forests of high biodiversity, such as the Ulugurus. These forests have, if at all, been placed under JFM rather than CBFM and roles of communities limited to the responsibility of management work and if at all – limited use rights. But even these high biodiversity forests were once managed effectively by communities under customary traditions. Woodcock (2002) argues that the fact that the policy does entrust communities with the management of forests on public and private lands but does not for forest reserves of high value shows that the FBD does not fully believe in the ability of local communities to play a meaningful role in forest management. Thus, scholars perceive JFM as maintaining the power imbalance between state and communities in Tanzanian forestry that has existed since colonial times (Woodcock 2002, Wily 1998, Koppers *et al.* 2004).

Wily (1998, 1997, 1996) emphasizes that stakeholders' roles in forests need to be negotiated. The negotiation process will influence the way in which the JMA is enforced and JFM is implemented. It is questionable to what extent stakeholders with

unequal power successfully negotiate their roles in the management of forest reserves. Where the state will try to facilitate the negotiation process itself this could impair the success of the process and increase conflict between two groups of stakeholders with a long history of mistrust (Woodcock 2002). Woodcock (2002) therefore calls for the facilitation of the negotiation process by independent experienced professionals, i.e. NGOs, who are aware of unequal power relations between stakeholders. A study conducted by FBD (Koppers *et al.* 2004) in preparation of guidelines on cost benefit sharing emphasized that the legal awareness of local communities about their potential rights and duties as stipulated in the Forest Act is limited. The study (Koppers *et al.* 2004) further outlines a gap in the current legal framework. According to the Forest Act, the inclusion of basic duties and rights in the JMA is only required between village councils and community groups (Section 16.3). This leaves a gap with regard to all other JMA arrangements between local and central government and village councils. Thus, there is a legal grey area about benefit sharing in JFM (Blomley *et al.* 2008). It is hence not surprising that from preliminary fieldwork and literature review it emerges that most of the existing JMAs do not stipulate clearly the rights and obligations of the contract partners. In the case of the three JFM sites that were part of the present study, a signed JMA did not even exist.

4.4. History and politics of the Uluguru mountains

The Ulugurus have a long history of conflict of human– forest interaction and land use management and have thus witnessed villagers' outright opposition against government policies of coercion. Land scarcity is the main feature of agriculture. Deforestation and soil erosion are major problems (Ponte 2001). The area has limited agricultural carrying capacity. Consequently, Van Donge (1992) described Uluguru farmers as "trapped in decline". Ponte (2001) tended towards a more positive outlook arguing that Uluguru households could improve their livelihoods mainly with the increase of non-farm income. Ponte (2001) considers the fact that farmers have been increasingly diversifying into non-farm activities positively. Rather than being caught in a poverty trap, rural people are reacting to market changes, demographic pressure and land degradation (Ponte 2001).

With high potential for crop production, the area has high population density and deforestation on the mountain slopes. On the main Uluguru ridge, 50 villages touch the forest boundary of the Uluguru Nature Reserve and over 151,000 people are found within the mountain area, often at increasing densities at higher altitudes up to the forest boundary. Lundgren and Lundgren (1983) assume that permanent settlements have always existed in the mountain forests and they were often used as temporary refuges during war times (Lundgren and Lundgren 1983, Woodcock 2002). Large-scale population movements up the mountain slopes occurred first during the eighteenth century, as a result of the invasion and occupation of the plains by the cattle-raising Maasai (Lundgren and Lundgren 1983). This forced the agriculturalist Bantu tribes to settle in the mountains where they could better defend themselves. They cleared the forest on the lower slopes and depending on skill and land potential, different forms of permanent and semi-permanent agriculture developed.

Although all land in Tanzania is owned by the state, in the Uluguru mountains land is still *de facto* regarded as private and inherited between generations (Mnzava quoted in Lundgren and Lundgren 1983). Some of the mountain tribes developed into powerful, well-organized societies (Lundgren and Lundgren 1983). The *Waluguru* have attracted much attention from the national and international research community. Much of the work on the *Waluguru* has focused on their agricultural practices, land use (Brain, 1980; Maack, 1996; Young and Fosbrooke, 1960), land degradation (Jones, 1996) and related socio-economic changes (Van Donge, 1993 and 1992; Ponte 2002) and forest disturbance in relation to agricultural use (Hymas, 2000 and 2001). As Bhatia and Ringia (1996) note, studies on forest resource use were undertaken in villages distant from the reserves and may hence have underestimated the actual use of the forest reserves.

Intensive small-scale arable farming on mountain slopes led to soil erosion and land degradation. Landslides are triggered in years of extreme rainfall (Lundgren and Lundgren 1983). This deterioration was already visible in the 1930s when the British administration launched the Uluguru Land Use Scheme, a soil conservation and rehabilitation project conducted in the post-war time (Lundgren and Lundgren 1983). The failure of the scheme is attributed to unsound and unwise implementation and practices that were badly adapted to the strongly developed traditional social and

cultural systems (Lundgren and Lundgren 1983). Through this, the *Waluguru* have become known as local cultivators who resisted the generic colonial solution to soil erosion: ridging (Scott 1989). The Ulugurus continued to be a focus of project work in post independence year up to today focusing on agricultural practices by *Waluguru* communities and their demands placed on forests (Forrester *et al.* 1996; Bhatia and Buckely 1998) as well as tests with forest management approaches such as CBFM in public lands forests and JFM in local authority forest reserves of the Ulugurus (Moshi *et al.* 2000). The Ulugurus are further an example of traditional management of public lands forests (Hymas 2001 and Ylhaisi (2000) in which resource use conflicts over public lands forests (Burgess *et al.* 2001) and the linkage of forest clearance and the loss of chiefly power (Hymas 1999) have been described.

The forests of the Uluguru mountains are protection forest reserves where harvesting of forest resources is not legally allowed. Their conservation history dates back to 1909 during the German colonial period when the gazettement of several forest reserves took place. Early conservation efforts (1940s) focused in the agricultural and land use practices of the *Waluguru*, which start with the basic perception of villagers as forest users - a potential 'threat' to the forests managed in a central government controlled regime. The failure of the state to manage Catchment Forest Reserves sustainably necessitated new approaches. In the 1990s a range of experiments with assigning specific forest management roles to communities started being implemented in and around the Uluguru mountain range and are today at various levels of implementation. These include government initiatives implemented through the Regional Catchment Forest Office of the Forestry and Beekeeping Division (FBD) for example in Kimboza and Kitulang'halo forest reserves as well as NGO implemented initiatives in particular by the Wildlife Conservation Society of Tanzania (WCST) for example in Milawilila forest reserve of this study. Since 1999, WCST has been implementing forest conservation project activities in the Uluguru Mountains. There has also been a project supported by the Sokoine University of Agriculture in Kitulang'halo Forest Reserve. All these early initiatives offer a wealth of experience in terms of JFM implementation. However, so far, the lessons learned of these initiatives have not been systematically analysed. Forest loss in the Uluguru Mountains has been documented since the 1950s up to date (Burgess *et al.*, 2002, Brooks *et al.* 2002, Hamisy 2000) and forest disturbance in these sites has been documented (Hymas 2001). However, existing

studies do not research the impact on livelihoods of the participating communities and local forest governance.

The three JFM forests included in this study were once harvested intensely. Although Kitulang'halo forest reserve has been a Catchment Forest Reserve since 1955 with protection history, it used to include a 155 ha part that was declared for productive use until 1985. Then, as a result of the catchment logging ban, the entire reserve was put under protection by FBD. During the transect surveys conducted as part of this study, signs of historic timber harvesting were visible. Biological interest in Kimboza goes back to the early German administration (Stuhlmann 1894, Kaiserliches Gouvernement von Deutsch-Ostafrika 1903). As a forest reserve it was initially formed during the German occupation and was later formally gazetted by the British. From 1983 onwards, Kimboza was administered by the Regional Forest Catchment Officer of Morogoro under direction from Divisional Headquarters in Dar es Salaam. In Kimboza, valuable timber species such as Mvule (*Milicia excelsa*), Mninga Maji (*Pterocarpus* sp) and especially Mkangazi (*Khaya anthotheca* (formerly *K. nyasica*) were common in the 1960s (Rovero *et al.* 2009). Logging has almost completely deprived the forest of its tall canopy trees. Rodger and Hall (1986) reported in the 1980s about pole cutting intensities of 50% of available poles in easily accessible areas in Kimboza associated with pit sawing activities.

Rodgers *et al.* (1983) describe how the practice of selling licenses to pit sawyers by the regional catchment office in Morogoro was ambiguous. While in theory up to three trees were allowed to be taken out at one time, at least five had been issued on occasion. In addition, the licenses did not represent the actual numbers as more logging was taking place than indicated in licenses. The fact that all planks were stamped would indicate that the local forest guard, whose prior approval was required, was aware of the higher level of extraction (Rodgers *et al*. 1983). Although, the collection of minor forest produce was in theory illegal unless done by license or permit, in practice, the collection of poles and firewood was thought insignificant and not seen as a threat. So, no permits were issued nor would they have been if applied for (Rodgers *et al.* 1983). Historically there are innumerable minor tracks and footpaths in Kimboza providing easy access to the interior of the forest to search for firewood, building poles and traditional medicines and food items.

The example of Kimboza forest shows the politics and conflicts of the forest guards that were placed in the villages by the forest division. Their duties included boundary and general patrolling plus checking, measuring and stamping of logging activities and timber planks (Rodgers *et al*. 1983). The forest staff had lived in the area for several years and became part of the social community of the village. Because of this the guards felt unable to control the cutting of forest produce by villagers: "If I arrest them, they will destroy my crops" (Rodgers *et al., p* 23). Thus, pit sawing was done in 1983 by imported labour from Iringa on contract to an entrepreneur in Morogoro, to avoid that enforcement of the law regarding timber extraction had 'community problems'.

5. Research design, methods and study sites

5.1. Research design

In order to answer the research questions, changes in forest condition, livelihoods and local governance resulting from the introduction of JFM needed to be assessed. Data were not available to compare the "before" and "after" situation, nor was it possible to conduct a longitudinal study. Changes were therefore assessed through a comparison between government forest reserves under JFM and nearby and closely similar government forest reserves under traditional state management ("non JFM"). The latter served as a control group for the subject under study, i.e. "JFM forests and adjacent villages" (experimental group). The main method used to assess change was to compare the forest condition of the experimental group with the forest condition in the control group at the same point in time.

A time dimension was built into the study design through certain questions of the household survey. Respondents were asked about perceived changes (to the forest, to certain livelihoods or governance aspects) in the present situation compared to five years ago (prior to introduction of JFM). This was undertaken because it was not possible to conduct interviews prior to the introduction of JFM or complete a longitudinal study. Thus, a control group and a time factor were built into the study design from the outset, aiming to assess JFM related changes. This type of research design is called retrospective experimental design (De Vaus 2002).

An important consideration in selecting the study sites was that they needed to contain forests that had been under JFM for a number of years, so that impact could be assessed. Therefore some of the early test sites of JFM in Tanzania, initiated in the late 1990s had to be selected, so that by the time of this study between June 2005 and July 2006, the effects of 4 to 5 years of JFM implementation could be assessed. Such sites existed only in and around the Uluguru or East Usambara Mountains. We selected sites in the Uluguru Mountains for this study.

These early pilot JFM areas were implemented by FBD to "test" JFM as a new approach. They predate the 1998 Forest Policy and the 2002 Forest Act. Since no guidelines for PFM/JFM existed at that time, these PFM agreements were developed

locally within the framework of donor-sponsored forestry projects, which resulted in the application of different approaches. The focus of the early donor funding in PFM was on securing high biodiversity forests (such as catchment forests), which had minimal local use options and corresponding management responsibilities (Blomley and Ramadhani 2006). A "national" approach was only developed after the 2002 Forest Act defined clear PFM regulations. Largely with funding from development partners, the FBD was developing a national programme for the implementation of PFM. By 2006 an estimated 3 million hectares of Tanzania's 33 million hectares of forest land were under PFM including 1200 of the 11,000 villages in 50 districts. This comprised both CBFM and JFM approaches, the latter comprising 1,386,000 hectares and 568 villages (Blomley and Ramadhani 2006).[12]

Another requirement of the site selection was that a comparable state managed forest needed to be nearby to serve as control group. Forest reserves fall under the same policy, laws and regulations, giving them all an equal status in the Tanzanian policy framework. Furthermore, each forest needed to have at least one adjacent sample village. In order to minimize the other factors besides the forest management regime that could influence the comparison, the experimental and control group forest and village pair needed to be in the same agro-ecological zone. The villages needed to be fairly similar in their livelihood and socio-economic patterns. The data collection took place during the dry-season months of two subsequent years to eliminate problems of seasonal effects. These elements of the study and field work design helped reduce the number of other factors that might influence the results, hence trying to leave JFM / non-JFM as a main factor under study.

One of the variables for the selection of each village – forest pair was their proximity to each other. This was based on the assumption that distance influences peoples' selection on which forest to use, favouring a nearby forest over a more distant forest. At the same time, an attempt was made to maximise the distance between the experimental and the control group within each of the three sites. This was done to strengthen the assumption of a relationship between one village and one forest per site. The distance between each of the three different sites is at least 10 kms so that one can assume that there was no influence between them and they could be investigated as separate case studies, but

[12] In addition there is an estimated 1,641,000 hectares of forest area under CBFM with 670 villages involved. This totals 1,238 PFM villages across the country (Blomley and Ramadhani 2006).

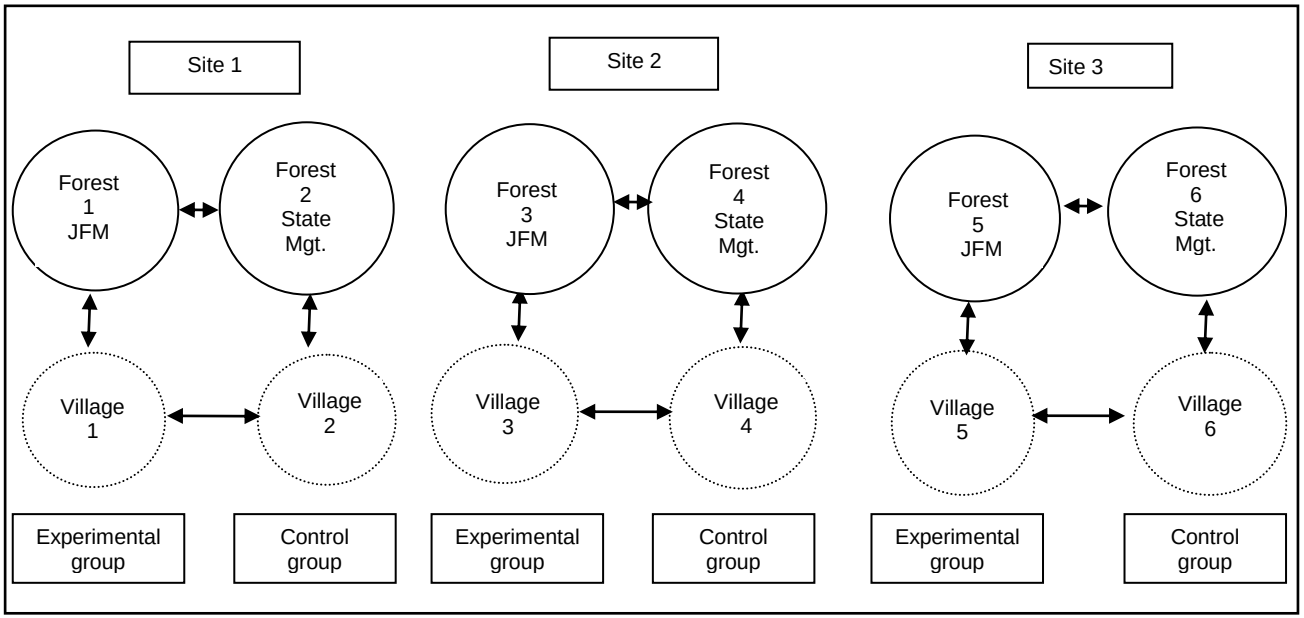
contributing data that can provide for some more general conclusions. The data analysis did not reveal any results which would question this assumption.

The Uluguru mountain range fulfilled these site-selection requirements because it has a number of forest reserves – amongst them some under JFM and some under ordinary state management. Livelihood patterns are quite similar in these rural Uluguru villages. The human use patterns of the forest reserves are also similar amongst the local villagers. At the same time forest utilization varies depending on outside market forces for forest products or particular features of the landscape, i.e. existence of mining resources. The vicinity of large urban centres or a regional road may exert high market pressure on forest products, in particular charcoal and timber. As Blomley and Ramadhani (2006) state, this makes it difficult for villages to prevent illegal harvesting by outsiders and undermines the JFM process.

To summarize, the study design required sites (government forest reserve with adjacent village) under JFM for 4 to 5 years ("the experimental group"), with a "mirror" forest-village pair not under JFM in the same agro-ecological zone to serve as a control group.

Thus, the sites chosen for this study comprise six forest reserves in the Uluguru mountain range, which are part of the Eastern Arc Mountains and six villages in Morogoro Rural District in Tanzania. The six forest reserves were arranged in three paired sets: Within each pair one forest was under JFM (the experimental group) and the other was under state management without community involvement (the control group). The sample villages were selected based on the same principle. In each of the three sites, one village is located directly adjacent to the forest reserve under JFM (experimental group) and a second village adjacent to the forest reserve under state management (control group). Thus, each site consists of two village – forest pairs, one forming the experimental group and the other the control group. This study design is illustrated in Figure 5.1 overleaf.

Figure 5.1 Study Design



Despite the efforts to eliminate other potentially influential factors than JFM, the method of comparing JFM with "non JFM" forests has certain limitations in assessing JFM related changes and hence to the ability to test the formulated hypotheses. The limitation of this experimental design is that the control group is never a perfect mirror image of the experimental group. This is because two forests and two villages are never absolutely similar even though they are located in the same zone and have similar physical and socio-economic characteristics.

Furthermore, with regard to forest quality, although the forests were paired in similar forest types, there was variation within in the vegetation type across the plots in each forest. By comparing all sampled plots split by JFM versus non JFM, sometimes forest and woodlands habitats were compared. These have naturally differences in some of the parameters, which may not be due to JFM, i.e. tree height, grass coverage etc. A separate analysis of wet forest and woodlands habitat plots within a particular forest was, however, not possible within this study.

In addition, the empirical analysis showed that despite this careful research design and resulting site selection there was not a unilateral relation between one forest and one village. With access restricted in the JFM forests, villagers sometimes used the control group forest to meet their resource demands despite longer walking distances. In particular in sites 2 and 3 the distance was not sufficient to prevent that villagers in the experimental group were using the "other" village's forest.

We do not have data on the investigated variables from before the JFM process in any forest or village. In the absence of such "before-JFM" data, there is no certainty that we are measuring changes in forest quality, livelihoods and governance due to JFM in the forests that are under JFM. It might be for example that the JFM forests were better off even before JFM was put in place or that certain livelihood differences exist even without JFM. As such, the methods used cannot reliably tell us that the differences in forest quality found are the real impact of the JFM. However, the comparison of sample plots and households from before and after the introduction of JFM, although preferable, was not possible within the scope of this study.

5.2. Research methods

5.2.1. Mixed method approach

5.2.1.1. Introduction

Mixed methods design is increasingly being used among socio-economic and poverty researchers because synergies can be gained from the careful combination of quantitative and qualitative methods (Gibson & Duncan 2005, Kanbur 2003, Sharp 2007, London *et al.* 2007, White 2002, De Vaus 2002, Place *et al.* 2007, Longhurst 1994, Moris and Copestake 1993). This is because "focusing on a single research method used by one academic discipline for understanding complex, multi-scale processes does not provide an understanding of how individuals in complex social-ecological settings react to institutional rules and affect ecological systems" (Ostrom *et al.* 2006:19231).

Quantitative and qualitative methodological approaches each have their strengths and weaknesses in generating certain types of empirical information. As White (2002) points out a combination of techniques will yield greater insight than either one if used in isolation.

Quantitative methods are suitable for determining mean or average strengths of relationships while qualitative methods are more effective in understanding cause and effect relationships and local power dynamics in participatory natural resources management (Place *et al.* 2007, Sharp 2007). The benefits of mixed methods design are also perceived in the sequencing of methods so that each can enrich and clarify the results of the other and in the triangulation of data during the analysis (Parker and Kozel 2007, Kanbur 2003, White 2002). However, the nature of data and different sample sizes lead to difficulties of integration. The qualitative analysis captures what is occurring across a small portion of households and therefore adds richness to just a small number of surveyed households (Place *et al.* 2007).

5.2.1.2. Mixing methods in this study

In this study, the forest condition questions required natural science methods, and inquiry into livelihoods, equity and governance required social data gathering. Thus the following methods-mix was used:

- **Quantitative methods**

A household questionnaire survey: Carried out for a sample of households in all study villages to collect quantitative data on household socio-economic and wealth characteristics, perceptions on forest management and governance, access to information, as well as forest resources use.

Forest transects: Conducted in each of the forest reserves to derive data on forest quality. The transect plots generated quantitative data on the condition and utilization of the forest reserves.

- **Qualitative methods**

Participatory Rural Appraisal (PRA) exercises: Designed to yield information directly relevant to the research questions, and generated both qualitative and quantitative data. These exercises were used to establish baseline socio-economic profiles of the study villages, to gain an overview of household economic dimensions, forest use and access, the role of relevant institutions, issues of power relations and to conduct a participatory wealth ranking.

Personal observation: During all the three above components, the researcher took detailed notes during both the village level fieldwork and the forest level fieldwork. Personal observation during the forest transects elicited first hand information on forest resource use. This data collected at the forest level was then triangulated with the village and household level data on forest resource use through the previous methods.

A research design matrix was developed to map the broad research questions to more specific ones, and to the different methods that would be used to answer each question.

The rationale for blending together the above methods was to achieve mutual advantages of each method to improve the quality of information. The quantitative

methods served the purpose of capturing measurable differences as well as some causal relationships between samples and sub-samples. The qualitative methods contributed to understanding the more complex relationships and interactions of forest resource use, power and socio-cultural relations around forest management that were particularly salient in the household survey. Thus, they helped explain some of the 'why' questions that arose through the quantitative methods. This was particularly important as the study was to explore dimensions of illegality, given that the Forest Act prohibits forest resource harvesting in the six forest reserves of this study. Honest answers cannot be expected about illegal livelihoods if asked for in a survey (Place *et al.* 2007).

There were great variations between the different villages in the degree to which the PRA exercises could disclose illegal access and forest resource utilization from the reserved forests. It was only through triangulation with the quantitative and observational data from the forest transects that the actual utilization of the forests could be revealed. For example, in Mwalazi village, people said that nowadays mining inside the forest is not an economic activity practiced anymore. However, while undertaking transects in nearby Ruvu Forest Reserve, active small-scale mining sites were sighted and the majority of miners encountered in the forest named Mwalazi as their village of residence. A foreigner counting trees was obviously perceived as an eccentric but harmless undertaking and villagers could be involved in open discussions while met inside the forest.

With regard to the sequencing of methods, the present study scheduled the qualitative PRA component first so that it could not only create a free standing base of information but also to focus and strengthen the subsequent survey. The sequencing of the PRA study at the beginning of the research further allowed the researcher to avoid working through the 'contact villagers'. These were farmers selected to work closely with the FBD in the enforcement of the forest management regime. Using these contact villagers would have been an obstacle to reaching greater numbers of villagers, including poor villagers. A similar finding was confirmed by Place *et al.* (2007: 320) in agricultural research in Kenya.

5.2.1.3. Research phases

The three major research phases of the present study were: sampling of households and stratification, questionnaire/checklist design, and analysis and interpretation. The integration of these phases is similar to what Carvallho and White (1996) call 'systematic integration'.

Criteria for sampling and stratification were developed through the PRA study. The formal household and forest surveys were then used to quantify the findings of the PRA study. Through the PRA group discussions lists of criteria for wealth ranking were created. A list of households falling into the different wealth categories was developed, which formed the basis for stratification and sampling of households for the quantitative survey to capture many of the stated wealth indicators over wide areas.

The PRA exercises helped to identity the key issues related to forest management and utilization, which were then built into the questionnaire design for further testing. Some initial analysis of the PRA exercises revealed interesting differences between gender groups and leaders and non leaders. It was thus decided that the quantitative study would be structured to allow these types of stratification. Within each village, households were selected to capture variation: first stratification was done across rich, middle and poor, and across all sub-villages. Across these categories, other variations were sought: gender, female-headed households, 'younger' and 'older' households as well as leaders and non-leaders. The latter was done due to the hypothesis that leadership plays an important role in determining access to forest resources, which was established during the PRA work.

Another major influence of the qualitative on the quantitative data was the notion that forest name, boundaries, ownership and management status are contested and unclear concepts at village level and differed from the perceptions of FBD and the official literature. The surveys thus included the local name of the respective forest reserve established during the PRA work in order to avoid confusion during the survey over which forest was meant. Lastly, the participatory wealth ranking allowed for the development of a list of assets suitable for the study area to be included in the household survey.

During the analysis and interpretation of data, the forest transects did not only provide quantitative data on the condition of the forest reserves but at the same time participant observation was used to understand everyday life and interaction with the forest, watching and talking to whoever walked in, out and through the forest. This revealed aspects of forest resource use and paths of explanation that were not revealed during the village level work. The same analyst was working on the analysis of the quantitative and qualitative data, which is considered beneficial (London *et al.* 2007).

The data collection for this study took place between April 2005 and August 2006. The researcher recruited a team of research assistants, who were trained in the required research methodologies prior to collecting the data. The research team consisted of two PRA facilitators and one translator; two to three enumerators during the household surveys; two to three transect recorders and one botanist during the forest transects. To facilitate the forest transect work one transect cutter was locally recruited from the surrounding villages on a daily basis. A field manual was prepared to guide the researcher and her team during the data collection. The manual included checklists for interviews and group exercises for the PRA sessions and data collection sheets for the forest transects.

5.2.2. PRA study

5.2.2.1. Introduction

Participatory Rural Appraisal (PRA), developed in the early 1990s, uses a range of techniques that are facilitating in nature and attempt to be less extractive and more participatory than survey based methods. PRA methods are considered fundamental tools for working in rural situations. Compared to formal surveys, PRA techniques are valued for their multidisciplinary and holistic examination of issues, and their flexible and responsive approach. The primary objective of PRA is the empowerment of local people and stimulating sustainable local action and institutions (Chambers 1994).

PRA data is usually considered robust in that cross-checking and triangulation can be made by professionals while they are in the field (IIED 1994). High validity and reliability can be achieved where properly conducted studies have been validated

against other approaches and sources of information (White 2002, De Vaus 2002, Longhurst 1994). However, PRA studies need to be conducted properly to lead to reliable results. PRA requires particular skills such as team management and facilitation skills and the ability to relate to local people within the context of a reversal of learning. Rushed and uncritical applications of the methodology can lead to biased results.

A critique of PRA studies is that they are affected by individual interest, influence of the facilitator and social dominance and authority in a community. Sometimes leaders let individual factors of interest prevail over wide group participation. The use of PRA techniques for data collection tends to emphasize the expression of general, normative information by consensus, and may therefore fail to identify the differences of opinion within the community. The perspectives and interests of the most powerful section of the community are likely to dominate the expression of consensus, to the exclusion of the views of non-dominant community members. It is for these reasons that Mosse (1994) warns that PRA can lead to the 'construction of local knowledge'. PRA events are usually not equally accessible to all social sections of the community and often women, in particular, and disadvantaged farmers of lower social status are less likely to participate in PRA events or to dominate groups (Place *et al.* 2007:320). The reasons for non participation can be practical (time, distance) and social (fractions, alliances). Furthermore, due to their limited sample size, PRA data is less suitable for comparison across villages because of the different meanings attached to numbers (Place *et al.* 2007).

5.2.2.2. Objective

The purpose of the PRA study was to:

- Collect general population and economic data to construct village profiles;
- Get to know the communities and get known them and to gain trust; get permission for the subsequent household survey and forest transect work;
- Establish an understanding of the patterns of natural resource use, forest resource use in particular and the prevailing forest management aspects and conflicts;
- Construct the sampling frame for the questionnaire survey, in particular the stratification by sub-villages and wealth groups;

- Pre-test aspects of survey methodology, such as how to best ask questions and the effect of alternative question wording on patterns of response.

The present PRA study was carried out during the month of June 2005 in Fulwe and Maseyu villages and during the months of June and July 2006 in Milawilila, Logo, Mwalazi and Ngong'olo villages.

5.2.2.3. Design

Key informants, single and multiple sex groups of up to 31 men or women contributed information in discussions, semi-structured interviews, mapping, diagramming and ranking exercises. In total 204 villagers participated in the PRA exercises in the six study villages. Table 5.1 overleaf provides an overview of the techniques used and the information outputs.

A programme for the PRA study, interview checklists and data entry sheets for the various exercises were prepared beforehand by the researcher to ensure consistency across the gender groups and across the villages. At the beginning of the PRA sessions, informants were encouraged to express their views and participate as freely as possible. All exercises were carried out in Kiswahili.

The villagers worked in gender groups, which were assisted by one trained male and female facilitator each, while the researcher took notes of the proceedings assisted by the translator. In this way, the PRA study involved process observation by the researcher, which introduced another source of triangulation (and validation) and generated valuable information about community structures and relationships. The facilitators recorded their notes and observations in the pre-developed data entry-sheets. The interviews and exercises were carried out so that the various topics of research were covered at least twice from different perspectives (i.e. men and women, village leader and non-leaders). The outputs produced by the villagers, notes of the facilitators and proceedings recorded by the researcher were compared at the end of each field day and the results discussed within the research team for validation.

The activities and discussions lasted two days per village. The researcher visited the villages prior to the PRA exercise for a brief introduction with the Village Chairman and/or VEO to request permission to conduct the research study.

Table 5.1 PRA techniques used in sample villages

Information type	Participants	Total numbers of participants in six villages	Technique used	Information output
Village profile	Village leaders, key informants	12 (Village Executive Officer and Village Chairman in each village)	Focus group discussion Semi-structured interviews	Population and ethnic groups Access to community services Infrastructure and housing Local economy Natural resource features Land ownership, tenure and access Forest resources and management
Role of village environment/forest committee	Village environment/ forest committee members	68	Focus group Venn diagram	History and formation Activities Meetings and records kept Licenses and fees/Dealing with offenders Understanding of JFM Perception of cost and benefits Importance of committee to villagers
Village spatial information	Men, women	124	Village Sketch map Natural Resources map	Village layout and land use Source area for natural resources
Village temporal information	Men, women	124	Seasonal calendar Focus group discussion	Cycle of farm and non-farm activities Livelihoods past and present/trends
Forest resource inventory	Men, women	124	Group discussion Ranking exercises	Species and type of use Preferred species
Forest resource values and perceptions		124	Focus group discussion	Perceptions on forest governance
Wealth ranking	Men, women	124 for indicators	Ranking exercise	Wealth ranking of households picked randomly from village register

To minimise the influence of the leaders on the invitation of villagers to the PRA sessions, participants were randomly pre-selected by the researcher from the village register. This minimized the potential danger of information bias. From the randomly selected households, either a woman, a man, an elderly person, or a young person, were invited so that each sub-village had one representative from each category. This was to ensure both equal representation of all sub-villages and participation of 'ordinary' villagers from various social segments of the community.

To avoid dominance during the discussion and to allow the villagers to talk freely, the leaders were interviewed separately and requested to leave the PRA exercise once their interviews were completed. Furthermore the separate gender groups allowed women to express their views more freely in the presence of a trained female facilitator. Women were more reluctant than men to express their views and to take an active role in group discussions and exercises, particularly in those involving discussion about forest management. Forestry was considered a men's topic.

The selection of experienced Tanzanian facilitators, focus of the research on recording of proceedings and team management, sound preparation of tools and daily team meetings to discuss the results and prepare for the next day were meant to ensure sound application of PRA methods and to reduce the risk of information bias. Careful cross-checking of data from group exercises and key informant interviews with direct observations of the research while working in the study villages was done to increase the reliability of information collected. Nevertheless due to the potentially sensitive subjects under discussion such as forest resource use in state forests, and my perceived position as an outsider with connections to the forest management authorities, people were reluctant to fully disclose their patterns of forest harvesting. Overall, the PRA study is considered to provide a reasonably accurate overview of the prevailing social, economic, ecological and institutional conditions in the study villages within a relatively short time period. The information gathered provided the basis for the construction and sampling of the household survey. The use of PRA methodology was furthermore an effective way of making personal contacts with the villagers and gaining trust as a harmless foreign researcher for the subsequent forest work and household interviews.

5.2.2.4. Wealth ranking

The wealth ranking exercise gave rapid and detailed insight into particular facets of rural wealth differences and local perceptions. The official village register served as the basis list from which names of households were randomly picked for each sub-village. Wealth ranking exercises were guided processes in which facilitators asked for measurable indicators, with some preconceptions about what type of indicators were sought. Groups of men and women from the respective sub-village were then responsible for ranking the households in their sub-village. Participants of small groups of about four people were then ranking the households of particular sub-villages once the criteria for the wealth groups had been established jointly in the larger group. Place *et al.* (2007:316) consider the use of PRA methods for wealth or poverty criteria more efficient than survey and it can be done with relatively few respondents.

Wealth is usually a sensitive issue. Nevertheless the people were open and willing to discuss wealth categories and not reluctant to classify village members according to these criteria. The wealth ranking exercise helped to sharpen differences between types of households because they also sought cut-off levels of the indicators that could sort households into different wealth groups. The most commonly cited relative wealth indicators were lack of or possession of various assets and ability or inability to meet important needs such as educating children or affording health services. The tables in Appendix 7 containing the wealth class indicators reveal for each village that villagers perceive well-being more in terms of assets than in the outcomes of assets and capabilities (i.e. consumption of goods and services). The fact, that poor people are considered lazy and thieves hints at a degree of marginalization. The ownership of a bike proved to be an important wealth indicator in the six villages. Having a house made of bricks indicates being better off, having a thatched house means the household is less well-off. The number of livestock (i.e. chicken, goats) is seen as evidence of wealth. Land acreage held by the household was positively correlated to wealth in this study. These findings are consistent with other participatory poverty assessment studies in Tanzania (e.g. Van Campenhout 2006).

5.2.3. Household survey

5.2.3.1. Introduction

Until the 1980s surveys were the dominant methodology in field research in rural development. Surveys are characterized by a systematic set of data which produces a variable-by-case data grid, often collected through random sampling and structured questionnaires, analysed through statistical techniques (de Vaus 2002, Carvalho and White 1997). Survey research is regarded as inherently quantitative and positivistic. Some of the common problems of surveys relate to the restricted focus as a result of the use of questionnaires with a narrow enquiry. Contrasted to qualitative methods, surveys are described as being rigid and unable to adapt to change once the fieldwork has started, unable to describe qualitative information and hence unable to investigate complex issues of causation. Bias is difficult to eliminate in sampling and interviewing. Nevertheless surveys are considered well suited to providing certain types of factual, descriptive information. By their nature, surveys must assume similar models of behaviour for all households (Place *et al.* 2007). This is beneficial for systematically testing for the effects of specific variables. However, its high degree of complexity can render interpretation difficult. The advantages of surveys are seen in their generation of representative quantitative information reliable with quantified confidence limits. It also generates data that allows comparative analysis across sites and results that can be replicated (White 2002). Survey data allows making inferences which can be generalized more with respect to certain topics (Place *et al.* 2007).

5.2.3.2. Objective

The household survey of this study aimed at obtaining quantitative data on some of the emerging aspects of forest resource use and management identified during the PRA work to complement the qualitative data collected. The survey objectives were to:

1. Collect household asset and income data;
2. Assess socio-economic differentiation between the households in the study villages and their relation to access to and utilization of forest resources;
3. Identify the knowledge and perception of villagers on the prevailing forest governance and management regime.

5.2.3.3. Questionnaire design

The questionnaire was developed to include indicators that were identified to address the three survey objectives described in Section 5.2.3.2 above. In addition it used indicators standardized by the Tanzanian National Bureau of Statistics as 'core poverty module' (United Republic of Tanzania 2006a). The questionnaire was pilot tested through six interviews in Lubungo village located between Dindili and Kitulang'halo forest reserves, which were not included in the main household survey. The type of testing employed was 'undeclared', meaning that it was not disclosed to the respondent that the questionnaire is being tested prior to recording the responses (De Vaus 2002). Once the questionnaire was completed, the interviewer informed the respondents about the test and gathered their views and feedback afterwards. After the testing the questionnaire was reviewed and revised. The final version of the questionnaire used for the survey (Appendix 2) consisted of questions on the subject of:

- **Core household and poverty information (Sections 1 to 6 , and 11) based on the core poverty module**

- **Forest resource use and access (Sections 7 and 9):**
  - Name of forest, frequency of entry
  - Products obtained and type of use (consume/sale)
  - Access and main use of forest, change
  - Benefits obtained
  - Perception on forest quality and its change; effect on livelihood

- **Forest governance (Sections 8 and 10):**
  - Forest ownership and management
  - Existence of committee and management agreement
  - Patrol activities
  - Forest revenue
  - Access to information about rules of access and use of forest reserve
  - By-laws and dealing with offenders, permits
  - Perception on forest governance

The use of factual questions in the opening sections allowed the respondents to become accustomed to the interview process. The core questions on forest resource use and governance then came in the middle of the interview to minimize the risk of reduction in the respondents' concentration and the most sensitive questions were placed at the end. The questionnaire combined 'open' and 'closed' questions. All questions were asked as open questions to which the respondent was free to answer as he/she saw fit. Responses to the closed questions were field-coded in the questionnaire such that they were checked into pre-set response categories that were not shown to the respondent (Sudman and Bradman 1982). To cross-check against the potential risk of misinterpretation of responses, the questionnaire included a set of statements relating to similar issues under different sections which were then cross-checked and compared during the analysis. The questionnaire was translated into Kiswahili and verified by the Institute of Agricultural Extension at the SUA in Morogoro.

5.2.3.4. Sampling

The household survey was carried out in the six villages of Fulwe, Maseyu, Milawilila, Logo, Mwalazi and Ngong'olo. The household is an important level of analysis, as farm households are key decision makers with regard to the management of the resource base and are hence considered the driving force of success or failure to achieve resource conservation policy and poverty reduction objectives at aggregate level (Reardon and Vosti 1995).

The researcher is aware of the difficulties of defining the household as a unit of analysis due to the complexity and variability of the arrangements that people make – either individually or in groups – for providing themselves with food and/or other essentials for living (Guyer 1981, Collier *et al.* 1986). For the agricultural population in Morogoro Region, the household unit is defined in terms of rights to land, with every village household being allocated its own residential plot and farmland by the village government. New households are formed as adult children move out of their parents' house to marry and start their own families, with their own areas of farmland. Within the household, husbands and wives – particularly in the case of polygamous households – sometimes cultivate separate farm plots. The majority of the population in the study area is of Moslem religion and one husband may have several wives living in separate houses. Although household members may then use some or all of the income generated by the sale of crops from these different plots for their individual needs, the subsistence

requirements of the household for food are met by the pooling of the crops produced. The head of the household is responsible for major decisions regarding the allocation of resources within the household. This might explain why some of the households interviewed were female headed, although the women themselves did not declare themselves as household head.

As Table 5.2 below shows, the sample sizes represented between 1 and 7% of the village population. It is important to note that the sampling technique was not adjusted to population size but rather tried to ensure an equal number of interviews per wealth group and sub-village. Therefore, purposive sampling was used to ensure representation of all wealth groups and all sub-villages, so that those sub-villages closest to the forest and those furthest from the forest were represented. Furthermore the purposive sampling ensured representation of both gender groups as well as leaders and non leaders. Usually the chairman and executive officer of the village government and the chairman and/or secretary of the village forest committee were interviewed, as well as other leaders where available.

Table 5.2 Village study sites and sample sizes

Village	Population 2002/03 Census	Population this study*) 2005-2006	Households sampled	Percent of population
Maseyu	2,034	1,328	66	5
Mwalazi	1,697	3,000	62	2
Milawilila	828	910	63	7
Fulwe	6,511	8,630	75	1
Ngong'olo	2,224	2,700	72	3
Logo	1,109	534	60	5

*) Based on information provided by the Village Leaders during interviews.

The remainder of the interviews (n = 371) were carried out in households that were selected through stratified random sampling from the household lists based on the village register. The following sampling procedure was used:

From each sub-village in a respective village 20 households were selected randomly from the village register. These names of households were then given to the small groups of village representatives from each sub-village during the PRA sessions for the

participatory wealth ranking. Given that each village has 4 to 8 sub-villages (see Table 5.9 in Section 5.3 below), per village a total of 80 (4 x 20) to 160 (8 x 20) households had been wealth grouped by the villagers. This constituted the sampling frame of the village household lists classified by wealth. From this sample frame a target sample size of at least 60 interviews per village was set to ensure representation of each of the three wealth groups (rich; middle; poor) with 20 interviews each per wealth group. Representation from each sub-village in the sample frame was ensured. The actual total sample size was 401 households with between 62 to 73 households per village.

The wealth distribution of the total sample and per study village is shown in Table 5.3 below. Again, it is noted, that the aim of the sampling method was to have a balanced representation of the three wealth groups within the sample to allow for wealth disaggregated analysis. The aim was not to represent within the sample the general distribution of wealth classes within the study area, a variable which is not known.

Table 5.3 Wealth distribution of household survey sample

Village	rich	middle	poor	∑
Fulwe				
n	23	26	26	75
%	30,7	34,7	34,7	100
Maseyu				
n	17	27	22	66
%	25,8	40,9	33,3	100
Logo				
n	20	25	18	63
%	31,7	39,7	28,6	100
Milawilila				
n	19	21	23	63
%	30,2	33,3	36,5	100
Ngong'olo				
n	16	30	26	72
%	22,2	41,7	36,1	100
Mwalazi				
n	19	25	18	62
%	30,6	40,3	29,0	100
Sample				
N	114	154	133	401
%	28,4	38,4	33,2	100

When respondents were not available for the interview or declined to be interviewed (20% of all cases) a random selection of substitutes was undertaken from the village register for the particular sub-village to achieve the required sample size. These 'replacement' households had not been part of the household list subjected to the participatory wealth ranking undertaken during the PRA and were therefore ranked retroactively based on their list of household assets, which showed to a large extent consistency with the participatory wealth ranking (see Table 5.5 below).

For each household in the sample, one respondent was interviewed; that person being either the head of the household (67.8% of the sample) or a wife of the head of household (31.9% of sample).[13] 14% of the household heads interviewed were female, 81% male and in 5% of the cases the household head did not indicate the sex. The gender distribution of the total sample is 58.4% male and 41.6% female respondents, which allowed for gender disaggregated analysis.

In addition to the leaders included through purposive sampling, leadership status was established from within the questionnaire through inclusion of two questions relating to i) membership in village government and ii) membership in a village committee.[14] These two were then combined, into the 'leadership status' of the household. This was done since the number of leaders obtained prior to the interview through purposive sampling was very small and this second method allowed identifying a larger number of leaders. The sample then had 34.2% of households with leadership status and 74.8% not with leadership status.

The rate of non-response in the sample was low, although women more frequently than men refused to answer some of the questions pertaining to forest governance and management on the grounds that matters pertaining to the forest were 'men's business'.

5.2.3.5. Interview procedure

Interviews were carried out during April 2006 and from June to August 2006 by three Tanzanian enumerators and lasted approximately 60 minutes per household. The researcher accompanied each interviewer during his/her first five interviews to ensure

[13] In one case a relative of the household head other than the wife was interviewed, which represents the remaining 0.2%.
[14] While the first question generated a sample distribution of 23.7% yes and 76.1% no answer categories, the second generated a distribution of 24.2% yes and 65.6% no answers.

consistency with the interview procedure. Meetings with the interviewer prior and after visiting each of the six villages further ensured consistency and the recording of additional notes and observations. The completed questionnaires were field checked within a couple of days of the interview to minimize errors and missing data items.

The enumerators were sometimes accompanied by a village guide, usually a person selected by the village leaders, who was well known in the village to direct the enumerators to the households and to help with initial introductions. Their presence was important as an indication that the work was being carried out with the knowledge and approval of the village leadership. However, in order to avoid that their presence at the interview would inhibit the respondent from freely expressing their views, even those expressing criticism of village institution and leaders, the person was requested not to participate in the interview and to leave.

Most interviews were carried out outside of people's houses, a setting at which respondents would feel familiar and not be inhibited in their responses. The setting furthermore allowed the enumerators to assess the characteristics of housing through personal observation without directly asking and to note down any other personal observations about the living conditions of the particular household. In some cases the household members had to be followed to their fields where they were undertaking their daily agricultural labour or to a funeral site. In such instances the respondents were formally asked about the condition of their housing facilities.

5.2.3.6. Wealth ranking

Although participatory wealth ranking is considered reliable, one limitation is that it does not allow comparisons across villages because definitions and criteria may vary, resulting in non-comparable distributions (Place *et al.* 2007). As Campenhout (2006) points out, participatory poverty assessments can be a fast and cheap way to gather information about poverty in a geographically limited area like a village or a subvillage, while large-scale surveys are superior in terms of comparability. Wealth ranking derived through participatory methods measures the 'relative' wealth of one particular village. However, the wealth or poverty levels differ between study villages. Therefore, this study used two methods of wealth grouping. First, the households were classified through participatory wealth ranking into three groups – rich, middle and poor – during the PRA sessions which served the purposive sampling of the household survey. Second,

the calculation of an asset level for each household, based on monetary values, provided the basis for the division of the entire sample into asset quartiles. The total asset value for each household was based on the type and number of assets owned valued at the average price across the full sample. The classification based on the total value of assets of the household therefore generated a grouping of households that allows for inter-village comparison. According to Carter and Barrett (2006) the measurement of asset values can help to overcome the various limitations of other poverty measures. The comparison of the result of the two methods of wealth ranking is shown in Table 5.4 below. Both types of wealth grouping were highly significantly positively correlated (Spearman: r=0.417, p<0.01; Kendall's tau_b: r=0.370, p<0.01).

Table 5.4 Comparison PRA wealth grouping and asset quartile groups (in % of respondents)

		Asset quartile group				Total (n)
		1	**2**	**3**	**4**	
wealth group per PRA	rich	56	28	15	15	114
	middle	32	48	49	25	154
	poor	12	24	36	60	132
Total		100	100	100	100	400

(Note: The total asset value (ranges) of the asset quartile groups in TSH are as follows: 1: > 610, 001; 2 = 370,001 - 610,000; 3 = 22,001 - 370,000; 4 < 22,000)

5.2.4. Forest transects

Forest transects were conducted with a method derived from what is called in conservation literature 'disturbance transects' (Ahrends *et al.* 2010; TFCG 2006, Frontier-Tanzania 2005c, Frontier-Tanzania 2001). These measure the type and extent of human use of a particular forest through the number of cuts of trees and poles. However, since the term disturbance is biased, the author of this thesis prefers to use the term 'human use' instead on the grounds that the main purpose of the present study was to assess the condition of the forests as a function of human forest use.

5.2.4.1. Sampling

Table 5.5 overleaf shows the sample sizes of the forest transects. Transects were marked on Tanzania Ordnance Survey topographic maps (Series Y742; 1:50,000) prior to the fieldwork and were laid randomly along the grid to cover areas with access from forest edge (area 0–1 km from identified forest boundary) and areas in the forest centre (all areas further than 1 km from the boundary). Every sub-unit was sampled to ensure that

spatial variations of human forest use within the sites could be assessed. Within these systematic divisions, sampling locations have been randomly assigned before knowing the actual area. This procedure is known as restricted random sampling (Krebs 1999; Moore and Chapman 1986) and allows statistical data analysis. Appendix 3 includes maps with transect lines to illustrate this sampling scheme.

Table 5.5 Forest study sites and samples drawn

Forest Study Site	Forest Size (hectares)	Number of 50 metre sample sections	Percent of total forest area sampled
Kitulang'halo	22,380	169	0.4
Kimboza	4,050	60	0.6
Milawlila	128	20	0.4
Dindili	10,069	80	0.4
Ruvu	30,935	310	0.5
Ngambaula	28	20	0.4

The field assessment was conducted along transects. The randomly assigned transect starting points were U.T.M. grid positions. They were fed into a previously calibrated GPS (Garmin 12), and the GPS navigation aid was used to reach the location. Due to the random sampling, some of the intended transect starting points proved to be impossible to access. In these cases, the nearest accessible area has been sampled instead. In other cases, it was impossible to continue on a particular transect as the thicket became impenetrable or the terrain inaccessible due to rock cliffs. Whenever possible, the survey team moved round these areas and continued the forest transect in a straight line.

The total area of the forest sampled by the transect lines was set to 0.4 to 0.6% of the area and using a compass, all transects were aligned north-south or east-west as far as possible. They were 10 m in width and, depending on the restrictions that the accessibility imposed on the headway, between a minimum of 500 m and 1,000 m in length. Ideally, all transects would have been 1 km in length. However, in areas of impenetrable terrain the forest transects needed to be aborted and on other days, where possible, they were expanded to cover the required sampling intensity in the given time period. The transects were subdivided into 10 x 50 m sections and data was collected separately for these sampling units, from now on referred to as 'plots'.

Changes in vegetation structure were assessed using standard plot-based vegetation sampling techniques (Mueller-Dombois and Ellenberg 1974). Along each 50 m section or plot of the transect the occurrence of the various tree species was recorded using the classification method to obtain a complete list of tree species in each sample (Mueller-Dombois and Ellenberg 1974). This method is based on generalizations about variable plant communities that allow a classification by abstracting from particular properties of individual plant communities. The limitations of this method are that the classification system is, due to the abstraction, only of regional significance and entails an element of personal judgement (Mueller-Dombois and Ellenberg, 1974).

The forest condition assessment required five people: a transect cutter, who went ahead with the measurement tape (50 m), a botanist for species identification and collection of herbarium samples, two observers of human forest use and site conditions and one recorder (the author herself), who also carried a compass.

5.2.4.2. Variables assessed

The assessment focused on relevant vegetation parameters and disturbance indicators. A simple methodology to measure man-made disturbance developed by Frontier and based on Hall and Rodgers (1986) was applied in this study. The methodology has been widely used in forest projects in Tanzania (Frontier-Tanzania 2001, Frontier-Tanzania 2001a, Frontier-Tanzania 2001b, Frontier-Tanzania 2005a, Frontier-Tanzania 2005b, Frontier-Tanzania 2007, Lowe and Clark 2000). In its core essence the Frontier methodology was applied during this study but some adjustments were made, which are described in this section. The Frontier methodology consists of a series of max. 300 m transects (30 m apart) recording all trees (>15 cm in Diameter at Breast Height (DBH) and 3 m long) and shrubs/saplings (<15 cm DBH). Within these two categories, the 'trees' are classified as 'live', 'dead', 'new cut' or 'old cut'. The Frontier approach was extended in the present study to include:

- **Detailed DBH measurements of standing trees**

Instead of merely distinguishing between two size classes (pole and trees), the DBH was measured for each tree > 15 cm DBH and larger or equal 3 m height at the standard height of 1.3 m above the ground. If at 1.3 m height the stem had growth anomalies, the measurement was taken directly above these. In the absence of a calibrated DBH tape, a normal measurement tape was used, and the DBH was obtained with standard circle

calculations. Trees between 10–15 cm DBH and > or equal 2.5 m height were recorded as poles. In addition the height of each standing tree was estimated. Estimation is not perfect and cannot claim precision. However if consistently done by the same person in all samples, any errors have been made consistently and should thus not make a difference to the comparison between the forests.

- **Recording of withies**

Recording of withies using the definition of Hall and Rodgers (1986) as a pole about 2 to 10 cm DBH and < or equal 2 m long was included in the study method.

Whereas poles, locally known as *nguzo,* are used for supporting structures during house construction, withies, in Kiswahili called *fitu,* are used to hold mud and thatch in place.

- **Recording of cuts**

The Frontier methodology was followed in that for each plot the number of old and recent cuts of timber trees and cuts of poles was recorded. In addition the cuts of withies were recorded as well. A "recent" cut is regarded less than 6 months ago. The "age" of the cutting was assessed by the colour of the tree stump, the crown and the surrounding surface area (Ahrends *et al.* 2010; TFCG 2006, Frontier-Tanzania 2005c, Frontier-Tanzania 2001, Graham *et al.* 2000). As Graham *et al.* (2000) describe "for a few months after felling the cut ends of the stump remain brown in colour. Within a year they have generally bleached grey or white. Eventually, under the combined actions of termites, boring insects, fungi and fire the stump decays away. In summary, a stump less than 6 months old is conspicuous by the state of the crown, colour of the cut ends, and presence of debris and clearing of the surrounding area. By 12 months the crown is bare and may be partly burnt away, the colour of the wood is grey and the vegetation of the ground round the stump shows little discontinuity. It then becomes impossible to assign an age with any confidence."

- **Species identification**

The various tree species that occurred throughout the 50 m plots were identified and recorded. While in most cases the identification could be made in the field, approximately 350 samples were collected for subsequent identification by the botanist in the herbarium of the University of Dar es Salaam.

- **Assessment of canopy cover, ground cover and liana density**

At the end of each 50 m plot the canopy cover, ground cover and liana density were assessed. Canopy cover was estimated as percentage of the sky being covered by the tree layer. Various methods exist to measure canopy integrity, commonly expressed as percentage cover. These methods range from sophisticated methods of using fish eye camera lenses to simple methods as using sighting tubes. The present study used a simple method with sighting tube during which the researcher assessed the percentage cover at four different points within a 10 by 10 meter square which were then averaged. The estimates were assigned to relatively robust percentage categories (> 5%, 5–10%, 10–20%, 20–30% etc). Although precision of the absolute percentage value is questionable, they can however validly be compared as they were estimated by the same observer throughout the study. Liana density was described through a scaling system between 0 and 5 (see Table 5.6 below).

Ground cover was assessed through three variables: the amount of grass, the amount of leaf litter and the amount of seedlings. For each of these variables a scale from 0 to 5, indicating increased intensity, was used.

Table 5.6 Liana density score

Score	Liana density
0	No liana
1	Very few
2	Some
3	Thicket with some liana
4	Thorny thicket with some liana
5	Lots of liana/impenetrable thicket

- **Accessibility parameters**

A score of accessibility (Table 5.7 below) of the terrain was calculated based on the following parameters and attributed to each plot based on the field notes:

Table 5.7 Accessibility scores

Score	Description	Attributes
1	easy	flat, no rocks, no streams or dry riverbeds
2	medium	slight slope, some smaller rocks, small stream or dry riverbed
3	difficult	medium to steep slope, big rocks, medium stream or dry riverbed
4	very difficult	very steep slope, many big rocks or cliff, larger stream

Furthermore, for each plot, the distance to the forest edge, to the nearest road, the nearest settlement, distance from Morogoro and distance from Dar es Salaam were noted. This has been established subsequently from field notes on the location of any road, settlement or footpath encountered.

- **Recording of other human use**

In the field notes, for each plot any other human use of forest resources (besides cutting) was also recorded. This included: burn marks on trees; traps and snares; pit-saw timber harvesting sites (both old and recent); charcoal production pits (old and recent); farming (both old and recent); mining, evidence of grazing; debarking for medicinal use and parts of tree stems removed for tool making. The purposes of such signs of human use were interpreted by the local villager leading the transect team through the forest. Evidence of grazing was recorded through encounters of livestock and cow dung during fieldwork.

5.2.5. Data analysis and interpretation

5.2.5.1. Forest data

In order to investigate research question one, experimental study design was used, allowing an analysis at two levels of comparison between JFM forest plots (experimental group) and non JFM forest plots (control group), the results of which are presented in Chapter 6 below:

- A plot wise comparison across the entire sample (N=659), to investigate the overall forest condition in the study area and major differences between JFM plots (N=249) and non-JFM plots (N=410);
- A pair-wise comparison across sites between the two forests (one from each group) within the three sites. The latter was done to investigate the differences between the three sites, which are ceteris paribus, due to the different JFM approaches.

The terms forest condition and forest quality are often used as synonyms in the literature measured through a range of variables. Commonly these are bio-physical indicators such as the number and density of trees, diameter of trees at breast height (DBH), basal area, canopy density and species richness (Ravindranath N. H. *et al* 2004). This is then differentiated from forest 'disturbance' measured through the number of cut

trees and poles in a forest. Without conservation bias, this shows the level of 'human use' of wood resources harvesting and other forms of anthropogenic use of the forests.

In the present study the term 'forest condition' is defined as encompassing two elements: i) the quality of the forest; and ii) the extent of human use.

Forest quality (i) is measured through the following variables:

- Number of standing trees per plot (Trees)
- DHB value of all standing trees per plot (DBH)
- Height of all trees per plot (Height)
- Number of poles per plot (Poles)
- Number of withies per plot (Withies)
- Number of naturally dead trees and poles
- Canopy cover
- Liana density
- Leaf litter, seedlings and grass coverage
- Species richness (average number of species found per plot)

For these variables mean values per plot have been calculated.

To measure the extent and type of human use of the forests (ii), mean values per plot have been calculated for the following variables:

- Number of trees cut per plot
- Number of poles cut per plot
- Number of withies cut per plot
- Other forms of human use, including: recorded incidences of burning, footpaths, traps, sawpits, charcoal burning sites, farm fields, mining sites, grazing, tool making, debarking.

Thus, in this study, forest condition describes the bio-physical indicators of forest quality as well as the extent of human forest use leading to disturbance of the bio-physical qualities of the forest.

Potential explanatory variables to be used for the analysis of predictors of human forest use through multiple regression analysis included the following:

- Distance from Dar es Salaam
- Distance from Morogoro
- Distance from nearest feeder road
- Distance from village
- Distance from forest edge
- Accessibility/ease of access scoring scale
- JFM

The Kolmogorov–Smirnov test of normality (Field 2005) showed significantly non normal distribution for the majority of variables across the full sample, the two groups (JFM/non JFM) and the six forests. Thus, non parametric tests were used to assess statistical significance of the differences between groups. Where a variable was normally distributed, both parametric and non parametric tests were used.

5.2.5.2. Household data

The analysis of the household data reflects the experimental study design by comparing the experimental (three village adjacent to JFM forests 'JFM villages') and the control group (three villages adjacent to the forests under sole state management 'non JFM villages'). The data gathered through the household survey was, where appropriate, triangulated with results from the qualitative PRA research and personal observation.

The data set was first disaggregated and compared for the two groups. Subsequently, to investigate the equity question, the data was further disaggregated by the four asset wealth groups, by gender and into the sub-samples of leaders (N=137) and non leaders (N=263). The gender analysis used sex of the respondent (male=234, female=167) or sex of the household head (Male=324, Female=56, missing=21) as grouping variable, depending on whether the question was about individual opinion and behaviour or household level decisions.

The Kolmogorov-Smirnov test of normality showed significantly non-normal distribution for the majority of household level variables. Thus non parametric tests were used to assess statistical significance of the differences between JFM and non JFM households. Where a variable was normally distributed, both parametric and non parametric tests were used.

It is important to note that in this study total household income could not be calculated. This is because people were reluctant to give reliable quantitative information on their household cash income. The wealth groups were therefore formed on the basis of household asset wealth. In contrast, forest income could be calculated as people indicated the type of forest products collected and sold as well as the prices. The study did not distinguish between cash and subsistence forest incomes.

In order to determine how important forest income is to people, this study compared forest income to total household asset wealth. The author of this study is fully aware that comparing income (a flow variable) with wealth (a stock variable) has limited illustrative validity only. Forest income is better compared to total income (annual flow variables). In a limited way forest income can be compared to total wealth, provided one is aware of comparing a flow variable with a stock variable. A Maasai, who owns 400 head of cattle, but only consumes blood and milk and wears a blanket and beads, has enormously high wealth and very low income. The translation of wealth into income or income into wealth is thus not a linear or proportional process. Nevertheless, the comparison made here can serve as an approximation of the relative significance of forest income to the households and the wealth categories.

5.3. The study sites

The three research sites of this study are located in the Uluguru mountains in Morogoro Rural District. This district is one of the six districts that comprise Morogoro Region in the mid-eastern part of Tanzania about 196 km south west of Dar es Salaam (see Figure 5.2 overleaf). The six forest reserves and six villages selected as study sites based on the criteria outlined in Section 5.1 above are shown in Table 5.8 below and Figure 5.2 overleaf.

Table 5.8 Study sites: Forest reserves and villages selected for the study

Site	Forest Reserve	Adjacent Village	Study Group
1	Kitulang'halo	Maseyu	Experimental Group
	Dindili	Fulwe	Control Group
2	Kimboza	Mwalazi	Experimental Group
	Ruvu	Ngong'olo	Control Group
3	Milawilila	Milawilila	Experimental Group
	Ngambaula	Logo	Control Group

Figure 5.2 Map of Eastern Arc Mountains, including Ulugurus and Morogoro

Table 5.9 and 5.10 below present an overview of key data about the six study villages and forest study sites. The forest study sites focused on forest reserves in two ecological zones: Tropical Lowland 'Coastal' Forests in Kimboza, Ruvu, Milawilila and Ngambaula, as well as sub-montane gradational lowland coastal forests and m*iombo* woodlands in Kitulang'halo and Dindili. Six forest reserves were chosen that are all protection forest reserves, meaning they are meant for conservation and not for productive use. With regard to the legal status, four of the forests are under central government ownership by the Forest and Beekeeping Division (FBD) and two are owned by the local government authorities (LGA) at district level. It was also possible to sample institutional differences with regard to the main party that first initiated and/or facilitated the JFM process. These are FBD in the case of Kitulang'halo forest reserve, the regional catchment forest office in Morogoro in the case of Kimbosa forest reserve and a non-governmental organization (NGO) on behalf of the local government administration in Milawilila forest reserve.

The three JFM villages were selected because it was either the only forest adjacent village where JFM had been initiated (i.e. in the case of Maseyu village), or the village which according to the initiators of the process was showing the best performance with regard to the implementation of JFM (i.e. in the case of Mwalazi and Milawilila villages). Chapter 8 below describes the JFM process itself and provides information about the quality of the implementation as part of the governance related analysis.

The six study villages are located in the same district and agro-ecological zone and have similar patterns of livelihood, which are described in more detail in Section 5.4 below. However, there are some distinct characteristics which differentiate the villages, which the researcher gathered through observation and during the PRA. These should be mentioned here.

Maseyu and Fulwe villages in site 1 of this study are located about 150 km west of Dar es Salaam and 10–35 km east of Morogoro municipality on the regional trunk road from Dar es Salaam to the Zambian border in Mbeya region (TANZAM highway). The village of Maseyu was formed in 1974/75 by the resettlement scheme of the mid 1970s villagization policy in Tanzania, when most people were moved from scattered settlements north of the forest reserve to be concentrated near the Dar es Salaam–Morogoro trunk road (Luoga *et al.* 2000). This road now marks most of the southern boundary of the Kitulang'halo forest reserve (Luoga *et al.* 2000a). The highway provides market access and exposes these villages to strong market forces putting pressure on forest resources. The PRA study revealed that in these two villages, charcoal making has replaced farming as the main source of livelihood for both men and women, providing an important source of cash income. Charcoal making is most prominent in Maseyu village. In Fulwe there were richer farmers with large land holdings and mechanized tools. Both Maseyu and Fulwe have no land scarcity and access to public lands forests that provide alternatives to the government forest reserves. In Fulwe, around the northern and western boundaries of the Dindili forest reserve are wide areas of woodlands. With the first settlements having been established there in the late 1990s, these areas have been added as sub-villages of Fulwe named 'Newland A and B'. Its location in the Mikese ward headquarters and closeness to Morogoro municipality provide market access and exposure to outside visitors. There is an agricultural extension officer of the SUA stationed in Fulwe.

Figure 5.1 Study sites, six forest and six villages

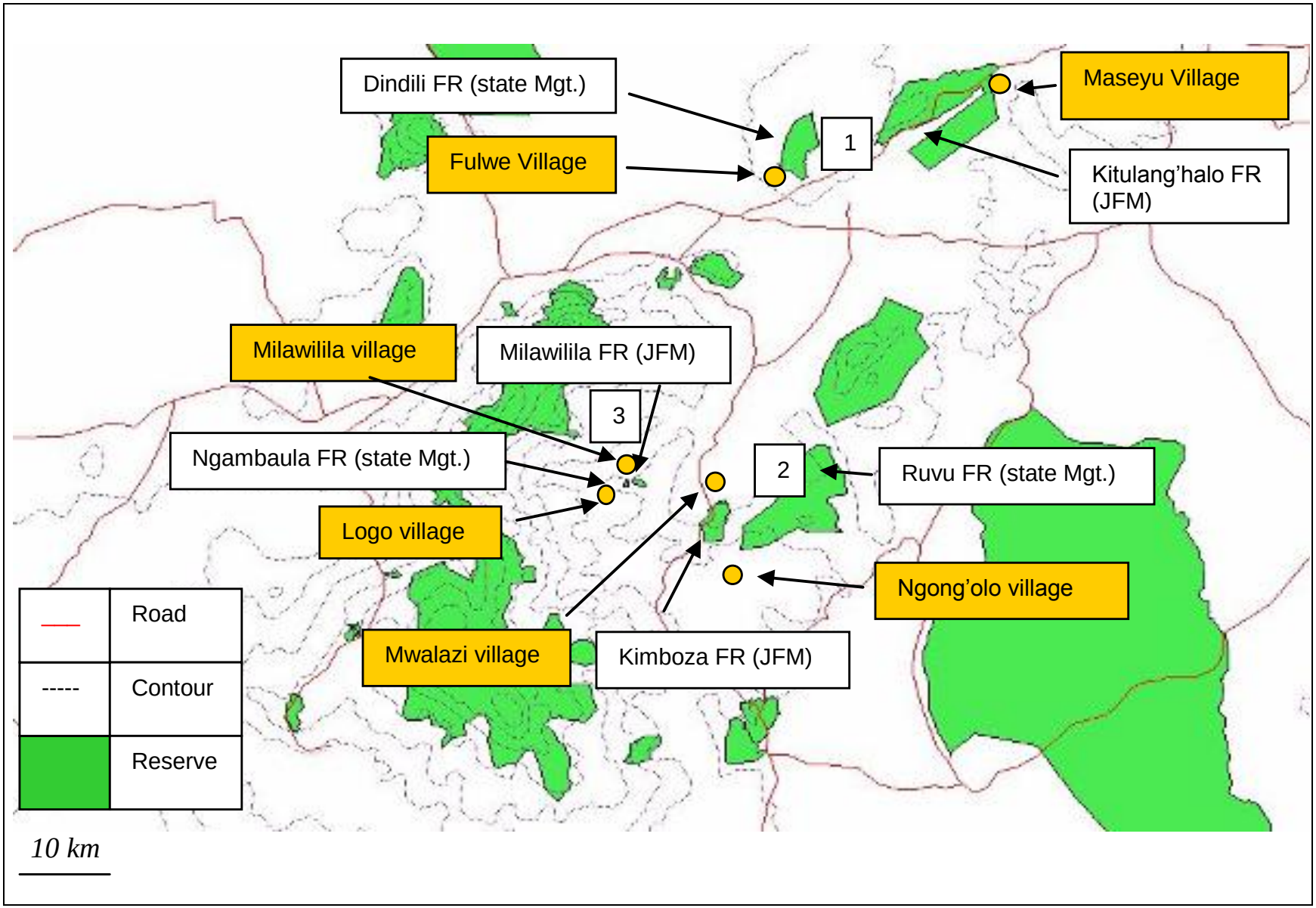


Table 5.9 Key data of the study villages

	Site 1		**Site 2**		**Site 3**	
	Experimental group	**Control group**	**Experimental group**	**Control group**	**Experimental group**	**Control group**
Village	**Maseyu**	**Fulwe**	**Mwalazi**	**Ngong'oloNgong'oloi**	**Milawilila**	**Logo**
Ward	Mikese rural	Mikese rural	Mkuyuni rural	Lundi rural	Tawa	Tawa
Sub-villages	5	7	4	4	8	4
Population	2,034 (2002 census); 1,328 (2006 village records)	6,511 (2002 census); 8,630 (2006 village records)	1,697 (2002 census); 3,000 (2006 village records)	2,224 (2002 census); 2,700 (2006 village records)	828 (2002 census); 910 (2006 village records)	1,109 (2002 census); 534 (2006 village records)
Median age	20.9	21.2	18.2	17.9	16.3	16.8
Migration	Net in migration 100% increase between 1990 and 2000 due to the acquisition of land and charcoal business (Ngaga 2004)	Net in migration due to good pasture and farming land	Neutral. Inward for mining activities, outward to larger towns	Net out migration	Net out migration	Net out migration
Ethnic group	Mixed, some Waluguru, Christian and Muslim	Mixed, mainly Wakame, then Waluguru. Christian and Muslim	Mixed, mainly Waluguru, Christian and Muslim	Waluguru, Christian and Muslim	Waluguru, Christian and Muslim	Waluguru, mainly Muslim
Literacy rate	80%	85%	75%	80%	75%	75%
Land	No scarcity, no household without land, 10-15 acres per household of max 6 people, inheritance patrimonial	No scarcity, 2-3 acres per household owned by men and women. Inheritance patrimonial, access through village government	No scarcity, no households without land, 20-50 acres for household with up to 6 people, owned by men and women, farm sizes increasing, price of land TSH 1,000 per acre to village leaders	Scarcity, 0.25-0.5 acres owned by both sexes, farm sizes decreasing strongly, used to be 10 acres per person 5 to 10 years ago	Scarcity, 3 acres per person owned mostly by men, decreasing sizes about 200 acres in 2005, land distribution through village council	High scarcity. 30% of households without land. 1.5 acres owned only by men. Sizes decreasing strongly from 3-4 acres 5 years ago, old fashioned system of in kind land rent from landlords
Sources of livelihoods	Charcoal making most important (80% of households), followed by farming	Farming, small scale business, charcoal and brick making	Farming, mining	Farming, mining, small-scale business, casual labour.	Farming, small business, brick making, casual labour	Farming, mining, fishing, casual labour
Agriculture	Subsistence crops: maize, millet, grams, cowpeas, beans. Cash crop: Sesame ('simsim').	Main crops are maize, millet, sesame, sunflower, cassava, sweet potatoes and	Crops: Maize, millet, paddy rice, sesame, cassava. Fruits: Oranges, tangerine, mangoes	Maize, rice, sesame, millet, cassava, coconut, banana	Rice, millet, cassava, pepper, coconut, pineapple, banana	Rice, sorghum, sesame, maize, black pepper, coconuts, oranges, pineapple, cassava,

	Site 1		Site 2		Site 3	
	Experimental group	**Control group**	**Experimental group**	**Control group**	**Experimental group**	**Control group**
Village	**Maseyu**	**Fulwe**	**Mwalazi**	**Ngong'oloNgong'oloi**	**Milawilila**	**Logo**
	Poor productivity due to bad weather, poor soils, tools and input supply, in particular seeds and fertilizers	tomato	grown as cash crops and sold to Arusha, Tabora and Dar es Salaam via middlemen.			banana
Livestock	Chicken, ducks, goats	Chicken, goats	Chicken, goats, rabbits, ducks	Chicken, goats	Chicken, goats	Chicken, goats
Non-farm activities	charcoal making, brick making	petty businesses (*biashara ndogondogo*) such as the sale of fruit, brick making	minor timber making, brick making	charcoal making, brick making, beer brewing, mining	brick making, *biashara ndogondogo*	
Forest resource use	Firewood, brick making, building poles, whities, medicines, Kitulang'halo has ritual value	Firewood, charcoal making, timber and building materials. Timber sawing was going on at the time when we were conducting our forest transects.	Fuelwood, brick making	Fuelwood, timber, building materials, medicines, mining, ritual such as rain praying	Firewood, in the past: collection of wild potatoes but not possible anymore due to JFM no access regime	Firewood, poles, building material, timber if available. Most valuable timber has been extracted from the forest
Main source of energy	Firewood	Fuelwood, charcoal, kerosene	Firewood	Firewood	Firewood	Firewood
Village land forests	Mazizi, Mavulu, Madondogo		Kulini, Hembadimala	Kitonga, Luvimbo, Ngerengere	none	none
Schools	2 primary schools	3 primary, 1 secondary school	1 primary school	No. Primary school 4 km away	1 primary	1 primary, 350 students
Health services	Poor. Health centre in Mbwawani (6 kms away)	Poor. Mikese, Mkwambarane, Morogoro	Fair. Kibungo mission dispensary close by	kms away	5 kms away in Tawa	12 kms away in Tawa
Use of traditional healers	Common	Common households	Common	Predominantly	Predominantly	Predominantly
Water supply	Hand pumped village wells, dry out during dry	Some subvillages have piped water. Others hand pumps which are dry	Hand pumped village wells, dry during dry	Hand pumped village wells in 3 out of 4 subvillages, dry during	Hand pumped village wells, dry during dry	Hand pumped village wells, dry during dry

	Site 1		Site 2		Site 3	
	Experimental group	**Control group**	**Experimental group**	**Control group**	**Experimental group**	**Control group**
Village	**Maseyu**	**Fulwe**	**Mwalazi**	**Ngong'oloNgong'oloi**	**Milawilila**	**Logo**
	season	during dry season	season	dry season	season	season
Electricity	No	Three subvillages electrified	No	No	No	no
Communication services	Mobile, those who don't own a phone pay for use to others	Mobile, those who don't own a phone pay for use to others	Mobile, those who don't own a phone pay for use to others	Mobile, those who don't own a phone pay for use to others	Mobile, those who don't own a phone pay for use to others	Mobile, those who don't own a phone pay for use to others
Agricultural extension services	Available, but poor	Extension officer based in Fulwe	poor	none	good. Extension officer in Tawa.	none
Markets (distance)	Chalinze (100km), Morogoro (35km), Mbwawani	Lively road side market at highway in Fulwe, Morogoro (25km), through middlemen (*walanguzi*) from Dar es Salaam	Mkwayuni (20km), Matombo (15km)	Matombo, 10 kms away	Tawa, 5 kms	Tawa, 12 kms
Roads	At regional trunk road (tarmac), poor feeder roads poor, some subvillages without road access	At regional trunk road (tarmac), poor feeder roads poor, some subvillages with poor road access	Close to district gravel road from Mkwayuni to Matombo, other roads poor, most subvillages without road access	Very poor. Narrow rural earth road leading into village about 5km off the Mkuyuni to Matombo road. Inaccessible during rainy season. Most subvillages without road access.	Poor. Close to rural earth road about 10kms of the Mkwajuni to Matombo gravel road. Some subvillages without road access.	Poorest. Narrow rural dirt road, hardly passable

(Source: PRAs conducted in the study villages)

Table 5.10 Key data of the forest study sites [15]

	Site 1		Site 2		Site 3	
	Experimental group	**Control group**	**Experimental group**	**Control group**	**Experimental group**	**Control group**
Forest	**Kitulang'halo**	**Dindili**	**Kimboza**	**Ruvu**	**Milawilila**	**Ngambaula**
Location	South east of the Uluguru mountains, 35 km east north east of Morogoro municipality, access from the Morogoro to Dar es Salaam regional road	10 km from Kitulang'halo forest and Maseyu village along the highway towards Morogoro, 25km north east of Morogoro	Eastern Uluguru foothills, road access from the Morogoro to Kisaki road between Mkuyuni and Matombo villages, south of Kibungo mission	Eastern Uluguru mountain foothills, road access from the Mkuyuni to Matombo road	Southern direction on Morogoro – Kisaki road, turning right after Mkuyuni towards Changa village. 4 km walking from Changa. Forest boundaries within Milawilila village land	Southern direction on Morogoro - Kisaki road, turning right after Mkuyuni towards Changa. Access during this study via a 1km footpath from Logo village
Forest type/ Vegetation	Miombo (60%)/ Sub-montane (30% dry semi-evergreen)	Miombo (40%)/ Sub-montane (60%, dry evergreen forest, closed forest with trees up to 30m. Typical coastal lowland forest, a type that declined during the last century	Tropical Lowland formerly 30-40m high canopy, now extracted, along the road *Cedrela* sp. and teak plantation protruding the forest	Tropical Lowland / Riverine alongside Ruvu river	Tropical Lowland closed canopy at 15 m, more open towards the edge, protects the banks of the Mvuha River	Tropical Lowland, open canopy at 20 m
Legal status	National Catchment Forest Reserve (Protection) since 1955	National Catchment Forest Reserve (Protection) since 1953	National Catchment Forest Reserve (Protection) since 1964	National Catchment Forest Reserve (Protection) since 1955	Local Authority Forest Reserve (Protection) since 1968, in 1914 gazetted as government reserve under German colonial rule	Local Authority Forest Reserve (Protection) since 1986
Altitude	Ridge with an altitude of 350 to 774 m	North south running mountain ridge, altitude of 849m	Karstic plateau with altitude of 300 to 400m	Plateau on either sides of the Ruvu River gorge, altitude of 200 to 480m	Gentle north-east slope, altitude of 320 to 400m	Steep north facing slope above Mvuha River, altitude of 280 to 500m
Climate	Oceanic-continental, estimated rainfall 700-900mm per year seasonally, wet season October to May, dry season June to September	Estimated rainfall 700-1000 mm per year, dry season June to October	Oceanic temperatures, dry season June to August, estimated rainfall 1700 mm per year	Oceanic temperatures, estimated rainfall 1800 mm per year on the western edge, peaks in Dec. and May, decreasing eastwards, dry season July to	Tropical, seasonal rainfall, driest periods September / October, orographic rainfall generated by the Uluguru Mountains	Tropical, seasonal rainfall, driest periods September / October, orographic rainfall generated by the Uluguru Mountain, gets water from nearby river

[15] Sources: Ngaga *et al.* 2004, Luoga 2000a, Luoga *et al.* 2000a, Holmes 1995, Doggart *et al.* 2000.

	Site 1		Site 2		Site 3	
	Experimental group	**Control group**	**Experimental group**	**Control group**	**Experimental group**	**Control group**
Forest	**Kitulang'halo**	**Dindili**	**Kimboza**	**Ruvu**	**Milawilila**	**Ngambaula**
				September on the western edge, longer in the eastern reserve		
Adjacent villages	Lubungo, Gwata Ujembe, Maseyu	Fulwe, Lubungo	Mwalazi, Changa, Uponda, Kibangile	Ngong'oloNgong'oloi, Mwalazi, Kibungo, Kibangile	Milawilila, Mifulu	Logo, Milawilila
Human forest use	Charcoal making	Fires, charcoal making, exploitation of *Brachylaena huillensis* for construction, hunting of forest antelopes, farming		Ruby and gold mining, small scale farming, fire	Mountain paddy cultivation, debarking of trees for medicine, logging of *Milicia excela*, *Albizia versicolor* and *Khaya anthotheca*, commercial hunting of Colobus monkeys, footpath runs through the middle of the reserve.	Mountain paddy cultivation, removal of many tall trees opened up the canopy, understorey dominated by thorny woodland plants, commercial trade of colobus and blue monkey skins, Duiker are hunted
Area	2638 ha	1006 ha	405 ha	3093 ha	14 ha	2.8 ha
Management status	Since 1987 supported under FBD Catchment programme funded by Norway; JFM since 1999 through FBD	FBD, through the Morogoro Regional Catchment Office. No JFM	Since 1987 under FBD Catchment Programme, JFM since 1995 through Morogoro Catchment Office	FBD, no JFM. Forest extension officer at Mwalazi village responsible for Ruvu	Morogoro Rural district forest officer, JFM since 1999	Morogoro Rural District Forest Officer, no JFM

(Sources: PRAs conducted in the study villages combined with literature study)

The aloofness of the village government towards the research team and a tiredness of receiving researchers were obvious signs of the high exposure to visitors. Prior to being allowed to ask questions, it had to be clarified how much people would be paid to spend time with the research team to answer the questions.

Mwalazi village in site 2 seemed to have sufficient farming land, access to forest resources, and the mining in Ruvu forest reserve provides non farm income to mostly younger men. Ruvu is an important locality for ruby mining in Tanzania. Unlicensed mining is carried out in many places in the reserve, the soil cover removed and the whole area disturbed by the digging. Villagers of Ngong'oloNgong'oloi village reported that land scarcity was high and access to land requires providing an "appreciation to the leaders" (VEO and Village Chairman, Ngong'oloNgong'oloi village). The village of Ngong'oloNgong'oloi is remotely located and thus lacks outside contact. There are few opportunities for non farm income other than mining. Upon our arrival in the village on Sunday afternoon the majority of the villagers had enjoyed the only distraction available, the local brew (*pombe*).

In site 3, villagers of Logo village reported that most of the land was owned by a few people. Based on an old-fashioned system, which the Logo Village Executive Officer (VEO) called '*Nyarubanja*' system, the land is rented out in kind to the villagers. This used to be a system of customary law regulating tenure in the West Lake Region of Tanganyika, which was abolished after independence in 1961[16]. *Nyarubanja* is the name given to a group of plantations owned by an individual, usually a clan head or chief. The landlord (*Mtwazi*) rents land to the tenant (*Mtwarwa*), who is allowed to stay on the land and pays an annual tribute in the form of commodities to the landlord and renders his labour (Cory & Hartnoll 1971). Women in Logo were in a very disadvantaged position, "Luguru men use wives as land labourers" (Village Executive Officer, Logo village). The impression of the researcher of Logo being somewhat "backward" was confirmed through the fact that the village was very remote. The only access road to the village was a dirt road, which was not passable for the research team without prior clearing. It was obvious that the road had not been used in a long time. The arriving

[16] Through the 'Act to enfranchise land held by Nyarubanja tenure', Act No. I of 1965, 18th March 1986.

researchers were surrounded by village elders and children upon their arrival making the remoteness of the village and lack of outside contact evident.

Milawilila had relatively fair road access and market access and good agricultural extension services. This is due to its closeness to Tawa ward headquarters. An extension officer of the Uluguru Mountains Agricultural Development Project (UMADEP) of Sokoine University of Agriculture (SUA), Morogoro, was stationed in Tawa. The deterioration of Ngambaula forest reserve and the enforced “no access regime” in nearby Milawilila forest reserve left the villagers in both Logo and Milawilila with no alternatives for their forest resource needs. There was land scarcity and there were few alternatives through village forests or public lands forests.

5.4. Livelihood patterns in the study villages

The descriptive statistics in the following sections serve to compare the socio-economically similarity of the paired villages. The comparison of household categories across the three pairs of PFM – non PFM villages shows that these villages are indeed quite similar. This is important to note, since otherwise observed differences in forest use might be explained by socio-economic differences rather than differences in terms of official management regime (JFM/non JFM).

5.4.1. Land ownership

Almost half (45.6%) of all households interviewed own between 1–3 ha of land (Table A5.1 in Appendix 5). 31.2% own less than 1 ha and a fairly large percentage (13.5%) is landless. Only 5.7% of all households own farms larger than 3 ha and only 3.9% own farms over 5 ha in size. The comparison of land distribution between the six villages shows that households in Fulwe village are comparatively rich in land given that 13.3% of the interviewed households own more than 5 ha of land. In Maseyu the percentage of large land holders is 6%. The gap to the other villages is then fairly large, followed by Logo village where 1.6% of households own over 5 ha and in Ngong'olo 1.4%.

In Milawilila and Mwalazi village none of the households had land holdings over 5 ha. The largest percentage of landless households was found to be in Mwalazi village (22.6%), followed by Ngong'olo (20.8%). In Logo and Fulwe the landless households represented 14.3% and 12%, respectively, of the sample. The smallest number of

landless households was in Maseyu (3%) and Milawilila (7.9%) villages. There was no statistically significant difference between JFM and non JFM villages in land ownership (U=19680.5, p>0.001).

The sample households in Fulwe village owned together 189 ha of land out of which 86% (163 ha) were cultivated in the same year (Table A5.2 in Appendix 5). This shows that Fulwe village is the village with the highest agricultural activity in terms of area cultivated. In Maseyu village only 55% of the total area owned by the respondents was cultivated. This corresponds with the finding of the PRA study that there was a shift in Maseyu village from farming to charcoal production as the main source of livelihood. Certain wealth groups cultivated more land than they owned in the respective year and others cultivated less land than they owned. Villagers in the poorest segment cultivated more land than they owned (Table A5.2 in Appendix 5).

The analysis of the property rights of farm land showed that almost 80% of the respondents were farming on land that they owned. 12.2% were farming on private land provided for free, 7.2% were renting land, 0.5% was farming on share cropped land and 0.5% on open access public lands. Mostly the poorest people were renting land and farming on private land provided for free.

5.4.2. Housing condition

Materials used for house construction are a proxy indicator for relative wealth. Metal sheets for roofs and brick walls are considered to indicate relative wealth compared to houses constructed of mud and grass materials for roofing (*makuti*). The type of bricks (burned or not burned) and other materials used for housing played a role as indicators identified by the villagers during the wealth ranking exercise of the PRA. Consistently across all villages, rich people had houses with burned bricks combined with iron sheets and mud flooring. Middle income people used the same materials but unburned mud bricks. Poor people relied on the old-fashioned poles and mud wall construction with *makuti* roofing. Table A5.3 in Appendix 5 shows the different materials for roofing, walls and flooring used in the different villages. Fulwe village had the highest occurrence of metal sheets for roofing and Maseyu the lowest. Fulwe also had the highest number of respondents with houses that were made with burned bricks and cement/concrete flooring. Poles were the main building material for house walls across

all villages, pointing at the importance of availability of poles from the nearby forests. With increasing wealth (like in Fulwe) bricks were replacing poles.

The cross-tabulation of building materials and wealth group (Table A5.4 Appendix 5) confirmed a significant correlation (Kendall's Tau_b) between asset wealth and the variables 'type of roof' ($r=-0.152$, $p<0.01$) and 'type of floor' ($r=-0.104$, $p<0.05$), while the type of walls was not significantly correlated to the asset wealth. The first asset quartile had the highest number of houses with metal sheets, burned bricks and cement flooring. In addition the number of rooms and the wealth status of the household were also significantly correlated ($r=-0.196$, $p<0.01$), so that wealthier households had more rooms ($M=3$, $SE=0.163$) than poorer households ($M=2$, $SE=0.091$). The building material used for the houses was influenced by the gender of the household head (Table A5.5 Appendix 5). While 49% of houses with a male household head had metal sheets as roofing material almost 62% of houses with female household heads had grass, leaves and bamboo as roofing material. 17% male headed households lived in houses with burned brick walls compared to 7% of the female headed households. Almost 4% more female headed households lived in houses with earth flooring than male headed households.

5.4.3. Education and social services

With regard to the educational level, most household heads (over 50% of the sample) were educated at the Standard 5 to 8 level (Table A5.6 Appendix 5). In Fulwe village 1.3% of the interviewed households had a household head with university education. The percentage of households with no formal education was highest in Logo village with 26.3%. Similarly, the comparison between education and asset group showed that 29% of household heads in the lowest asset quartile had no formal education compared to 14.1% in the richest group (Table A5.7 Appendix 5). However the two variables asset wealth and level of education of the household head were not significantly correlated. The educational level of the household head was significantly influenced by the gender of the household head (see Section 5.4.6 below).

The social services and infrastructure provided at communal level influence as part of the social capital the livelihoods of individual households. The social services situation was similar in all study villages with some slight variations. While Fulwe village was relatively well serviced due to its location at the Mikese ward headquarters, Logo and

Ngong'olo villages were worst off due to their remoteness. All villages except Fulwe have neither electricity nor piped water. The drying up of the traditional wells during the dry season made water supply the most eminent problem for the villagers. Water supply was poor, mostly from public wells or rivers (Table A5.9 Appendix 5) with up to over 40 minutes walking time (Table A5.10 Appendix 5) to reach there. With none of the villages being electrified, firewood served as the main source of energy for cooking for 90% of the households in all villages and across all wealth groups. Firewood was either collected from nearby forests or purchased. Charcoal was produced for sale and served as a source of income rather than household energy. Mobile phone communication was accessible in all six villages and while some of the better off villagers (mostly younger men) owned mobile phones, other villagers could usually purchase phone services from them.

The school and health services situation varied slightly between the villages but was generally described as poor by the villagers in all six villages. Taking natural medicines from the forest or referring to traditional healers was common in all six villages. While people in Maseyu (63%) and Fulwe (43%) had access to a public hospital, there were no health services available in Ngong'olo, Logo and Milawilila villages. Fulwe (18.9%) and Maseyu (26.3%) residents frequently used traditional healers. The majority of respondents in Mwalazi (93.2%) used a private hospital (Table A5.11 Appendix 5). There was no significant difference in the type of health services used between the four wealth groups, apart from the fact that most people who use traditional healers were in the poorest wealth group (Table A5.12 Appendix 5), which was statistically significant (0.01 level, 2 tailed; Pearson's correlation coefficient of 0.223). More female (14.5%) than male (6.7%) headed households used traditional healers (significant at 0.05 level Spearman's rho 0,105; see Table A5.13 Appendix 5).

Fulwe and Maseyu villages had the comparatively best market access out of the six study villages due to their location by the highway. Logo and Ngong'olo villages are worst placed in terms of market access (Table A5.14 Appendix 5). In Ngong'olo, Logo and Mwalazi villages people walk on average over 2 hours (159, 146 and 131 minutes respectively) to reach the nearest market (Table A5.14 Appendix 5). There was no correlation between market access and wealth group. Whereas in all villages, except Maseyu most respondents walked to the market, 54.5% of respondents in Maseyu used

the minibus to reach the nearest market (Table A5.15 Appendix 5). In Maseyu (13.6%), Fulwe (12%) and Mwalazi (11.3%) over 10% of respondents used bicycles as a means of transport, whereas in the three remaining villages the percentage was below 5%.

5.4.4. Sources of livelihood

As Section 5.4.2 above has shown, the main source of household livelihoods in the study villages was agriculture combined with small scale businesses and small livestock keeping. Only teachers and government staff had formal employment, hence the unemployment ratio in these villages was very high. Daily labour on larger farms was an important source of income in particular for people with smaller land holdings or without land. While the inhabitants of the study villages traditionally named farming as their main source of livelihood (85% of the survey respondents), deeper inquiry during the PRA revealed that the yield from the fields they cultivate was too low to make a living. Villagers stated that the conditions for agriculture were not favourable due to the lack of land, infertile soils, lack of inputs, tools and extension services. In cases where people had not mentioned other sources of livelihoods from the beginning, they first hesitantly but then openly explained that they depended on other sources of livelihood, the majority of which was forest resource based. This might be because most of these activities, i.e. mining, charcoal burning, timber and pole harvesting, are conducted illegally in forest reserves.

In Fulwe village the level of livelihood diversification was the highest, with 14.7% of households being self employed and 2.7% being employed in the private sector (Table 5.11 overleaf). The percentage of households that indicated farming as their main activity was only 69.3%. This is comparatively low as in most other villages, except Maseyu, the percentage of farmers was around 90%. In both Fulwe and Maseyu the percentage of self employed households heads was relatively large (Maseyu 21%), which might be due to the charcoal business in these villages and their location directly adjacent to the highway which offers opportunities for economic activities. In Logo and Milawilila villages no household indicated ‘self-employed’ as livelihoods activity and there seemed to be the highest dependency on farming.

A cross-tabulation between the main activity of the household head and the asset wealth group showed that the level of livelihood diversification was low across all wealth groups (Appendix 5, Table A5.16). About 80% of households in all wealth groups

indicated farming as their main livelihood activity. In the richest wealth group it was even 88%, which is most likely due to large landholdings in this group. The lowest asset wealth group had the highest number of self-employed people, which may indicate that this group depends on petty business for survival.

Table 5.11 Main activity of head of household (in % of respondents)

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi	All
farming	69.3	73.8	93.0	98.2	89.1	93.4	85.1
government employee	2.7	1.5	5.3	0.0	3.1	0.0	2.1
private sector employee	2.7	1.5	0.0	1.8	0.0	0.0	1.1
self-employed with employees	2.7	16.9	0.0	0.0	3.1	3.3	4.5
self employed without employees	14.7	4.6	0.0	0.0	0.0	1.6	4.0
unable to work (too old, retired, sick, disabled)	6.7	1.5	1.8	0.0	4.7	1.6	2.9
others	1.3	0.0	0.0	0.0	0.0	0.0	0.3

Business income (29%) and remittances (21.5%) played the most important role as non-farm source of household income, followed by seasonal (7.8%) and occasional (7.1%) labour (Appendix 5, Table A5.17). 16.9% of households indicated other non-farm activities as source of income. A more detailed inquiry into types of non farm income (Table A5.18, Appendix 5), showed that mining was the most important non-farm activity (28.3%), followed by beer brewing (10.9%), casual labour (8.7%), carpentry (6.5%), house-building (6.5%) and weaving (6.5%). Only 2.2% of the respondents indicated charcoal burning as a non-farm activity. This percentage might be so low because charcoal burning is illegal and most respondents would not openly admit to it.

In Maseyu village, 57% of the respondents had business income (Table A5.19, Appendix 5), which hints at the lively charcoal business in Maseyu. Seasonal wages (16.7%) and remittances (15.5%) were also important in Maseyu. In Fulwe, remittances were the most important non-farm source of income (33%), followed by business income (30%). In Logo (24%) and Milawilila (25%) village remittances were the most important source of non farm income. The fairly high percentages of other non-farm activities (Ngong'oloNgong'oloi 28%; Mwalazi 37.8%) and business income (Ngong'oloNgong'oloi 25.5%, Mwalazi 26.7%) hint at the mining activities in this area

(Table A5.19, Appendix 5). There were no significant differences (t-test 0,134) in non-farm activities between the JFM and non JFM study sites (Table A5.20, Appendix 5)

Households were growing between 1 and 8 types of crops at a time (Table A5.21, Appendix 5). Lowest mean values were in Fulwe (M=2.31) and Maseyu (M=2.37) and the largest variety in Logo and Milawilila (M=3.79 and M=3.89). At the same time these two villages had smaller land holdings. This indicates that a variety of crops was grown on small pieces of land, leading to lower productivity. There was no significant difference in the number of crops grown between the JFM and the non JFM villages (t=0.064; independent t-test (Levene's Test). Table A5.22 in Appendix 5 shows a full list of agricultural crops grown by the farmers in the study villages.

In times of food shortages, households were primarily buying food on credit and undertaking casual labour as a coping strategy. Forest related activities, i.e. charcoal and mining, played a minor role, were however more common among richer than poorer people. Searching for edible plants and hunting in the forest was common across all wealth groups, but most common among the poorest (Table A5.23, Appendix 5). As a secondary strategy to overcome food shortages, the forest as a safety net becomes more important. Searching for fruit and hunting was a strategy for about a quarter of households, mostly among the rich. Burning charcoal featured as a secondary strategy only among the poorest households (Table A5.24, Appendix 5). Primary and secondary strategies were identified by asking people about their first choice and second choice of measures (if buying on credit or working on farm failed) to adjust to food shortages.

5.4.5. Household asset wealth

The wealth distribution across the villages (measured in asset wealth) is shown in Table 5.12 below. While Fulwe village has the highest percentage of rich households (29.7%), it has at the same time the highest percentage of poorest people (43.2%), followed by Maseyu (31.8%). Milawilila has the lowest percentage of poor people (7.9%).

Table 5.12 Relative wealth in the study villages (% of households in asset groups)

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
1 (richest)	29.7	28.8	19.0	20.6	29.2	21.0
2	8.1	24.2	31.7	44.4	25.0	19.4
3	18.9	15.2	31.7	27.0	27.8	30.6
4 (poorest)	43.2	31.8	17.5	7.9	18.1	29.0

Table A5.25 in Appendix 5 shows selected wealth indicators, i.e. value of assets in TSH, household size, land owned and land farmed per study village. The wealthiest people (in terms of asset value and land owned) of the sample population live in Fulwe village, the poorest in Mwalazi.

Table A5.26 in Appendix 5 shows the full list of assets owned by the households and the frequency. There were no cattle owning households in the sample. The assets were grouped into the four asset categories: productive assets (PA), non productive assets (NPA), livestock assets (LSA), and land assets (LA).[17] Table 5.13 overleaf shows the mean value of assets in TSH for the four categories disaggregated by wealth group. Wealth group 1 (richest) had the highest mean values for all four asset categories and wealth group 4 (poorest) the lowest mean values with the exception of land assets, where the second richest group had the lowest mean asset value.

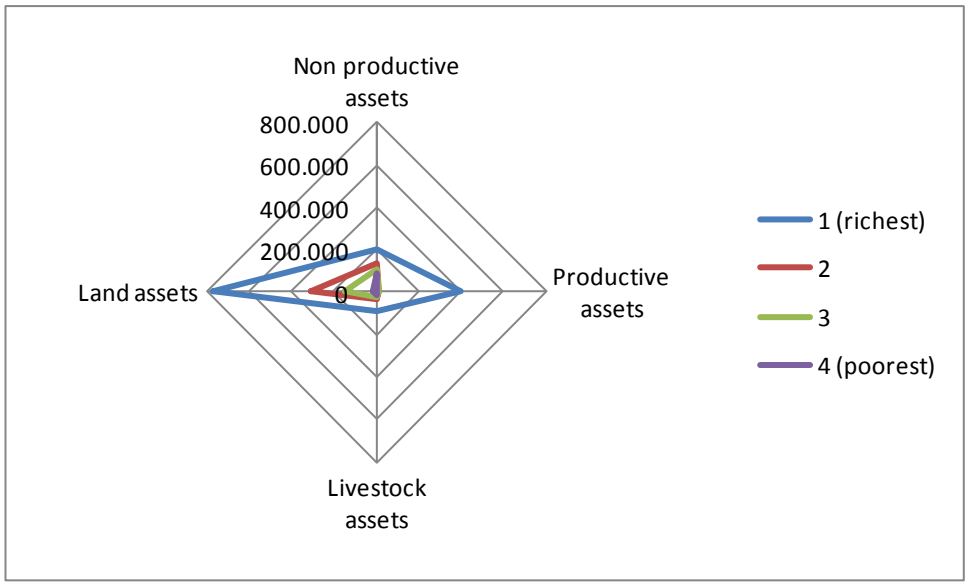
Table 5.13 Value of assets in TSH by household, mean values

		1 (richest)	2	3	4 (poorest)
Non productive assets	Mean	202,809	132,187	109,706	89,251
	Median	143,134	116,418	88,934	87,196
Productive assets	Mean	396,104	9,821	10,745	7,508
	Median	10,547	6,947	6,947	6,855
Livestock assets	Mean	86,255	34,236	22,284	10,674
	Median	39,389	18,381	9,191	2,626
Land assets	Mean	762,871	301,900	149,900	12,500
	Median	600,000	300,000	200,000	0
Total value of Assets	Mean	1,448,039	478,144	292,636	119,933
	Median	879,066	482,881	287,221	121,597

The asset nets in Figure 5.4 below show that the richest wealth group (1) lies clearly above all other wealth groups in total asset wealth and the poorest group (4) has the smallest asset net. The asset values of the different asset categories were higher for the upper percentiles than for the lower percentiles. This result was highly significant based on the Kruskal-Wallis test.

[17] All four variables are significantly non-normally distributed (Kolmogorov-Smirnov: Total value of assets ($D(400)= 0.27$, $p<.05$), Non productive assets value ($D (194) = 0.14$, $p<.05$), Productive assets value ($D (194)=0.45$, $p<.05$), Livestock assets value ($D (194) = 0.29$, $p<.05$) and Land asset value ($D (194)=0.26$, $p<.05$). Grouped into wealth groups, all variables are significantly non-normally distributed in the four asset groups, with the exception of non-productive assets for the second ($D(72)=.08$, $p<.05$) and the third percentile groups ($D(44)=0.13$, $p>.05$) which are normally distributed.

Figure 5.4 Asset nets, types of assets compared across wealth percentile groups



('Original in colour')

The spatial analysis of household asset wealth showed only in site one a significant difference between JFM and non JFM households. Here, the JFM village Maseyu had significantly[18] smaller asset wealth than households in Fulwe village.

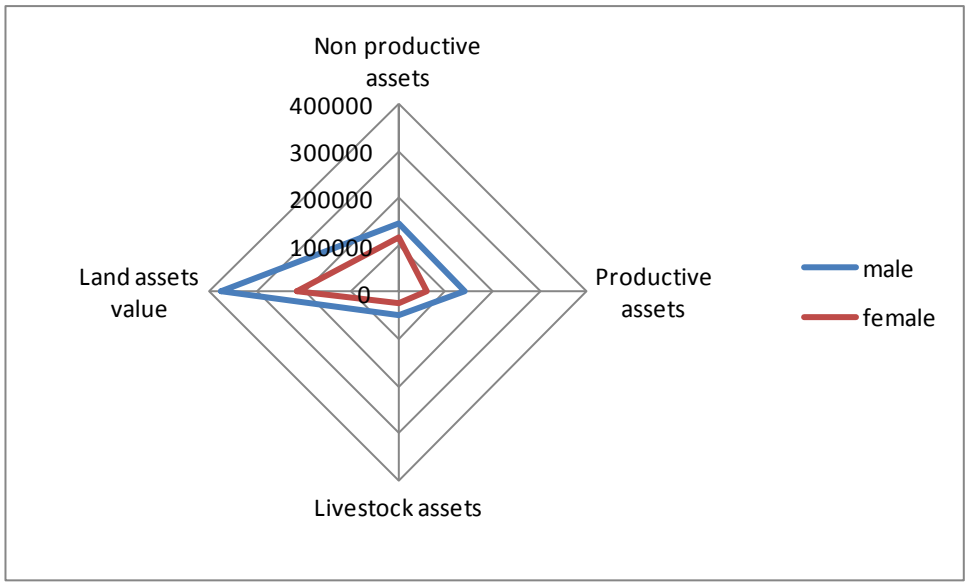
5.4.6. Gender and relative wealth

The sample included 58.4% male and 41.6% female respondents. Among the households interviewed, 85.3% were male and 14.7% female headed. Mwalazi village had with 23% of the sample the largest representation of female headed households and Ngong'olo village the smallest (6.1%). More female (45.5%) than male household heads (18.5%) had no formal education (Table A5.28, Appendix 5). The variables education of household head and gender were significantly correlated ($r=-0.162$, $p<0.01$, Kendall's Tau_b). The majority of female headed households were in the lowest asset category ($r=0.208$, $p<0.01$, Kendall's Tau_b) (Table A5.28, Appendix 5).

The asset nets in Figure 5.5 below (mean values in TSH in Table A5.29, Appendix 5) show that male headed households had on average larger asset wealth than female headed households.

[18] Non-productive assets value $t(138) = 2.81$, $p<.05$ with a small to medium effect ($r=.22$). Productive assets value $t(138) = 1.63$, $p<.05$ with a small effect ($r=.14$). Land assets value $t(57)=2.88$, $p<.05$ with a medium size effect ($r=.36$). Total value of assets $t(138)=1.54$, $p<.05$ with a small effect ($r=.14$).

Figure 5.5 Asset nets (mean values in TSH) by gender of household head

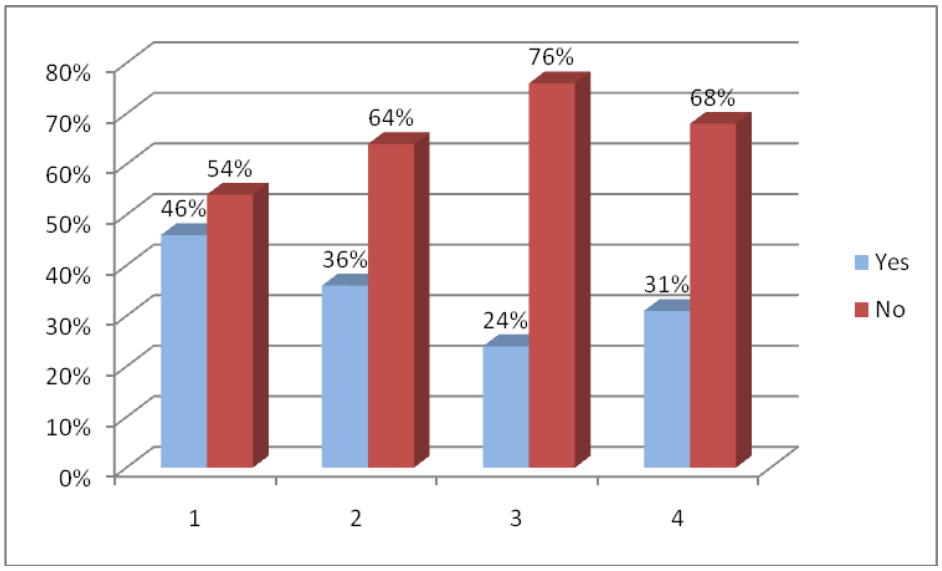


This difference is significant in the case of the variable 'value of productive assets (U=5,981, p<.001) with a small to medium size effect (r=-.19) and in the case of the variable 'value of livestock assets' (U=2,482, p<.001) with a small to medium size effect (r=.20). Also for the total value of assets, this difference due to gender is highly significant (U=5,671, p<.001) with a small to medium size effect (r= -.22). For the other asset categories (productive and land), the Mann-Witney Test reveals a p value larger than .001 and is hence not significant.

5.4.7. Leadership and relative wealth

34.3% of the households in the sample had leadership status, which means either a household member who was part of the village government and/or a member who was part of a village committee. 65.8% of the households did neither have a member represented in village government nor a village committee ("no"). The comparison between leadership status and asset quartile group (Figure 5.6 below) showed that the majority of leaders fell within the first (46%) and second (36%) asset percentile groups. There were significantly more leaders in the richer wealth quartiles than in the poorer ones and leadership status of the household was strongly positively correlated to the asset wealth group with both Spearman (r=0.132, p<0.01) and Kendall's tau_b (R=0.132, p<0.01) correlation coefficients.

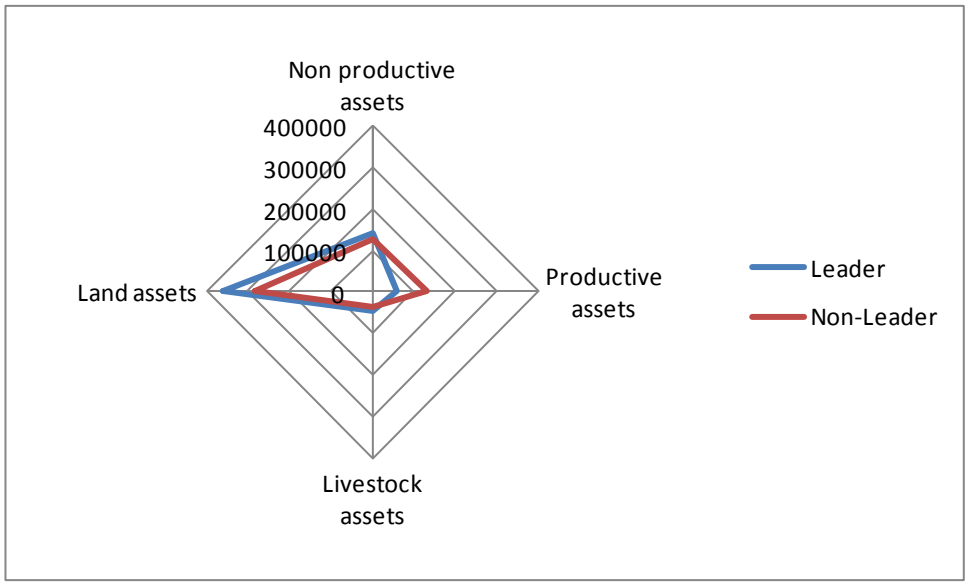
Figure 5.6 Representation of leaders in the asset quartile groups



(Yes = leaders; No = non leaders)

The comparison between leadership status and gender of the HH head showed that out of the households with leadership status, 61% were male headed and 39% were female headed households. However, the correlation between the two variables gender of household head and leadership status did not test as statistically significant (r=0.099, p>0.05, Kentall's tau_b).

Figure 5.7 Asset nets (mean values in TSH) by leadership status



Leaders had higher average asset wealth (M=609,992) than non-leaders (M=583,652) (Table A5.30, Appendix 5), however not at a statistically significant level. Figure 5.7

above shows the asset net for households where the household head had leadership status (“leader”) and those where he/she did not (“non leader”). Disaggregation into the asset categories showed that the higher average land assets value of leaders (M=511,213) in comparison to non-leaders (M=424,457) was significant (U=6.134, p<.001) with a small to medium size effect (r= -.23).

The picture is reversed for the sub-category ‘productive assets’, where non leaders (M=126,971) had larger wealth on average than leaders (M=59,581). The larger wealth in productive assets for non-leaders was significant (U=13,152, p<.001) with a small to medium size effect (r=-.22).

6. Impacts on forest condition

6.1. Introduction

The purpose of this chapter is to answer the first research question "Does JFM influence the physical condition of the forest and forest use patterns? ". The basis of the analysis is the research results on forest condition gathered during 120 days spent in the field, surveying 659 plots of 50 m lengths adding up to a length of 33 km of forest transects.

PFM has been associated with improvements in forest condition (see Chapter 2 above). Thus, it was expected that the surveyed plots in the three JFM forests would contain a higher number of trees, poles and withies than the plots in the control group. If JFM shifts the harvest of timber trees from JFM forests to non-JFM forests, then we would expect to find bigger timber tress. However, trees need a long time to grow and JFM is a fairly recent development. It was implemented in the three sites at the end of the 1990s, which allows for a 5 year time span to time until the data collection through this study took place. Therefore, the effect on trees may not be visible in the data, or if at all, it will be slight. In contrast, poles and in particular withies should show a larger effect. Thus, there should be more poles and withies on average on the experimental plots in comparison to the control group plots. However, if the cutting of poles and withies is considered socially acceptable due to local subsistence needs, JFM forest might still be utilized in this way.

All in all, it is expected that human forest use in JFM forests is less intense than in the control group. These expected results are in line with the general objectives of PFM and the policy goals of PFM in Tanzania (see Chapter 2). Due to the different quality of the JFM process in the three sites, it is expected that the forest condition improvements will be strongest in Milawilila, followed by Kimboza and then Kitulang'halo. This is because the JFM process in the latter forest received the smallest input of external support and showed the highest degree of villagers' dissatisfaction (see also Chapter 8).

Thus, the following hypotheses are applicable:

1. JFM forests have a better forest quality measured through a larger number of trees, poles and withies than in the non JFM forest plots. This result is strongest for withies, milder for poles and smallest for trees.
2. The canopy density is higher in JFM than in non JFM forests.
3. The species richness as an indicator of forest quality will be higher in JFM forests than in non JFM forests.
4. The liana density, as an indicator of disturbance, is lower in JFM forests than in non JFM forests.
5. The occurrence of seedlings and leaf litter on the forest floor is higher in JFM forests than in non JFM forests and the occurrence of grass cover on the forest floor is lower in JFM than in non JFM forests.
6. The extent of human use measured through the number of cuts of trees, poles and withies is lower in JFM forests than in non JFM forests.
7. The occurrence of other forms of human use is less in JFM forests than in non JFM forests, due to the less permeable access regime.
8. The improvement of forest condition in the JFM versus non JFM comparison is strongest in the Milawilila-Ngambaula site, followed by Kimboza-Ruvu. Kitulang'halo-Dindili forest reserves should have the least effect, if there is one at all.

The results of the descriptive and comparative analyses are presented in the subsequent sections. Section 6.2 includes the analysis of the forest quality variables for the entire sample and Section 6.3 analyses spatial patterns of forest quality across the three sites. Human forest use is analysed in Section 6.4 for the entire sample, and then subsequently across sites in Section 6.5. Section 6.6 presents the results of multiple regression analysis to identify variables or factors that influence human forest use and the role that JFM has played. In addition to the quantitative analysis of forest condition through forest transects collecting biophysical data, forest condition was assessed through group discussion and household surveys to understand the perception of the community of forest condition. These perceptions are presented in Section 6.7. Section 6.8 discusses the findings of Chapter 6.

6.2. Overall forest quality in the study area

6.2.1. Timber resources, poles and withies remaining

A total of 7,877 trees, 12,293 poles and 6,041 withies were measured and trees identified in the 659 surveyed forest plots. On average, there were 12 trees per plot (SE=0.33, sd=8.5) with a maximum number of 51 and a minimum of 0 trees per plot. The average DBH value in this study across all 7,877 trees was 25 cm (SE=0.18) with a maximum value of 239 cm and large variation between the trees (sd=16). The tallest tree in the entire sample was estimated to be 45 m and the smallest 2 m, the average height of trees was 11 m (SE=0.08, sd=6.7). A total of 10,887 remaining poles and 11,729 withies were recorded in the 659 surveyed plots. On average there were 16.5 poles (SE=0.48) and 17.8 withies (SE=0.70) per plot, the maximum number of poles recorded on a plot was 74 and the maximum number of withies 92. The large standard deviations of poles (sd=12.35) and withies (sd=18.05) showed that the number of poles and withies in particular varied considerably across the different plots.

The comparison between experimental and control group plots (Table 6.1 overleaf) showed that the JFM plots had on average significantly more trees than the non JFM plots. However, the trees on JFM plots had a significantly smaller DBH value than the trees found on the non-JFM plots. There was no significant difference in the height of trees found between the JFM and the non JFM plots. The larger standard deviations of all three variables in the JFM plots showed that there were larger variations in number, DBH value and height of trees across JFM plots compared to the control group.

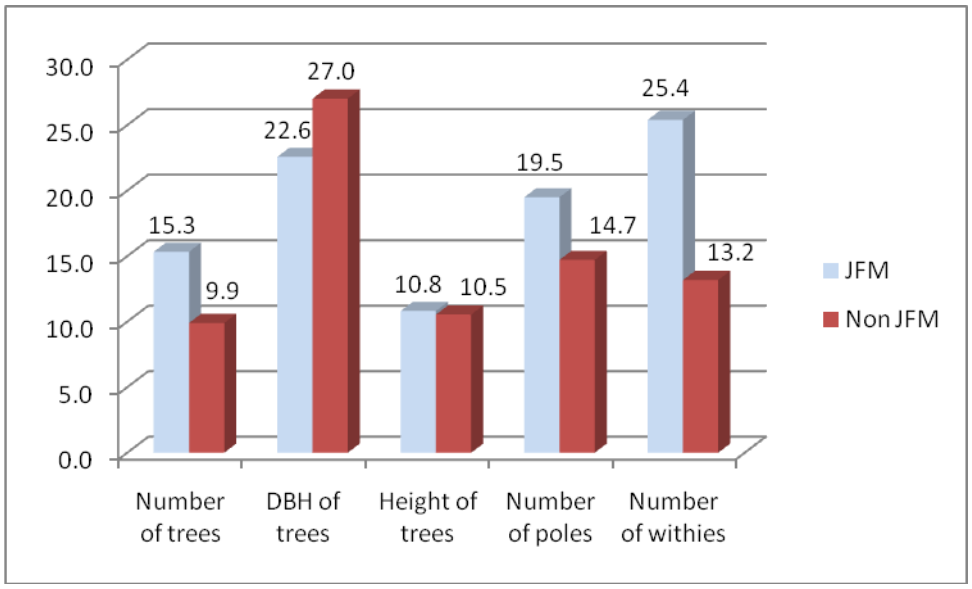
The comparative analysis of remaining pole resources showed a similar picture. JFM plots had on average significantly more poles than the non JFM plots.

The average number of withies was also significantly higher in JFM forest plots than in non-JFM plots. The r values in Table 6.1 overleaf show the effective sizes of the differences between the experimental and control group plots. The strength of difference between JFM and non JFM forests was strongest for withies (r=-0.34), then trees (r=-0.29), then poles (r=-0.24).

Table 6.1 Descriptive statistics, forest quality variables, JFM versus non JFM plots

	JFM	Non JFM	Significance
Trees	M=15.30, SE=0.36, sd=9.97	M=9.99, SE=0.32, sd=6.39	U= 33,366.5, p<.001, r= -0.29
DBH	M= 22.57, SE=0.63, sd=9.7	M=27.02, SE=0.43, sd=8.57	U=33,051.0, p<.001, r= -0.30
Height	M=10.81, SE=0.34, sd=5.43	M=10.62, SE=0.19, sd=3.75	Not significant
Poles	M=19.50, SE=0.73, sd=11.56	M=14.70, SE=0.62, sd=12.47	U= 36,593.5, p<.001, r= -0.24
Withies	M=25.40, SE=1.23, sd=19.41	M=13.20, SE=0.76, sd=15.46	U= 30,194.5, p<.001, r=-0.34

Figure 6.1 Remaining trees, poles and withies: JFM versus non JFM



(Mean values per plot)

As Figure 6.1 above illustrates, the JFM plots had a comparatively increased abundance in wood resources, which represent a 54.5% increase towards the non JFM plots in terms of tree coverage, as well as 32.7% and 92.5% improvement in the abundance of poles and withies respectively. However, with regard to DBH value, the JFM forests show an almost 20% reduction compared to the non JFM forests. This might be explained by the fact that the JFM forests were harvested intensely in the past (see Section 4.3.4 above). Despite the lower DBH value, the above results are beginning to lend support to the idea that JFM forests are of better quality than the non JFM forests measured in abundance of the wood resources. There are variations across the three sites and additional variables were explored in order to confirm this result.

6.2.2. Naturally dead trees and poles

Naturally dead trees and poles are part of the forest regeneration cycle and thus indicate forest health. A total of 1,911 naturally dead trees and 1,857 naturally dead poles were recorded with an average of 3 of each per plot and little variation across the study area (sd trees=3.28; sd poles=3.44). There was no significant difference between the two groups.

6.2.3. Canopy cover and liana density

Canopy cover indicates how closed the forest is (Ravindranath N. H. *et al.* 2004). Canopy cover was on average higher in the JFM plots (M=17.3, SE=1.45, sd=22.83)

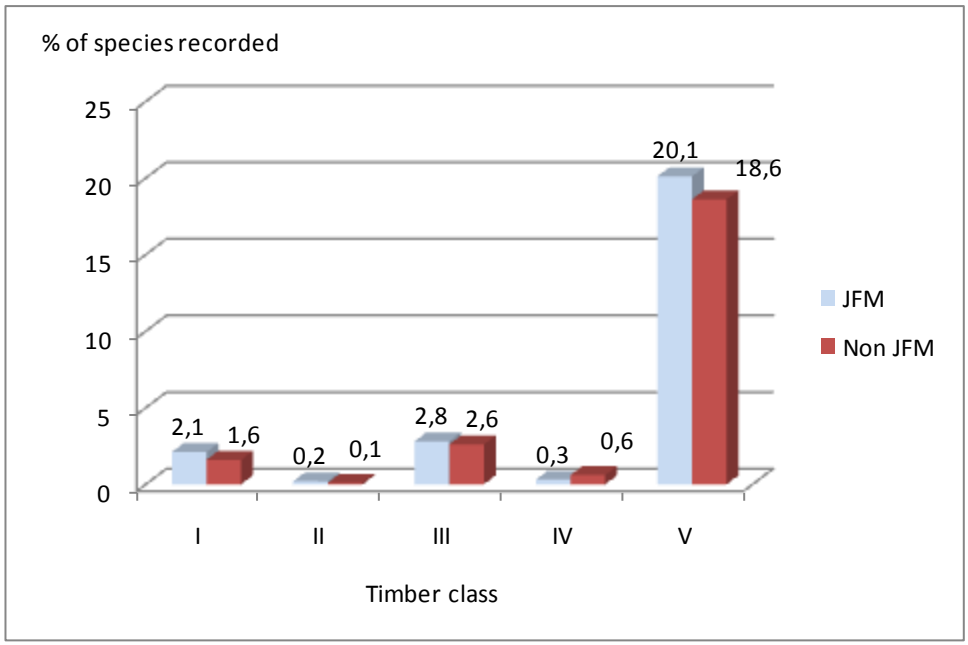
than in the non JFM plots (M=12.1, SE=0.87, sd=17.59). However, this difference tested to be statistically insignificant. This might be a result of big trees having been removed from JFM forests.

Liana density indicates forest disturbance within the lowland coastal forest habitat (Mwasumbi et al. 1994). Thus, a high density of liana most likely points at disturbance that originated from before the introduction of JFM. Liana density was on average higher in JFM plots (M=0.8, SE=0.095) than in non JFM plots (M=0.7, SE=0.065), hinting at higher rates of forest disturbance in the past. However, this result was not statistically significant, neither in the plot-wise comparison, nor in the pair-wise comparison across the three sites.

6.2.4. Species richness

Species richness measures the average number of species per plot and is considered an indicator of forest quality (Ravindranath N. H. *et al.* 2004). Species richness in this study was on average significantly (U=39,789, p<.001, r= -0.19) lower (M=7.55, SE=0.14, sd=2.18) in the JFM plots than the non JFM plots (M=8.50, SE=0.14, sd=2.79). Appendix 6 contains a full list of species found in the six forest reserves. On average 79% of all species found were timber class V species, which are of lower value according to the classification of the Tanzanian FBD (United Republic of Tanzania 2002). On average only 8% of all species found in JFM forests and 7% in non JFM forests were class I species. Figure 6.2 overleaf shows the mean values across the forest plots of the species found in the different timber classes from I to V. It shows that there is no significant difference between control group and experimental group. The complete lack of class I to IV timber trees is interesting and shows that all the six forests have been logged heavily and there is not much left to harvest. Given hundred years of logging this is not surprising. In the past these forests hosted class I to IV timber species, such as *Pterocarpus angolensis (Mninga), Afzelia Quanzensis (Mkongo), Milicia excelsa (Chlorophora e.) (Mvule), Dalbergia melanoxylon (Mpingo), Albizia gummifera/schimperiana(Mkenge), Antiaris toxicaria (Mkula), Khaya nyasica (K. anthotheca) (Mkangazi), Khaya anthotheca (Mkungazi)*. JFM would not be expected to really have made any difference in the short time frame of its implementation and the heavy earlier logging in the JFM forests in the past.

Figure 6.2 Timber classes, JFM versus non JFM plots



6.2.5. Leaf litter, seedlings and grass coverage

In contrast to liana density, leaf litter, grass and seedling coverage on the forest floor responds on an annual cycle to forest disturbances. Therefore, responses to human forest use in these three variables were expected to show up more clearly in the JFM versus non JFM comparison. Table 6.2 overleaf confirms this expectation. The occurrence of seedlings and leaf litter on the forest floor was significantly higher in JFM plots than in non JFM plots. In contrast, there were significantly fewer plots with predominantly grass coverage among the JFM plots than amongst the non JFM plots. These results combined indicate better forest health and less canopy opening on the JFM plots, which is consistent with Section 6.2.3 above. The lower grass coverage makes it harder for fire to invade the forest. This may be an explanatory factor for the lower fire intensity in JFM forests (see Section 6.5 below), as much as a stronger protection regime.

The results of analysing these three variables are highly compatible with the findings of higher numbers of tree, poles and withies resources in JFM plots in Section 6.2.1 above. This shows that the JFM forests are regenerating better than the non-JFM forests. The following section will investigate whether there are variations to this overall finding in the forest pairs across the three sites. This will provide the basis to explore potential

implications of such variations on livelihoods and potential institutional explanatory factors in Chapters 7 and 8.

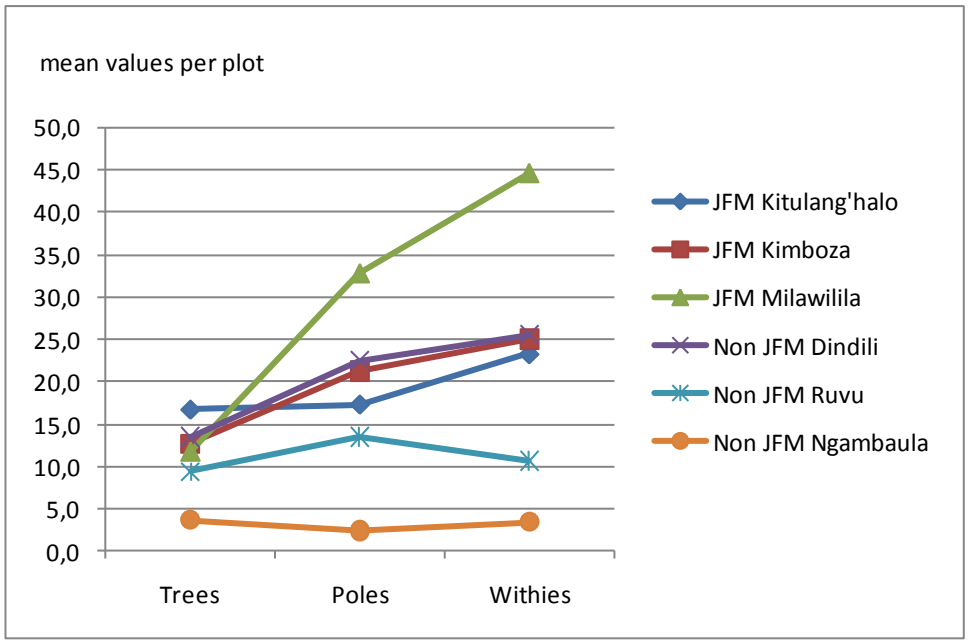
Table 6.2 Descriptive statistics, ground cover variables, JFM versus non JFM plots

	JFM	Non JFM	Significance
Seedlings	M=2.20, SE=0.12, sd=1.92	M=1.10, SE=0.08, sd=1.54	U= 33,796, p<.001, r= -0.30
Leaf litter	M= 2.78, SE=0.12, sd=1.92	M=1.53, SE=0.08, sd=1.59	U=32,639.5, p<.001, r= -0.31
Grass	M=1.15, SE=0.11, sd=1.73	M=2.06, SE=0.08, sd=1.79	U=36,297.5, p<.001, r=-0.26

6.3. Spatial patterns of forest quality across the sites

Figure 6.3 below illustrates the spatial variation of trees, poles and withies across the six forests. While Milawilila has the highest average number of poles (M=33) and withies (M=45) per plot of all forests, Kitulang'halo scores highest with its mean value of 17 trees per plot. The non JFM forest Ngambaula scores lowest in all three variables – number of trees (M=3.7), number of poles (M=2) and withies (M=3) – followed by Ruvu, which is on the second but last position of all six forests. The lines demonstrating forest quality for Kimboza and Dindili forest run almost parallel, indicating that there is not much difference in forest quality, although one is a JFM and one a non JFM forest (albeit in different sites). In other words, although Kimboza the JFM forest in site 2 scores higher in forest quality than its control group forest Ruvu, it is still at the same level of quality as Dindili the non JFM control group forest in site 1. This indicates that the forest management regime is not the only explanatory factor for the difference in forest quality variables presented here. Other physical factors were explored in this thesis to the extent possible in Section 6.6 below.

Figure 6.3 Remaining trees, poles, withies, spatial comparison across the six forests



('Original in colour')

Taking a closer look at the trees in the forests, it was noticeable that although Kitulang'halo forest reserve hosts the largest average number of tree resources in the entire sample, the trees were at the same time lowest in DBH (M=18.0) and smallest in height (M=8.1).This indicates that the trees are young in age. It points towards heavy harvesting in the past, with regeneration in recent years. On the other hand, this result could also indicate that as soon as trees reach a certain maturity they are harvested selectively, despite JFM. This assumption is supported by personal observation of the researcher during the transect work. Valuable trees of above average size in Kitulang'halo had been marked by chipping a small piece off the stem with an axe. Our local village guide, who happened to be the secretary of the forest committee, explained that this meant that somebody had 'reserved the tree' so that it could not be cut by anybody else.

Milawilila holds first place among the six forests in average DBH value per plot (M=37.5). Kimboza forest hosts the tallest trees (M=17.0) within the sample. In this latter case, the result could be biased due to the fact that some of the trees recorded in Kimboza were *Cederela odorota*, an exotic fast growing species introduced as an inside forest plantation by the FBD in the 1970s. Furthermore, Kimboza as a lowland wet forest is environmentally more conducive for trees to grow tall than some of the drier forests in this sample. Tree height is partly influenced by the forest type. Kimboza and

Milawilila are both forests on the wetter lowlands. Kitulang'halo, Dindili and Ruvu are drier and rockier so that trees get naturally shorter.

Higher abundance of taller and bigger trees is usually correlated to higher canopy density of the forest. In this sense the data analysis showed consistency across the results of the various variables: Milawilila had the highest average canopy density (M=49.4, SE=5.26), followed by Kimboza (M=36.4, SE=3.46). However, the large standard deviations (Milawilila: 23.5; Kimboza: 26.79) indicate that this was not a consistent picture across all plots. Dindili (M=3.1, SE=0.37, sd=3.34) and Ngambaula (M=3.4, SE=1.63, sd=7.3) had the lowest canopy density. In the case of Ngambaula this well matches the earlier findings of few and small trees, showing that there is not much real forest left. In the case of Dindili, the low canopy density combined with fewer but comparatively big and tall trees, hints to the fact that there are mature trees, which are however selectively logged out, leading to canopy gaps. The data for the various forest sites is included in Tables A4.1 to A4.3 in Appendix 4.

Site 3 showed the strongest positive difference in forest quality of a JFM forest, Milawilila, in comparison to the non JFM forest, Ngambaula (Figure A4.1, Appendix 4). Out of the six forests, Milawilila had the highest species richness and Ngambaula the lowest. The improvement of the JFM forest in comparison to its non JFM control group forest is 3.5% for the number of trees, 5.2% for the DBH and 59% for the height of the trees. The higher abundance of poles and withies recorded in Milawilila presented a 57% and 136% improvement respectively when compared to the neighbouring non JFM forest Ngambaula. This corresponds with the finding that Milawilila village had the best JFM regime out of the three sites (see Chapter 8). However, there are indications that this impressive impact that JFM may have had in Milawilila, may be partially based on a displacement effect due to the well enforced access restriction in Milawilila, which may have aggravated the poor forest quality of Ngambaula (see also Section 7.5 below).

6.4. Human forest use in the study area

6.4.1. Types and extent of human forest use found

Various types of human use were found in the forests throughout the study area. A total of 1,214 cuts of trees, 3,193 cuts of poles and 14,163 cuts of withies were recorded over a period of five months (between April 2005 and August 2006). Every forest and 86.9% of all the plots had evidence of some form of human use (Table 6.3 overleaf) while 13.1% of the plots had no evidence of human use. This included cutting of poles, trees, withies, firewood and bark, farming and animal grazing inside the forest reserves, the presence of charcoal pits, pit sawing structures, woodcutter and charcoal maker camps, animal traps, footpaths, mining sites, incidences of burning of trees and taking of parts out of the tree stem for tool making. To avoid bias, only those incidences of fire were included in the transect records that looked like obviously set through human activities. For example very common were signs of burning of single timber trees possibly to justify illegal harvesting thereafter, given that they were damaged anyway.

6.4.2. Cutting of trees, poles and withies

The entire sample included a total of 10,988 recorded trees, out of which 72% were standing, 11% had been cut and 17% had died naturally. The ratio of tree cuttings to standing trees is 6.5:1; in other words, about every sixth tree had been cut. A total of 45% of all plots on which trees were recorded had tree cuttings.

It is interesting, however, that only 20% of all cuttings of trees were recent cuts (less than 3 month old), while the remaining (80%) were old.

Out of the total 15,032 poles recorded, 72% were standing, 16% had been cut and 12% were naturally dead. The ratio of pole cuttings to standing poles was 4.8:1. In other words, about every fifth pole had been cut. A total of 62% of all plots on which poles were recorded had pole cuttings. The percentage of recent cutting of poles (4%) compared to old cuttings (96%) was even lower than for trees.

Table 6.3 Human forest use in the study area and extent across all the sample plots

	Pole cutting	Withies cutting	Tree cutting	Burning	Foot-path	Pit sawing	Charcoal making	Mining	Farming	Trap	Parts of tree taken	Grazing	Debar-king	Total
No of plots with human use	409	370	299	155	67	51	30	18	15	13	11	8	2	573
% of plots with human use	62.06	56.15	45.37	23.52	10.17	7.74	4.55	2.73	2.28	2	1.67	1.21	0.3	86.9
Total no of incidences recorded	2,288	2,815	1,211	172	68	58	40	19	15	25	11	8	2	

A total of 11,729 withies were recorded and 1,968 cuttings of withies, which is a ratio of about 6:1, meaning there was one cut withies to every sixth recorded standing one. On 60% of the plots with occurrence of withies, cuttings of withies were found. 8% of withies cuttings were new cuts and 92% old cuts.

The group comparison showed that overall JFM plots had a lower percentage of cuts (41%) than the non JFM plots (59%). The ratio of old and new cuts to total cuts was almost identical in JFM and non JFM plots: about 5% of recent cuts in both groups and 95% and 94% cuts older than 3 months in the JFM plots and non JFM plots respectively. This was similar with regard to poles, where 46% of all cuts were on JFM plots and 54% on non JFM plots. In both groups about 4% of all poles cut were recent cuttings and 96% were older than 3 months. 41% of all cuts of withies were on JFM plots compared to 59% on non JFM plots. The rate of old to new cuts differed with regard to the withies, as 6% of withies in JFM plots were cut recently and 94% were old cuttings, while in the non JFM forests 9% were recent cuts and 91% older than 3 months.

Table 6.4 overleaf contains the descriptive statistics for the cuttings of trees, poles and withies. The average number of total tree cuttings was significantly higher in JFM than in non JFM forests. This is explained by the significantly higher rates of old timber felling in JFM than in the non JFM plots. The average number of new cuts of trees was the same in both groups. The relatively small standard deviations of the tree cuttings show that there was not much variation of the timber felling rate across the plots. This variation was slightly higher in the case of poles. Pole cuttings show a very similar picture to timber cuttings: the total number of poles cut and the number of old pole cuttings were both significantly higher in JFM than in non JFM forest plots. New cuttings of poles were only slightly higher in JFM plots and tested as statistically not significant compared to the non JFM plots. While the total number of cuttings of withies and the number of old cuttings was slightly higher in JFM forest than in JFM forests these differences were not significant. Fresh cuttings of withies were higher in the non JFM plots than in the JFM plots but only slightly and not statistically significant. It seems from these results that cutting is mostly a sign of old forest disturbance and there is a time factor involved. However time series analysis would be required to confirm this result. The pair-wise comparison statistics in table 6.4 tests the effect of JFM on actual forest utilization.

Table 6.4 Descriptive statistics, cuttings, JFM versus non JFM

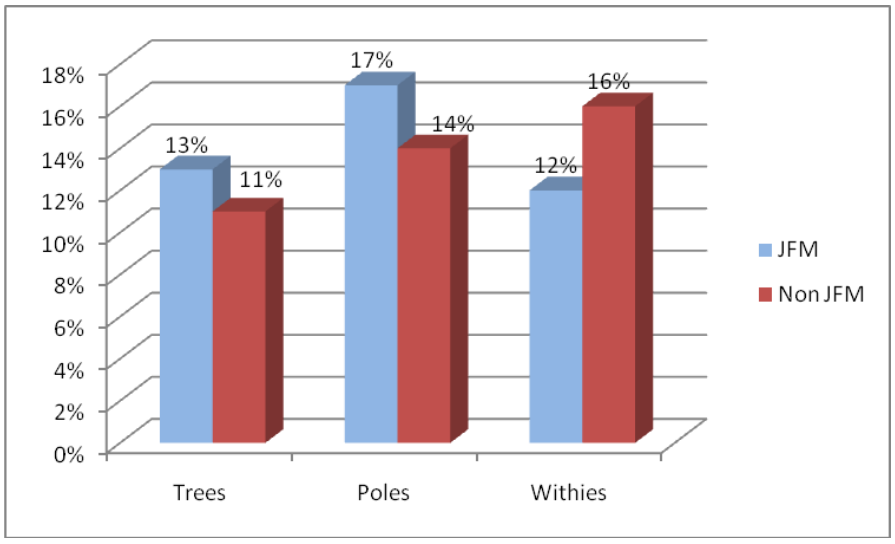
	JFM	Non JFM	Significance
Trees, total cuts	M=2.0, SE=0.2, sd=3.0	M=1.8, SE=0.2, sd=4.3	U= 39,559.5, p<.001, r= -0.21
Trees, old cuts	M=1.9, SE=0.2, sd=2.9	M=1.7, SE=0.2, sd=4.1	U=39,465, p<.001, r = -0.21
Trees, new cuts	M=0.1, SE=0.1, sd=0.8	M=0.1, SE=0.0, sd=0.5	Not significant
Poles, total cuts	M=4.2, SE=0.3, sd=5.1	M=3.0, SE=0.3, sd=5.4	U= 40,201.5, p<.001, r= -0.18
Poles, old cuts	M=4.1, SE=0.3, sd=5.0	M=2.9, Se=0.3, sd=5.2	U=40,537.5, p<.001, r = -0.23
Poles, new cuts	M=0.2, SE=0.0, sd=0.7	M=0.1, SE=0.0, sd=0.9	Not significant
Withies, total cuts	M=6.6, SE=0.8, sd=13.3	M=2.8, SE=0.3, sd=5.6	Not significant
Withies, old cuts	M=3.0, SE=0.3, sd=4.6	M=2.6, Se=0.3, sd=5.2	Not significant
Withies, new cuts	M=0.2, SE=0.1, sd=0.9	M=0.3, SE=0.1, sd=1.7	Not significant

The “not significant” difference between new cuts of trees, poles and withies in JFM versus non JFM forests, respectively documents little difference in actual forest utilisation. These results strongly indicate that JFM has had little effect on wood-cutting.

It is interesting to note that the standard variations increase from tree, to pole to withies cutting, showing that tree felling occurs more consistently across the forests, with poles and in particular withies showing stronger variations between the plots. The cutting of withies in JFM forests showed the largest degree of variation across the plots. This lends support to the idea that the cutting of withies due to their higher abundance, is stronger influenced by distance to the settlement while pole and in particular timber trees which are more difficult to find, and much more valuable, are harvested throughout the forest. This idea is supported through the regression analysis (Section 6.6 below) where the distance to the village shows up as a significant predictor for withies cutting.

Finding a higher rate of cuttings in the JFM forests was an unexpected result. In order to take the higher availability of trees, poles and withies in JFM forests into consideration, the cutting intensity was calculated as a percentage of the available forest resources for each of the categories trees, poles and withies (see Figure 6.4 below).

Figure 6.4 Intensity of cutting as percentage of resources, JFM versus non JFM



The intensity of tree cutting (U=41,293; p<0.01, r=-0.2) in relation to the remaining tree resources as well as the intensity of pole cutting (U=43,942.5, p>0.01, r=-0.2) in relation to pole resources, remained significantly higher in JFM forests. With regard to withies resources the difference did not test as statistically significant. To further explore the unexpected higher cutting rates in JFM plots, the data was disaggregated by forest to verify whether this was a consistent result across all sites (Section 6.5 below).

6.4.3. Other forms of human forest use

Table 6.5 below shows other forms of forest use. Incidences of fire were on average three times higher in non JFM plots (M=0.35, SE=0.028) than in JFM plots (M=0.12, SE=0.027). This difference is significant (U=39,781.50, p<.001, r=-0.25). Burning could be related to higher occurrence of grass, more open areas, and lower protection in the non JFM forests. Similarly, the incidence of traps, small scale mining and the harvesting of trees for tools are higher in non JFM plots. The higher intensity of mining in non JFM forests (M=0.05) than in JFM forests, where none were recorded, was significant (U=48,804, p<.001, r=-0.13). In contrast JFM forests had more footpaths, more saw pits and charcoal pits, more farm fields and incidences of animal grazing inside the forest, as well as debarking. However, the higher number of charcoal pits, saw pits and footpaths dissecting JFM forests were not a statistically significant difference to the control group.

Table 6.5 Incidences of other human uses recorded, mean values per plot

	JFM	Non JFM
Burning*	0.12	0.35
Footpath	0.12	0.09
Trap	0.03	0.04
Saw pits	0.12	0.07
Charcoal pit	0.10	0.04
Farm field	0.03	0.02
Mining*	0.00	0.05
Grazing	0.02	0.00
Harvesting for tools	0.01	0.02
Debarking	0.01	0.00

(*= statistically significant difference)

6.5. Spatial patterns of human forest use across sites

The harvesting intensity of tree, poles and withies varied strongly across the six forest reserves. In some forests, in particular Dindili, timber harvesting was very intensive with a level close to 40% of the available timber resources. In Milawilila and Ngambaula the harvesting rate was with almost 30% also high. Tree harvesting was least intense in Ruvu and Kimboza where the cutting rate stayed below 10% of the available timber resources. The spatial analysis of pole cutting revealed a similar trend. Whereas withies cutting were highest in Ngambaula and lowest in Kitulang'halo (see Figures A4.2 and A4.3 in Appendix 4).

The above analysis reveals that there is not a consistent picture of the human forest use but that there are considerable differences between the sites.

In site 1, the JFM forest Kitulang'halo showed lower values than the non JFM forest Dindili consistently across all variables (Tables A4.4 and A4.5 in Appendix 4). Dindili was hosting trees of comparatively large DBH value and height, which provided a valuable resource for harvesting. These statistical results are confirmed by the personal observation of the research team, which witnessed on-going timber felling and pit sawing while transecting Dindili. The timber fellers ran away as soon as they noticed the researchers, well aware of their illegal undertaking. The freshly cut trees provided valuable timber, including mature *Milicia excelsa* (a class I timber) trees. The significantly ($U=5{,}698$, $p<.001$, $r= -0.20$) higher number of sawpits recorded in Dindili compared to Kitulang'halo is consistent with the other results in confirming the high timber harvesting rate in the non JFM forest Dindili (Table A4.6 Appendix 4).

In site 2, the picture of JFM performance is reversed: On average, the number of total cuts was significantly higher in the JFM forest Kimboza than in the non JFM forest Ruvu for all three variables (Table A4.7 Appendix 4). Old cuts of trees, poles and withies reflected the same picture of higher harvesting intensity in Kimboza, all three variables at significant levels. On average Kimboza had a significantly higher number of sawpits per plot than Ruvu ($U=8613.5$, $p<.001$, $r=-0.19$; see Table A4.8 Appendix 4). Just as in site 1, the higher number of saw pits matches with the higher timber cutting rate in Kimboza compared to Ruvu.

Surprisingly, site 3 showed significantly higher mean values of total cuts of trees, poles and withies in the JFM forest Milawilila in comparison to the non JFM forest Ngambaula (Table A4.9 Appendix 4). When disaggregated into old and recent cuttings, it became clear that all cuttings in Milawilila forest were old cuttings whereas there were no recent cuttings recorded at all. When only the recent cuttings were considered, the performance between Milawilila and Ngambaula was reversed as the cuttings where higher in the non JFM forests as compared to the JFM forest. The above analysis has shown that higher rates of human forest use in the JFM forest Milawilila compared to the control group forest are an indication that Milawilila was once harvested intensively. However, the fact that no recent cuttings were recorded, lends support to the idea that cutting has stopped most likely as a result of the no access regime enforced through the JFM in Milawilila. The number of incidences of burning recorded in Ngambaula were significantly ($t(187) = -4.895$, $p<0.05$) higher than in Milawilila and so was the occurrence of farm fields inside the forest reserve ($t(187) = -6.490$, $p<.05$) (Table A4.10 Appendix 4).

In summary, the spatial analysis of human forest use provides a very mixed picture. It seems to be influenced by historical forest use and the effectiveness of the JFM regime. This calls for a further examination of possible predictors of human forest use to test whether JFM is an explanatory variable for the variations in forest condition between the sites. This is done next.

6.6. Predictors of human forest use

6.6.1. Introduction

The following Sections investigate possible other factors than the management regime that influence human forest use and that may in turn influence the viability of JFM implementation. In particular possible causal relations between forest use and economic factors are investigated. Blomley and Ramadhani (2006) describe how market forces are believed to drive or destroy PFM processes in Tanzania. The influence of market pressure on a particular forest is supposed to be a dependent of the distance from urban centres and the road accessibility; pressure increases with increasing closeness and

quality of the access roads. In particular for charcoal and timber these two variables may make it impossible for villagers to prevent "relentless and illegal stripping of assets by outsiders" (Blomley and Ramadhani 2006: 97). On the other hand, weak market forces may undermine the villagers' possibilities to gain economic benefits through PFM. Distance from Dar es Salaam was shown by Ahrends *et al.* (2010) to be the largest factor explaining disturbance in forests on a transect of 200 km length south of Dar es Salaam. As the demand for wood products extends to the area of this study it has to be included as a possible factor explaining the results. During this study no data were collected on likely agents of harvesting, transporting and buying/consuming timber, poles and charcoal. However it was obvious during the PRAs conducted that Maseyu and Fulwe village are well integrated in markets due to their location at the TANZAM highway (see Section 5.3 above). This road is the main transportation route for agricultural and forest products to urban and commercial centres such as Dar es Salaam and Morogoro (Luoga *et al.* 2000a). According to the villagers, middlemen from Maseyu village buy the charcoal from the charcoal makers and place the bags along the road. Buyers come from Morogoro, Dar es Salaam, Mbwawani and Chalinze. The consumers of the charcoal and timber are the urban middle class. The following sections test the validity of some of these factors with regard to the study results on human forest use.

6.6.2. Predictors for the intensity of timber logging

A stepwise regression model was built with the 'percentage of trees cut compared to remaining timber resources' as dependent variable y (see Table 6.6 overleaf).
This model was significant and explained 29% of the total variation in the data. The negative relationship between the dependent variable and the 'distance from Dar es Salaam' in this case indicates that the rate of tree felling decreases with increasing distance from Dar es Salaam. Similarly, the cutting rate decreased with further distance from the nearest feeder road. With increasingly difficult accessibility the cutting rate decreased. The model shows a statistically significant relationship between the variable 'JFM' and the dependent variable, with the intensity of tree cutting decreasing if there is JFM. In the above model, the variable 'distance from Dar es Salaam' was not significant. A second stepwise regression model run without this variable still explained 28% of the variation in the data (see Table 6.7 overleaf).

Excluded variables in both models were the ‘distance from the village’ and the ‘distance from the forest edge’, which seemingly did not influence the timber logging intensity. Both models indicate clearly that timber logging decreased with increased distance from the road and difficulty of access.

6.6.3. Predictors for the intensity of pole and withies cutting

A step-wise regression model to investigate the predictors of the intensity of pole cutting showed that significant predictors were the distance from the nearest feeder road, the distance from the forest edge, as well as the accessibility and the presence of JFM. These four variables together explained 15% of the variation in the data on the pole cutting intensity (see Table 6.8 overleaf). Excluded variables were the distance from Dar es Salaam and from Morogoro, the distance from the village and the distance from the nearest tarmac road.

Pole cutting intensity decreased with increasing distance from the nearest feeder road and the forest edge, increasing difficulty in access and with the existence of JFM. The distance from urban centres and the village seemingly did not play a significant role.

Table 6.6 Regression: y ='percentage of cuts to remaining trees per plot'

Predictor	Model	Anova F	Total df	Sig.	R^2	Adj. R^2	Beta In
Distance from Dar es Salaam (x_1)	$y=55.25+-.061x_1-0.177x_2-0.643x_3-0.785x_4$	55.25	4	0.148	0.286	0.282	-0.061
Accessibility score (x_2)				0.000			-0.177
JFM (x_3)				0.000			-0.643
Distance to nearest feeder road (x_4)				0.000			-0.785

Table 6.7 Regression: 'y = percentage of cuts to remaining trees per plot'

Predictor	Model	Anova F	Total df	Sig.	R^2	Adj. R^2	Beta In
Distance to nearest feeder road (x_1)	$y=48.11+-.806x_1-0.174x_2-0.623x_3$	86.55	3	0.000	0.284	0.281	-0.806
Accessibility score (x_2)				0.000			-0.174
JFM (x_3)				0.000			-0.623

Table 6.8 Regression: 'y = percentage of cuts to remaining poles per plot'

Predictor	Model	Anova F	Total df	Sig.	R^2	Adj. R^2	Beta In
Distance from nearest feeder road (x_1)	$y=41.82+-.408x_1-0.229x_2-0.354x_3-0.116x_4$	28.81	4	0.000	0.150	0.145	-0.408
Accessibility score (x_2)				0.000			-0.229
JFM (x_3)				0.000			-0.354
Distance from forest edge (x_4)				0.009			-0.116

In contrast, the step-wise regression model to investigate the predictors of the intensity of withies cutting excluded the variables distance to tarmac and feeder road, distance to forest edge and distance to urban centres (Dar es Salaam and Morogoro). Significant were the variables distance to the nearest village, accessibility and JFM (see Table 6.9 overleaf). However, the model explained only 5% of the variation in the data.

The withies cutting rate decreased with increasing distance from the village, increasing difficulty of access and the presence of JFM. The distance to roads and urban centres seemingly did not play a role in the intensity of withies cutting. This points to the fact that withies are predominantly used by the villagers for house construction and carried by foot from the forest to the building site.

6.6.4. Predictors for the occurrence of charcoal pits and burnings

A stepwise built regression model identified the distance from urban centres (Dar es Salaam and Morogoro), the forest edge, the accessibility and the presence of JFM to be significant predictors for occurrence of charcoal pits in the forests (Table 6.10 overleaf). The regression was significant, however explained only 7% of the total variation in the data. The variables 'distance from the village' and 'the road' were excluded. Clearly the distance to urban centres was the most important factor. The incidence of charcoal pits in the forests increased with decreasing distance from Dar es Salaam and from Morogoro. The significance of the variables JFM and accessibility is not high in this case. The distance to the forest edge, interestingly shows a positive correlation, indicating that charcoal pits are further away from the forest edge where they are less visible and where there are remaining wood resources. Generally pits are also not much near the road, although there can be a strip of good forest as a 'screen', then a really degraded area and then better trees, which can be harvested.

The frequency of incidences of burning in the forest was a significant difference between JFM and non JFM forests (see Section 6.4.3 above). A step-wise multiple regression model identified the distance to the road as the only significant predictor, which explained 6% in the total variation of the data. Interestingly, the positive Beta coefficient indicates that the frequency of burning increased with increasing distance from the road (Table 6.11 overleaf). All other potential predictors distance to urban centres, distance to village and forest edge, accessibility and also JFM were excluded.

Table 6.9 Regression: 'y = percentage of cuts to remaining withies per plot'

Predictor	Model	Anova F	Total df	Sig.	R^2	Adj. R^2	Beta In
Accessibility score (x_1)	$y=29.23+-0.146x_1-0.231x_2-0.181x_3$	11.37	3	0.000	0.05	0.045	-0.146
JFM (x_2)				0.000			-0.231
Distance from village (x_3)				0.000			-0.181

Table 6.10 Regression: 'y = occurrence of charcoal pits'

Predictor	Model	Anova F	Total df	Sig.	R^2	Adj. R^2	Beta In
Distance from Dar es Salaam (x_1)	$y=0.96-0.35x_1-0.278x_2+0.075x_3-0.098x_4-0.09x_5$	11.58	5	0.000	0.081	0.074	-0.350
Distance from Morogoro (x_2)				0.000			-0.278
Distance from forest edge (x_4)				0.080			0.075
Accessibility score (x_3)				0.012			-0.098
JFM (x_5)				0.078			-0.090

Table 6.11 Regression: 'y = signs of burning'

Predictor	Model	Anova F	Total df	Sig.	R^2	Adj. R^2	Beta In
Distance to road (x_1)	$y=0.104+0.251x_1$	44.09	1	0.000	0.063	0.061	0.251

6.7. Villagers' perception of forest condition

Table 6.12 below shows the villagers response (N=393) to the question of how they would describe the present condition of the respective forest reserve. Over 50% of respondents perceived the JFM forest in their vicinity to have many big trees of value in contrast to only 28% respondents for the non JFM forests. This shows that villagers perceive the forests under JFM to be of higher quality. A higher percentage of respondents in non JFM villages (16%) perceive the forest to have big trees of low value. Fewer people adjacent to JFM forests responded with 'I do not know' (14%) than people adjacent to non JFM forests (25%). The difference between the two groups was significant ($X2\ (6)=45.35$, $p<0.001$, Cramer's $V=0.34$).

Asked how they would rate the present condition of the forest reserve compared to 5 years ago (Figure 6.5 overleaf), 57% of the households adjacent to JFM forests responded that in their view the condition of the forest had improved and 14% felt that it had worsened.

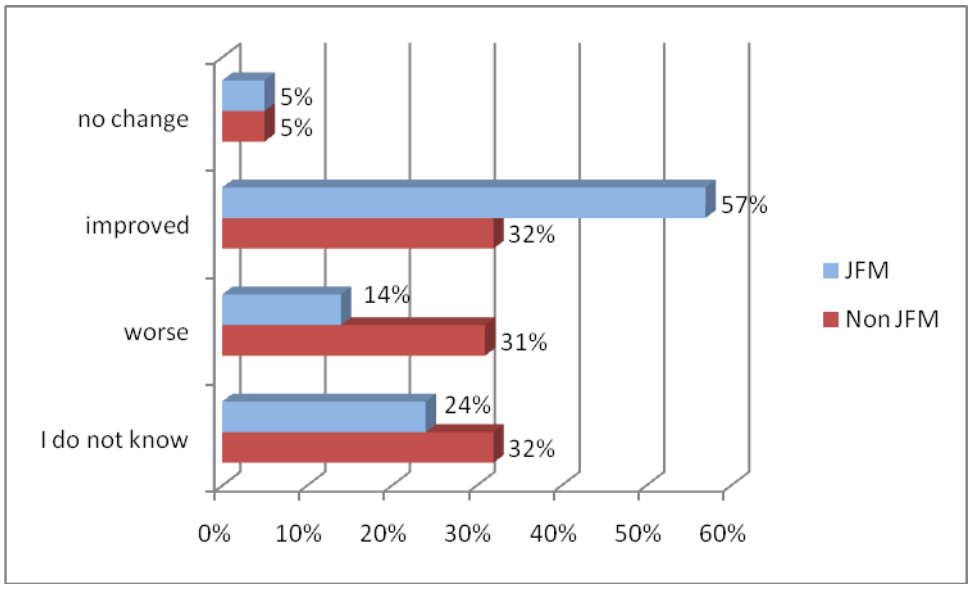
Table 6.12 Villagers' description of the overall condition of the forest reserve

	JFM (n=188)	Non JFM (n=205)
many big trees of value	55	28
many big trees but of no value	9	9
a few big trees of value	10	14
a few big trees but of no value	3	16
no big trees, many little trees	9	5
no big trees, few little trees	1	2
I do not know	14	25

(In percent of respondents)

The period of 5 years was chosen to coincide with the introduction of the JFM processes in the respective sites. The non JFM villagers were more equally divided: 32% voted for an improvement in forest condition and 31% for a worsening. Again, more villagers in the non JFM group responded with 'I do not know' (32%) than in the JFM group of villagers (24%). Only 5% out of both groups felt that there was no change. The difference between the two groups was significant ($X2\ (5)=50.68$, $p<0.001$, Cramer's $V=0.36$).

Figure 6.5 Villagers perception, change of forest condition compared to 5 years ago



(N= 399, JFM= 189, non JFM=210)

Thus, across the entire sample the villagers' opinion on change in forest quality matches the quantitative analysis. However, unfortunately there is no baseline to compare to. Spatial analysis disaggregated by village showed that similarly villagers adjacent to the JFM forests rated the condition of the forest higher than the villagers adjacent to the non JFM forests across all three sites. Nevertheless, in some instances, villagers' opinion did not match the statistical analysis of forest quality. The largest difference in opinion was in site one, where 57% of villagers in Maseyu felt that Kitulang'halo forest reserve had 'many big valuable trees' compared to only 13% of Fulwe villagers who had this positive perception of Dindili forest reserve. However, as Section 6.6 above has shown, Dindili had trees with significantly larger DBH value (some of them class I) and height than Kitulang'halo. Interesting is also that Milawilila forest reserve, which ranked highest out of all six forest in average DBH value of trees (M=37.50, see Section 6.6. above) was not particularly strongly perceived by the villagers as containing large trees. 21% of the respondents felt that Milawilila had 'no big trees, but many little trees'. Kitulang'halo forest reserve in contrast, which ranked lowest in average DBH value (18.04), was perceived much more positively by the villagers in Maseyu, where only 2% thought that there were 'no big trees but many little trees' in the forest (Table A4.11, Appendix 4).

The perception of male and female villagers about the forest condition differed during the focus group discussion. For example in site 1, the men felt that there were no

valuable species in the forest reserve, in particular *Mninga.* The women in contrast believed that these species were still in the forest. The household survey confirmed these results as in Maseyu 17% of the men felt that Kitulang'halo forest had many large tree of value in contrast to 19% of the women who felt the same. Villagers in Logo village had observed that wild animals had lived close to people's houses some years ago, whereas nowadays they lived further away. This was interpreted by the villagers as an indicator of forest decline. In contrast, Milawilila forest was perceived to be in good condition because a donor supported the nearby villagers in reforestation and the formation of groups who guarded the forest. Further, Milawilila forest's location close to the road was perceived to prevent illegal entry and harvesting because of its visibility. Since Ngambaula forest was more remote and far away from the road there was reportedly more disturbance. Villagers in Logo village expressed that Ngambaula forest had in contrast to Milawilila much deteriorated over the recent years.

These results show that the villagers' perception is congruent with the results of the quantitative forest quality analysis. In site 1, where the differences between JFM and non JFM forests are not statistically significant, villagers in the two groups are the closest in their judgement about the two forests. In site 3 where the statistical differences are most pronounced, so is the difference in opinion of the villagers.

6.8. Summary and discussion of results

In the sample of the six lower altitude Coastal / Eastern Arc forest and *miombo* woodland sites around the Uluguru Mountains, a comparative analysis of 659 forest plots divided into JFM forest plots and plots in forests under central management showed significant signs of improved forest quality in the JFM forests. This was consistent across a range of variables presented, such as presence of timber, poles and withies, as well as other indicators of forest health, such as coverage of seedlings and leaf litter on the forest floor, and lower invasion of grass coverage. This contrasts with measurements taken on land administered solely by government agencies with no community involvement (non JFM) where forest quality was significantly lower. While JFM plots had significantly higher numbers of trees (54.5% more), they were smaller in size when compared to the non JFM forest plots. The difference in average DBH value represented a 20% reduction compared to the non JFM forests. Since the size is an indicator of age, we can conclude that the remaining trees in the JFM forests are

younger on average than in the non JFM forests. This may be due to heavy logging in these forests prior to JFM and forest regeneration over the past 5 to 10 years or continuous selective logging despite JFM. There was no significant difference in the estimated height of trees between JFM and non JFM plots. Poles and withies resources on JFM plots presented an improvement compared to the non JFM plots of 32.7% and 92.5% respectively.

With the exception of the lower DBH value, these results confirm the first hypothesis that JFM forests have a better forest quality measured through a larger number of trees, poles and withies than non JFM forest plots. This result is consistent with Blomley *et al.* (2008) but differs from Persha and Blomley (2009), who found no signs of improved condition in their comparison of a co-managed to a centrally managed forest in the West Usambaras in Tanzania. The second part of the first hypothesis (that the improvement in abundance of resources in JFM forests is strongest for withies, milder for poles and smallest for trees), was not confirmed for the full sample. The improvement in forest condition measured through these three variables was strongest for withies, followed by trees and then poles. However, in the spatial analysis by sites the comparison between the JFM forests Kimboza and Milawilila to their paired non JFM forests Ruvu and Ngambaula respectively, showed progressively higher occurrences of trees, poles and withies in the JFM forests at significant levels.

For the full sample, the second hypothesis, that the canopy density is higher in JFM than in non JFM forests, needs to be rejected. However, in the disaggregated comparison by site, canopy density was significantly higher in site 2 (Kimboza compared to Ruvu) and site 3 (Milawilila compared to Ngambaula). There were, however, large variations in canopy density between the plots within each of these two JFM forests. Dindili and Ngambaula, both non JFM forests, had the lowest canopy density.

There was no significant difference between JFM and non JFM plots in terms of species richness. This is consistent with the finding of Huang *et al.* (2003) in their study of species diversity of tropical forests in Tanzania that species diversity is significantly influenced by the structure and composition of the forest. JFM may not be a significant predictor. Thus, the third hypothesis, that the species richness is higher in JFM forests, was not confirmed. The majority of species found in the forest reserves (80%) were of class V type. These are of lower value than class I species of which there were only

about 7–8%. This result supports earlier findings of Ahrends (2005) and TRAFFIC (2005) that valuable species are harvested first – independent of the management regime. This is consistent with the observation mentioned in Section 6.3 that timber trees are being marked for felling in JFM forests. It suggests that JFM rules are not implemented. However, it also needs to be considered that the occurrence of high value big size trees cannot be expected to change much over 5 years. This might be another factor explaining the lack of difference in species richness between the two groups.

The fourth hypothesis that the liana density is lower in JFM forests than in non JFM forests, is rejected. On the contrary, the liana density was on average higher in JFM plots than in non JFM plots, which would indicate higher disturbance of the JFM forests from earlier times, but did not test as statistically significant in this study.

Higher occurrence of leaf litter and seedlings on the forest floor as well as less grass coverage were significant indicators of better forest health and less canopy opening on the JFM plots. The fifth hypothesis is therefore accepted. While this result could also be related to the intensity of cattle grazing, in this study there was no significant difference in the occurrence of cattle grazing between the two groups (table 6.5). The lower grass coverage may be an explanatory factor for the significantly lower fire intensity measured in the JFM forests, as much as a stronger protection regime would be. Due to the limitations of the study design (see Section 5.1.2 above), i.e. comparing JFM with non-JFM without much evidence of "before-JFM" similarities of the investigated parameters, these results concerning grass coverage might be slightly biased. This is because plots in wet forest and woodlands habitat, which naturally have more grass coverage, were compared.

In summary the analysis of all forest quality variables combined provided a fairly consistent picture of generally better forest quality in the forests managed under JFM by the communities when compared to the solely state managed forests. Villagers' perception of the condition of the respective forest reserve adjacent to their village was found to be fairly consistent with the quantitative forest transect analysis.

While scoring better in forest quality, the JFM forests in the full sample comparison also showed significantly higher levels of tree and pole cutting than the non JFM forests. The harvesting of withies was also more intense on JFM plots. However, it did not test

as a statistically significant difference between the two groups. Thus, the sixth hypothesis that the extent of human use measured through the number of cuts of trees, poles and withies is lower in JFM forests than in non JFM forests needs to be rejected. Considering that JFM forests had better forest quality – in other words, more timber, pole and withies resources remaining – the cuttings were compared to the available forest resources. When the average cutting rate per plot was expressed as a percentage of the remaining resources, JFM forest plots showed significantly lower intensity of withies cutting than the centrally managed forests, remained however higher with regard to timber and pole cutting. The finding of higher cuttings in JFM forests is consistent with Persha and Blomley (2009), who found higher levels of anthropogenic disturbance in terms of illegal logging and pole cutting in their comparison of a co-management and centrally managed forests.

Disaggregation into old and recent cuttings confirmed the significant higher values for old cuttings in the JFM forests, but did not produce statistically significant differences for recent cuttings. This is a strong indication of no effect of JFM on wood cutting. A higher ratio of old cuttings to recent cuttings is consistent with earlier findings in the Uluguru mountains (Frontier-Tanzania 2005a and 2005b). This result seems to indicate that the higher cutting rates on the JFM plots are from earlier times, prior to introduction of the relatively young JFM process. Further research is needed to confirm this assumption, in particular time series analysis. Some time series research over the period 2000 to 2004 has been conducted by Frontier-Tanzania in the Uluguru North and South Forest Reserves (Frontier-Tanzania 2005 a and 2005 b), which shows a significant increase in pole and timber cutting over 5 years time where there was no PFM, and no significant difference in the levels of pole cutting but increased timber extraction where PFM was introduced.

Hypothesis seven, that other forms of human use are less in JFM forests than in non JFM forests due to the less permeable access regime, was confirmed through the analysis for the occurrence of opportunistically encountered burning, sawpit and mining sites as well as farming inside the forest. Non JFM plots had significantly more incidences of burning in the forest than JFM plots. Also, there were significantly more mining sites in non JFM plots compared to JFM plots, where there were none recorded. However, on the basis of recorded new cuttings of trees, poles and whities being not

significantly different (table 6.4), hypothesis seven must be rejected. This suggests a *de facto* management regime where only some but not all forest uses are effectively restricted by JFM. In other words, this supports the assumption of collective agency by JFM villages vis-a-vis the state. They do not implement JFM as it is officially intended, but modify the rules to suit their own ends and objectives rather than those of the state This supports Cleaver's (2007) hypothesis of "bricolage" that officially created local institutions and their rules are being melded by the villagers with existing and locally negotiated rules to fit their purpose (see Chapter 2).

The results of the spatial analysis of the three sites provide indication to accept the eighth hypothesis as far as it refers to the forest quality component of this study. Improved forest quality in the JFM forest compared to the centrally managed forest is strongest in the Milawilila-Ngambaula site, followed by Kimboza-Ruvu and lowest in Kitulang'halo-Dindili where there was no significant difference. With regard to the human use component, this ranking of sites is not confirmed. The spatial analysis of three separate JFM versus non JFM pairs showed that there was large variation in the results achieved through JFM. This which lends support to the idea that the degree of sustainable forest management is dependent on the quality of the JFM regime implemented.

The study investigated possible predictors of human forest use and whether and to what extent the presence of JFM could explain the variation in the data. In a multiple stepwise regression model, the presence of JFM and accessibility played a significant role in predicting the intensity of timber logging, pole and withies cutting. With the presence of JFM and increasingly difficult accessibility, cutting intensities decreased. In addition to these two factors, the distance from Dar es Salaam and feeder roads influenced the intensity of timber logging. Pole and withies cutting was not affected by the distance from urban centres. This points to the fact that poles and withies are predominantly used for subsistence level rural housing construction. Timber cutting in contrast depends more on the demand from urban centres. Distance from the forest edge was not a significant predictor for pole and timber cutting, and the study did hence not confirm earlier findings that pole and timber cutting are greater at the forest edge (MNRT 2005a and b; Hofstad 1997). JFM did not play a significant role in predicting the occurrence of charcoal making, mining and burning in the forests. The distance to

urban centres was the most important factor explaining the occurrence of charcoal pits. It increased with decreasing distance from Dar es Salaam and from Morogoro and with further distance from the forest edge where they are less visible. This is consistent with the finding of Ahrends *et al.* (2010) that distance from Dar es Salaam is the largest factor explaining forest disturbance. This also confirms earlier studies which show that charcoal is besides timber the most commercialized forest resource supplying the large charcoal markets in Dar es Salaam and Morogoro (Luoga *et al.* 2000a, Luoga *et al.* 2000b; Monela n.d.; Hofstad 1997). These findings show that JFM rules have limited effectiveness in restricting economically motivated human use of forests. Economic use of forests is influenced by other factors, such as commercial demand for wood resources from urban areas and subsistence need for construction purposes from adjacent villages. These demand pressures might be so strong that controlling the related forest uses only through JFM is difficult, in particular if it is not well implemented. It might require a mix with economic policy instruments beyond the forest sector (i.e. taxation) that aims to influence the consumer rather than controlling the harvesting.

The pair-wise comparison statistics in table 6.4 tests the effect of JFM on actual forest utilisation. The "not significant difference" between new cuts of trees, poles and withies in JFM and non JFM forests documents little difference in forest utilization. This is consistent with the results of the multiple regression analysis that JFM rules have not been effectively restricting the economically motivated human use of forests. This is an important governance related finding. At the same time it shows that the study design is more suitable to assess governance effects of JFM. As explained in Section 5.1 above, the study design has limitations in testing the hypotheses. The pair-wise comparison of JFM versus non JFM seems more useful in testing whether JFM rules were actually implemented in JFM forests and only secondly if JFM has resulted in improved forest quality. Pair-wise comparison to assess the bio-physical effects of JFM may produce biased results because we cannot assume that forests - apart from the management regime - are completely similar in their biophysical characteristics. Without taking the "before JFM" situation into account, we do not know if the variables measured and compared between the forests have not been already different between the two forests prior to JFM. Longitudinal studies would be better suited to assess bio-physical changes within a particular forest. However these were not possible within the scope of this study.

7. Impacts on livelihoods and equity

7.1. Introduction

The aim of this chapter is to answer the second research question: How does JFM impact on households' forest access, forest related livelihoods and equity? In addition to improving the condition of the forests, a key assumption of PFM is to improve the livelihoods of forest adjacent communities. However, as the literature review in Chapter 2 above has shown, PFM does not lead to positive livelihoods outcomes under all circumstances. Based on the literature review the following six hypotheses are developed for this study:

1. People in the JFM villages face more limited access to the forest reserves compared to the control group.
2. The more limited access in the JFM forests leads to reduced forest resources use.
3. The more limited access in the JFM forests leads to reduced forest incomes.
4. JFM improves the access of the villagers to information about forest access and use and their participation in decision making about forest management.
5. JFM manifests inequity and poverty as it grants preferential access to certain social groups and excludes others from access to and benefits from the forest reserve.
6. The less permeable access regime of the JFM forests leads to a displacement of forest harvesting to adjacent forest areas that are less well protected.

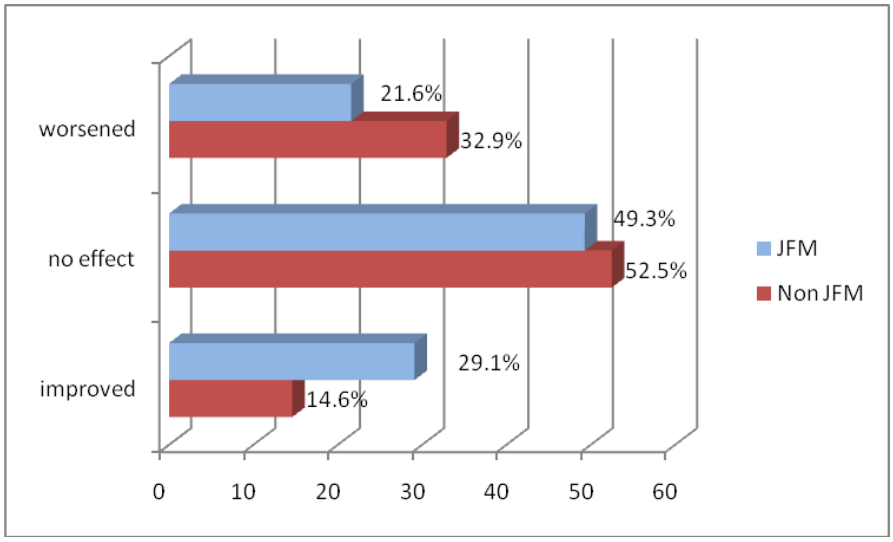
This chapter presents the research results from the survey of 401 households conducted in the six study villages. The following section (7.2) looks at the specific livelihoods effects of JFM and Section 7.3 at unequal outcomes. Section 7.4 investigates displacement of forest resource use. The findings of this chapter are summarized in Section 7.5.

7.2. Livelihoods effects of JFM

Chapter 6 showed that the JFM forests had improved forest quality compared to the non JFM forests. About half (51%) of the respondents to the household survey expressed that the change in the condition of the respective forest reserve had no effect on their

livelihoods. The remaining half showed statistically significant differences between the JFM and the non JFM group of households (U=11.677, p>0.001, r=-0.19; X^2 (2) = 12.04, p<0.001. Cramer's V: 0.19; Kendall's Tau_b, p>0.05): Significantly more residents adjacent to JFM forests felt an improvement in livelihood (29%) compared to non JFM villagers (15%). At the same time, less JFM villagers (22%) than non JFM villagers (33%) expressed that their livelihood had worsened (Figure 7.1 below).

Figure 7.1 Perceived livelihood impact due to change in forest condition



While these results lend support to the idea that the JFM regime had some positive impact on people's livelihoods, at the same time they give reason to question the extent to which the formal management regime of a particular forest does actually matter for rural livelihoods. People could have learned these replies as part of the awareness raising usually conducted in the PFM process. In Chapter 6 the study demonstrated no effect of JFM in frequency of recent tree cutting, meaning that differences in forest use between JFM and non JFM forests are not that big. In other words, actual (as opposed to formal) differences on forest management regimes might still have an effect on rural livelihoods. Therefore, further variables are presented in the subsequent sections to analyse the impact of JFM on livelihoods in the forest adjacent villages.

7.2.1. Forest resource use

Households in the sample used on average about seven different types of forest resources for their livelihoods. In some cases, such as in Mwalazi village up to 16 different forest resources were used. There was no difference between JFM villages and the control group in the type of forest resources that households were collecting.

Fuelwood (15%), building materials such as poles (13%), withies (12%) and ropes (11%), as well as farm land (12%) were the most important resources for both groups (Table A5.31 in Appendix 5).

The choice of where to collect those forest products showed a statistically significant difference between the JFM and the non JFM villages ($U=641.562$; $p<0.001$, $r= -0.16$). Fewer people in the JFM villages (3.3%) indicated government forest reserves as their source of forest product collection than villagers adjacent to the non JFM forests (5.9%). The government forest reserve was named in the survey of the adjacent village to ensure that reference was made to the six reserves under study. For the purpose of data analysis they were summarized as "government forest reserve" (Table 7.1 below).

Table 7.1 Sources of forest product collection, JFM versus non JFM villages (% of respondents)

	JFM	Non JFM	All
public lands forest	23.7	35.7	29.6
village government forest	8.4	6.4	7.3
community forest	1.4	0.4	0.8
central government forest	3.3	5.9	4.8
private forest	1.4	1.3	1.3
home garden	4.0	8.5	6.4
farm fields	58.7	42.0	49.8

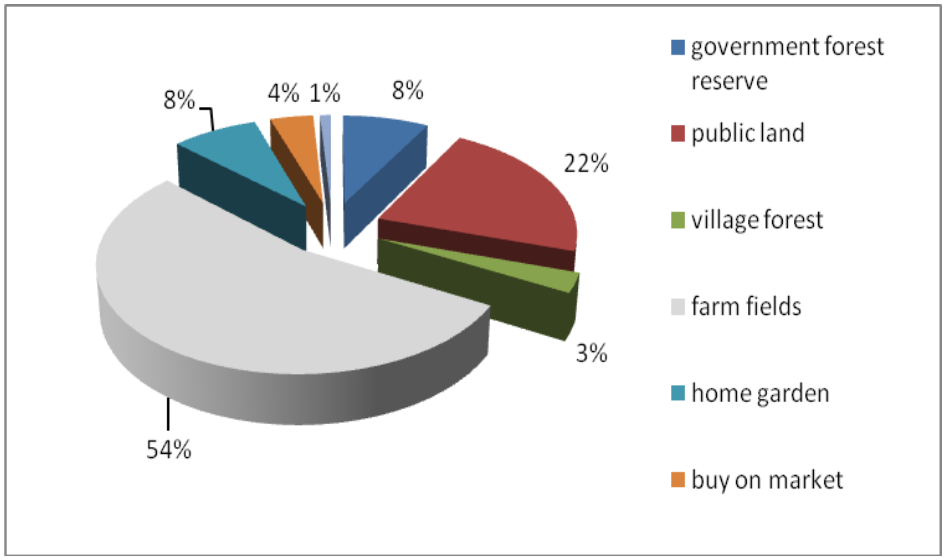
The fact that farm fields (58.7%) and village government forests (8.4%) played a stronger role as forest product sources in the JFM villages than in the non JFM villages (42% and 6.4% respectively; see table 7.4 above), hints at the more restricted access to the government forest reserve under JFM. The sample households in the JFM villages collected forest resources significantly less frequently (Kendall's Tau_b, $p>0.05$, at 0.01 level), than the households in the non JFM villages (Table 7.2). Fewer respondents in JFM villages (15%) than in non JFM villages (19%) collected daily and more respondents collected less than once per month (JFM: 50%; non JFM: 41%). This difference in frequency of collection, although it is small, might be a possible indication of reduced accessibility to forest resources in the JFM scenario.

Table 7.2 Frequency of forest product collection, JFM versus non JFM villages (% of respondents)

	JFM	Non JFM	All
Daily	15.0	19.0	17.0
2-3 times per week	22.0	22.0	21.7
once per week	4.0	10.0	6.7
every other week	3.0	7.0	7.8
less than once per month	50.0	41.0	46.1
Never	1.0	1.0	0.7

With regard to fuelwood in particular people used a variety of sources. Only 8.4% of the households indicated government forest reserves as fuelwood source (see Figure 7.2 overleaf), while farm fields (54%) followed by public lands (22%) were the predominant sources. Private woodlots played only a minor role in fuelwood provision (1.4% of respondents on Fulwe village only) in the study area. The above result did not significantly differ between the JFM and non JFM groups of households (U=17,778, $p<0.001$). This means that JFM did not significantly impact on the availability and accessibility of fuelwood.

Figure 7.2 Type of land where fuelwood is collected (% of respondents)



('Original in colour')

The spatial analysis across the three sites showed different trends with regard to fuelwood collection: In both site 1 and site 2, more respondents in the JFM villages Maseyu (18.2%) and Mwalazi (7.3%) than in the non JFM villages Fulwe (14.9%) and Ngong'olo (0%) said that they collected fuelwood in the government forest reserve. This is because in both of the JFM forests in site 1 and 2 fuelwood collection was allowed on certain days. On the other hand, even in JFM villages such as in Mwalazi village, where fuelwood collection from the JFM forest Kimboza was allowed, only 7.3% of the respondents utilized this source. The majority of people still collected fuelwood on public land and farm fields. Thus, despite the legal access to fuelwood from the reserve many people opted not to use this source. In Ngong'olo village adjacent to the open access Ruvu forest, people did not rely at all on the forest reserve for fuelwood collection, 47.2% collected on public land 48.6% on farm fields. This

shows that other factors besides the management regime influenced people's choice of where to collect fuelwood.

The distance from the house to the forest in minutes walking was significantly longer in the control group villages (M=48, SE=1.8) than in the JFM villages (M=36, SE=1.1) (U=630,437.5, $p<0.001$, $r = -0.1$). While the forest reserve was further away for the non JFM villagers, at the same time when asked about the distance to the fuelwood source, there was no significant difference between both groups in terms of minutes walking to the fuelwood source (U=18,009.5, $p<0.001$). It was on average between 5 to 10 minutes for all households. This indicates that people adjusted to the longer distance to the forest reserve by choosing an alternative nearer source of fuelwood, despite the seemingly open access to the reserve. Thus, distance in addition to the access regime of the nearest forest comes out as an important factor in the villagers' choice on where to gather their fuelwood.

7.2.2. Forest cash income and wealth

With regard to the use of forest products collected, 96.5% of the respondents favour home subsistence use over sale (2.0%) of forest products, while 1.5% both consumed at home and sold forest products. There was no significant difference in forest product use between JFM and non JFM villages. Home consumption remained the dominant use in both groups.

Only 70 out of 401 households provided information on the cash income derived from forest resources[19]. This might be because only a small portion of the respondents sold forest products and many activities related to forest product collection were illegal. The information and valuation of subsistence income was incomplete and therefore not used for the analysis. The average forest resource cash income was with TSH 70,470/= (SE=15,896) higher amongst the respondents from JFM villages than the non JFM villages (M=TSH 64,603/=; SE=18,703), however the difference did not test as statistically significant. In the entire sample, the maximum cash income recorded in a JFM household was TSH 350,000/= while it was TSH 500,000/= in a control group household.

[19] Out of the 70 respondents, 37 were in JFM villages and 33 were in non JFM villages.

There was a large variation with regard to the mean annual cash forest resource income that the households earned (M=67704 TSH; s.d. = 12,095 TSH; SE= 101,193 TSH). While about a quarter of the respondents in the entire sample (24.3%) earned less than TSH 10,000 per annum, more than half of the respondents (57.1%) earned between 10,000 and 100,000 TSH, 8,6% between 100,000 and 200,000 TSH and almost 10% earned over 200,000 TSH per annum. Although more respondents from JFM villages were in the higher forest cash income ranges (Table 7.3 below), the difference between JFM and non JFM tested as statistically not significant. In Section 7.3.3 below the forest cash income ranges are cross-tabulated with the four asset wealth groups.

Table 7.3 Cash forest income ranges, by JFM and non JFM villages

Forest income range (TSH)	JFM	Non JFM
x<10.000	21,6	27,3
10.001<x<100.000	54,1	60,6
100.001<x<200.000	13,5	3,0
x>200.000	10,8	9,1
Total	100,0	100,0

(Percent of respondents)

The cross-tabulation of the forest income range group with the forest product type (Table 7.4 overleaf) showed which income range groups favoured which products and was thus able to derive the highest cash incomes from forest resources. These are charcoal, poles, timber and withies. Charcoal provides the number one cash based forest product, followed by timber. The spatial analysis showed that in site 1, Maseyu and Fulwe village, the highest forest income earned in the sub-sample was in the JFM village Maseyu and not Fulwe. This can be explained through the charcoal business in Maseyu village which was an important source of cash income. Rules or quota reducing charcoal production were not an integral part of the JFM regime, such as in some of the CBFM projects in Tanzania (Lund and Treue 2008).

Studies that compare forest income to total household income show that forest products contribute between 12 and 20% to overall household income (MNRT 2009; Vyamana 2009a).

Table 7.4 Cross tabulation: Forest product type and forest resource cash income group

	x<10,000	10,001<x<100,000	100,001<x<200,000	x>200,000	Total
Timber	1	8	0	1	10
Poles	1	0	0	2	3
Withies	0	1	0	1	2
Ropes	0	1	0	0	1
Firewood	4	0	0	0	4
Charcoal	8	26	6	3	43
Medicines	2	0	0	0	2
Edible fruit, vegetables, leaves	1	0	0	0	1
Honey	0	2	0	0	2
Bush meat	0	2	0	0	2
Total	17	40	6	7	70

These figures could not be compared in the present study (see sub-Section 5.2.5.2 above). In order to determine how significant forest income is to people, forest cash income was compared to total household asset wealth. Thus, the relative importance of forest income was calculated as an approximation of the relative importance of forest cash income to the households and not a proportional variable. The limitations of comparing a flow variable (forest income) with a stock variable (asset wealth) are acknowledged. Across the entire sample, the mean household forest cash income per annum (M=94,786/=TSH) was 14.2% in relation to the mean household asset wealth (M=666,801/=TSH). The JFM group of households had with 12.7% a lower proportional forest cash income compared to total asset wealth than the non JFM group of households (16.6%). This comparison thus, indicated the same trend as studies that compare forest cash income with total household income. This calculation is done by wealth categories in JFM and non JFM villages in Section 7.2.3 below).

A disaggregated analysis of forest cash income by asset wealth groups and also gender related patterns of forest cash income are considered in Section 7.3 below.

7.2.3. Information access and participation

Villagers in the JFM villages were significantly more satisfied with the amount of information about access and use of the forest reserve (X^2 (2) = 17.3, p<0.001., Cramer's V=.24) than the control group (Table 7.5 below). However, at the same time, over 90% of the respondents in both JFM and non JFM villages said that they would like to have more information about the forest reserve.

Table 7.5 Satisfaction with amount of information about forest reserve

	JFM	Non JFM
Feel well informed, have enough information	13%	8%
Feel informed, have some information	56%	38%
Do not feel informed, have no information	31%	54%

The JFM process in the three JFM sites had not increased people's level of participation in decision making about the respective forests under JFM in comparison to the control group. The percentage of households that, during the past 5 years, had not taken part in making

rules about forest access and management was above 80% in both JFM (N=185) and non JFM villages (N=207). Table 7.6 shows that there was no significant difference.

Table 7.6 Participation in decision making on forest management

	JFM	Non JFM
yes during village assembly meetings	10%	6%
yes during other village meetings	7%	5%
no we have not taken part at all	83%	89%

Rules about forest access and use were being made by the village government regardless of the fact if there was a JFM project or not, which is what most respondents in both groups replied (Table 7.7). Table 7.7 refers in each village to the respective adjacent government forest reserve. This shows that the non JFM forests are also subject to, *de facto*, management regimes made by village governments (with no *de jure* rights to pass such rules). Irrespective of JFM being implemented or not in a given forest, the village governments make and enforce rules on forest access and forest use. In other words, non JFM forests are *de facto* subjected to locally devised but not formally recognised management regimes and the same actually goes for JFM forests. This is in the sense that the *de facto* rules devised and enforced by village governments do not entirely correspondent with the (draft) JMAs. Thus, management regimes in non JFM forests can hardly be defined as *de facto* open access.

Furthermore, JFM did not make much difference with regard to the awareness on by laws. 70% of the JFM respondents and 75% of the control group respondents had never read or seen village by-laws about forest access and use.

Table 7.7 Parties taking decisions about access to and use of the adjacent forest reserve

	JFM	Non JFM
central government	6%	6.5%
village government	37.5%	50%
forest committee	14%	12%
district	0.5%	0.5%
village + central government jointly	25%	21%
private person	17%	10%

Thus, in summary although JFM did lead to improved access to information compared to the control group, overall the level of information as not satisfactory. JFM did not lead to increased participation in decision making about forest access and use rules.

7.3. Unequal access and outcomes

This section accesses the validity of the fifth hypothesis that JFM manifests inequity, as certain social groups, in particular women and poorer villagers have less access to forest resources and related benefits. Forest access describes the opportunity or ability of a person to gain from a resource (Ribot and Peluso 2003) providing social identity and physical and material wealth. Access comprises a complexity of legal mechanisms, structures, and processes, which determine the *de facto* situation in contrast to the *de jure* legal provisions. Empirical research on forest access therefore can illustrate livelihood effects (Lund and Treue 2008) both in terms of social capital (social relations identity and relations) and physical capital. Three factors have been investigated as potential factors influencing equity in the JFM context: committee membership and leadership (sub-Section 7.3.1), gender (sub-Section 7.3.2) and poverty (sub-Section 7.3.3).

7.3.1. Committee membership and leadership

Two different sets of questions within the survey showed independently that in the JFM villages committee membership was strongly associated with preferential forest access and access to benefits. The question about which social group had primary access to the forest reserve brought out highly statistically significant differences between the respondents from the villages adjacent to the JFM forests and the control group (X^2 (10) = 90.0, p<0.001; Cramer's V:0.47, p<0.001). 54% of the respondents from JFM villages answered that 'forest committee members' were primarily accessing the forest reserve, compared to 59% of the respondents from the control group who answered "male villager" (Table 7.8).

The perceived motivation of this primary access group to enter the forest reserve was also significantly different between the JFM and non JFM groups (X^2 (13) = 78.58, p<0.001; Cramer's V: 0.44, p<0.001). In the JFM scenario, forest committee members primarily entered the forest to undertake patrol (54%) but also to take timber (25%).

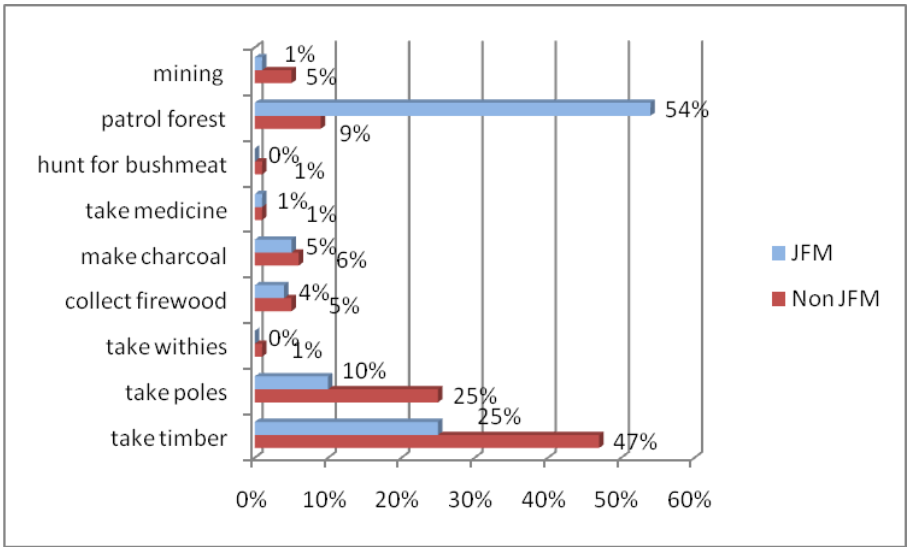
Table 7.8 Primary access to the government forest reserve

	JFM	Non JFM
all villagers	2%	8%
women and children	4%	4%
male villagers	31%	59%
village leaders	7%	26%
forest committee members	54%	1%
people from district	0%	1%
people from central government	1%	1%

(N= 400, JFM=191, non JFM= 209)

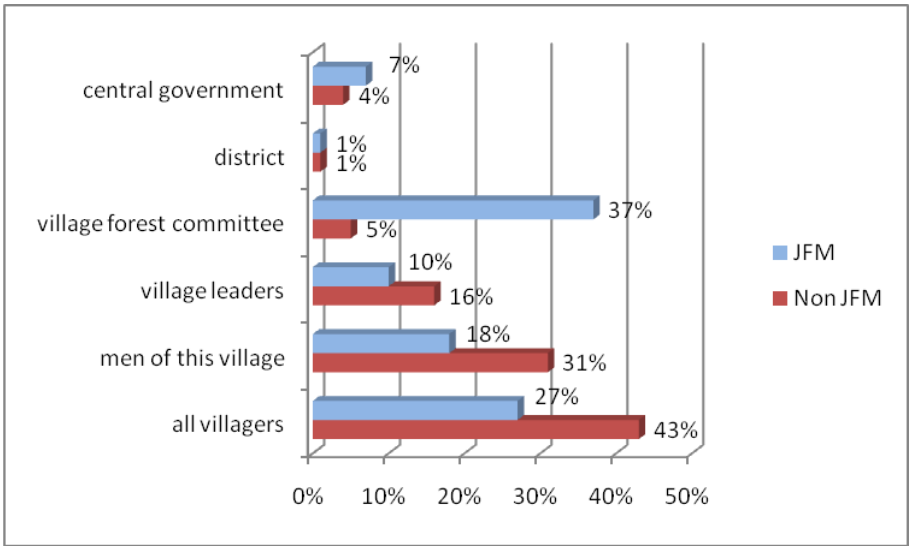
In non JFM villages, which were primarily accessed by ordinary villagers of male gender, the reason for entry were timber (47%) and pole (25%) cutting (Figure 7.3 below).

Figure 7.3 Primary motivation of preferential access group to enter forest reserve



These results match with the second set of questions about the primary beneficiary of the forest reserve, which also brought significant differences between the JFM and the non JFM villages (X^2 (10) = 43.1, p<0.001; Cramer's V=0.29, p<0.001). In the JFM case, the forest committee members were perceived (37%) to be the main beneficiaries of the forest reserves under JFM. In contrast, all villagers were perceived to benefit (by 43%) from the non JFM forests (Figure 7.4 below). This result confirms that while the non JFM forests benefit the large majority of the villagers (particularly men), JFM reduces these benefits in favour of the forest committee members.

Figure 7.4 Who benefits most from the forest reserve?



The JFM forest committees were provided with preferential access with the purpose of patrolling the forest on behalf of the state. The predominance of patrol as a reason of entry accompanied with a reduction of timber cutting as primary motivation of entry in the JFM forests reflects this. This result lends itself to explain the reduced disturbance of JFM forests. Nevertheless, when benefits are considered, it emerges that the forest committee is not interpreting its role simply as forest protectors but that they use their preferential access to enrich themselves with forest resources in the lack of other formal benefits. This is illustrated through the quote of a VFC member in Maseyu village below, which might explain why JFM did not lead to a significant reduction in wood cuttings (Chapter 6 above):

> "I have my ID, if I see a timber tree how can I let it stand there? These people [from FDB] have not been here for 2-3 years. If I get no other benefits, I use my ID to take my own benefits from the forest." Member VFC, Maseyu village

The villagers felt that the forest committee members benefitted mainly (Table 7.9) through taking timber (37%) and charcoal from the forest (22%), to some extent also through the receipt of allowances (6%), collection of fines (10%) and bribes (6%). 9% of the respondents felt that the committee members as the main beneficiaries of the JFM regime benefitted through increased power over decision making of the forest and 8% through gaining respect from other villagers. In the non JFM villages, in contrast, over 50% of the

respondents indicated that primary beneficiaries of the forest reserve were male villagers and leaders, who got timber (55%) and charcoal (25%) from the forest reserve (Table 7.10 below).

Table 7.9 Ways in which forest committee members are perceived to benefit (JFM)

Perceived benefits of the forest committee (JFM)	% of respondents n = 191
salary/allowances	6%
more power over decision making about forest	9%
gain respect from other villagers	8%
get charcoal	22%
get timber	37%
fines collected	10%
bribes collected	8%

Table 7.10 Ways in which male villagers and village leaders are perceived to benefit (non JFM)

Perceived benefits of male villagers and village leaders (non JFM)	% of respondents n = 210
get charcoal	26%
get timber	55%
fines collected	4%
bribes collected	8%
mining activities	7%

This statistical result is illustrated with a concrete example from Kitulang'halo forest reserve, where a leading forest committee member was well known in the neighbouring village as charcoal burner making his own profit off the forest. After the research team had come across several active charcoal pits while transecting Kitulang'halo forest in the vicinity of the member's house, the village executive officer tried to stop the research. This shows the alliance between the village government and the forest committee.

The village leadership data shows consistent results. Table 7.8 above showed that in the non JFM villages 26% of the respondents felt that the village leaders have primary access to the forest reserve, compared to only 7% in the JFM villages. This implies that the strong role of the village leaders over the state controlled forest reserves is shifted towards the forest committee in the JFM case. This may explain the close control of the forest committee by the village leaders observed in the JFM villages, which includes for example

nomination of committee members and dealing with offenders (see Chapter 8). More leaders (10.6%) than non leaders (7.7%) indicated that they would collect fuelwood from government forest reserves. However this difference was not statistically significant (U=16,387, p>.001). All other variables in the data set disaggregated by leadership status did not show any significant differences in forest resource use and income between the leaders and non leaders in the sample.

Table 7.8 above has also shown that forest access was perceived to be male dominated by both groups of villagers, JFM (31%) and non JFM (59%). Given that the forest committees are mostly male dominated apart from sometimes one or two 'quota' women, in general access to reserved forest areas is male dominated independent of the management regime. Gender related patterns are dealt with in more detail in the subsequent section.

7.3.2. Gender

The more detailed gender disaggregated analysis confirmed that women, children, elders and disabled were facing exclusion from the forest reserve in both groups. The association between who was excluded from the forest reserve and whether or not it was a village adjacent to a JFM forest was statistically significant (X^2 (4) = 52.9, p<0.001. Cramer's V=0.36 p<0.001). However, this was more strongly so in the non JFM villages (65%) than in the JFM villages (39%) (Table 7.11).

Table 7.11 Villagers' perceptions about which groups are excluded from the forest reserve

	JFM	Non JFM
ordinary villagers	13%	5%
women, children, elders, disabled	39%	65%
all villagers, except forest committee members	16%	0%
I don't know	20%	20%

(Source: Household survey; n = 191 JFM; n = 210 non JFM)

This result indicates that while JFM reduces forest access for ordinary villagers in general and favours forest committee members in their access, it does at the same time reduce the extent to which marginalized groups (e.g. women, elders, children, disabled) are excluded from the forest. Most likely this can be explained with the fact that there were designated days under JFM during which access to the forest is legal and then all social groups can go,

whereas in the non JFM reserves access always remains illegal and women were just told not to go. The PRA work also revealed that villagers in non JFM villages reported that bribes needed to be paid to the village leaders, which in turn excluded women and the poorer villagers (see Chapter 8 below).

The analysis of the source of forest product collection confirmed the same picture. Whereas 6% of the male respondents collected from central government forests, only 2% of the female respondents did so (Table 7.12). This confirms the stronger limitation on access to reserved forests for women. The correlation between the gender of the respondent and the source of forest products was highly significant (Kendall's_Tau b, $p<0.05$, significant at the 0.01 level).

Table 7.12 Source of forest resources by gender

	Male	Female
public lands forest	31	27
village government forest	7	8
community forest	1	1
central government forest	6	2
private forest	1	2
home garden	7	5
farm fields	46	55
Total	100	100

Interestingly, there was no significant gender difference in the time spent walking to the fuelwood source. ($U=17{,}990.5$, $p>0.001$).

The differences regarding the sources used for forest resource collection by the two gender groups were significant for both JFM (X^2 (6) = 20,956, $p<0.05$; Cramer's V: 0.125,$p<0.05$) and non JFM (X^2 (6) = 25,634, $p<0.001$; Cramer's V:0.148,$p<0.001$), however stronger in the non JFM case. This lends further support to the idea that to some degree JFM reduces inequalities for women vis-as-vis men when compared to the control group.

However, this finding did not match the qualitative research where women during the focus group discussion in the non JFM villages spoke openly about going into the forest to collect forest products. In contrast, in the JFM villages women mentioned to only go into the forest on days allowed for fuelwood collection but would otherwise stay away from the reserve

because they were being told so by their husbands and out of fear of being caught by the forest committee.

With regard to the use of forest products, 3% of the male respondents sold forest products while only 1% of the female respondents did so. The correlation between the gender of respondent and use of forest product was highly significant (Kendall's Tau_b, $p<0.05$, at 0.01 level). Split into the JFM and non JFM groups, this gender difference was still statistically significant for the non JFM case (X^2 (2) = 10,861, $p<0.05$; Cramer's V: 0.095, $p<0.05$) but not in the JFM case, where about the same percentage of men and women sold forest products.

Although male respondents had a higher mean cash income from forest products (M= TSH 69,317/=, SE= 14,200) than female respondents (M= TSH 63,044/=, SE= 23,660), this difference did not test as statistically significant. Furthermore, it was not possible to distinguish if the forest cash income originated from products collected from government reserves or other sources. Since very few people collect their products from government reserves (see Table 7.1 above; Table 7.13 below) the distinction between JFM and non JFM hardly matters to anybody's income.

7.3.3. Poverty

There was a statistically significant difference in the sources used for forest resource collection between the four wealth groups ($H(3) = 111.07$; $p<0.05$). Poorest people out of all four asset groups relied most heavily on the central government forests (7%) compared to 5% and 4% in the two rich groups (Table 7.13). Public lands forests and farm fields were the most important sources of forest products across all four wealth groups. Public lands were most heavily used by the poorest wealth group (38%) and farm fields less so (29%). Farm fields were the most important source for the second richest group (61%).

With regard to fuelwood collection in particular, the highest percentage of respondents who collect fuelwood from government forest reserves (13.1%) was in the poorest wealth group (Table 7.14).

Table 7.13 Sources of forest product collection (in % of respondents)

	1 (richest)	2	3	4 (poorest)
public lands forest	32	22	28	38
village government forest	8	4	7	11
community forest	0	0	1	2
central government forest	5	4	3	7
private forest	1	2	0	1
home garden	6	5	4	11
farm fields	48	61	56	29

However, the difference in the source of fuelwood between the four wealth groups did not test as statistically significant ($H(3)=3.34$, $p>.05$). A possible reason to explain the higher reliance of the poorest wealth group on reserved forests is their more limited ownership of farm fields.

Table 7.14 Fuelwood sources, by wealth group (in % of respondents)

	1 (richest)	2	3	4 (poorest)
government forest reserve	9.3	7.1	4.1	13.1
public land	28.9	18.2	20.6	21.2
village forest	3.1	2.0	3.1	2.0
private land	0.0	0.0	1.0	0.0
own woodlot	1.0	0.0	0.0	0.0
farm fields	47.4	65.7	59.8	43.4
home garden	5.2	2.0	8.2	14.1
buy on market	3.1	4.0	3.1	6.1
brought to the house	2.1	1.0	0.0	0.0

There was no significant correlation between the wealth group and the frequency or the variety of forest resources collection.

The time spent in minutes walking to the fuelwood source was significantly dependent ($H(3)=9.210$, $p<0.05$) on the wealth group. Poorer people walked longer distances to collect fuelwood (see Table 7.15 below). Given that the predominant source of fuelwood was farm fields this indicates that poorest people have less access to farms located in the vicinity of the village. Or, in cases where the forest reserve is far away and other groups can rely on their closer fields, poor people still walk to the more distant reserve. Due to a more limited ownership of land assets the poorest people had hence fewer opportunities to adjust their

livelihood strategies (i.e. forest resource collection) in situations of reduced access to forest reserve through introduction of JFM.

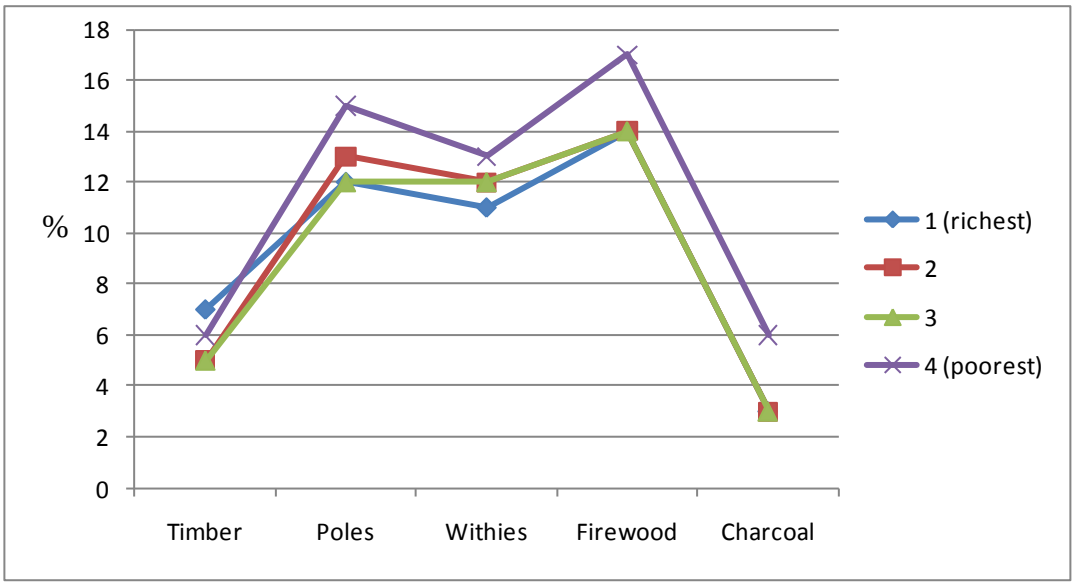
Table 7.15 Distance to fuelwood source in minutes walking, by wealth group

	1(richest)	2	3	4 (poorest)
Mean	21.9	25.5	29.3	27.5
s.d.	30.7	38.1	50.4	29.9
Median	10.0	10.0	10.0	15.0
Maximum	180.0	180.0	300.0	180.0

The type of forest products collected was significantly correlated (at the .05 level) with the wealth group (Kendall's tau_b, $p<0.5$). Figure 7.5 overleaf shows the wealth disaggregated use of wood based forest resources. Poorer people used the reserved forest mainly for firewood (17% of respondents), poles (15%), and withies (13%). More respondents from the richest wealth group (7%) than from the poorest group (6%) used the forest reserve as a source of timber.

With regard to non-timber forest products (NTFPs) the differences between rich and poor people were even more pronounced (Figure 7.6). 12% of people in the richest wealth group (1) used the forest reserve to provide farm land, compared to only 1% in the poorest group (4). Similarly 5% of the villagers in the richest quartile used the forest reserve for grazing land while none of the poorest people did so. All four wealth groups used the forest reserve to collect medicines, leaves, vegetables, fruit and grass. The majority of people who used the forest reserve to provide edible fruit, vegetables and leaves were not in the poorest but in the second wealth quartile group (10%).

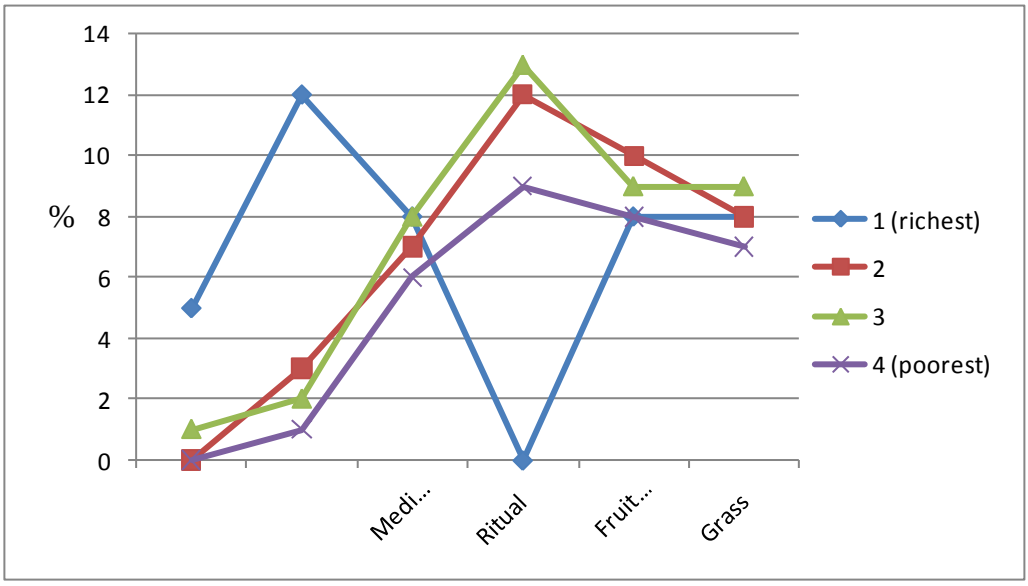
Figure 7.5 Wood based forest resource use by wealth group (% of respondents)



('Original in colour')

Ritual use was more pronounced amongst the two middle wealth groups, the richest people did not practice rituals in forest reserves at all.

Figure 7.6 Non Timber Forest Product use by wealth group (in % of respondents)



('Original in colour')

While home consumption is the dominant form of forest resource use across all wealth groups, poorest people have the highest percentage of sale (3%) and the lowest of home consumption (94%) compared to the other three wealth groups (Table 7.16). This indicates their stronger dependency on forest resources as a source of cash in the lack of other sources. The correlation between the use of forest products and the wealth group of the respondent tested as statistically significant (Kendall's Tau_b, $p<0.05$, at 0.05 level).

Table 7.16 Use of forest products by wealth group (% of respondents)

	1 (richest)	2	3	4 (poorest)
HH consumption	97	98	97	94
sale	2	1	2	3
both	1	1	1	3

With regard to cash income from forest products, the poorest wealth group had the lowest average income. The correlation between wealth group and forest cash income tested as statistically highly significant (Kendall's Tau_b, $p<0.05$, at 0.01 level). There was a significant negative correlation between annual forest cash income and asset wealth group ($r= -.236$; $p<.05$; $rs=-0.308$; $p<.01$; $\tau = -0.236$, $p<.01$). The poorer the household is in asset wealth, the lower the forest cash income (Table 7.17).

Table 7.17 Average forest resource cash income by wealth group

	1 (richest)	2	3	4 (poorest)
Mean	88,406	99,894	60,840	35,387
SE	20,832	36,286	27,524	122,507
Min	1,000	4,000	1,500	1,000
Max	300,000	500,000	350,000	297,000

All wealth groups in the JFM villages except the second richest one had a higher average annual forest resource cash income than in the non JFM villages (Table 7.18 below). Thus, while wealth groups 1, 3, and 4 gained in the JFM scenario compared to the control group, wealth group 2 with the highest average annual cash income from forest resources in the non JFM scenario faces a cash income 'loss' of over 100,000 TSH p.a. on average under JFM.

Table 7.18 Mean cash forest income p.a. (TSH) by wealth group

	1(richest)	2	3	4 (poorest)
JFM	98,250	36,643	92,888	42,880
Non JFM	58,875	149,089	24,214	29,623
Income gain/gap	39,375	-112,446	68,674	13,257

Keeping the above mentioned (sub-Section 5.2.5.2) limitations about comparing forest cash income and asset wealth in mind, relative forest cash income was calculated as a percentage of the average asset wealth of the respective wealth group. This relative importance of forest cash income to the household was highest for the poorest wealth group and lowest for the richest group. For the poorest wealth group the average annual cash income from forest products represents almost 30% of their total average asset wealth. For the richest group in contrast the relative importance was only 6%. In other words, for the poorest households, forest resources play a more important role to contribute to contribute to the overall wealth situation of the household than for richest group. This situation was the same for the JFM (poorest: 35.6%; richest: 8.3%) and the control group (poorest: 24.7%; richest: 3.4%).

7.4. Displacement of forest resource collection

This section assesses the validity of the sixth hypothesis that the less permeable access regime of the JFM forests leads to displacement of forest harvesting to adjacent forest areas that are less well protected (i.e. leakage effect).

Section 7.2.1 above indicated reduced access to JFM forests in comparison to the control group. At the same time there are no signs of reduced availability and accessibility of forest resources to households in the JFM villages. Farm fields and public lands forests play a stronger role as a source of forest product collection in the JFM villages than in the non JFM villages. These results lend themselves to assume that due to the less permeable access regime in the JFM forests resource collection was diverted to the more easily accessible areas, i.e. public lands and farm fields, which still offer sufficient resources.

The villagers were asked whether their access to the respective forest reserves had changed during the past 5 years. While over 60% in both groups responded that they never went to

the forest, over 25% said they went less often and 15% that they went more often. Those respondents who answered that they went less often to the forest reserve nowadays than 5 years ago were asked about their strategy to respond to this change (Table 7.19 below). Increased use of public lands forests was the most important coping strategy of the respondents from the JFM villages (63%), while it was less relevant (23%) for the control group. This association between people's strategy to respond to reduced access to the forest reserve and whether or not it was a village adjacent to a JFM forest was highly significant (X^2 (4) = 26.76, p<0.001; Cramer's V= 0.47 p<0.001).

Table 7.19 Coping strategies of villagers who went less often to forest reserve than 5 years ago

	JFM (n= 53)	Non JFM (n = 69)
go more to public land forest	63%	23%
use home garden more often	33%	61%
buy forest products on market	2%	16%
go when forest committee members are away, or at night	2%	0%

This result hints at the fact that the restricted access through the JFM regime causes more frequent use of the public lands forest, indicating a leakage effect of the JFM process to open access forest areas. During the PRA, JFM villagers confirmed to be relying on open areas due to the limited access to the reserved forests. For example in Kitulang'halo, villagers explained that since it was not allowed to make charcoal in the forest reserve, they would go to the unreserved areas. However, the ones who were close to the forest reserve were given permission to enter. This is consistent with Vyamana (2009), who found that in JFM villages where the community had access to 'open' forests, the latter tended to become degraded once JFM 'closure' was in place.

The qualitative research confirmed the importance of alternatives for villagers in their strategies to cope with changed forest resource availability. In Logo village, where Milawilila JFM forest has an enforced no access regime, increased land scarcity, puts more stress on Ngambaula forest.

> "Milawilila is protected by the villagers. Other forests [on public land] have been cleared now, so more people go to Ngambaula. People still cut logs for timber. There is only this one forest for Logo village, we have no alternative." Villager, Logo village

7.5. Summary and discussion of results

7.5.1. Impacts of JFM on livelihoods

With regard to hypothesis one, the study results support the assumption that villagers adjacent to a forest reserve under JFM face reduced forest access compared to villagers adjacent to a forest under sole state management. The three government forest reserves under JFM in this study were used less often by adjacent villagers as a source of forest resources than the three control group forests. However, the more limited access to the forest reserve did not in turn lead to a reduced household level accessibility of forest resources in the JFM villages. There was no difference in the types of resources used between the two groups of households and no indication of reduced fuelwood availability in the JFM households. Neither positive nor negative impacts of the JFM regime on forest resource use could be clearly identified and the second hypothesis is thus rejected.

The spatial analysis by site showed that even in the non JFM villages the government forest reserves were not used for fuelwood collection, where other sources were available that were closer. Thus, the study results indicate that fuelwood availability at household level cannot be directly linked to the access regime of a particular forest reserve. Rather this study has shown that distance to the forest reserve is an important factor in addition to access for people's decision on where to collect fuelwood. This confirms the argument of Dewees (1997) that people adopt their strategies for fuelwood collection to their particular situation and there is hence no direct link between the access to a forest and fuelwood scarcity. Farmers develop tree management strategies and cultural responses to deal with scarcities on the basis of their access to bush and managed fallow land, the community's land and labour resources, and to on farm trees (Arnold and Dewees 1997). This explains why making fuelwood collection the only benefit for the villagers participating in JFM (as it was the case in two of the three research sites) is not a sufficient incentive for the villagers to protect the forest. Over 90% of the villagers in this study collected dead fuelwood available on the lands surrounding their homesteads and fuelwood collection was thus not a motive of forest entry and tree cutting. Therefore, in contrast to Ravindranath N. H. *et al.* (2004) this study does not confirm that the availability and accessibility of

fuelwood is a suitable variable to gauge the benefits that communities derive from the forest.

Based on this study, the third hypothesis, that households in JFM villages have lower forest cash incomes compared to the households in the non JFM villages, needs to be rejected. The average forest resource cash income was higher amongst households from JFM villages than from non JFM villages, however not at a statistically significant level. There was a large variation with regard to the total annual forest resource cash income that the households earned and divided into income ranges, more JFM than non JFM households were in the higher income range groups. These results match other studies that showed that household incomes from PFM forests increased slightly (Vyamana 2009). Charcoal provided the number one cash based forest product, followed by timber. This explains why forest incomes were highest in the JFM village Maseyu where the active charcoal business provides an important source of cash income and has replaced agriculture as the main source of livelihood. This confirms the findings of Malimbwi *et al.* (n.d.) that an average charcoal making household around Kitulang'halo forest reserve, realizes a monthly income[20] above the minimum salary paid to government staff.

The JFM villagers did feel better informed about forest issues than the villagers in the non JFM sites. However, the level of information was still unsatisfactory to the villagers. The study confirms earlier findings (Sundar 2002, Nayak and Berkes 2008, Agarwal 2001) that JFM did not increase participation in decision making about access and use rules. These were made by the village government in both scenarios. The fourth hypothesis is thus rejected.

An important finding of this study (summarized in Table 7.7 above) is the fact that non JFM forests are not *de facto* open access. Rather, this study shows, that access to and use of non JFM forests by local people is *de facto* subjected mainly to village government decisions. In the lack of central government, represented through the forestry division, taking up its management role, the village governments have put unofficial management

[20] 43 bags of TSH 1,000/= earning 43,000/= per month.

regimes in place without the *de jure* authority to pass such rules. This confirms the observations of Cleaver (2007 and 2002) that there are differences between *de jure* and *de facto* local level institutions.

7.5.2. Impacts of JFM on equity

The findings of this study regarding the fifth hypothesis are mixed. Forest access in both JFM and non JFM forests was male dominated. In JFM forests primary access holders were forest committee members while in non JFM forests primary access was for male villagers and village leaders. Women, elders and disabled are social groups facing highest limitation on forest access, which is more pronounced in the non JFM forests than in the JFM forests. In other words, the JFM process smoothened the more disadvantaged access position of these groups. Two reasons may explain this. First, JFM restricted access for all villagers more strongly compared to the non JFM forests in favour of committee members. Second, by introducing certain days during which all villagers can enter the reserve for firewood collection, women had enforceable opportunities to enter the forest whereas in the non JFM forests they were told by the men not to enter the reserve. To what extent the preferential access of the committee manifests or extends inequity is a complicated issue. This is because access to the forest reserve is even in the non JFM forests not fully equal to all social groups within the village. Therefore these forests cannot be considered "open access". There are leadership, gender and wealth related patterns to forest access and resource use in both scenarios JFM and non JFM. Given that the committees comprised mainly male members and did not include the poorest village members, women and the poor were still disadvantaged in their forest access. In addition to access to the forest reserve, access to rule making was often not equal. The latter point is shown by other studies, which established unequal distribution of benefits from PFM which perpetuates or even reinforces social inequity and that while the potential exists to reduce social inequity, it does not increase benefits to poor and marginalized households (McDermott and Schreckenberg 2009, Maharjan *et al.* 2009).

With regard to poverty, the study confirms earlier findings (Lund and Treue 2008, Straede and Treue 2006, Cavendish 2000, McDermott and Schreckenberg 2009, Ngaga *et al.* 2009,

MNRT 2009) of a higher importance of reserved forests and forest incomes of poorer people. This is explained with their limited access to ownership of good land which may provide these resources in alternative to the reserved forest areas and to which richer groups divert their demand. There was no significant correlation between wealth and leadership in this study which might be due to the small sample size. Therefore it cannot be concluded that committee membership is primarily for the rich. The wealth disaggregated analysis for the forest resource variables showed that the type of forest products collected was significantly correlated with wealth. The majority of respondents in the richest wealth group used the forest to provide farm land and grazing land and as a source of timber, while poor people used the forest mainly for firewood, poles, and withies. This is consistent with research from India, where poorer people depend more heavily on firewood from the natural forests than richer people (Hobley 1996), who are more interested in the forest as a timber resource.

The study results show that poorest people were the ones who relied most heavily on the central government forest reserves. Given their higher dependency, access restriction thus has a stronger negative effect on poorer people. The poorest people had the highest percentage of sale and the lowest of subsistence use of forest products compared to the other three wealth groups. This indicates their stronger dependency on forest resources for their livelihood and as a source of cash. The correlation between wealth group and forest income tested as statistically highly significant. The poorest wealth group had the lowest absolute income from forest products, however expressed in relative terms, the poorest group had the highest income derived from the forest. In contrast, the richest group had the lowest relative forest income. This means that for the poorest households, forest resources play a more important role to contribute to relative wealth than for the richest households. Their average annual cash income from forest products represents almost 30% of their total average asset wealth compared to only 6% for the richest group. These percentages are consistent with earlier studies (Lund and Treue 2008, McDermott and Schreckenberg 2009, Ngaga *et al.* 2009, Blomley 2009). In this study, households of all wealth groups (except the second richest one) in JFM villages had higher annual forest incomes than in the non

JFM villages. However, this higher income is most likely based on illegal forest use as no legal utilization was allowed in the forest.

7.5.3. Impacts of JFM on displacement of resource use

The research results show that forest products were collected from a variety of sources not only the respective forest reserves. The restricted access of forests placed under JFM then led to a stronger diversion of the demand for forest resources into surrounding forests and woodlands with open access. This latter finding supports the sixth hypothesis that the less permeable access regime of the JFM forests leads to a leakage effect into other forest and woodlands areas, which confirms earlier studies (MNRT 2009, Robinson *et al.* 2005). By spreading their demand for forest products on the surrounding more permeable forests and woodlands, the households were able to equalize a restriction in access to one particular forest placed under PFM. However, this is only possible as long as these open access areas still contain sufficient resources. This finding may contribute to explain why deforestation in Tanzania is highest on General Lands, the land which is neither classified as reserved or village land (REDD-net 2009). The synthesis of this chapter is that the access to the forest is reduced for the majority of (male) villagers and preferential access to the forest and related benefits is given to the forest committee. A diversion of forest resource collection by the majority takes place to public lands areas, while harvesting in the forest reserve continues on a smaller scale by a few privileged people of the forest committee. Thus, the study confirms the elite-capture concerns raised in Asian PFM sites (Iversen *et al.* 2006, Kumar 2002, Nagendra and Gokhale 2008, Behera and Engel 2006, Padit and Thapa 2004). Hence, the end results are comparatively better off forests, without a negative livelihoods effect for the majority of the villagers – at least in the short and medium term. Long-term effects remain to be seen, but with increasing inequity and harvesting in both public lands and the forest reserve continuing, the set up may not be sustainable.

8. Impacts on forest governance

8.1. Introduction

This chapter aims to answer the third research question: "Has JFM created sustainable forest governance institutions at the village level?" The finding made in Section 6.4.2 that JFM has had no significant effect on actual forest utilization, raises doubts about the effectiveness of the local institutions of forest governance. Based on this result and the literature review in Chapter 2, the following hypotheses are formulated:

1. A lack of delegation of power and rights at the local level inhibits the achievement of decentralization through JFM.

2. The local institutions of forest management created at village level do not embody principles of good governance, and foster corrupt practices.

3. The local institutions of forest management reinforce inequity.

As a tool for the analysis, the JFM process in the three study sites will be compared to the process steps and guiding principles defined in the government JFM guidelines (United Republic of Tanzania 2006). These guidelines define what is considered 'good practice' with the aim of leading to successful, sustainable JFM implementation. Although the JFM projects in the study sites had been initiated prior to the formulation of the JFM guidelines, the latter can serve as a useful tool to assess 'what was done' against 'what should have been done'. Subsequently, conclusions about the sustainability of the JFM process and the local forest committees created in the three case study sites can be drawn.

Chapter 2 above described theoretical concepts that can be useful to determine if the local forest management institutions created through the JFM processes in the three sites can be considered sustainable. These are Ribot's description of decentralization, the categories of participation and criteria for successful local CBNRM institutions based on the property rights literature.

In Section 8.2 the JFM process in the three sites is compared against the process steps and guiding principles listed in the government JFM guidelines. In Section 8.3 it is assessed whether the local forest committees created represent a serious decentralization effort. Section 8.4 presents a short summary of the findings on governance related impacts.

8.2. The JFM process in the study sites

The following sub-sections compare each stage of JFM implementation outlined in the government guidelines defining 'what should have been done' to 'what was done' in the study sites. This serves the purpose to provide an overview of the nature of the JFM schemes implemented in the study villages and to demonstrate the many shortcomings in the process. Reference to the JFM principles outlined in the government guidelines shows that these principles have not been realized. Comparison to the control group sites shows that JFM, in the way it was implemented, did not improve the forest governance situation compared to the sites without JFM.

8.2.1. Stage 1: Getting started

What should have been done:

The JFM guidelines recommend that as a first step, the FBD staff should brief the district staff, and form an inter-disciplinary team to undertake the work at the village level. A meeting with the Village Council and the Village Assembly should be held. The team should then facilitate the establishment and orientation of a Village Natural Resource Management Committee or Village Forest Committee (VFC) as local institution of forest governance.

What was done:

The JFM process in the three sites was initiated by different actors: in Maseyu village by FBD staff; in Mwalazi village by foresters from the Regional Catchment Forest Office in Morogoro; and in Milawilila by the Wildlife Conservation Society of Tanzania (WCST), a local NGO. Only in Milawilila did the facilitation team consist of a mixed team composed of forestry and community extension staff, as well as ward and district representatives. In the two other sites, the team consisted of forestry staff only. Principle 7 of the JFM

guidelines points to the fact that forest staff are locally perceived as policemen but PFM responsibilities require work in partnership with communities. Therefore using forest staff only was not an ideal approach.

The guidelines emphasize that the participatory approach requires foresters to turn into facilitators, advisors, mediators and environmental watchdogs. This study shows that this change of roles does not come easy. The district forest officer who facilitated the introduction of the research to one of the JFM study villages, quickly and reluctantly turned into a policing officer when he observed a villager with a push cart full of *Dalbergia melanoxylon (Locally: mpingo)* wood beside the road. He arrested the villager on the spot in the presence of the researcher.

Usually the first contact people were the village leaders (village executive officer and village chairman). Meetings with the Village Council and the Village Assembly had only been held in Milawilila, where the NGO was involved.

Forest committees had been established in all three JFM study villages, although in Maseyu and Mwalazi they seemed dormant. With the exception of Milawilila, the VFC members had not been elected by the Village Assembly but directly appointed by the village leaders and then retroactively announced in a Village Assembly meeting (see also Section 8.3.1 below).

Further orientation of the VFCs once they had been established was poor in Maseyu, better in Mwalazi and the best out of the three sites in Milawilila. In Maseyu village, identity cards had been given to the committee members by the FBD representatives, allowing legal entry into the forest reserve for patrol but there had been hardly any further orientation or training of the VFC. In Maseyu, the VFC members were promised payment of allowances, boots and working gear. However these items had reportedly never been provided by FBD. Resentments of the VFC members in Maseyu were expressed openly during the PRA:

> "We think forest officials keep away now because they have not kept their promise." (VFC member, Maseyu village)

Only in Milawilila village did the VFC members report that sensitization meetings and workshops had been conducted. Village leaders had been on study tours to learn from other districts about PFM experiences.

In Kitulang'halo, although FBD had initially instructed the VFC to appoint a treasurer, there was no treasurer in place, as the committee had no income to administer. These types of instructions show that a blueprint approach was followed by forest officials when introducing JFM to the villagers without considering what makes sense in the particular circumstances. Similarly, in Milawilila villagers reported that they were told by WCST to open an account. There was no income from tourism related activities and there were no future plans for harvesting of forest products. When the villagers where asked by the researchers from which source the money for the account would be coming they replied "from donors".

8.2.2. Stage 2: Assessment and management planning

What should have been done:

The JFM guidelines foresee that internal and external forest boundaries are to be defined and marked jointly with the VFC. Internal boundaries refer to a division of the management of the forest into separate areas for each of the surrounding villages to manage, called a forest management area. A participatory forest resources assessment should be conducted as a basis for the forest management plan.

What was done:

Boundary issues were reasons of dispute in two of the three JFM sites. In the 1999 JFM proposal for Kitulang'halo FBD acknowledges that confusion over the Kitulang'halo forest boundary has historical nature (see Luoga *et al.* 2005). Nevertheless in Maseyu village a discussion of forest reserve boundaries had not been part of the JFM process. During the interviews conducted as part of this study, the villagers and the Regional Catchment Office in Morogoro had different views of the boundary lines of Kitulang'halo forest reserve. In Mwalazi village joint boundary planning and marking between FBD and the VFC had

taken place during JFM implementation, however when this study was conducted the boundary was not marked at all places and perceptions between villagers and FBD staff about the boundary line differed. The view of the forest extension officer about the boundary was inconsistent with the map of Kimboza forest reserve issued by his office. Only Milawilila forest reserve was resurveyed in 2004 as part of the JFM process. The area was found to be almost intact compared to the gazettement in 1914. A permanent boundary had been established by planting trees und it was easily recognizable during the forest transect walks. There were no deviating perceptions about the boundary of Milawilila forest by the villagers during the PRA.

With the exception of Milawilila, the JFM process did not make a difference with regard to the clarity of boundary issues when compared to the control group sites. In all control group sites, forest boundaries were disputed. The only map of Ngambaula that could be found to plan the forest transects was an old map from colonial times. Female villagers during the PRA expressed their wish for clarification on the forest boundaries. At the time of this study, forest border clearing and planting by the district forest office had just taken place in Dindili. This had caused much discontent amongst the villagers as the quote below demonstrates.

> "People from forestry created boundaries and took areas of our farms. Land was taken away from us when the boundaries for the forest reserve were cleared, which had been given to us by the previous village chairman. We know where the forest started. There are old demarcations (holes in the ground). The new demarcations do not follow the old ones. The old village chairman, who now passed away told us to not bypass these. This was in 1986. In Kilombero people were participating in the process of boundary negotiation but here there was no participation." Elderly lady, Fulwe village

There was no evidence that a participatory forest resource assessment and planning process had taken place for Kitulang'halo and Kimboza forests. In Milawilila, in 2005 a participatory forest resources assessment had been undertaken assisting in the development of the Milawilila forest management plan.

8.2.3. Stage 3: Formalizing and legalizing

What should have been done:

The Forest Act requires that every forest reserve has a management plan (Section 11(4)). The Forest Management Plan, to be developed in consultation with the adjacent communities, will describe if the overall objective of forest management is protection or production. The guidelines call for a Joint Management Agreement (JMA) to be prepared subsequently, defining how cost and benefit are shared between the parties. The JMA specifies important issues such as how the responsibility of management will be shared, which rules will apply, how funds from forest management will be managed and expended and the procedures for resolving disputes between the parties. By-laws are to be developed to enforce the JMA.

What was done:

- **Forest Management Plan and Joint Management Agreement**

Although the 1999 Kitulang'halo JFM proposal foresees the drafting and signing of a JMA during the six month trial period of joint management, no JMA existed by the time of this study in 2006. There was a management plan for Kimboza forest reserve dated May 2004, prepared by the Morogoro Regional Catchment Forest Office. There was also a JMA between the FBD and the four forest adjacent villages Changa, Uponda, Kibangere and Mwalazi dated June 2003. Both documents were available at the Morogoro Region Catchment Office but not in Mwalazi village. Hence, the Mwalazi VFC members were not sure if these documents existed and did not know the function of the documents. In site 3, the villagers and VFC members of Milawilila village claimed that there was no management plan and no written agreement about the JFM process in Milawilila forest. In contrast, the WCST office reported that a JMA had been drafted and sent to the district for approval, where it had been subject to delay.

The lack of forest management plans led to confusion about the ownership and the management status of the forest reserves in both JFM and control group sites. These

questions required long debates during the PRAs. In Maseyu, villagers believed that due to the JFM process in Kitulang'halo, the forest was owned by the village. In Mwalazi village government and villagers alike knew that Kimboza was owned by central government and that the role of the villagers was simply 'guarding' the forest. In Milwawilila villagers responded that all villagers owned Milawilila forest. Similarly, there were conflicting ownership claims in the control group sites, as the quote below from the Village Executive Officer (VEO) of Logo village shows:

> "Ngambaula used to be protected by elders. After independence the government came and put up boundaries. There was some management but this is when the destruction started. Now it is our forest. The Land Act of 1999 says that anything around the village land belongs to the village. Also the District understands that. Lately, the District Commissioner came and said the forest belongs to the village. There is no documentation, there are no procedures. The forest is within our village hence it is our forest." VEO, Logo village

In the absence of clear rules of forest ownership and management, there is a cloud of mystery around forestry issues, which villagers in more powerful positions use to their advantage.

- **Cost-benefit sharing**

Principle 1 of the JFM guidelines " Communities as Forest Managers" stipulates that communities for their efforts of forest protection and patrol receive a range of concrete benefits, such as rights to harvest forest products, share revenue from forest harvesting, retain fines and confiscated materials, etc. The evidence collected in this study shows that no formal benefits were provided to the communities. An "equitable sharing of cost and benefits of forest management" as recommended in JFM principle 5 of the guidelines, did not take place. This is due to the lack of a JMA as basis for an agreement on shared management responsibilities and benefits. There was never a negotiation process but rather a top down way of instructing villagers to form a committee and start patrolling the forest. Dissatisfaction and conflict arose, once the villagers had realized that FBD did not even keep up its promises with regard to providing equipment and other incentives. The Kitulang'halo case demonstrates how the lack of such balanced agreement makes the JFM

process unsustainable in the long term – a concern even recognized by FBD in its guidelines.

- **By-laws**

All 3 JFM villages had developed by-laws referring to the illegal harvesting of forest resources. For example a fine of TSH 10,000/= was to be paid when someone was caught inside the forest with a saw; TSH 50,000/= if caught sawing (Maseyu), TSH 50,000/= for charcoal making, TSH 100,000/= for timber cutting (in Mwalazi), or TSH 500/= to TSH 1,000/= if caught with a *Panga* (a local Machete) inside the forest reserve (Milawilila). Such by-laws that include restrictions on equipment a user takes into the forest are according to McKean (2000) simpler to enforce than quantitative extraction limits.

However, approval of the village by-laws by the district was missing in all three JFM study sites. For example, in Milawilila, the by-laws had been approved by the Village Assembly and had been sent to the district in June/July 2005. 12 months later, the by-laws had not been endorsed by the District Council. The delay was attributed by WCST staff to the fact that some of the village or ward executive leaders were cushioning some of the illegal activities for their benefits. Thus, although by-laws had been formulated they were not enforced. Hence, the knowledge about the by-laws was not well spread amongst the villagers. Female farmers expressed that they had never seen any written by-laws. By-laws were formulated by the village government who read them out during the Village Assembly but the women had not been involved in their formulation. The women expressed fear of by-laws and believed that whoever was caught in the forest was jailed for 30 years.

The situation in the JFM villages did not differ much from the control group villages. Forest related by laws had either not been developed (e.g. in Ngong'oloNgong'oloi), or they were not known to the villagers (e.g. Fulwe). In Logo village, draft by-laws had been formulated in 2004 but for two years they had not been endorsed by the district.

8.2.4. Stage 4: Implementing

What should have been done:

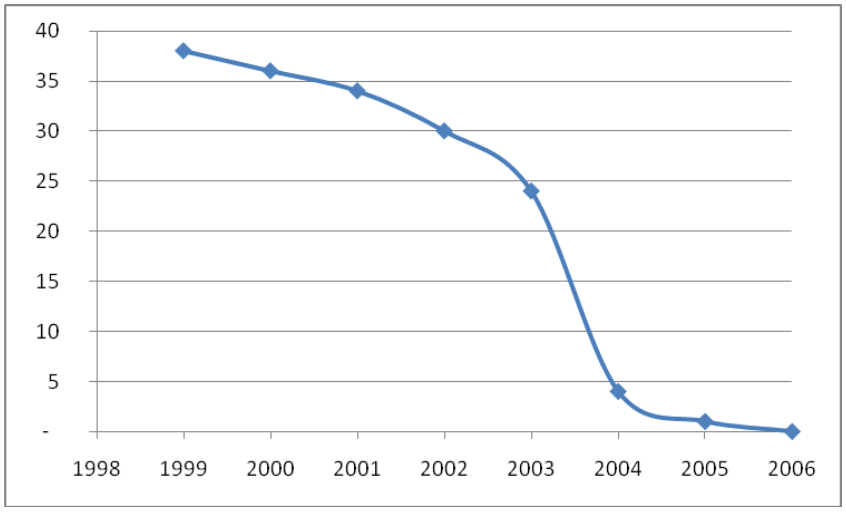
According to the JFM guidelines, the forestry extension staff should help the community to put systems of forest management into place, including appointing and training a patrol team, starting and maintaining records e.g. patrol book, receipt book, minutes of meetings etc., and making sure the rules about forest access and use are known. Frequent extension visits are required to keep an eye on progress and help with problem solving.

What was done:

- **Patrol**

In Maseyu a patrol book was kept for patrol records from the year 1999 to 2004 with declining frequency of entries. There were regular monthly records in 1999, sometimes with forest patrols 3 to 4 times per month up to the year 2003. After 2003 the entries in the patrol book became much less regular (see Figure 8.1).

Figure 8.1 Approximate number of forest patrols per year in Kitulang'halo



(Source: Approximation based on patrol book records from Kitulanghalo village)

This coincides with the time when the village leaders reported that the FBD officials did not come anymore, which hints at the importance of extension visits to keeping the system alive. The last entry in the patrol book was dated April 2005 and the second last one November 2004. Patrols were reportedly undertaken twice per week, although this was not consistent with the written records.

In Mwalazi, although not verifiable through records, VFC members claimed to be patrolling regularly twice per month in groups of four people, including two men and two women. These sound like responses that people were told to give by government officials. Only in Milawilila were patrols conducted regularly and documented in a patrol book, which was shown to the research team.

- **Extension visits**

In Maseyu, forest officials had reportedly come to the village every six month initially to check how the committee was working and how patrols were organized. In Mwalazi village an FBD extension officer stationed in Mwalazi village made continuous follow-up. Consequently, the JFM process in Mwalazi seemed more alive than in Kitulang'halo. In Milawilila, WCST staff reportedly came to visit Milawilila between one to three times per month. The NGO took an active role in facilitating the JFM process. They distributed forest education materials. While the frequent and continuous follow up of the NGO strengthened the JFM process in Milawilila, at the same time it reduced the perception of the importance of the district as partner to the village in the JFM process. The villagers were not aware of any meetings with the district that had taken place during the entire JFM process. They assumed that the district had delegated its responsibility to WCST. The District Forest Officer and donor representatives had come to visit the project about once per year.

- **Record keeping**

The investigation of public records and accounts kept was a way of analyzing the practices and the effectiveness of the forest committees. Although in the three JFM sites there was no forest revenue, prudence in keeping of information about the activities of the committee including patrols, fines collected and meetings held are signs of good governance – that is transparency and accountability. However, in all villages, except Milawilila, no records were publicly available. There is a habit among leaders to lock away record books in their residential houses. This makes accessing them difficult, prevents transparency and creates power. Milawilila was the only village where the secretary of the VFC kept a range of records, e.g. minutes of meetings, a book of by-laws, a record of activities undertaken in the

forest, and a patrol book, which upon request where made available to the researchers without delay.

- **Rules of access and forest resource use**

In the dearth of any written agreement, the rules of forest access and forest resource use were not clearly established. The Maseyu village government leaders stated that the community was allowed to go to the forest twice a week to take out fuelwood and medicines under VFC supervision. However, just like in Mwalazi, could the days on which access to the forest for fuelwood collection was allowed not be established as views differed. This shows the lack of clarity and transparency with regard to forest related rules.

Charcoal making was according to the leaders not allowed and the charcoal alongside the road was supposedly from open areas and a private forest (Ngerengere army). The VFC in contrast stated that charcoal burning was taking place inside Kitulang'halo forest which was also observed by the research team during the forest transect walks.

There was a different understanding about the rules between male and female villagers. For example in Kitulang'halo, the male PRA participants claimed that they were allowed to enter the reserve twice per week to take out fuelwood and poles, which had been announced during the Village Assembly. Female participants did not know that entry into the reserve was allowed and claimed that they did not enter the reserve at all ("We do not even go into the reserve for fuelwood"). The women were suspicious to hear that the men reported to enter the forest for fuelwood collection as fuelwood collection was a woman's chore. Thus, the women assumed that the men had other motives. The women said that Kitulang'halo had been protected since the 1960s and they were told that they were not allowed to enter this forest. These examples show that social norms and culture are at play when explaining gender related factors of resource access. These cannot be changed simply by introducing a female quota in committee membership, just like the experience in Asia has shown (see Section 3.13 above).

In Milawilila, access to the forest was not allowed at all. This was much to the discontent of the villagers who were not able to harvest wild forest potatoes anymore which had contributed a nutritional source in the past. VFC members explained that there was improvement in forest quality, more rainfall and higher water levels, because the villagers refrained from using the forest. These sound like the usual responses that people are told to give during awareness raising activities.

In the control group villages, leaders as well as ordinary villagers spoke openly about harvesting forest resources from those forests:

> "We go into the forest often as the public land is exhausted and there is no other option. We get caught and we go back. My son (30 years) was caught several times. Everybody just goes into the forest to steal things." Elderly lady, Fulwe village

The villagers of Fulwe described the access to Dindili forest reserve as 'free', whereas Kitulanghalo was perceived to be actively guarded by the Maseyu villagers.

8.2.5. Stages 5 and 6: Revising and expanding

The FBD guidelines recommend planning and budgeting for expansion as other villages start demanding JFM regimes (United Republic of Tanzania 2006). In Kitulang'halo, in the absence of written procedures, there had been no revision of the same. The JFM process had stalled before it could even be fully implemented. In Maseyu villagers, VFC members and village leaders alike expressed their discontent with the JFM process. In Mwalazi, there had been no revision of the Management Plan and JMA and no expansion beyond the four forest adjacent villages. In Milawilila, at the time of this study the JFM project was coming to an end and there were worries among the WCST field staff about the sustainability of the JFM process because the district had not taken ownership in the process. Table 8.1 below summarized the main findings of the above analysis.

Table 8.1 Summary Table: The JFM process in the study sites

"What should have been done" 2006 JFM Guidelines requirement	"What was done" Actual implementation process in the villages		
	Maseyu	**Mwalazi**	**Milawilila**
Stage 1: Getting Started			
• Interdisciplinary team	Only forestry staff (FBD)	Only foresters (Regional Office)	Mixed team (WCST)
• Meeting with Village Council & Assembly	Village leaders	Village leaders	Done
• Establishment of VFC	Done. Members appointed by leaders	Done. Members appointed by leaders	Done. Members elected by Assembly
• Sensitization of VFC	ID cards given, gear promised but not provided	Sensitization meeting	Sensitization meetings and workshops
Stage 2: Assessment and management planning			
• Forest boundaries defined and marked jointly with VFC	None; lots of dispute about boundary	Joint planning and marking; still boundary disputes	Joint process, boundary visible, no disputes
• Participatory forest resources assessment	No evidence	No evidence	Done in 2005
Stage 3: Formalizing and legalizing			
• Management plan	No evidence	Yes. In 2004. Not available at village	Not available at village
• Joint Management Agreement	No evidence	Yes. In 2003. Not available at village	Not available at village
• Cost benefit sharing	None	None	None
• By laws	Existed. Not approved by district; not enforced; not known by villagers	Existed. Not approved by district; not enforced; not known	Existed. Not approved by district; not enforced; not well known
Stage 4: Implementing			
• Appointing and training patrol team	Patrol book, declining entries once extension visits ceased	Impression of regular patrols not credibly supported	Regular patrols, documented in book
• Starting and maintaining records (patrol book, by-laws)	No records available	No records available	All available; maintained
• Making sure use & access rules are known	Lack of clarity about rules	Lack of clarity about rules	Known by villagers
• Frequent extension visits	Every six months initially, then none	Continuous follow-up; local FBD officer	1-3 times per month through NGO
Stage 5 and 6: Revising Plans and JMAs and Expanding to other areas			
	Not done	Not done	Not done

8.3. Sustainability of village forest committees

Village forest committees are the principal local institutions created to govern the JFM process at the village level and to interact as counterpart with outside agents, in particular the FBD. The household survey researched the perceived mandate of the VFCs more deeply. This section investigates the extent to which the village forest committees set up in the three JFM sites fulfil the requirements of effective decentralization outlined in Ribot's (2005) institutional and power choice questions (see Appendix 1).

8.3.1. Institutional set up

The study investigated the question of how the forest committees were integrated into the routine governance structures at village level, in particular their linkage to the Village Assembly. This was explored from two angles: firstly the way in which VFCs had been formed and whether they had been elected through public voting in the Village Assembly as a representative body, and secondly, whether information was shared by the VFCs via the Village Assembly to inform all villagers. As described in Chapter 2 above, such embedding of the VFCs into the village assembly would be a measure of 'good governance for PFM' (Ribot 2005).

The majority of respondents said that the forest committee was appointed by the leaders and not elected in the Village Assembly. The form of inclusion or belonging to the VFC was based on residency and social status in the village, above all personal interest of the village leaders decided over membership. Poor populations had no voice in the VFCs. Although one or two quota women were usually selected, there was no effective mechanism to ensure the inclusion of women and poor populations in decision making and benefits. The study therefore confirms the finding of Cleaver 2001 that formal institutions of forest governance ill reflect the complex social and livelihood identities and the VFCs cannot be considered representative democratic organs of village governance.

Principle 6 of the FBD JFM guidelines "making the most of the existing village framework" underscores for JFM not to create new institutions but build upon already existing ones. However, this principle was not followed. New committees were set up by FBD staff in

parallel to the existing routine village committees (e.g. the village development committee) and given the mandate to look after the forest and to receive powers in the name of decentralization. However, these forest committees were not downwardly accountable with respect to the exercise of the transferred powers and no mechanisms of accountability were put into place. Respondents said that they were not at all informed about the activities of the VFC. There was hence a missing link between the VFCs formed through the JFM process with the elected village governance bodies. Meetings of the VFCs were held sporadically and the Village Assembly was not briefed about forest activities. The village population could not sanction the forest committees via systematic and effective mechanisms to avoid rise of self-interest and power concentration. Table 8.2 below demonstrates that these forest committees were not accountable to the village assembly.

Table 8.2 Villagers' opinion (%) on how forest committee informs the village assembly

	JFM	Non JFM
Villagers are not informed about activities of environment/forest committee	58	55
Committee briefs villagers regularly during assembly meeting	21	8
Committee briefs villagers occasionally at village assembly	5	5
Village government informs us at assembly meeting but committee does not appear	15	10
There is no environment/forest committee in our village	1	22

Over 50% of the respondents in all villages were not informed at all about activities of the forest committees. However, there was a significantly (X^2 (5) = 52.00, p<0.001. Cramer's V=0 .37, p<0.001) higher number of respondents (22%) in JFM villages that reported that the forest committee informed the villagers during Village Assembly meetings than in non JFM villages (8%).

The appointment by central government through the village leaders and the lack of democratic representation lifted the committees to some degree out of the realm of the local and the elected governance bodies at the village level (i.e. Village Council, Village Assembly). Villagers felt that they could not question them. This is compared by Ribot (2005) to privatizing public resources. The forest committees did not strengthen the decision making power of the local elected governance bodies but rather undermined their power leaving the village with no power over who is in charge of the forest.

The VFCs were not responsive in the sense that they responded to local demands. They did not encourage broad based involvement of local people, they did not give local people voice and agency nor did they enable long-term stability. The question of whose interest the VFCs were serving is therefore emerging. Surely, they were not serving the interest of the village as a whole. To a large degree the VFCs were serving the interests of central actors by being mandated to patrol and protect the forest. To some extent they were serving members' interests, or rather a sub-section of the members who benefitted from forest resources sometimes in cooperation with the village leaders. The VFCs were single purpose oriented and not integrative across sectors. Mediating conflicts was not included as a role.

Given the fact that in the study sites village assembly meetings were not held regularly (see Table 8.3 below) and assembly meeting attendance was poor (64% attended sometimes, 24% every time, 12% never), the results of this study lend itself to question the importance of the Village Assembly as a governance body. However, Ribot (2005) argues that it is better to use the elected governance bodies and strengthen them through the PFM process rather than to sideline and further weaken them.

Table 8.3 Frequency of village assembly meetings (% in the perception of interviewed villagers)

	JFM	Non JFM
every month	9	7
every 2-3 months	32	40
every 6 months	18	20
sporadically	6	5
None	4	2
I do not know	29	25

8.3.2. Transfer of power

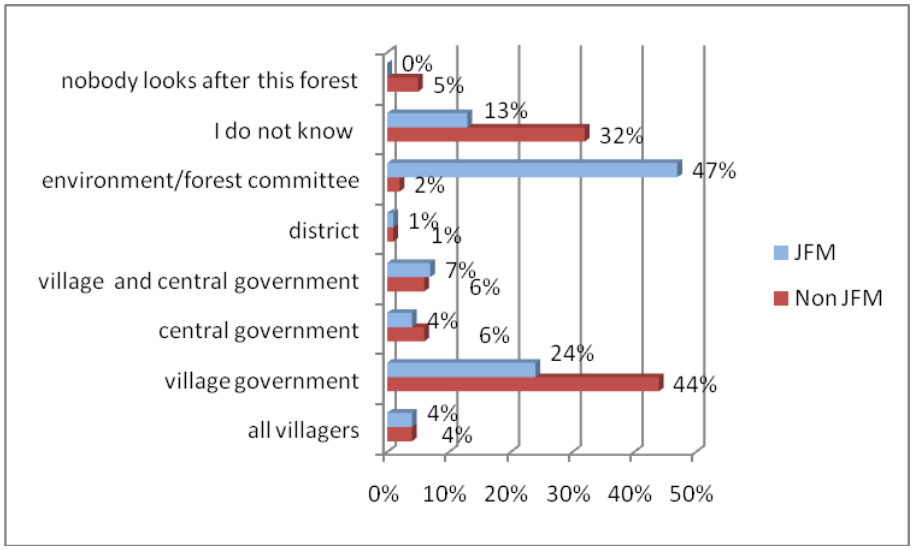
Principle 4 "Communities as Decision-Makers not just Protectors" in the FBD guidelines emphasizes that JFM is a power-sharing strategy. Communities should be given authority to make decisions. JFM should enable local participation in forest management and bring control and management to local levels. The right to control and manage the forest should be shared and not just the right to use and benefit. These principles have not been achieved, not only because there were no JMAs that could have provided the legal basis for such power sharing, but also because JFM was introduced as a forest conservation concept and

not a power sharing concept from the outset. The review of the 1999 FBD proposal for a pilot "joint management of Kitulang'halo forest reserve between FBD, SUA and the community" shows this. It was developed with the immediate objective to 'make an end to the continuing damaging of the forest' (United Republic of Tanzania 1999). The language used in this proposal shows that the communities were perceived as a means to enforce protection of the forest and the approach did not entail power sharing. As one of the early test sites for JFM, the introduction of this new management approach was driven by the excessive extraction of wood products as FBD faced lack of manpower, funding and working gear as main constraints to effective forest protection (United Republic of Tanzania 1999).

The forest administration describes its own management style as limited to patrolling and boundary planting with little involvement of the local communities as regards to information giving about offenders (United Republic of Tanzania 1999). JFM was introduced to change this situation. The villagers were very clear about the fact that FBD's motivation to involve people was to reduce forest destruction and not to grant them rights and empower them. Interestingly the villagers had the suspicion that they would be co-opted in an unfair deal, they still did not show opposition. This confirms the assumption that the history of coercion left its mark on current village-state relationships.

In the JFM villages the VFCs were perceived as the main agents of forest management. As Figure 8.2 below shows, the majority of respondents (47%) said that the forest reserve was managed by the VFC. In contrast, in the non JFM villages 44% replied that the forest was managed by the village government. This statistically significant difference (X^2 (10) = 95.1, $p<0.001$, Cramer's V: 0.54) shows that in the JFM cases the VFC replaced the village government in its role as the perceived management agent of the forest reserves. This result is consistent with the analysis of forest access in sub-Section 7.3.1 above.

Figure 8.2 Perceived management responsibility over the forest reserves



Although in JFM villages, the VFCs were perceived as the main body responsible for the forest, responsibility over making rules about forest access and use still remained with the village government (Table 8.4 below). This shows that no decision making power had been devolved to the VFCs. Forest management was mainly associated with patrol. Decision making power over rules of forest access and utilization as well as law enforcement remained with the (local and central) government in both JFM and control group villages. These results about the VFC strengthen the findings of Chapter 7 that villagers' stated no increased participation in decision making on forest rules. The wide spread of responses in the non JFM group, hints at the fact that, there were no clear rules about forest patrol.

Table 8.4 Body perceived to be responsible (%) to make rules about forest access and use

	JFM	Non JFM
central government	12	10
village government	42	51
environment/forest committee	8	6
village leaders	14	8
village government + central government	22	25
do not know	2	0

Patrol is clearly the main role associated with the VFCs. The perceived frequency of patrol in JFM forests was significantly higher than in the non JFM forests (X^2 (6) = 70.19, p<0.001. Cramer's V=0 .42, p<0.001). While 43% of the respondents from JFM villages

reported forest patrols were taking place 2-3 time per week, only 13% in the non JFM villages reported this. 13% of the non JFM villagers replied that the forest was never patrolled, while none of the JFM villagers gave this reply (Table 8.5).

Table 8.5 Respondents' perceptions regarding patrol of government forest reserve

	JFM	Non JFM
Daily	7%	4%
2-3 times per week	43%	13%
once per month	9%	12%
only if there was an incident	7%	13%
Never	0%	13%
I do not know	34%	45%

(n: JFM = 191; non JFM=207)

There was a significant difference between the two groups (X^2 (8) = 53.82, p<0.001, Cramer's V= .40, p<0.001) about the main party responsible with dealing with offenders against forest rules. Table 8.6 below shows that respondents in JFM villages were spilt over who was in charge: 46% said it was the village government and 40% said it was the forest committee. In contrast, the clear majority of non JFM respondents (64%) indicated that village government was in charge of dealing with illegal activities.

Table 8.6 Body perceived to be responsible (%) for dealing with offenders

	JFM	non JFM
central government (FBD)	4	3
village government	46	64
environment/forest committee	40	9
village leader	2	10
the police	1	2
nobody cares	0	2
I do not know	8	9
Total	92	91

(n: JFM = 167, non JFM = 169)

The stronger role of village governments to deal with offenders is consistent with the PRA studies. In Mwalazi, VFC members who had caught offenders had sent them to the village government and if timber was confiscated, it had been handed over to the forest extension officer. A case was reported when the VFC confiscated three logs and the offender paid TSH 10,000/= to the Village Council, who gave money to the Village Executive Officer

and the Forest Extension Officer. The logs were still at the house of the extension officer. Similarly, offenders caught in Milawilila, were reportedly sent to the village government who judged over them. Not many offenders had been caught as they always ran away. The VFC reported to have collected some fines from timber dealers but did not know what happened to the money once it had been handed over to the village government. The VFC had no mandate to keep the fines and hence no revenue source.

The existence of the VFCs did not make a difference with regard to enforcement. Table 8.7 below shows that there was no significant difference between JFM and non JFM households with regard to their observation of people violating forest rules and whether and to whom such violations were reported. 20% of respondents from non JFM households had observed a forest rule violation during the past 12 months, compared to 11% of the JFM respondents. Only 30% of the respondents from both groups said that they reported such rule braking behaviour. There was no significant difference as to whom the report was provided nor with regard to the effect of the reporting between the two groups. The underlying sample was much smaller (N= 58) than for most other tables summarizing governance data because very few people responded to this question.

While the above results seem to indicate that although VFCs have been created at the village level as local governance agents of JFM, they have not received any real power over decision making of the forest and law enforcement. This power still rests with village and central government, just like in the control group sites.

Table 8.7 Effect of reporting of offenders (in percent of respondents)

	JFM	non JFM
no action was taken	6	3
offender was fined	38	20
offender taken to police/court	6	3
offender put in jail	17	5
offender sent to court	0	3
forest products were confiscated	0	35
I do not know as villagers are not informed	33	33

(n: JFM = 18, non JFM= 40)

Although the three JFM villages did have by-law authority, they did not have the principle power to act over the forest, including power to develop local laws pertaining to the forest. Therefore, villages had no regulatory power over resource use or users. The VFCs as appointed local forest management institutions did not receive the right to determine who exploits the resource and who has subsistence access to the resource. Where the district needed to approve by-laws, the time period in which to respond was not enforced and the process was delayed as the village had no power to enforce the process. Similarly, FBD was not given a time frame in which to respond to village requests.

The villages did not have the power to develop and implement a forest management plan. Due to the absence of signed JMAs, the transfers of power made to the VFCs and the rights of access they had gained were not secure and could have been taken away at the whim of central authorities. Under such circumstances, the committee members were not likely to invest in keeping up the patrol regime. Also, there were no agreements on how cost and benefits in relation to forest management would be shared. While the villagers carried all cost associated with JFM (transaction cost of patrol, time invested in meetings) there were no official benefits. Apart from patrolling the forest, no other mandates had been transferred to the VFCs. The mandate of patrolling the forest was not matched with fiscal resources and sufficient technical support. The committees were not provided with a budget to cover their cost. No power over forest revenue had been delegated and no power to establish economic incentives for forest management. The VFCs could not allocate commercial exploitation rights. Therefore there was no generation of financial resources at the local level, which could have compensated the villagers for the cost they incurred. Approval was required for every decision and no decisions could be made locally. Political decision choices, such as who can use a resource and who can benefit, were being retained at the centre by FBD and not transferred to local decision makers.

Given this situation it is not surprising that the VFCs were not operational anymore at the time of this study, which was about 5 years after their initiation. While some VFC members tried to keep up the picture towards the researchers that the committee was meeting regularly twice per month, others admitted that the committee was dormant. The assumption that the Maseyu VFC was not playing an active role in forest management was

confirmed during the Venn Diagram exercise, where the VFC for Kitulang'halo forest did not even appear. In Mwalazi in contrast, the VFC was the second most important institution after the Mwalazi village government in the Venn Diagram. In both villages, there were no meetings being conducted, no written records and no forest patrols. In this way, the VFC members showed their protest against the unsatisfying deal silently but the image of a functioning committee was kept up to impress outside visitors and to intimidate fellow villagers to keep them out of the forest.

It was not possible to establish at which point in time the VFC of Maseyu village started to stagnate. Possibly it was a process of declining interest over time once there was no follow-up from FBD who initiated it. Since Kitulang'halo is still referred to as a JFM site by FBD, it seems that this stagnation is not well known at the policy level. The consequences for the forest are that even with a non-operational VFC, the "impression" of keeping up a working JFM regime by a few elitist village members helps to reduce illegal harvesting to some extent.

Although Milawilila is in many aspects an exception, transferring powers to NGOs, who are not accountable to or representative of local people, cannot be considered more democratic or representative. It is according to Ribot (2005) not a form of decentralization. The more active role of the NGO in the case of Milawilila was accompanied by a remoter role of the district and central government, who were not active partners in the JFM regime. Thus, the JFM process in the three sites has not led to meaningful power transfer to local representative institutions. The process followed had the motive of administering the local population to be used for a purpose defined by the FBD rather than empowering and enabling. The forms of local forest governance established in the three case study sites can thus not be considered sustainable or replicable. It rather leads to the development of corrupt practices due to the lack of an enforceable system of control from within the village and reinforces the existing imbalance of power between state and community.

8.3.3. Misuse of power

In all three JFM case studies the VFCs were not earning any income through the forest management activities. There were no financial incentives to compensate the transaction cost incurred:

> "The VFC receives no direct money, all goes through the village government. Our duty is only to guard the forest. The government should think about compensating us." Maseyu village, VFC member

In the absence of formal benefits and lack of control it is not surprising that power is misused for personal enrichment. The requirements of permits for forest harvesting were not transparent and there were signs of corrupt practices and embezzlement both at the village level and the central government – village interface. Village leaders in Maseyu stated that to harvest timber, poles and charcoal from Kitulang'halo a permit needed to be obtained. They further claimed that the forest was divided into a reserved area and an area where harvesting was allowed. This information is not consistent with FBD records where Kitulang'halo is a catchment forest reserve under protection. The VFC was not issuing any permits in relation to forest resource use. The VFC had no source of income from permits or fees. This was confirmed by the male farmers who stated that there were no official permits or licenses for forest products. However, the harvesting of poles from Kitulanghalo forest required a special permission from the village government. The village government had tried to introduce a tax on charcoal (TSH 100/= per bag) to finance a village project, however, the villagers were refusing to pay.

In Mwalazi village a campsite had been established close to the forest reserve, from which tourists were taken on tours into the forest. This 'eco-tourism' initiative could in principle provide an income to the VFC, however, on every occasion that the researcher had arrived on this campsite over the period of several months, it was the chairman of the VFC himself who took the role of a guide to work for tourists. He was setting his prices randomly and no receipt was ever issued. Although initiated through the JFM project with good intentions, in the absence of a control mechanism and downward accountability, the income generated through the campsite turned into a source of corruption and did not benefit the village nor was it reinvested into sustainable forest management.

In Mwalazi village several cases of embezzlement of previous committee chairmen were reported, which led to their dismissal by the villagers. After the researcher of this study left Mwalazi village, her research assistant who remained behind reported that the present chairman and village leaders were being questioned by the villagers and put under pressure to resign because there was no public reporting about the income received from the campsite.

Villagers in Milawilila reported that the District Forest Officer had issued timber licenses in the past. For example in 1982 the license fee was THS 180/= per tree. Timber could not be transported unless it was hammer marked. Nowadays such licenses were not issued anymore. The VFC in Milawilila further reported that sometimes people carried a permission to cut for example 2 trees but they were cutting more trees. In these cases, the District was involved, they were corrupt.

In Mwalazi village, the VFC and the FBD extension officer reported that no timber harvesting licenses for Kimboza were issued by FBD. In contrast the farmers said that one could buy licenses from the Forest Extension Officer based in the village to harvest forest products. It was nowadays more difficult to get a permit for Kimboza as one needed to negotiate with the VFC as well as with the extension officer. The villagers claimed that lumbering and pole cutting required a special permission. The villagers of Mwalazi further reported that for Ruvu forest illegal harvesting continued as there was no committee to protect the forest. The male farmers reported about roadblocks for preventing timber transport to town. However an a priori mobile phone call and payment of the forest staff and the police would help to get the road blocks removed if one had access to the established network of corruption. However, the quote below lends support to the assumption that the level of corruption is somewhat reduced compared to the pre-JFM situation, where there has historically been corruption in Kimboza (see Chapter 4).

> "Before you could bribe the forest officer to go into the forest but now this is more difficult because of the committee." Farmer, Mwalazi village

In comparison to the control group, the JFM process seems to have reduced the extent to which village leaders monopolize the benefits derived from the forest. There was a

significant association between people saying that they had to pay for cutting timber/poles/withies and with whether it was a JFM or a non JFM village (X^2 (1) = 8.25, p<0.001, Phi value=.19, p<0.001). 21% of the non JFM respondents (N=67) needed to pay for cutting timber and poles compared to 8% of the JFM respondents (N=159). The respondents indicated that they had to pay the village leaders to cut a timber tree or poles. Prices for such direct payments varied between TSH 3,000/= to 10,000/=. 10 participants (from Logo, Ngong'olo and Mwalazi villages) openly expressed that the village leaders took bribes and were corrupt. In the absence of control from outside and a VFC, in the control group sites, village leaders had monopolized the power over the forest reserves more freely.

The quote below illustrates that the village leaders in the control group control access and use of the forests:

> "If you need timber, poles or charcoal you ask the village leaders. Fuel wood is free."
> Ngong'olo, Village Executive Officer

In Logo a fee of THS 5000/= had to be paid to the VEO to get the permission to cut a tree in Ngambaula forest. There was a tendency for leaders to be randomly setting fees of all kinds. For example the VEO in Logo villages needed to be paid to permit the practice of traditional dances on Maulid day (TSH 2,500/=), to build *kigenge* (small shops; Tshs 5,000/= per year). This confirms the generally weak local governance in Tanzanian villages described in Chapter 4 above. The data and analyses indicate that JFM leads to a slight modification of elite capture, which already existed before JFM and still exists in the non-JFM villages.

8.3.4. Type of participation

The typologies of participation explained in Chapter 2 were used to assess the level of participation achieved in the three JFM projects. The process applied in the three sites carried elements of 'manipulative participation', where people's representatives on official committees were not elected and had no power. This is described by Cornwall (2008) as simply pretence as it lacks representativeness and delegated power. The process also

carried elements of ‘functional participation’, where people participate to meet project objectives more effectively and to reduce cost, after the main decisions have been made by external agents. These forms of participation do not challenge existing distributions of wealth and power (Pretty 1995).

8.3.5. Criteria for successful common property institutions

Most of the key elements of successful common property institutions (see Chapter 2) were not in place in the case study villages. The resource boundaries and group membership criteria were not clearly defined. Clear and easily enforceable rules existed only to a limited degree. Infractions of use rules were not monitored and not always punished. Fines were not reinvested into paying forest guards but evaporated in the pockets of the leaders. Users did not have the right to modify the use rules to allow for the ability to adjust to ecological changes and new economic opportunities by e.g. lengthening the period of closure on a forest, altering distribution of forest products etc. There was no fair distribution of decision making and access rights with an acceptable balance of cost and benefits. As McKean (2000) points out, if a group of people feels cheated, they become unwilling to invest in protecting the commons, as it was the case with the villagers in Maseyu. This was aggravated by the fact that no possibilities to air grievances were provided, for example through regular meetings with FBD. No methods of conflict resolution existed. A clear agreement on rules, a prerequisite for successful enforcement, was not always in place. According to Gibson *et al.* (2000), this leads to a lower level of rule compliance and the effort to guard effectively results in either corruption between government guards and local forest users (especially bribery) or high levels of conflict. The categories of property rights defined by Agrawal and Ostrom (2001) allow scaling local forest management institutions regarding their independence from government forest departments. Using these categories, the communities in the three sites are authorized users, the most marginalized category with the most limited rights to withdraw specific forest products in practice (Nagendra and Gokhale 2008).

8.4. Summary and discussion of results

The study results confirm the first hypothesis. The forest committees were merely organs of patrol while decision making power over access and use and law enforcement remained *de jure* with FBD and *de facto* with the village leadership. With the ownership status of the forest generally remaining unchanged in JFM, the JMA is important in clearly defining the rights and responsibilities of both partners. However, in the three sites, there were no signed JMAs and hence no secured rights for the communities. There was no official compensation for the hours put into looking after the forest, and illegal benefits were captured by a few privileged committee members and leaders. The lack of enforceable powers also shows that central government does not yet perceive the villagers as equal partners in forest management and historical patterns of state control and patronising perpetuate even through the implementation of JFM. Communities are not equal partners, their wishes are not considered and future rights are not secured. Thus, the principal imbalance between state and communities persists, as has been criticized by earlier studies (Matose 2006, Appiah 2001, Lele 2000, Sundar *et al.* 2001, Kumar 2000).

Essential ingredients for decentralized forest governance are political accountability, democratization and responsiveness (Nygren 2005; Ribot 2005). However, with setting up forest committees in parallel to the existing elected local governance bodies at village level, the three JFM cases did not fulfil these conditions. The village forest committees were non-representative institutions, who were given (limited) public decision-making power over the forest without making them accountable to the villagers to exercise these powers. In the absence of any mechanism of downward or upward accountability, the committees developed their own patterns of self-interest. Thus, the JFM process transferred the benefits to a selected interest group which was not accountable to the majority of the villagers.

The VFCs did not embody principles of good governance. No records were kept by the VFCs, hence there was no transparency and accountability and cases of corruption and embezzlement were reported. Villagers were found to highly mistrust government officials from higher levels, be it district or central government. This is reinforced by the fact that

there were obvious examples where government staff had been involved in corruption and used the JFM regime to their benefit. The second hypothesis is hence confirmed.

On a positive note, to some extent JFM led to higher awareness of good governance issues amongst the villagers who in some places started to question their leaders and forest committee members due to their higher exposure to information and visitors from outside the village. The fact that in some instances villagers started to question corrupt committee chairmen and village leaders about the activities of the forest committee. In particular in situations when income was involved such as through the campsite in Kimboza, the JFM process contributed to some extent to more public accountability and transparency. In contrast to Lund and Treue (2008), who reported that the dismissal of corrupt chairmen was due to horizontal accountability – leaders checking on leaders – in the case of Kimboza, it was downward accountability, as ordinary villagers tried to bring their leaders to justice, triggered through the embezzlement in the JFM process.

By not being representative, the formal institutions set up for JFM seem to reproduce existing patterns of inequity. However, with regard to the third hypothesis, this study has shown that even in the forest reserves under sole state control, access is not fully equal to all social groups. Leaders had privatized forest access to their personal benefit and bribes needed to be paid. Thus, forest access and use patterns are a complex mixture of the prevailing cultural norms and do not only depend on the access regime. The research therefore supports Cleaver's argument (2000) that social rules and norms within a village have long traditions and are formed partly outside the formal institutions of local resource management. The local forest committees formed by outsiders are also shaped by the existing social structures and norms existing within a village and the society at large. These social relationships and collective action may structurally be based on the exclusion of the poorest, which are then reproduced in the local institutions (Cleaver 2001, Cleaver 2005, Cleaver and Toner 2006). By creating new institutions of local forest governance through JFM a new layer of rules is added to the already existing informal rules and traditions but inequity that existed within the village prior to its introduction is not resolved. This is why even the non JFM forest reserves cannot be considered as *de facto* open access. Rules of

asses and use were devised by the village government without having the *de jure* right to do so. The non JFM forest reserves were thus managed "unofficially" in a slightly different manner by the village government/elite. In this sense, the study confirms the findings of Saito-Jensen *et al.* (2010) that elite capture in JFM is owing to pre-existing social structures at the village level.

9. Summary and conclusions for forest management policy

This thesis set out to examine the three dimensions of JFM, comprising its impact on forest condition, on livelihoods and equity, and on forest governance. Key research questions and hypotheses arose in respect of each of these dimensions. They are listed below in summary form, focusing only on the key points that contribute to the overall narrative of the thesis. Interesting but more minor aspects are put aside here.

Research question one: Does JFM influence the physical condition of the forest and forest use patterns?

To answer research question one, the following hypotheses were formulated:

1. JFM forests have a better forest quality measured through a larger number of trees, poles and withies than in the non JFM forest plots. This result is expected to be strongest for withies, milder for poles and smallest for trees.
2. The canopy density is higher in JFM than in non JFM forests.
3. The species richness as an indicator of forest quality will be higher in JFM forests than in non JFM forests.
4. The liana density, as an indicator of disturbance, is lower in JFM forests than in non JFM forests.
5. The occurrence of seedlings and leaf litter on the forest floor is higher in JFM forests than in non JFM forests and the occurrence of grass cover on the forest floor is lower in JFM than in non JFM forests.
6. The extent of human use measured through the number of cuts of trees, poles and withies is lower in JFM forests than in non JFM forests.
7. The occurrence of other forms of human use is less in JFM forests than in non JFM forests, due to the less permeable access regime.
8. The improvement of forest condition in the JFM versus non JFM comparison is strongest in the Milawilila-Ngambaula site, followed by Kimboza-Ruvu. Kitulang'halo-Dindili forest reserves should have the least effect, if there is one at all.

The comparative analysis of 659 forest plots confirmed the first hypothesis that the forests placed under JFM have a better forest quality than forests under sole state control without community involvement. This was measured through a significantly larger number of trees, poles and withies. However, the higher abundance was not strongest for withies, milder for poles and smallest for trees as was assumed in the second part of the first hypothesis. The trees on JFM plots were significantly smaller in size (average DBH value) when compared to the non JFM forest plots, indicating that the trees in the JFM forests were younger in age than in the non JFM forests. This may be explained through the heavy logging history of these forests prior to the introduction of JFM. It may also be a sign that there was continuous selective logging of mature trees by a few elitist village members despite JFM.

The second hypothesis, that the canopy density is higher in JFM than in non JFM forests was only confirmed for two sites but rejected for the sample sites taken together. This study found no correlation between species richness and JFM; thus, the third hypothesis that the species richness is higher in JFM forests is rejected. 80% of all species found in both groups of forests was of low commercial value (class V type), compared to only about 7 to 8% of the high value class I species. This result shows that all six forest reserves had basically been depleted of valuable timber resources. The assumption that liana density, as an indicator of disturbance, is lower in JFM forests than in non JFM forests (hypothesis 4) was not confirmed. There was a significantly higher occurrence of leaf litter and seedlings on the forest floor as well as less grass coverage on the JFM plots compared to the non JFM plots. The fifth hypothesis is therefore accepted. These are significant indicators of better forest health in the JFM forests. The lower grass coverage may be an explanatory factor for the significantly lower fire intensity measured in the JFM forests, as much as a stronger protection regime would be.

In summary, the analysis of all forest quality variables combined hints of some degree of forest regeneration taking place under JFM when compared to the forests solely managed by the state without community involvement. This result is consistent with the villagers' perception about the condition of the two groups of forests. However, the finding that there

were no valuable timber species in both groups of forests hints at the fact that selective logging of mature valuable timber species is continuing by a few elitist village members independent of the management regime. This was confirmed through personal observation during the forest transects and triangulation with the PRA data. It is consistent with the result that the number of cuttings in JFM forests was higher than in non JFM forests. When the average cutting rate per plot was expressed as a percentage of the remaining resources, JFM forest plots showed significantly lower intensity of withies cutting than the centrally managed forests; however, they remained higher with regard to tree and pole cutting. Disaggregation into old and recent cuttings confirmed significantly higher values for old cuttings in the JFM forests, but did not produce statistically significant differences for recent cuttings. This is a strong indication of no effect of JFM on wood cutting. The pair-wise comparison statistics between new cuts of trees, poles and withies in JFM versus non JFM forests (Table 6.4) tests the effect of JFM on actual forest utilization. The "not significant" difference strongly indicates that JFM has had little effect on wood-cutting. The sixth hypothesis is therefore rejected. The higher old cutting rates on the JFM plots indicate also that they are from earlier times, prior to introduction of the relatively young JFM process. Further research is needed, in particular time series analysis, to confirm this assumption.

Other forms of human forest use measured through opportunistically encountered burning, sawpit and mining sites as well as farming inside the forest, were less prevalent in JFM forests. On this basis, the seventh hypothesis would be confirmed. However, on the basis of recorded new cuttings of trees, poles and whities being not significantly different, hypothesis seven must be rejected.

These results suggest a *de facto* management regime where only some but not all forest uses are effectively restricted by JFM. In other words, this supports the assumption of collective agency by JFM villages vis-a-vis the state. They do not implement JFM as it is officially intended but modify the rules to suit their own ends and objectives rather than those of the state. This supports Cleaver's (2007) hypothesis of "bricolage" that officially created local institutions and their rules are being melted by the villagers with existing and locally negotiated rules to fit their purpose.

The spatial analysis of the three separate research sites showed that there were large variations in the results achieved through JFM. Improved forest quality in the JFM forest compared to the centrally managed forest was strongest in the Milawilila-Ngambaula site, followed by Kimboza-Ruvu and finally Kitulang'halo-Dindili. In the latter case there was no significant difference between JFM and non JFM. This result confirms the eighth hypothesis and lends support to the idea that the degree of forest regeneration is dependent on the quality of the JFM regime.

Multiple regression models confirmed that JFM was a significant predictor of the intensity of timber logging, pole and withies cutting, even though it explained the data variation only partially. JFM did not play a significant role in predicting the occurrence of charcoal making, mining and burning in the forests. The differences in timber cutting and charcoal making were explained by additional factors. These were the accessibility of, and in particular the distance to, urban centres. The intensity of pole and withies cutting was not affected by the distance from urban centres. The pole cutting intensity increased with decreasing distance to the road and the forest edge. The rate of withies cutting increased mainly with decreasing distance from the village in addition to being affected by decreasing accessibility. This shows that poles and withies are predominantly used for subsistence level rural housing construction, whereas timber cutting depends more on the demand from urban centres. These factors will influence forest utilization in addition to the forest management regime, and thus need to be considered in policies that aim at forest conservation. These findings show that JFM rules have limited effectiveness in restricting economically motivated human use of forests. Economic use of forests is influenced by other factors, such as commercial demand for wood resources from urban areas and subsistence need for construction purposes from adjacent villages. These demand pressures might be so strong that controlling the related forest uses only through JFM is difficult, in particular if it is not well implemented. It might require a mix with economic policy instruments beyond the forest sector (i.e. taxation) that aim at influencing the consumption rather than controlling the harvesting. JFM (or PFM) is thus only one piece in the puzzle of complexity that explains forest quality and human forest use.

The pair-wise comparison statistics between new cuts of trees, poles and withies in JFM and non JFM forests documents little difference in forest utilization. This is consistent with the results of the multiple regression analysis that JFM rules have not been effectively restricting the economically motivated human use of forests. This is an important governance related finding. It also shows that the study design is more suitable to assess governance effects of JFM. Thus, the results confirm the limitations of the research design in testing the hypotheses (see Section 5.1.2 above). A pair-wise comparison of JFM versus non JFM seems more useful in testing whether JFM rules were actually implemented in JFM forests and only secondly if JFM has resulted in improved forest quality. Without taking the "before JFM" situation into account, we do not know if the variables measured and compared between the forests have not been already different between the two forests prior to the introduction of the JFM process.

Research question two: How does JFM impact on households' forest access, forest related livelihoods and equity?

Hypotheses:

1. People in the JFM villages face more limited access to the forest reserves compared to the control group.
2. The more limited access in the JFM forests leads to reduced forest resources use.
3. The more limited access in the JFM forests leads to reduced forest incomes.
4. JFM improves the access of the villagers to information about forest access and use and their participation in decision making about forest management.
5. JFM manifests inequity and poverty as it grants preferential access to certain social groups and excludes others from access to and benefits from the forest reserve.
6. The less permeable access regime of the JFM forests leads to a displacement of forest harvesting to adjacent forest areas that are less well protected.

The first hypothesis is confirmed. The somewhat better condition in the JFM forest reserves is achieved as JFM creates a barrier of entry for the majority of villagers. However,

surprisingly, this reduced access did not in turn lead to reduced forest resources use and forest cash incomes. The second and third hypotheses are therefore rejected. There was no difference in the types of resources used between the two groups of households and no indication of reduced fuelwood availability in the JFM households. The average forest resource cash income was higher amongst households from JFM villages than from non JFM villages, although not at a statistically significant level. The higher annual forest income of JFM households compared to non JFM households was consistent across all wealth groups (except the second richest one). However, given that harvesting is not allowed in these forest reserves, this higher income is either based on illegal forest use or on resources from public lands.

Charcoal is the most important forest product providing cash to households, followed by timber. This explains why forest cash incomes were highest in the JFM village Maseyu where the active charcoal business provides an important source of cash income. It has replaced agriculture as the main source of livelihood. In this sense the study confirms the earlier established safety-net function of forests (Lund und Treue 2008, Sunderlin *et al.* 2005, Chambers and Leach 1989). Charcoal production and mining are becoming increasingly important as agriculture is becoming a less reliable source of livelihood due to land scarcity and climate changes.

The fourth hypothesis is rejected. Although the JFM process in the three sites did provide the villagers with somewhat improved access to information about forest management compared to the control group sites, overall the level of information provided was still not satisfactory. Information and knowledge of rights are key factors to a successful JFM regime but these factors had not been given sufficient attention during JFM implementation in the three case study villages. Participation of the villagers in decision making about forest access and use rules did not increase. These decisions were *de facto* made by the village government in both the JFM and the control group villages.

In the non JFM forests village government did have a dominant role in decision making. This shows that also the non JFM forests are subject to *de facto* management regimes made by the village government, although they do not have the *de jure* rights to pass such rules.

Irrespective of JFM being implemented or not in a given forest, the village governments make and enforce rules on forest access and forest use. In other words, non JFM forests are *de facto* subjected to locally devised but not formally recognised management regimes and the same actually goes for JFM forests in the sense that the *de facto* rules devised and enforced by village governments do not entirely correspondent with the (draft) JMAs. This study therefore does not confirm the common description in the literature that forests under state control are *de facto* open access. The central government, represented by the FBD does not hold much or any *de facto* control over the non-JFM forests. However, this does not automatically imply that the forests have become open access resources. If, as this study documents, other actors possess enough agency to "capture" some if not total control over access to the forests, then that is the *de facto* regime. Thus, the data and analyses indicate that JFM leads to a slight modification of elite capture, which already existed before JFM and still exists in the non JFM villages.

The findings of this study regarding hypothesis five are mixed. While there are clear indications that the JFM regime equipped certain social groups with preferential access to the forest reserves, to what extent this manifests or extends existing inequity is a complicated issue. Access to the forest reserve even in the non JFM forests is not fully equal to all social groups within the village. Leadership, gender and wealth related patterns are at play in both scenarios, JFM and non JFM. Forest access in both JFM and control group villages was male dominated. Leaders and male villagers were perceived as the primary access holders in the non JFM forests. This privilege was shifted strongly towards the forest committee in the JFM forests. However, given that the committees comprised mainly male members, it seems that women remained just as disadvantaged in their forest access.

Women, elders and disabled are social groups facing the highest limitation on forest access, which is more pronounced in the non JFM forests than in the JFM forests. In other words, the JFM process softened the more disadvantaged access position of these groups. By introducing certain days during which all villagers could enter the reserve for firewood collection, women had enforceable opportunities to enter the forest whereas in the open access scenario they were told by the men not to enter the reserve. Transparent use rules,

which are publicly known, provide women and other marginalized groups with a basis to claim equal rights regarding the forest.

An important finding of this study is the fact that non JFM forests are not *de facto* open access. Rather, this study shows that access to non JFM forests is also subject mainly to village government decisions. In the lack of central government, represented through the forestry division, taking up its management role, the village governments have put unofficial management regimes in place. This confirms the observations of Cleaver (2007 and 2002) that there are differences between *de jure* and *de facto* local level institutions.

The JFM forest committees were provided with preferential access with the purpose of patrolling the forest on behalf of the state. The predominance of patrol as a reason of entry accompanied with a reduction of timber cutting as primary motivation of entry in the JFM forests reflects this. This result lends itself to explain the better quality of JFM forests. Nevertheless, when benefits are considered, it emerges that the forest committee is not interpreting its role simply as forest protectors but that they use their preferential access to enrich themselves with forest resources in the lack of other formal benefits. This might explain the "not significant" finding with regard to the difference in wood cutting rates in Chapter 6.

With regard to poverty, the study confirms a higher dependency of poorer people on reserved forests and forest related cash incomes to make their living. This is explained by their limited access to ownership of good farming land which may provide wood resources in alternative to the reserved forest areas. However, despite having more alternatives, the majority of respondents in the richest wealth group used the forest reserve to provide farm land and grazing land and as a source of timber. In contrast, poor people used the forest reserve mainly for the collection of firewood, harvesting of poles, and withies. Poorest people had the highest percentage of sale and the lowest of subsistence use of forest products compared to the other three wealth groups. This indicates their strong dependency on forest resources as a source of cash income. If people who are already disadvantaged through lack of access to land also have their access to forests restricted or removed, then

they will be even worse off as a consequence of the introduction of JFM. These results support the fifth hypothesis.

This study has shown that we cannot assume that managing forests at the local level leads to broad community ownership, nor management in the interest of all. Socially fair and equitable solutions for the poorest cannot be automatically assumed through PFM or CBFM in a broader sense. Furthermore, in Chapter 6 the study demonstrated no effect of JFM in frequency of recent tree cutting, meaning that differences in forest use between JFM and non JFM forests are not that big. In other words, actual (as opposed to formal) differences on forest management regimes might still have an effect on rural livelihoods and poverty.

Hypothesis six is confirmed by this study. The restricted access of forests placed under JFM then leads to a stronger diversion of the demand for forest resources into surrounding forests and woodlands with open access. In this way, households are able to substitute the restriction in access to one particular forest placed under PFM and to avoid negative livelihood impacts. However, once these open areas are depleted, negative livelihoods effects are bound to occur. In the Milawilila-Ngambaula site, there were few alternatives on public lands and land scarcity. Thus, the non JFM forest Ngambaula was severely degraded while the nearby JFM forest Milawilila was well regenerated and was the only forest with a significant reduction in recent cutting rates. In the other two research sites, villagers had more alternatives to resort to surrounding woodlands to satisfy their resource needs as well as larger farm sizes. In order to avoid this "leakage" effect of JFM, a different approach needs to be followed that goes beyond the protection of single forest patches. The current policy debate about how PFM can be used as the main vehicle to deliver Reduced Emissions from Deforestation and Degradation (REDD) under the UNFCCC in Tanzania and elsewhere may further increase the forest area put under PFM. A village may decide to conserve a forest to get REDD payments for carbon credits but the results of this study suggests that this may aggravate degradation of forests outside the protected areas. In other words, there may be no benefits in terms of carbon reduction. This shows the importance of general forests and woodlands outside reserved areas (Treue 2001).

Research question three: Has JFM created sustainable forest governance institutions at the village level?

Hypotheses:

1. A lack of delegation of power and rights at the local level inhibits the achievement of decentralization through JFM.

2. The local institutions of forest management created at village level do not embody principles of good governance, and foster corrupt practices.

3. The local institutions of forest management reinforce inequity.

The first hypothesis is confirmed through this study. The local forest committees were only empowered to patrol the forest, while decision making power over access and use and law enforcement remained *de jure* with FBD and *de facto* with the village leadership. In that sense, JFM did not make a difference compared to the control group, where the village government was the main decision making body regarding forest access and use. The results hint at the fact that the central government represented through the FBD does hold only limited, if any, *de facto* control over the non JFM forests. However, this does not automatically imply that the forests have become open access resources. If, as this study documents, other actors possess enough agency to capture some if not total control over access to the forests, then that is the *de facto* regime. Even in the JFM forests, a *de facto* regime developed, which was subject to interpretation by local actors. As the results of Chapter 6 indicated some but not all forest uses appear effectively restricted through JFM. Rules were not implemented as they might have been originally intended by FBD. The villagers posses agency vis-a-vis the state because they do not implement JFM as it is officially intended. They modify the rules to suit their own ends and objectives rather than those of the state (Cleaver 2007). The absence of signed JMAs was in a sense "conducive" to this situation as there were no clearly established rules. In the absence of signed JMAs there were also no secured rights or benefits that the communities could have demanded for. Despite this, there was little outright opposition. Disapproval is shown rather silently by

altering the system to fulfil more selfish motives – a culture that has its origins in Tanzanian history.

The involvement of an NGO in Milawilila, although it did increase villagers' trust and improve the JFM process to some extent, did not lead to the delegation of power or rights to the community, either. The NGO has been the main driving force of the process while the state (represented through the district) refrained from taking up its responsibilities as partner in the JFM process.

The fact that the forest committees were set up in parallel to the existing elected local governance bodies at village level supports the first and the second hypothesis. This prevented decentralization as it created institutions that are non-representative and not accountable to the villagers. In the absence of any mechanism of accountability, the committees developed their own patterns of self-interest. Illegal benefits were captured by a few privileged committee members and leaders. This led to an inequitable outcome since some more powerful members of the forest committee used their legal access to the forest as a privilege to support their own interest, such as in Maseyu the charcoal business. Thus, the JFM process itself created a situation that nurtured corrupt behaviour. The lack of forest management plans led to confusion about the ownership and the management status of the forest reserves in both JFM and control group sites. In the absence of clear rules of forest ownership and management, there is a cloud of mystery around forestry issues, which villagers in more powerful positions used to their advantage.

The study therefore supports Ribot's argument that decentralization is only achieved when meaningful powers to democratically elected and downwardly accountable decision making bodies is achieved (Ribot 2004). Insufficient delegation of power to the local forest governance institutions and lack of downward accountability of those institutions to the villagers prevent the realization of livelihood benefits and sustainable local forest management. Although elected village authorities have a bad track record, local forest management has to be vested in these local institutions and not through parallel committees (Ribot 2005, Brockington 2008). Brockington 2008 argues that the presence of adversity

enhances local action and that problems of government performance are a necessary ingredient that drives local change and success.

With regard to hypothesis two, villagers were found to mistrust government officials from higher levels in general, be it district or central government. Occasionally, villagers questioned corrupt committee chairmen and village leaders about the activities of the forest committee, sometimes triggered through information brought by visitors from outside. One could argue that in this way JFM has increased exposure and did make some contribution to more public awareness of the self-serving actions of civil servants and village leaders. On an optimistic reading, this suggests that decentralized forest management does hold 'self-correction potential' (Lund and Treue 2008) contrary to state controlled set ups and that it can curb corruption.

On the other hand, it is questionable if this can be regarded as a positive impact of JFM, as the very JFM process itself created the situation that fostered corruption in the first place. This happened as new local institutions of forest governance were created by outsiders to the village, equipped with the mandate to control the forest on behalf of the state without formal compensation. It provided them with exclusive right of access without supervision while at the same time weakening existing systems of downward accountability (which did not really function in the first place). This may well have aggravated inequity as the village leaders and members of the forest committee in leading positions turn JFM to their own benefit. While excluding the majority of villagers more or less successfully, they have privatized the forest for their own use. Thus, charcoal burning and timber harvesting is continuing through an exclusive group but on a comparatively smaller scale than in the forests under sole state control. They keep up the system and get recognition and professional credit by randomly visiting government and donor representatives. They can show that 'their' JFM works, as the forest is doing better and they are controlling access to the forest by keeping their fellow villagers out. It is them who usually get the contact to those outside visitors, which re-enforces the unequal power relations within the village. While the leaders 'shine' in front of the visitors, the story of exclusion and inequity never gets told. The origins and mechanisms of this story, which are based on a complex social system, are not at the core of the interest of the forest officer who is satisfied to see that the

forest is improving and they are beyond the time span and level of detail available to the visiting donor representative.

Thus, while this line of argument supports the third hypothesis, one needs to keep in mind that forest access is not equal to all social groups even in the absence of PFM. Data and analyses indicate that JFM leads to a slight modification of elite capture, which already existed before JFM and still exists in the non JFM villages. It results out of a complex mixture of the prevailing cultural norms, traditions and negotiations. These take part partly outside the formal institutions created by outsiders for forest management and are influenced by the norms of the society at large. JFM does not touch upon or resolve these but rather adds new rules to the existing ones and is a highly political process at the local level itself. JFM requires a process of institutional change that is very complex, where issues of wealth and power are at play. This shows the need for a social definition of forest management and for politically negotiated implementation. These findings are consistent with Saito-Jensen *et al.* (2010) who found that elite capture occurring in JFM in India was largely due to pre-existing social structures.

In summary, most of the key elements of successful common property institutions (see Chapter 2) were not in place in the three case study JFM villages. Therefore it is not surprising that the VFCs once created by outsiders were actually not really functioning. The resource boundaries and group membership criteria were not clearly defined. Clear and easily enforceable rules existed only to a limited degree. Infractions of use rules were not monitored and not always punished. Fines were not reinvested into paying forest guards but evaporated in the pockets of the leaders. Users did not have the right to modify the use rules to allow for the ability to adjust to ecological changes and new economic opportunities. There was no fair distribution of decision making and access rights with an acceptable balance of cost and benefits. As McKean (2000) points out, if a group of people feels cheated, they become unwilling to invest in protecting the commons, as it was the case with the villagers in Maseyu. This was aggravated by the fact that no possibilities to air grievances were provided, for example through regular meetings with FBD. No methods of conflict resolution existed. A clear agreement on rules, a prerequisite for successful enforcement, was not always in place. According to Gibson *et al.* (2000), this leads to a

lower level of rule compliance and the effort to guard effectively results in either corruption between government guards and local forest users (especially bribery) or high levels of conflict. The categories of property rights defined by Agrawal and Ostrom (2001) allow scaling local forest management institutions regarding their independence from government forest departments. Using these categories, the communities in the three JFM sites are authorized users, the most marginalized category with the most limited rights to withdraw specific forest products in practice (Nagendra and Gokhale 2008).

This study therefore underpins the critique of other authors that JFM is just a 'confidence-trick' (Blaikie and Springate-Baginski 2007:374) of the state to co-opt communities into management through patrolling without transferring any clear rights or benefits (Lund and Nielsen 2006, Blomley and Ramadhani 2006, Meshack and Raben 2006, Blaikie and Springate-Baginski 2007, Blomley *et al.* 2008, Springate-Baginski 2001). If the government felt politically able to adhere to its own principle in the JFM guidelines of sharing benefits with communities, there would be ways to do so, even in mountain forests of high biodiversity. Benefits would then need to go beyond the current two to three open access days per week for fuelwood collection to incorporate forms of utilization that can be combined with sustainable management. For example, in Milawilila this could mean allowing the traditional collection of wild potatoes. In Kimboza it could mean selective harvesting and sale of *cederela odorata* for the benefit of the villagers. This would at the same time reduce the invasion of this exotic species throughout the natural forest. In addition, for catchment forests, where no commercial exploitation is possible, community forest managers should be paid for their protection work as they exercise a service function to the state as the legal owner of the forest and to the majority of the population who benefits from the ecosystem services. However, it is not clear that the political will exists for this to happen in practice.

This study confirms earlier findings that central governments in Sub-Saharan Africa rarely devolve actual powers to the local level, resulting in a lack of checks and balances in the institutional set up and preventing institutions of local governance to take up their comparative advantage of being close to the resources (Brockington 2008, Blaikie 2006, Ribot 2002a, Ribot 2004a, Oyono 2004, Campbell *et al.* 2001). The lack of delegating

enforceable powers through JFM shows that central government does not yet perceive the villagers as equal partners in forest management, their wishes are not considered and future rights are not secured. Historical patterns of state control and patronising perpetuate even through the implementation of JFM.

There are certain paradoxes inherent in the JFM concept that may never quite be resolved. On the one hand, the desire is to hand over to the community their own fate. This involves central or even local government releasing power and control to new community-led institutions. Then, on the other hand, when these institutions are observed to behave (sometimes) in perverse ways, e.g. the finding that they use their new powers of exclusion to reserve the resource for the own use of the committee (and leaders and officials), there is a tendency to call for the government to intervene to correct this outcome. However, it is unrealistic to assume that the government will do this. It was already over-stretched and was unable to police its own state-owned forests, so it certainly does not have the resources and manpower to police the varying outcomes of JFM forests on an individual basis. Advocates of PFM or CBNRM often seem to want it both ways – they want community control, but then when the community control goes wrong, they want the government to come back in to enforce the even more complex institutional process that now exists compared to the previous 'state exclusion' regime. Maybe the conclusion is that government should not even interfere and try to regulate these local institutional processes.

The author recognizes that success can seldom be engineered by outsiders. Therefore, one has to take a realistic look at the likelihood that the relevant institutions will evolve in ways that make JFM more effective. Some scholars (Cleaver 2005, Brockington 2008, Ribot 2005) argue that these problems of governance that occur in the local forest committees are normal and necessary ways of dealing with a process of change. It is what Cleaver calls 'bricolage' and what will eventually lead to solutions that local people find acceptable. As Collier *et al.* (1986) state, inequality has historically been an inherent characteristic of Tanzanian villages and there will hence always be winners and losers. The poor may accept losses in some areas knowing they gain in others. These local social processes are so complex that outsiders cannot understand them and interference from outside can often distort more than help the situation. If there was the political will, it would be preferable to

provide the necessary framework (law, education, etc.) that empowers people to make their own decisions, rather than trying to regulate local institutions and processes.

A second paradox is that providing statutory provision to enable local institutions to function in an independent and formal manner would empower them to take cases of abuse to court. The fact that this would then include abuse by the forestry staff itself might be a disincentive for the FBD to promote such legal rights. It is for the same reason that the lack of providing information can be explained, as civic education of local people would provide them with a basis to demand accountability, as people would know what they can demand and what they can hold local and central authorities accountable for (Ribot *et al.* 2006).

A third paradox is that PFM requires a change in roles of forest extension staff that may not be compatible with the prevailing hierarchical structures of the state forest department. Ylhäisi (2003) argues that inefficiency, informal structures, and rent-seeking behaviour in the Tanzanian forest administration caused by complex administrative procedures, lacking economic resources, and poor incentive structures may work against principles of democratic decentralization. These problems have been observed in PFM processes as well as in government decentralization processes in other parts of the world (Ellis and Bahigwa 2003, Ellis and Mdoe, Blair 2000). The very existence of the forestry bureaucracy would be threatened by the required unpacking of the PFM model (Appiah 2001).

These paradoxes are very difficult to resolve in practice, compared to the ease with which someone can write what 'ought to be done' in an advisory report. Although government's own guiding principles entail all the right concepts, the practice of implementation shows a different reality. PFM, as many other policies of decentralization, is based on government documents written by consultants. Often there is a lack of buy in, and the understanding of the same documents by different stakeholders differs. In consequence people do not do what they should do or ought to do; they often do what is in their personal or family or political interest to do, which may not be in anyone else's interests particularly.

This study has shown that although JFM may work when the line up of interests, forces and institutions comes together in a particular way, this cannot be guaranteed. The adverse factors may outweigh the positive ones, in ways that are just not susceptible to being

overcome. JFM may not turn out in the way it is intended by the forest policy or by the ideals of its enthusiasts. Ultimately there might be a lack of political will to true community empowerment as it would be perceived as a threat to the power of the state (Hobley and Wollenberg 1996, Sundar 2000).

Thus, this study confirms that the main obstacles to successful JFM are not local people or elite capture but the bureaucratic structures and culture within which JFM must operate (Blaikie and Springate-Baginski 2007). Underlying this situation are problems of unresolved conflicts over resource rights and benefits and contradictions between scientific and local forest management. As several scholars state, these require continuous structural reforms of the long established classic forestry administration and its set of practices and a civil society that holds local and central government accountable to the implementation of agreed policies. Ultimately, PFM has to deal with the question of to what extent the governments of the implementing countries represent true democracies.

Appendices

Appendix 1: Criteria to evaluate decentralization

The following questions are formulated by Ribot 2005 to determine whether a decentralization effort is serious and likely to achieve effective and equitable outcomes, consisting of institutional choice and power choice questions.

Institutional choice questions

- What kind of institution (elected or appointed committee or elected local government authority) is receiving powers in the name of decentralization?
- To whom is the local institution accountable with respect to the exercise of the transferred powers and through what mechanism? Are they multiple?
- How does the origin of their funding or their powers affect their accountability?
- Is the institution integrative across sectors, multi-or single purpose, and does its role include mediating among sectors?
- Is the form of inclusion or belonging based upon residency, identity or interest?
- Do poor populations have influence over and voice in the institution? Are there mechanisms to ensure the inclusion of women and poor populations in decision making and benefits?
- Whose interests are served by the chosen local institutions? Is the institution serving patronage interests of central actors, only members' interests, or only a sub-sector of the population, or the population as a whole?
- When non-representative institutions are given public decision-making power, are they accountable to representative authorities concerning the exercise of these powers? Do these institutions compete with and undermine representative authorities, or do they strengthen them?
- Do these institutions encourage broad based involvement of local people, do they give local people voice and agency, do they enable long-term stability? Are they replicable across territory?

Power choice questions

- Are transfers of powers made in a secure manner or can they be taken away at the whim of central authorities?
- Are mandates (obligations) being transferred?
- Are those mandates sufficiently funded and within the capacity of local authorities to implement?
- Are political choices, such as who can use a resource and who can benefit, being retained at the centre or transferred to local decision makers?

- Are resources, i.e. forests, that have been accessible to the public and service the public interest being privatized?
- Is there sufficient power (executive, legislative, judicial) in the local arena to balance and fight central interests?
- Are local authorities receiving the right to determine who exploits the resource? Can they decide over who has subsistence access to the resource? Can they allocate commercial exploitation rights?
- Is approval required for every decision or are there decisions that can be made locally?

Appendix 2: Household survey questionnaire

Questionnaire for Household Survey

0. Interview Details

Enumerator: _____ Questionnaire no._____

Date of interview: _____ Household Name: _____

Interview start time: _____ Village: _____

Interview end time: _____ Sub-village: _____

Date checked by researcher: _____

_____

00. Section for comments on the interview by the enumerator:

……

……

……

……

……....

To interviewed is the head of the household (male or female) or his wife in case of a male head of household. Remember to ensure equal gender distribution.

1. Basic Household Information

1.1. Name, age, sex, relationship to head, education and main activity of all people who have been **living in and sharing the food of this household on a daily basis for at least 6 of the past 12 months? Circle the respondent**

	1	2	3	4	7	8
ID	**Name**	**Age (years)**	**Sex**	**Relationship to HH head**	**What is the highest grade (NAME) completed?**	**During the last 12 months what was (NAME) main activity?**
	The name is only required for the head of the household and his wife! If the respondent is reluctant to reveal names of children do not insist as long as you have filled columns 2 to 8.		1 = M 2 = F	1 = Head 2 = Wife/Husband 3 = Child 4 = Other relative 5 = Other permanent	1 = no formal education 2 = Std 1 to Std 4 3 = Std 5 to Std 8 4 = Form 1 to 3 5 = Form 3 – 6 6 = Training after primary 7 = University/related Training after secondary 8 = Adult Education	1 = Farming/Livestock 2 = Govt. employee 3 = Private sector employee 4 = Self employed with employees 5 = Self employed without employees 6 = Unpaid family helper in a non-agricultural business 7 = Not working & available for work 8 = Household chores 9 = Student 10 = Unable to work (too old, retired, sick, disables) 11 = Nursery school 12 = Others (specify)
1						
2						
3						
4						
5						
6						
7						
8						
9						

1.2. Is any member of the HH a member of the village government?

1 = Yes
2 = No

1.3. Is any member of the HH a member of a village based committee?

1 = Yes
2 = No
If yes on 2.2 or 2.3, specify which one? _____
Position held? _____

1.4. Has your family always lived in this village (may vary according to whether you interview a husband or a wife)?

1 = Yes
2 = No
3 = I do not know

If no, a) when did you move here? ……

b) why did you move here? ……..

c) where did you move from? …….

2. Housing Particulars (2.1. and 2.2. To be completed by RAs through observations, without asking, unless Q 2.2 is answered with 'yes')

2.1 Is the house you live in owned by your household?

1 = yes (→ Q 2.3.)
2 = no, it is rented
3 = others (specify……..)

2.2. If this house it not your own, do you own a house somewhere else?

1 = yes (specify where? ……..)
2 = no

2.3. What are the main building materials used for the roof of the main dwelling owned by your household?

1 = Grass, leaves, bamboo
2 = Mud and grass
3 = Concrete, cement
4 = Metal sheets
5 = Asbestos sheets
5 = Tiles
6 = Other (Specify) _____

2.4. What are the main building materials used for the walls of the main dwelling?

1 = Poles, branches, grass
2 = Poles, mud, stones
3 = Mud only
4 = Mud bricks
5 = Baked/burnt bricks
6 = Concrete, cement, stones
7 = Other (Specify) _____

2.5. What are the main building materials used for the floor of the main dwelling?

1 = Earth
2 = Cement, concrete, tiles, timber

3 = Other (specify)

2.6. How many rooms in your household are used for sleeping? ☐☐

3. Household Assets

3.1. Does your HH own the following? No. of items owned? Current price in TSH?

Asset	**How many items owned**	**Current Price in TSH if you were to sell it**
Radio and Radio cassette		
TV/Video		
Bicycle		
Mobile Telephone		
Fridge or Freezer		
Electric/gas stove		
Iron (Charcoal)		
Iron (Electrical)		
Motorbike		
Car		
Tractor		
Torch		
Lantern		
Watch		
Clock		
Charcoal stove		
Kerosine stove		
Cooking pots, cups, kitchen utensils		
Hand Hoe		
Axe		
Panga		
Mosikto net		
Bed made out of ropes		
Bed with mattress		
Sewing machine		
Milling maschine		
Wheelbarrow		
Pit sawing blade		
Sheeps		
Cows		
Chicken		
Ducks		
Doves		

4. Household Facilities

4.1. What is the main source of energy used for lighting in the household? ☐

1 = electricity
2 = solar
3 = gas (biogas)
4 = paraffin
7 = candles
8 = firewood
9 =others (specify)

4.2. What is the main source of energy for cooking in the household?

1 = electricity
2 = solar
3 = bio-gas
4 = bottled gas
5 = paraffin/kerosine
6 = coals
7 = charcoal
8 = firewood
9 = others (specify)

4.3. Where do you usually collect firewood/charcoal?
Name location _____
Time spent in hours to walk there (one way)

H:	M:

4.4. How often do you/does your household collect firewood?

	1= every day
	2 = 2-3 times per week
	3 = once per week
	4 = others (specify……..)

4.5. Are there any changes with regard to the firewood you use these days compared to 5 years ago? In terms of the time spent in hours to walk to the place of collection?

	1= these days we need more time
	2 = these days we need less time
	3 = we need the same amount of time

4.6. Do you collect dead of live firewood these days?

1 = dead firewood
2 = live firewood

4.7. Did you collect dead or live firewood 5 years ago?

1 = dead firewood
2 = live firewood

4.8. Which species do you collect for firewood these days? ……

4.9. Which species did you collect 5 years ago? ……..

4.10. What is the main source of drinking water for your household – that is, the one used for most of the year?

1 = private piped water in house
2 = private piped water outside house
3 = piped water on neighbour's house
4 = piped water on community supply
5 = rainwater catchment tank
6 = public well (protected)
7 = public well (unprotected)
8 = private well (protected)
9 = private well (un-protected)
10 = spring (protected)
11 = spring (unprotected)
12 = river, dam, lake

13 = others (specify)

4.11. How long does it take to walk to this drinking water source (one way)

H:	M:

4.11. How often do you/does your household collect water?

	1= more than once per day
	2 = once per day
	3 = 2-3 times per week
	4 = others (specify…….)

4.12. Are there any changes with regard to your water use/collection these days compared to 5 years ago? In terms of time spend in hours walking to the main source of water collection?

	1= these days I need more time spent in hours walking to collect water than 5 years ago
	2 = these days I need more time spent in hours walking to collect water than 5 years ago
	3 = no change

4.14. What type of toilet does your household use?

1 = No toilet
2 = Flush toilet
3 = Pit Latrine
4 = Improved Pit Latrine
5 = Other type (specify)

4.15. What is the name of the nearest market place (gulio = informal market) ?

…….

4.16.1. How to you reach there?

1 = walking
2 = bicycle
3 = car
4 = other (specify…….)

4.17. How long does it take you to reach there (one way?

H:	M:

4.16.2. Which health services do you use in case of illness?

	1= none
	2 = private hospital
	3 = public hospital
	4 = traditional healer against payment
	5 = traditional healer who serves for free

5. Food consumption

5.1. How many meals does your HH usually have per day (may vary across the year)?

5.2. In the past 30 days has your HH ever had fewer meals than this usual number?

1 = yes
2 = no
3 = I do not remember

5.3. In the past week how many mealtimes did your household consume meat?

5.4. What are your strategies to overcome food shortage?

	1 = cut down food intake/number of meals
	2 = borrow money from relatives/neighbours
	3 = buy food on credit
	4 = search for edible plants, fruit and animals in forest
	5 = other (specify)

5.5. How do you compare the overall economic situation of the HH with one year ago?

1 = much worse now
2 = a little worse now
3 = same
4 = a little better now
5 = much better now
6 = do not know

☐

5.6. How do you compare the overall economic situation of the community with one year ago?

1 = much worse now
2 = a little worse now
3 = same
4 = a little better now
5 = much better now
6 = do not know

☐

Enumerator, if the respondents picks number 1 ask "why"?

……..……..

6. Land Ownership

6.1. How many acres of land for farming/grazing are owned (land titles, land is not owned: clearcut issue in study area?) by the household?

This year: Acres *(None 0000)*
Last year: Acres

☐☐☐☐
☐☐☐☐

6.2. Does the household use land for farming/grazing that it does not own this year?

1 = No → Q 7
2 = Yes, rented
3 = Yes, sharecropped
4 = Yes, private land provided free
5 = Yes, open access land/communal land

☐

6.3. How many acres of land used are not owned by the HH?

This year: Acres
Last year: Acres

☐☐☐☐
☐☐☐☐

6.4. How many acres of land owned by the HH are rented out?

This year: Acres
Last year: Acres

☐☐☐☐
☐☐☐☐

7. Forest Resource Use

7.1. Which forest products do you use, From which forests do you obtain these forest products, and what is the use of these to your HH ?

ID	Products obtained	Name of Forest	Type of land use	Distance from house	Frequency of entry	Amount/Use		Average Price or value
						Consume	Sale	
	1 = timber 2 = poles 3 = fitu 4 = ropes 5 = kuni 6 = mkaa 7 = medicines 8 = edible fruit, vegetables, leaves 9 = honey 10 = grass 11= gum and resins 12= bushmeat 13 = grazing land 14 = farm land 15 = wood for carving 16 = ritual 17 = other (specify)		1 = public lands forest 2 = village govt. forest 3 = community forest 4 = central govt. forest 5 = privately owned forest 6 = home garden/ shamba	In minutes walking	1 = every day 2 = one per week 3 = more than once per week 4 = less than once per week 5 = less than once per month 6 = never			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

8. Forest Governance

8.1. Who owns (NAME) forest reserve?

1 = All villagers
2 = Village Government
3 = Central Government (FBD)
4 = Districts
5 = Private company
6 = Individual
7 = Environment/Forest Committee
8 = Village and District jointly
9 = Village and Central Government jointly
10 = I do not know

8.1a. Who are the main people who look after (NAME) forest reserve?

1 = All villagers
2 = Village Government
3 = Central Government (FBD)
4 = Districts
5 = Private company
6 = Individual
7 = Environment/Forest Committee
8 = Village Scouts
9 = Village and District jointly
10 = Village and Central Government jointly
11 = I do not know

8.2. Is there is a Committee that deals with forest issues in your village?

1 = yes
2 = no
3 = I don't know

8.3. If yes, how was the Kamati selected?

1 = through voting in village meeting
2 = through voting in full village assembly
3 = directly by village chairman/executive officer
4 = directly by serikali kuu
5 = donor programme
6 = by others (specify)
7 = I do not know

8.4. In the last 12 months how many village assembly meetings have there been in your village?

	1 = 12 (every month)
	2 = 4 (every 2-3 months)
	3 = 2 (every 6 months)
	4 = they are held sporadically without specific time schedule
	5 = none
	6 = I do not know

8.5. How often have you been present?

	1 = every time
	2 = sometimes
	3 = never

8.6. How are you being informed about the activities of this environment (natural resources/forest) committee?

	1 = I am not informed and I do not know what the Kamati is doing
	2 = Kamati ya mistu briefs villagers regularly during village assembly meetings

	3 = Kamati ya mistu briefs villagers occasionally during village assembly meetings
	4 = Village govt. informs villagers during village assembly meetings but the Kamati does not appear
	5 = Villagers are not informed about Kamati ya msitu's activities during village assembly but in other ways

8.7. Is there a management agreement for (NAME) Forest Reserve?

1 = yes
2 = no ☐
3 = I do not know

8.8. Is (NAME) Forest Reserve patrolled?

1 = daily
2 = 2-3 times per week ☐
3 = once per month
4 = occasionally, if there was an incident
5 = never
6 = I do not know

8.9. Is there any revenue collected from (NAME) Forest Reserve?

1 = a lot
2 = a little ☐
3 = nothing
4 = I think there is but it is never reported to us
5 = I do not know

8.10. If any, who collects revenue?

	1 = Village Forest Committee
	2 = Village government
	3 = District
	4 = Central government
	5 = Private company
	6 = individual
	7 = I don't know

8.11. Enumerator: If answer 1 or 2 is chosen ask "What happens to the revenue?" Record "don't know" if people do not know.

……

8.12. Have you or anybody in your household taken part in making the rules restricting forest access and use during the last 5 years?

	1 = yes, during village assembly meetings
	2 = yes, during other village meetings (specify)
	3 = no, we have not taken part at all
	4 = I do not know

8.13. What can you say about the information you personally have about the rules of access and use of (NAME) forest reserve?

	1 = I feel well informed, have enough information → Q 8.15
	2 = I feel informed, have some information
	3 = I do not feel well informed, have no information

8.14. Would you like to have more information about rules of access and use of (NAME) forest reserve?

	1 = Yes, I would like to have more information
	2 = No, I do not want to know

8.15. If you were in charge, how would you like to see (NAME) forest reserve managed?

1 = by serikali ya kuu
2 = by serikali ya kijii ☐
3 = by camati ya mazingira/misitu
4 = by district
5 = by serikali ya kijiji and serikali ya juu pa moja
6 = private person/firm
7 = other (specify)
……

9. Access and Utilization of (NAME) forest reserve

9.1. Who in the village is entering (NAME) forest reserve?

	1 = all villagers
	2 = women and children of this village
	3 = men of this village
	4 = village leaders
	5 = forest committee members
	6 = village forest guards
	7 = tourists
	8 = people from district
	9 = people from central government
	10 = other outsiders to this village (specify)
	11= nobody enters forest
	12 = others (specify)

9.2. For which purpose is the above group entering (NAME) forest reserve?

	1 = take timber
	2 = take poles
	3 = take fitu
	4 = make ropes
	5 = collect firewood
	6 = make charcoal
	7 = take medicines
	8 = take fruits, leaves, plants
	9 = collect honey
	10 = fetch grass
	11= collect gums and resin
	12 = hunt for bushmeat
	13 = graze animals
	14 = farming
	15 = get wood for carving
	16 = ritual purposes
	17 = bring tourists
	18 = patrol forest
	19 = through passing on footpath
	20= others (specify)

9.3. Who does <u>not</u> enter (NAME) forest reserve and why?

……
……

9.4. Who do you think benefits <u>most</u> from (NAME) forest reserve?

	1 = all villagers
	2 = women and children of this village
	3 = men of this village
	4 = village leaders

	5 = forest committee members
	6 = village forest guards
	7 = tourists
	8 = people from district
	9 = people from central government
	10 = other outsiders to this village (specify)
	11= nobody
	12 = others (specify)

9.5. How do these people benefit from (NAME) forest reserve?

	1 = salary/allowances
	2 = have ID
	3 = gain respect from other villagers
	4 = more power for decision making about forest
	5 = get charcoal
	6 = get timber
	7 = fines collected
	8 = bribes collected
	9 = others (specify……..)
	10 = I do not know

9.6. How has your access to (NAME) forest reserve changed over the last 5 years?

	1 = I did not go 5 years ago and I do not go these days → Q 9.8.
	2 = I go these days more often than 5 years ago → Q 9.8
	3 = I go these days less often than 5 years ago
	4 = I go these days as frequently as 5 years ago → Q 9.8

9.7. If you go less often these days, what has been your strategy to respond to this change?

	1 = go more to public land forest
	2 = use home garden
	4 = use other forest reserve
	5 = buy forest products on market
	6 = make footpath to ritual site
	7 = go early in the morning or at night
	8 = go on days when committee members have traveled away from village
	5 = others (specify…….)

9.8. How would you describe the overall condition of (NAME) forest reserve at present time? (Enumerator: Try to refer to the last 6 months so that you do not capture effect of rainy season)

	1 = many big trees of value
	2 = many big trees but of no value
	3 = a few big trees of value
	4 = a few big trees but of no value
	5 = no big trees, many little trees
	6 = no big trees, few little trees
	7 = only shrub

9.9. How would you rate the change of the overall condition of (NAME) forest reserves today compared to 5 years ago?

1 = Much improved
2 = Some improvements
3 = Stable
4 = a bit worse
5 = Much worse
6 = don't know ☐

9.10. How has this change (improvement/worsening of forest condition) affected your livelihood?

	1 = It has much improved my livelihood
	2 = It has improved my livelihood a bit
	3 = The change in forest condition did not have any effect on my livelihood → Q 10.1
	4 = It was worsened my livelihood to some extend
	5 = It was worsened my livelihood a lot

9.11. If your livelihood has worsened or improved, how/why?

……
……

10. Control of Forest Reserve

10.1 Are there to your knowledge any restrictions on the way people use (NAME) forest reserve?

Entry:

	1 = entry and use not allowed at all
	2 = entry allowed on certain days per week
	3 = others (specify……..)
	4 = I do not know

Taking Fuel wood:

	1 = taking fuel wood not allowed at all
	2 = taking fuel wood is allowed all the time
	3 = taking allowed on certain days only
	4 = I do not know

Do you pay for collection firewood?

1 = yes
2 = no ☐
If yes, how much and to whom? ……

Cutting trees for timber/poles/fitu:

	1 = cutting trees not allowed at all
	2 = cutting trees is allowed
	3 = cutting tress is allowed only with permit
	4 = cutting trees allowed for fitu
	5 = cutting trees allowed for poles
	6 = others (specify……)
	7 = I do not know

Do you pay for cutting timber/poles/fitu?

1 = yes
2 = no ☐
If yes, how much and to whom? ……

Others:

	1 = agriculture and grazing not allowed
	2 = agriculture and grazing is allowed
	3 = I do not know

Do you pay for grazing ?

1 = yes
2 = no ☐
If yes, how much and to whom? ……

10.2. Do you think rules restricting forest use are necessary to maintain the forest?

1 = yes
2 = no ☐

10.3. Who makes such rules about forest access and use?

	1 = serikali ya kuu

	2 = serikali ya kijiji (village assembly)
	3 = camati ya mazingira/msitu
	4 = village chairman
	5 = other village leader
	6 = village government and central government jointly
	7 = district
	8 = other organization (specify)

10.4 Are there by-laws regulating access and use of the (NAME) Forest Reserve?

1 = yes
2 = no (→ Q 10.8.) ☐
3 = I do not know (→ Q 10.8.)

10.5 What do these by-laws say?

……
…

	1 = I do not know

10.6 What is the status of these by-laws?

	1 = drafted by village but not endorsed by district
	2 = endorsed by district
	3 = enforced
	4 = not enforced
	5 = I do not know

10.7 Have you seen the by-laws documented?

1 = yes, I have seen them
2 = yes, I have read them ☐
3 = I have never seen or read them

10.8. Who is in charge of dealing with offenders against forest rules?

	1 = serikali ya kuu (FBD)
	2 = serikali ya kijiji
	3 = camati ya mazingira/msitu
	4 = village chairman
	5 = other village leader
	6 = the police
	7 = district
	8 = other (specify)

10.9. Have you or anybody from your HH during the last 12 months seen or heard of a person with a permit to enter the forest and cut trees or make charcoal?

1 = yes
2 = no (→ Q 10.11) ☐

10.10. If yes, who issued the permit?

	1 = serikali ya kuu (FBD)
	2 = serikali ya kijiji
	3 = camati ya mazingira/msitu
	4 = village chairman
	5 = other village leader
	6 = the District
	7 = Catchment office Morogoro
	8 = other (specify)

10.11. Have you or anybody in your HH seen a person violating forest rules during the past 12 months?

1 = yes
2 = no (→ Q 10.16) ☐

10.12. What did the person do?

……..…

10.13. Did you or the HH member report this person?

1 = yes
2 = no ☐

10.14. To whom did you report the person?

	1 = serikali ya kuu
	2 = serikali ya kijiji (village assembly)
	3 = Kamati ya mazingira/msitu
	4 = village chairman /executive officer
	5 = district
	6 = other person/organization (specify)

10.15. What was the effect of the reporting?

	1 = offender was warned without further action
	2 = offender was fined
	3 = offender was taken to police
	4 = offender was beaten up
	5 = offender was put in jail
	6 = no action was taken
	7 = do not know as villagers are not informed
	8 = do not want to know

10.16. During the PRA conducted in this village, participants made the following statements, about why no action is taken following an offense. Which statement do you agree or disagree with ?

	Statement	Strongly agree	agree	Strongly disagree	disagree	Don't know
1	People in charge of dealing with offenders are not serious and do not follow through					
2	People in charge of dealing with offender are involved themselves and are not trustworthy					
3	In most cases offenders ran away and there is no follow-up					
4	Rules in this village are in general not important					
5	People in charge of dealing with offenders want to avoid conflict					
6	People in charge do not patrol or take action against offenders because of the danger of being hurt					

11. Income and Savings

11.1. What is the household's main source of cash income? (Rank by importance!)

	1 = sale of food crops
	2 = sale of livestock
	3 = sale of livestock products
	4 = sale of cash crops
	5 = sale of forest products
	6 = business income
	7 = wages or salaries in cash
	8 = other casual cash earnings
	9 = income from land rent
	10 = cash remittances
	11 = fishing
	12= others (specify)

If 6 is most important source of income, specify which business?_____

11.2. Which crops has your HH grown over the last 12 months, how is it used and which income is obtained?

Name of Crop	Amount of harvest/ Unit	Quantity consumed	Quantity sold	Ave price

11.3. Which agricultural inputs did you use over the last 12 months?

Type of input	Amount	Cost
Employ field labour		
Purchase of fertilizer		
Seeds		
Transport		

11.4. From which other livestock or non-farm outputs did you earn income over the past 12 months?

Enumerator: These can be from fishing, mining, handicrafts, beer brewing, brick making …

Name of Output/Activity	Amount/ Unit	Quantity consumed	Quantity sold	Ave price

11.5. Did you HH receive income from renting out land during the past 12 months?

1 = yes
2 = no

☐

11.6. If yes, what was the amount received over the past 12 months?

☐

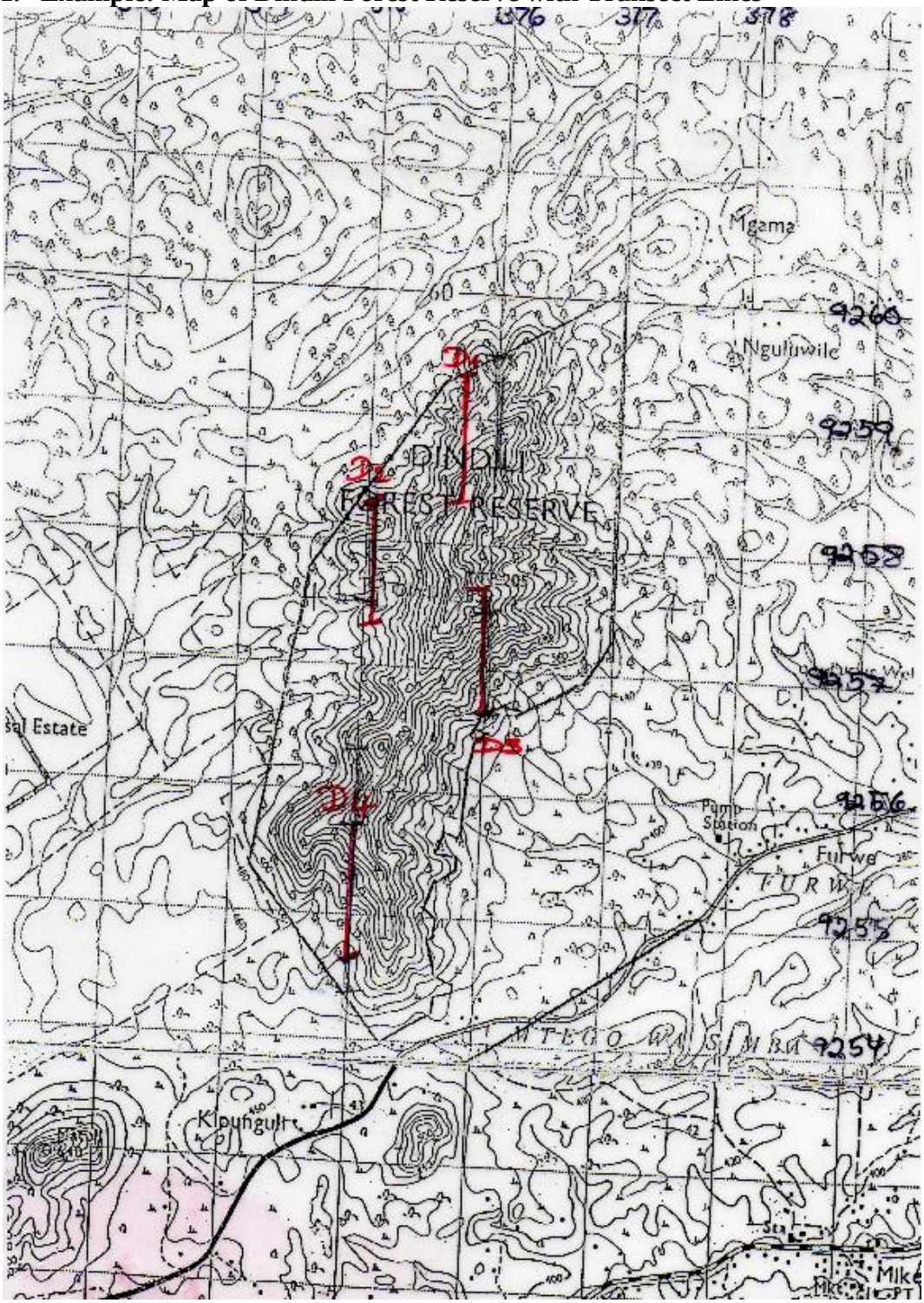
(11.7. Enumerator If the HH was/is using land that it is <u>not</u> owning (see 6.2/6.3), ask now what did you have to pay to rent this land and note the amount here!)

11.8. What is the income earned from other non far sources over the 12 months? ☐

No.	Type of work	Amount earned 12 months	Place of work
		Earnings for year up to date of interview	1 = nearby 2 =district 3 = town (name) 4 = city (name)
1	Occasional labour		
2	Business income		
3	Wages seasonal		
4	Wages regular		
5	Salary private sector		
6	Salary government sector		
7	Payments in kind		
8	Pension payments		
9	Interests/Dividends		
10	Remittances		
11	Other non farm		

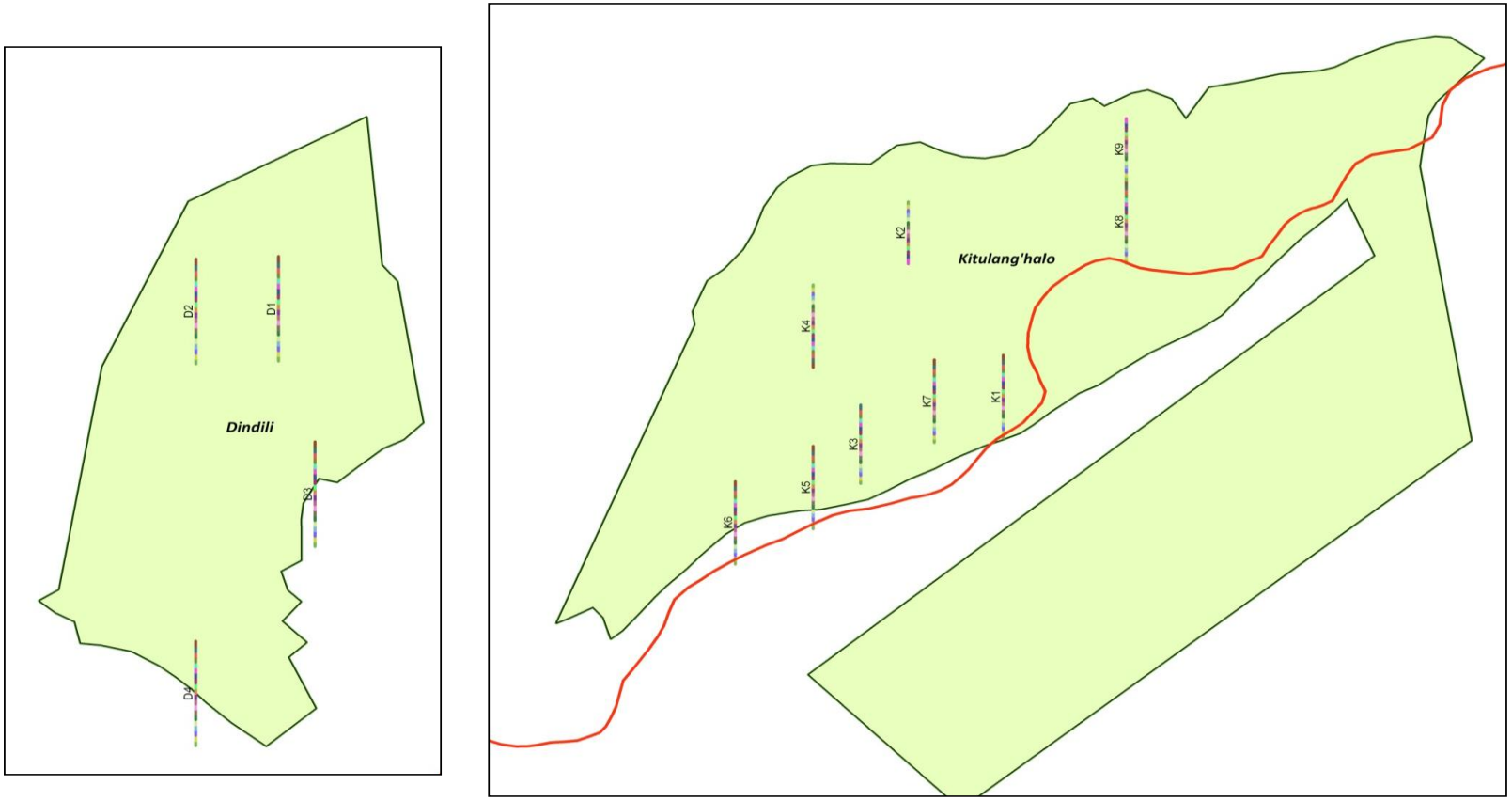
Appendix 3: Transect Maps

1. Example: Map of Dindili Forest Reserve with Transect Lines [21]

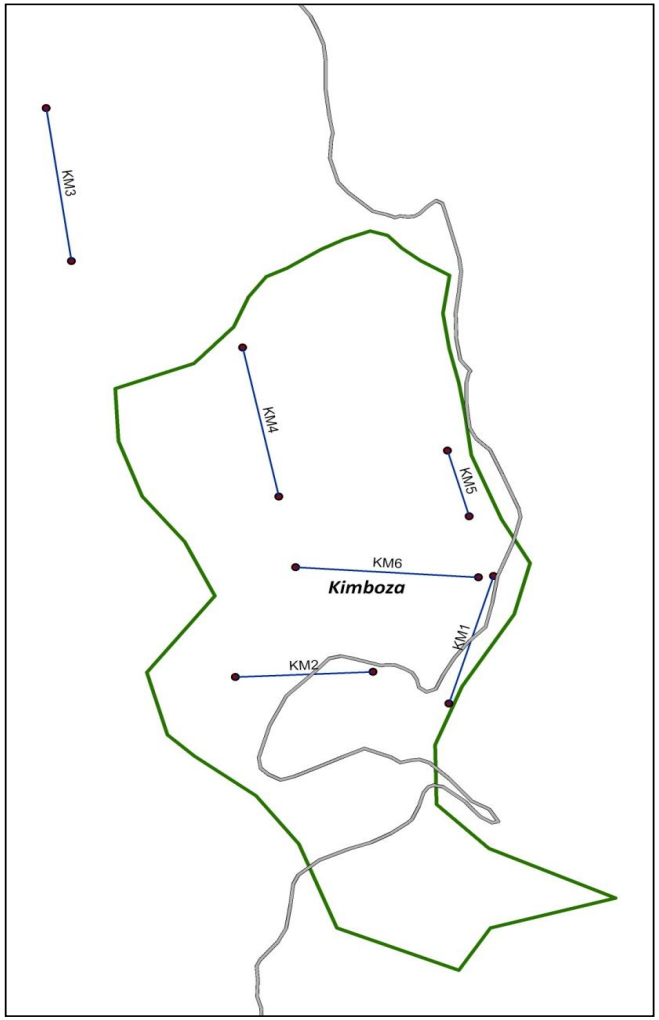


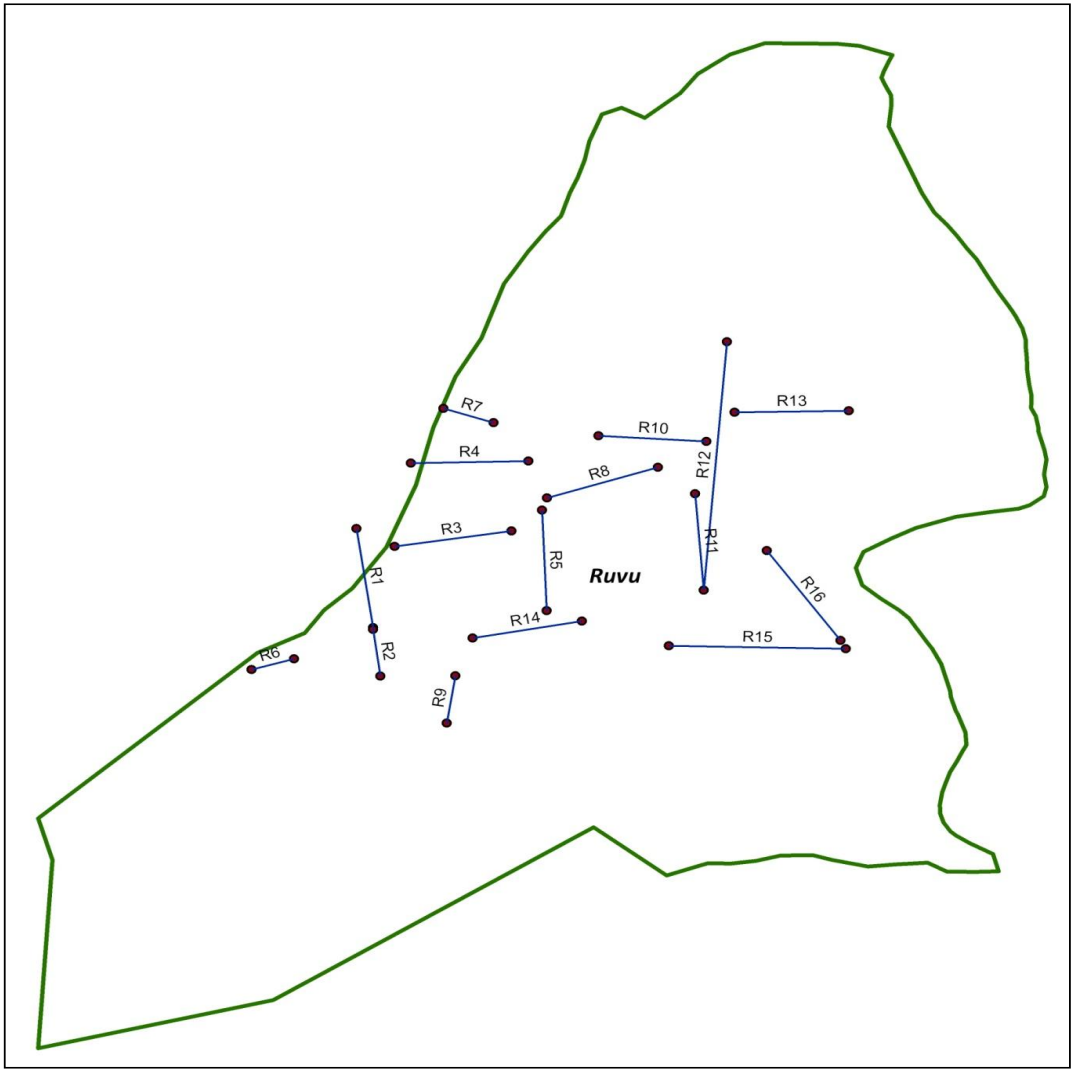
[21] Digitised maps/GPS data for Ngambaula and Milawilila were not available. The boundaries of the digitized maps were not consistent with the boundaries on the UTM gridmaps/boundary marks found in the field. Therefore some transects seem slightly out of the reserve boundaries on these maps below. KM 3 in Kimboza was not used for this study.

2. Maps of Dindili and Kitulang'halo forest reserves with transect lines

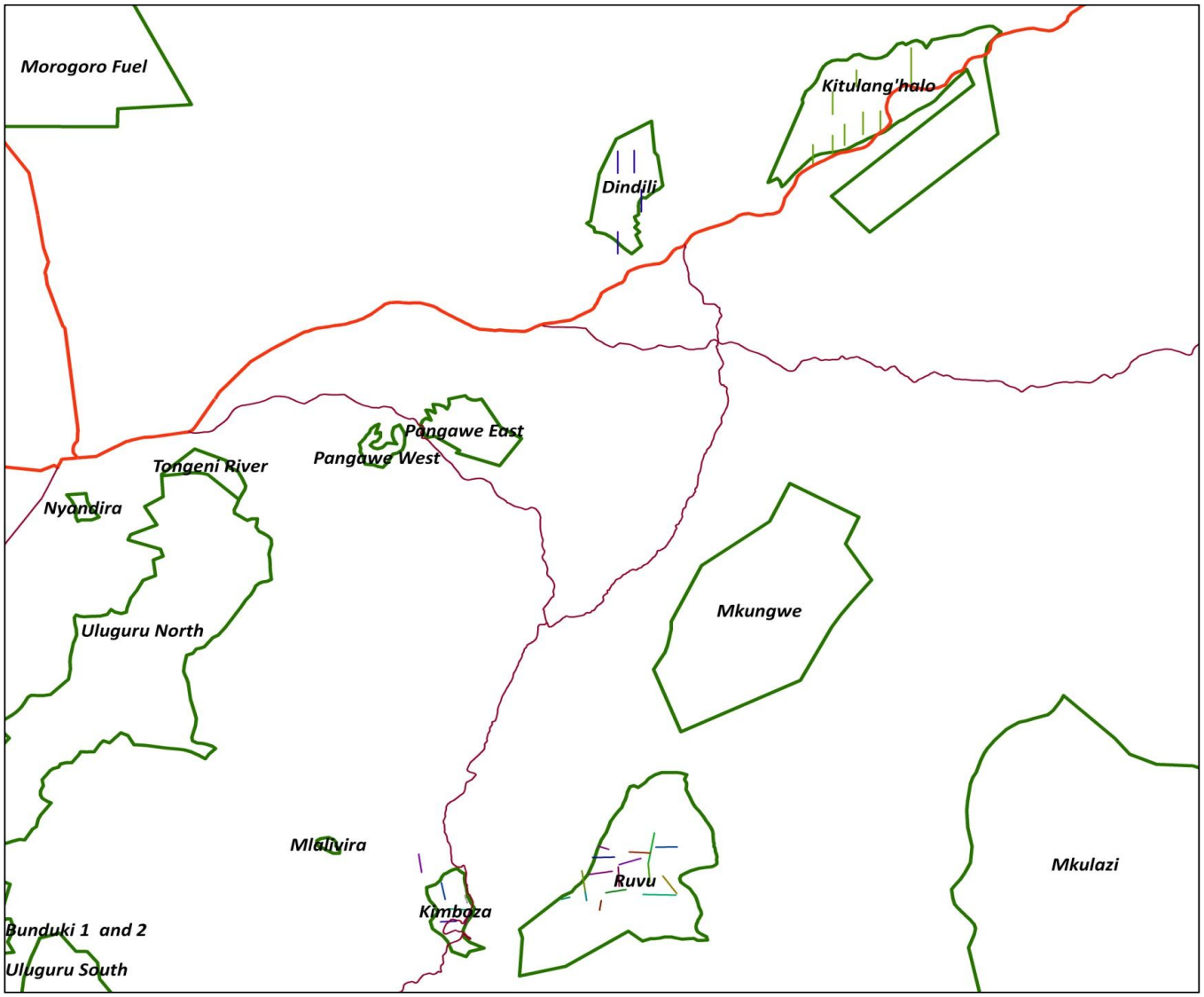


3. Maps of Kimboza and Ruvu forest reserves





4. Overview map



Appendix 4: Spatial patterns of forest quality

Table A4.1. Descriptive statistics, forest quality variables, Kitulang'halo versus Dindili

	Kitulang'halo	Dindili	Significance
DBH	M=18.04, SE=0.58, sd=7.55	M=21.16, SE=0.76, sd=7.03	U=4,706.50, p<.001, r=-0.25
Height	M=8.09, SE=0.28, sd=3.68	M=9.75, SE=0.40, sd=3.15	U=4,806.00, p<.001, r=-0.23

Table A4.2. Descriptive statistics, forest quality variables, Kimboza versus Ruvu

	Kimboza	Ruvu	Significance
Trees	M=12.67, SE=0.88, sd=6.88	M=9.39, SE=0.271, sd=6.87	U=6,216.00, p<.001, r= -0.21
DBH	M=30.34, SE=0.88, sd=6.81	M=28.83, SE=0.39, sd=6.87	Not significant
Height	M=17.03, SE=0.45, sd=3.51	M=10.96, SE=0.35, sd=3.87	U=2171.50, p<.001, r = -0.49
Poles	M=21.23, SE=1.14, sd=8.82	M=13.51, SE=0.62, sd=10.83	U=4,501.00,p< .001, r = -0.34
Withies	M=25.02, SE=1.55, sd=12.04	M=10.62, SE=0.73, sd=12.83	U=3,026.00, p< .001, r = -0.43
Leaf litter	M=3.42, SE=0.181, sd=1.41	M=1.35, SE=0.088, sd=1.54	U=3,153.5, p<.001, r=-0.44
Seedlings	M=2.63, SE=0.171, sd=1.33	M=0.93, SE=0.082, sd=1.44	U=3,164, p<.001, r=-0.45
Grass	M=0.03, SE=0.033, sd=0.26	M=2.17, SE=0.098, sd=1.73	U=2,796.5, p<.001, r=-0.47
Canopy	M=36.3, SE=3.46, sd=26.79	M=15.0, SE=1.09, sd=19.21	U=4727, p<.001, r=-0.31

Table A4.3. Descriptive statistics, forest quality variables, Milawilila versus Ngambaula

	Milawilila	Ngambaula	Significance
Trees	M=11.85, SE=0.88, sd=3.94	M=3.65, SE=0.97, sd=4.00	U=29.00, p<.001, r=-0.74
DBH	M=37.53, SE=1.43, sd=6.41	M=22.41, SE=4.46, sd=19.95	Not significant
Height	M=15.22, SE=0.96, sd=4.28	M=7.28, SE=1.20, sd=4.16	Not significant
Poles	M=32.9, SE=2.49, sd=11.14	M=2.4, SE=0.96, sd=4.29	U=1.00, p <.001, r = 0.86
Withies	M=44.65, SE=3.68, sd=16.47	M=3.4, SE=1.39, sd=6.20	U=3.50, p <.001, r =0.85
N.dead trees	M=3.9, SE=0.57, sd=2.55	M=1.6, SE=0.34, sd=1.54	U=1,639.5, p<.001, r=-0.20
N.dead poles	M=2.7, SE=0.61, sd=2.74	M=0.25, SE=0.12, sd=0.55	U=6,699, p<.001, r=-0.18
Leaf litter	M=3.65, SE=0.357, sd=1.60	M=0.50, SE=0.21, sd=0.95	U=243, p<.001, r=-0.24
Seedlings	M=3.60, SE=0.366, sd=1.64	M=0.30, SE=0.15, sd=0.66	U=237, p<.001, r=-0.25
Grass	M=0.1, SE=0.1, sd= 0.45	M=2.15, SE=0.49, sd=2.21	U=96, p<.001, r=-0.17
Canopy	M=49.1, SE=5.26, sd=23.51	M=3.4, SE=1.63, sd=7.29	U=19.0, p<.001, r=-0.25
Species richness	M=10, SE=0.54, sd=2.43	M=6, SE=0.93, sd= 4.16	U= 76.5, p<.001, r=-0.17

Figure A4.1. Forest quality variables, Milawilila and Ngambaula

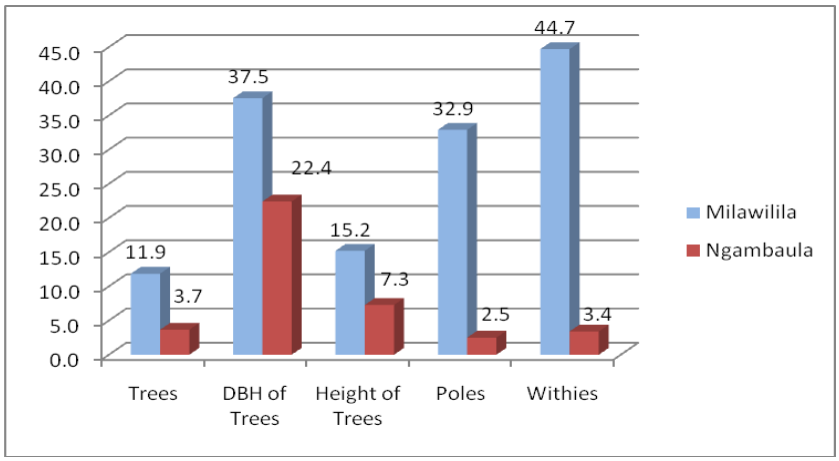


Figure A4.2 Percentage of poles cut across the investigated forests

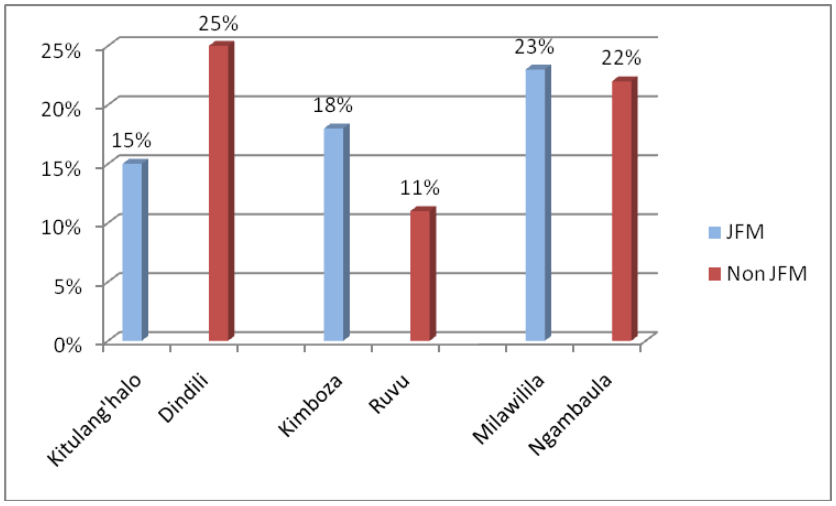


Figure A4.3 Percentage of withies cut across the investigated forests

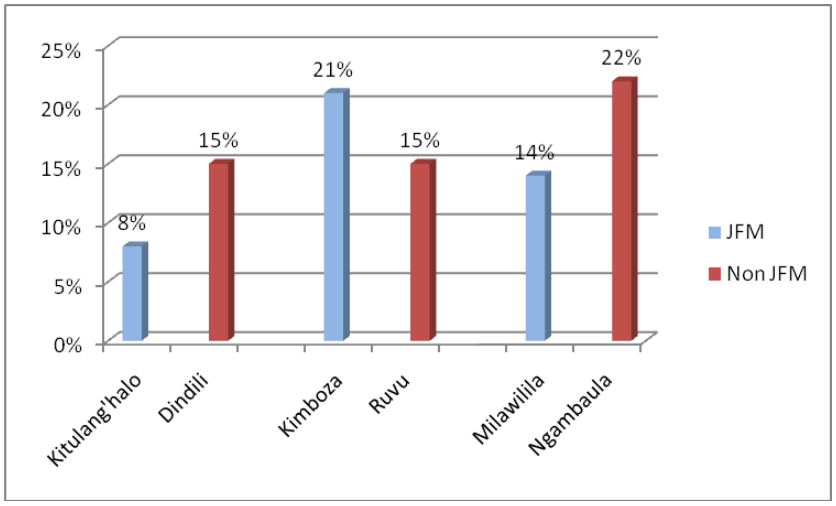


Table A4.4. Total cuts, descriptive statistics, Kitulang'halo versus Dindili

	Kitulang'halo	Dindili	Significance
Trees	M=2.01, SE=0.26, sd=3.33	M=6.99, SE=0.83, sd=7.46	U= 3,339.5, p<.001, r= -0.42
Poles	M=3.30, SE=0.35, sd=4.55	M=6.10, SE=0.6, sd=5.36	U= 4,061.5, p<.001, r= -0.33
Withies	M=1.59, SE=0.26, sd=3.40	M=3.62, SE=0.54, sd=4.81	Not significant

Table A4.5. Old cuts, descriptive statistics, Kitulang'halo versus Dindili

	Kitulang'halo	Dindili	Significance
Trees	M=1.88, SE=0.25, sd=3.19	M=6.68, SE=0.81, sd=7.26	U= 3,462.5, p<.001, r= -0.41
Poles	M=3.05, SE=0.33, sd=4.30	M=5.68, SE=0.58, sd=5.15	U= 4,032 p<.001, r= -0.33
Withies	M=1.30, SE=0.21, sd=2.71	M=3.29, SE=0.50, sd=4.50	U= 4,418.5, p>.001, r=-0.30

Table A4.6. Other forms of human use (mean values): Kitulang'halo and Dindili

	Kitulang'halo	Dindili
Burning	0.16	0.14
Footpath	0.14	0.20
Trap	0.04	0.01
Sawpit*	0.11	0.29
Charcoal pit	0.14	0.20
Farm field	0.02	0.01
Mining	0.00	0.00
Grazing	0.04	0.00
Parts taken	0.02	0.08
Debarking	0.01	0.00

*Statistically significant difference

Table A4.7. Descriptive statistics, cutting data, Kimboza versus Ruvu

	Kimboza	Ruvu	Significance
Trees, total cuts	M=1.12, SE=0.18, sd=1.43	M=0.40, SE=0.06, sd=1.01	U= 5,549, p<.001, r= -0.32
Trees, old cuts	M=1.08, SE=0.18, sd=1.42	M=0.38, SE=0.05, sd=0.93	U=5,652, p<.001, r = -0.31
Trees, new cuts	M=0.03, SE=0.01, sd=0.18	M=0.03, SE=0.01, sd=0.21	Not significant
Poles, total cuts	M=5.05, SE=0.66, sd=5.15	M=2.34, SE=0.30, sd=5.22	U= 4,835.5, p<.001, r= -0.32
Poles, old cuts	M=5.03, SE=0.66, sd=5.14	M=2.30, SE=0.29, sd=5.09	U=4,812, p<.001, r = -0.32
Poles, new cuts	M=0.02, SE=0.02, sd=0.13	M=0.04, SE=0.02, sd=0.28	Not significant
Withies, total cuts	M=6.68, SE=0.76, sd=5.85	M=2.71, SE=0.33, sd=5.86	U= 4,681.5, p>.001, r=-0.33
Withies, old cuts	M=6.65, SE=0.76, sd=5.87	M=2.50, SE=0.31, sd=5.42	U=4,578.5, p<.001, r = -0.34
Withies, new cuts	M=0.03, SE=0.03, sd=0.26	M=0.22, SE=0.09, sd=1.65	Not significant

Table A4.8. Other forms of human use (mean values): Kimboza and Ruvu

	Kimboza	Ruvu
Burning*	0.05	0.36
Footpath	0.07	0.06
Trap	0.02	0.05
Sawpit*	0.10	0.01
Charcoal pit	0.00	0.00
Farm field	0.00	0.00
Mining	0.00	0.06
Grazing	0.00	0.01
Parts taken	0.00	0.01
Debarking	0.00	0.00

*statistically significant difference

Table A4.9. Total cuts, descriptive statistics, Milawilila versus Ngambaula

	Milawilila	Ngambaula	Significance
Trees	M=4.40, SE=0.51, sd=2.26	M=1.60, SE=0.38, sd=1.70	U= 70.5, p<.001, r= -0.18
Poles	M=9.70, SE=1.34, sd=5.98	M=1.00, SE=0.38, sd=1.72	U= 13.50, p<.001, r= -0.26
Withies	M=6.75, SE=1.14, sd=5.08	M=1.70, SE=0.84, sd=3.74	U= 67.50, p>.001, r=-0.18

Table A4.10. Other forms of human use: Milawilila and Ngambaula

	Milawilila	Ngambaula
Burning*	0.00	0.90
Footpath	0.15	0.05
Trap	0.00	0.00
Sawpit	0.30	0.05
Charcoal pit	0.00	0.00
Farm field*	0.15	0.35
Mining	0.00	0.00
Grazing	0.00	0.00
Parts taken	0.00	0.00
Debarking	0.05	0.00

*statistically significant

Table A4.11 Villagers' perception of forest condition, by village and forest

Village name	Maseyu	Fulwe	Mwalazi	Ngong'olo	Milawilila	Logo
Forest name	**Kitulang'halo**	**Dindili**	**Kimboza**	**Ruvu**	**Milawilila**	**Nagambaula**
many big trees of value	57	13	66	48	41	22
many big trees of no value	8	11	8	1	11	16
few big trees of value	21	32	2	6	8	3
few big trees of no value	2	35	5	3	2	8
no big but many little trees	2	4	3	1	21	11
no big and few little trees	0	1	3	3	0	3
I do not know	11	3	13	38	17	37

In percent of respondents

Appendix 5: Livelihood patterns data tables

Table A5.1. Size distribution of land owned by households, by study village

	Study village						All
	Fulwe	Maseyu		Milawilila	N'gongolo	Mwalazi	
Area Range	%	%	%	%	%	%	%
None	12.00	3.03	14.29	7.94	20.83	22.58	13.47
Less than 1 ha.	17.33	33.33	38.10	26.98	34.72	38.71	31.17
1.01 - 3 ha.	49.33	50.00	44.44	60.32	38.89	30.65	45.64
3.01 - 5 ha.	8.00	7.58	1.59	4.76	4.17	8.06	5.74
More than 5 ha.	13.33	6.06	1.59	0.00	1.39	0.00	3.99
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Data are percentages of sample households

Table A5.2. Land area owned and farmed (in ha) by study village and wealth group

Asset Per-centile group	Fulwe		Maseyu		Logo		Milawilila		Ngong'olo		Mwalazi		Total	
	owned	% cultiv.	Owned	% cultiv.	owned	% cultiv.	owned	% cultiv.	owned	% cultiv.	owned	% cultiv.	owned	% cultiv.
1	119.38	76%	75,27	40%	31,16	49%	31,77	52%	53,62	63%	35,41	49%	346,61	59%
2	9.71	67%	25,9	75%	23,03	81%	36,02	95%	18,62	109%	14,77	73%	128,05	86%
3	19.22	103%	7,85	87%	14,97	89%	13,35	97%	13,76	98%	14,77	88%	83,92	95%
4	40.27	114%	19,22	75%	1,62	356%	0,4	810%	1,62	506%	3,04	243%	66,17	128%
Total	188.58	87%	128,24	55%	70,78	75%	81,54	82%	87,62	87%	67,99	71%	624,75	77%

1 = asset richest, 4 = asset poorest

Table A5.3. Housing materials used by study village and for the entire sample

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi	All
Type of roof							
grass, leaves, bamboo	38.7	62.1	50.8	54.8	47.9	48.4	50.1
mud and grass	4.0	0.0	4.9	0.0	0.0	0.0	1.5
concrete, cement	0.0	0.0	1.6	0.0	0.0	0.0	0.3
metal sheets	57.3	37.9	42.6	45.2	52.1	51.6	48.1
Type of walls							
poles, branches, grass	22.7	6.3	8.1	1.6	2.8	17.7	10.1
poles, mud, stones	17.3	48.4	53.2	48.4	43.7	43.5	41.7
mud only	25.3	35.9	1.6	0.0	0.0	9.7	10.9
mud bricks	4.0	1.6	25.8	4.8	42.3	9.7	21.0
baked/burned bricks	26.7	4.7	11.3	0.0	11.3	29.0	14.9
concrete, cement, stones	2.7	3.1	0.0	1.6	0.0	0.0	1.3
other	1.3	0.0	0.0	0.0	0.0	0.0	0.3
Type of floor							
earth	76.0	84.4	93.5	95.2	88.9	95.2	88.4
cement, concrete, tiles, timber	22.7	15.6	4.8	4.8	9.7	4.8	10.8
other	1.3	0.0	1.6	0.0	1.4	0.0	0.8

Table A5.4. Housing materials and sanitary facilities by asset quartile

	Asset quartile			
	1	**2**	**3**	**4**
Type of roof				
grass, leaves, bamboo	39.0	47.0	55.1	60.2
mud and grass	1.0	1.0	3.1	1.0
concrete, cement	0.0	0.0	0.0	1.0
metal sheets	60.0	52.0	41.8	37.8
Type of walls				
poles, branches, grass	12.0	5.1	9.2	14.3
poles, mud, stones	37.0	48.5	50.0	31.6
mud only	3.0	6.1	5.1	29.6
mud bricks	22.0	30.3	22.4	9.2
baked/burned bricks	23.0	9.1	12.2	14.3
concrete, cement, stones	3.0	1.0	1.0	0.0
other	0.0	0.0	0.0	1.0
Type of floor				
earth	82.0	88.9	91.8	91.9
cement, concrete, tiles, timber	18.0	9.1	8.2	7.1
other	0.0	2.0	0.0	1.0

Table A5.5. Housing material and sanitary facilities by gender of HH Head

	HH Head	
	Male	**Female**
Type of roof		
grass, leaves, bamboo	48.6	61.8
mud and grass	1.9	0.0
concrete, cement	0.3	0.0
metal sheets	49.2	38.2
Type of walls		
poles, branches, grass	10.3	12.5
poles, mud, stones	41.1	46.4
mud only	10.3	17.9
mud bricks	19.4	14.3
baked/burned bricks	17.2	7.1
concrete, cement, stones	1.3	1.8
other	0.3	0.0
Type of floor		
earth	87.5	91.1
cement, concrete, tiles, timber	11.6	8.9
other	0.9	0.0

Table A5.6. Education of HH head by study village

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
no formal education	20.0	17.7	26.3	25.9	20.0	26.2
Std 1 to Std 4	14.7	8.1	28.1	14.8	23.1	19.7
Std 5 to Std 8	53.3	64.5	38.6	55.6	53.8	54.1
Form 1 to 3	4.0	0.0	1.8	1.9	3.1	0.0
Form 3 to 6	5.3	1.6	1.8	1.9	0.0	0.0
training after primary	0.0	3.2	0.0	0.0	0.0	0.0
university	1.3	0.0	0.0	0.0	0.0	0.0
adult education	1.3	4.8	3.5	0.0	0.0	0.0

Table A5.7. Education of HH head by asset quartile in percent

	Asset quartile group			
	1 (richest)	2	3	4 (poorest)
no formal education	14.1	21.5	25.0	29.0
Std 1 to Std 4	25.3	23.7	15.9	6.5
Std 5 to Std 8	49.5	48.4	54.5	62.4
Form 1 to 3	3.0	3.2	1.1	0.0
Form 3 to 6	3.0	1.1	2.3	1.1
training after primary	1.0	1.1	0.0	0.0
university	1.0	0.0	0.0	0.0
adult education	3.0	1.1	1.1	1.1

Table A5.8 Differences in education between male and female headed household

	HH Head	
	male	female
no formal education	18.5	45.5
Std 1 to Std 4	19.4	9.1
Std 5 to Std 8	55.2	43.6
Form 1 to 3	2.2	0.0
Form 3 to 6	2.2	0.0
training after primary	0.6	0.0
university	0.3	0.0
adult education	1.6	1.8

In percent of respondents

Table A5.9. Type of drinking water source, frequency of collection, change of frequency compared to 5 years ago, by village

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
Type of drinking water source						
piped water community supply	0.0	0.0	0.0	0.0	41.7	9.7
piped water on neighbour house	1.3	1.5	0.0	0.0	0.0	0.0
rainwater catchment tank	4.0	0.0	0.0	0.0	0.0	0.0
public well (protected)	2.7	0.0	0.0	0.0	30.6	19.4
public well (unprotected)	68.0	34.8	0.0	3.2	26.4	58.1
private well (protected)	2.7	0.0	0.0	0.0	0.0	0.0
private well unprotected	2.7	1.5	0.0	1.6	0.0	0.0
spring (unprotected)	1.3	0.0	27.0	68.3	1.4	1.6
river, dam, lake	16.0	62.1	73.0	27.0	0.0	11.3
others	1.3	0.0	0.0	0.0	0.0	0.0
Frequency of water collection						
more than once per week	84.0	90.6	98.4	98.4	100.0	95.2
once per day	6.7	7.8	1.6	1.6	0.0	4.8
2-3 times per week	4.0	1.6	0.0	0.0	0.0	0.0
others	5.3	0.0	0.0	0.0	0.0	0.0
More or less time than 5 years ago						
more time	88.0	57.8	1.6	4.8	39.4	8.1
less time	6.7	29.7	14.3	28.6	21.1	37.1
no change	5.3	12.5	84.1	66.7	39.4	54.8

Table A5.10. Time spent in minutes walking to nearest drinking water source

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
Mean	31.11	42.86	15.25	9.85	8.94	10.76
s.d.	*23.0*	*42.7*	*23.1*	*10.3*	*6.8*	*11.7*
Median	30.0	30.0	10.0	5.0	7.5	6.0

Table A5.11. Type of health services by village in percent

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
none	27	11	98	98	100	0
private hospital	11	0	2	0	0	93
public hospital	43	63	0	2	0	5
traditional healer against payment	19	26	0	0	0	0
traditional healer who serves for free	0	0	0	0	0	2
Total	100	100	100	100	100	100

Table A5.12. Type of health services by asset group in percent

	1 (richest)	2	3	4 (poorest)
none	60	71	59	38
private hospital	16	13	18	18
public hospital	21	12	15	26
traditional healer against payment	2	3	7	18
traditional healer who serves for free	0	0	1	0

Table A5.13. Type of health services by gender in percent

	female	male
none	41.8	57.4
private hospital	25.5	15.7
public hospital	18.2	19.9
traditional healer against payment	14.5	6.7
traditional healer who serves for free	0.0	0.3
Total	100	100

Table A5.14. Market access, by village

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
Mean	48.92	56.17	145.56	79.76	159.01	130.77
s.d.	*57.79*	*64.22*	*35.79*	*35.59*	*51.65*	*53.43*
Median	30	30	150	60	180	120

Table A5.15. Means of transport to reach market, by study village.

	Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
walking	86.7	30.3	96.8	95.2	94.4	85.5
bicycle	12.0	13.6	3.2	4.8	4.2	11.3
minibus	0.0	54.5	0.0	0.0	1.4	1.6
other	1.3	1.5	0.0	0.0	0.0	1.6

Table A5.16. Comparison main activity of household head and asset wealth group

	richest			poorest	Total
	1	2	3	4	
farming	88	80	73	80	321
government employee	1	4	2	1	8
private sector employee	1	1	1	1	4
self-employed with employees	5	4	4	4	17
self employeed without employees	3	1	4	7	15
unable to work (too old, retired, sick, disabled)	1	2	3	4	10
others	1	0	0	0	1
Total	100	92	87	97	376

Table A5.17. Type of non-farm activities, total sample

	Count	Percent
occasional labour	39	7.1
business income	160	29.1
wages seasonal	43	7.8
wages regular	32	5.8
salary private sector	2	0.4
salary government sector	9	1.6
payments in kind	4	0.7
pension payments	3	0.5
interests, dividends	1	0.2
Remittances	118	21.5
other non farm	93	16.9
Total	504	91.8
System	45	8.2
	549	100.0

Table A5.18. Non farm activities

	Frequency	Percent
beer brewing	5	10.9
bicycle repair	1	2.2
brick making	1	2.2
carpentry	3	6.5
casual labour	4	8.7
charcoal burning	1	2.2
fishing	1	2.2
house building	3	6.5
mechanic	1	2.2
milling maschine	1	2.2
mining	13	28.3
mitafuliwa	1	2.2
radio repairing	1	2.2
selling local medicine	2	4.3
tailoring	2	4.3
technician	1	2.2
weaving	3	6.5
welding	1	2.2
wine making	1	2.2
Total	46	100

Table A5.19. Type of non-farm activities by village

	Fulwe		Maseyu		Logo		Milawilila		Ngong'olo		Mwalazi	
	N	%	N	%	N	%	N	%	N	%	N	%
occasional labour	8	8.5	1	1.2	3	3.6	1	1.1	10	9.1	16	17.8
business income	28	29.8	48	57.1	13	15.7	19	21.6	28	25.5	24	26.7
wages seasonal	7	7.4	14	16.7	5	6.0	6	6.8	4	3.6	7	7.8
wages regular	9	9.6	4	4.8	3	3.6	13	14.8	3	2.7	0	0.0
salary private sector	1	1.1	0	0.0	0	0.0	1	1.1	0	0.0	0	0.0
salary government sector	2	2.1	1	1.2	4	4.8	1	1.1	1	0.9	0	0.0
payments in kind	2	2.1	1	1.2	1	1.2	0	0.0	0	0.0	0	0.0
pension payments	2	2.1	0	0.0	0	0.0	1	1.1	0	0.0	0	0.0
interests, dividends	0	0.0	1	1.2	0	0.0	0	0.0	0	0.0	0	0.0
remittances	31	33.0	13	15.5	20	24.1	22	25.0	23	20.9	9	10.0
other non farm	1	1.1	1	1.2	17	20.5	9	10.2	31	28.2	34	37.8
Total	91	96.8			66	79.5	73	83.0	100	90.9		
Missing	3	3.2			17	20.5	15	17.0	10	9.1		
Total	94	100.0	84	100.0	83	100.0	88	100.0	110	100.0	90	100.0

Table A5.20. Type of non-farm activities by JFM and non JFM study sites

	JFM		Non-JFM	
	N	**%**	**N**	**%**
occasional labour	18	6.87	21	7.32
business income	91	34.7	69	24
wages seasonal	27	10.3	16	5.57
wages regular	17	6.49	15	5.23
salary private sector	1	0.38	1	0.35
salary government sector	2	0.76	7	2.44
payments in kind	1	0.38	3	1.05
pension payments	1	0.38	2	0.7
interests, dividends	1	0.38	0	0
remittances	44	16.8	74	25.8
other non farm	44	16.8	49	17.1
Total	247	94.3	257	89.5
Missing	15	5.73	30	10.5

Table A5.21. Mean number of crops grown by study village

	Fulwe	**Maseyu**	**Logo**	**Milawilila**	**Ngong'olo**	**Mwalazi**
Mean	2.31	2.37	3.79	3.89	3.64	3.20
s.d.	*1.00*	*0.79*	*1.67*	*1.43*	*1.46*	*1.38*
Median	2	2	4	4	4	3
Max.	4	5	7	7	8	7
Min	1	1	1	2	1	1
N	70	62	63	63	72	60

Table A5.22. Type of crops grown by study village

	Fulwe		Maseyu		Logo		Milawilila		Ngong'olo		Mwalazi	
	N	%	N	%	N	%	N	%	N	%	N	%
bananas	3	1.9	1	0.7	22	9.2	23	9.4	4	1.5	2	1.0
beans	2	1.2	1	0.7			1	0.4	1	0.4		
Cassava	3	1.9	3	2.0	32	13.4	57	23.3	10	3.8	6	3.1
coconuts					6	2.5	15	6.1	7	2.6	2	1.0
cow peas	1	0.6	4	2.6	3	1.3			3	1.1	2	1.0
groundnuts			1	0.7	1	0.4						
cucumber	1	0.6										
maize	67	41.4	60	39.7	37	15.5	11	4.5	69	25.9	56	29.0
mangoes					1	0.4	1	0.4				
millet			10	6.6	20	8.4	5	2.0	44	16.5	23	11.9
oranges	1	0.6			16	6.7	10	4.1	1	0.4	2	1.0
pepper	1	0.6			10	4.2	11	4.5			1	0.5
pigeon peas	6	3.7	15	9.9	3	1.3			6	2.3	3	1.6
pineapples					8	3.3	29	11.8				
potatoes					1	0.4			1	0.4		
pumpkins							1	0.4				
rice	1	0.6			57	23.8	65	26.5	74	27.8	57	29.5
sesame	44	27.2	35	23.2	19	7.9	11	4.5	43	16.2	35	18.1
sorghum			19	12.6			2	0.8				
soya	1	0.6										
spice												
sugar cane	1	0.6			1	0.4			1	0.4	1	0.5
sunflower	5	3.1										
tobacco									1	0.4		
tomatoes	17	10.5	1	0.7	2	0.8						
vegetables	1	0.6	1	0.7			1	0.4			1	0.5
yam							2	0.8			2	1.0
water melon	7	4.3										
Total	162	100.0	151	100.0	239	100.0	245	100.0	266	100.0	193	100.0

Table A5.23. HH Primary strategies to overcome food shortage (in % of respondents)

	Asset quartile group			
	1 (richest)	2	3	4 (poorest)
cut down food intake/number of meals	15	20	19	42
seek support from relatives/neighbours	6	10	13	8
buy food on credit	21	26	20	8
search for edible plant, fruit and hunt in the forest	2	2	3	6
casual labour	19	18	28	21
eat cassava as substitute	4	5	10	3
eat fruit from garden	1	2	0	0
sell chicken, livestock or other assets	5	4	1	2
petty trade: fruit, vegetables, bites, water, beer brewing	15	9	2	4
burn, sell charcoal	2	1	1	0
mining	1	1	0	0
other	1	0	1	4
never experienced food shortage	8	2	2	2

Table A5.24. HH secondary strategies to overcome food shortage (in % of respondents)

	Asset quartile group			
	1	2	3	4
cut down food intake/number of meals	50	6	15	14
search for edible plant, fruit and hunt in the forest	25	13	23	17
casual labour	25	38	31	14
seek support from relatives/neighbours	0	6	15	7
buy food on credit	0	25	0	38
petty trade: fruit, vegetables, bites, water, beer brewing	0	13	15	0
eat cassava as substitute	0	0	0	7
burn, sell charcoal	0	0	0	3

Table A5.25. Mean and Medium selected indicators by Study village

		Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
Value of Assets (Ths.)	Mean	980,927	608,204	462,834	499,659	492,553	448,443
	s.d.						
	Median	252,172	424,677	374,749	411,099	399,333	314,175
No of HH members	Mean	4.93	4.61	4.62	4.90	4.93	4.10
	s.d.	*2.54*	*2.19*	*2.25*	*2.28*	*2.58*	*2.42*
	Median	5.00	4.50	5.00	5.00	5.00	4.00
Land owned (ha.)	Mean	2.51	1.94	1.12	1.29	1.22	1.10
	s.d.	*3.15*	*2.20*	*1.07*	*0.82*	*1.62*	*1.11*
	Median	1.62	1.21	0.81	1.21	0.81	0.81
Land farmed (ha.)	Mean	2.18	1.07	0.84	1.06	1.06	0.78
	s.d.	*3.08*	*0.76*	*0.44*	*0.55*	*0.73*	*0.55*
	Median	1.42	0.81	0.81	0.81	0.81	0.81

Table A5.26. Assets owned by the sample households

	N	Percent
radio/cassette	249	6.1
TV/Video	7	0.2
bicycle	127	3.1
mobile phone	46	1.1
fridge/freezer	4	0.1
iron charcoal	53	1.3
iron electrical	3	0.1
motorbike	1	0.0
car	2	0.0
tractor	5	0.1
torch	222	5.5
lantern	177	4.4
watch	110	2.7
clock	27	0.7
charoal stove	101	2.5
kerosine stove	49	1.2
cooking pots	390	9.6
hand hoe	394	9.7
axe	264	6.5
panga	343	8.5
moskito net	188	4.6
bed (ropes)	284	7.0
bed with matress	313	7.7
sewing machine	11	0.3
milling machine	8	0.2
wheelbarrow	4	0.1
pit sawing blade	23	0.6
goats	93	2.3
sheep	3	0.1
chicken	260	6.4
duck	12	0.3
pidgeon	3	0.1
pigs	2	0.0

Table A5.27. HH size, age and gender of HH head by study village

		Fulwe	Maseyu	Logo	Milawilila	Ngong'olo	Mwalazi
No of HH members	Mean	4.93	4.61	4.62	4.90	4.93	4.10
	s.d.	*2.54*	*2.19*	*2.25*	*2.28*	*2.58*	*2.42*
	Median	5.00	4.50	5.00	5.00	5.00	4.00
Age of HH head	Mean	52.51	46.65	49.45	46.71	48.52	45.08
	s.d.	*15.98*	*14.20*	*14.98*	*17.32*	*16.23*	*16.14*
	Median	51.00	44.00	48.00	43.00	45.00	41.00
Gender of HH head	% male	85.3	78.8	89.5	87.3	93.9	77.0
	% female	14.7	21.2	10.5	12.,7	6.1	23.0

Table A5.28. HH size, age and gender of HH head by asset quartile

		Asset quartile group			
		1	2	3	4
No of HH members	Mean	5.44	5.14	4.19	4.05
	s.d.	*2.33*	*2.25*	*2.43*	*2.28*
	Median	5.00	5.00	4.00	4.00
Age of HH head	Mean	51.29	48.43	46.44	46.53
	s.d.	*14.34*	*15.79*	*15.77*	*17.22*
	Median	48.00	45.00	43.50	43.00
Gender of HH head	% male	94.0	90.4	85.2	72.2
	% female	6.0	9.6	14.8	27.8

Table A5.29 Asset categories, mean values in TSH, by gender of household head

	Male	Female
non productive assets	144,873	96,645
productive assets	125,799	8,150
livestock assets	60,610	24,801
land assets	486,239	343,333
Total assets	657,385	305,043

Table A5.30 Asset categories by leadership status, mean value in TSH

	Leader	Non Leader
non productive assets	143,682	130,283
productive assets	59,581	126,971
livestock assets	63,572	50,297
land assets	511,213	424,457
Total assets	609,992	583,652

Table A5.31. Types of forest resource use, by people living adjacent to JFM and non-JFM forests

	JFM		Non JFM	
	N	%	N	%
timber	67	5.4	86	6.3
poles	162	13.2	173	12.7
fitu	153	12.4	161	11.8
ropes	138	11.2	146	10.7
firewood	194	15.8	188	13.8
charcoal	33	2.7	65	4.8
medicines	84	6.8	108	7.9
edible fruit, vegetables, leaves	105	8.5	132	9.7
honey	8	0.6		
grass	103	8.4	102	7.5
gum and resins	1	0.1		
bush meat	5	0.4	2	0.1
grazing land	32	2.6	38	2.8
farm land	139	11.3	162	11.9
ritual	6	0.5	3	0.2
others	1	0.1		
Total	1,231	100.0	1,366	100.0

Appendix 6: Species list

Table A6.1 below contains a full list of all tree species found during the transect surveys in the six forest reserves.

Genus	**Family**	**Eng.Name**	**Swahili name** *other name*
A			
Acacia polyacantha (A.campylacantha)	Mimosoideae	White thorn	Mgunga,
Acacia hockii	Mimosoideae		Mgunga
Acacia indica	Mimosoideae		
Acacia kirkii	Mimosoideae		
Acacia nigrescens	Mimosoideae	Knobthorn	*Mkambala,*
Acacia nilotica (A. arabica)	Mimosoideae	Egyptian thorn	Mgunga,
Acacia senegal	Mimosoideae	Sudan gum arabic	*Mkoto,*
Acacia seyal	Mimosoideae	*White thorn*	
Acacia xanthophloea	Mimosoideae	Fever tree	*Mgunga,*
Adansonia digitata	Bombacaceae	Baobab	Mbuyu,
Afzelia quanzensis	Caesalpinoiodeae	Pod mahogany	Mbambakofi/Mkongo
Albizia amara	Mimosoideae	Bitter albizia	*mtanga*
Albizia anthelmintica	Mimosoideae		
Albizia gummifera/schimperiana	Mimosoideae	Long podded Albezia	Mkenge
Albizia petersiana	Mimosoideae		
Albizia versicolor	Mimosoideae	poison pod albizia	Mchanidovu,
Allanblackia stuhlmanii	Clusiaceae		
Allophylus congolanus	Sapindaceae		
Allophylus africana	Sapindaceae		
Annona sp.(fruits on trunk)	Annonaceae		
Annona senegalensis (A. chrysophylla)	Annonaceae	Wild custard apple	Mchekwa/Mtomoko
Antiaris toxicaria			Mkula/Mkuzu
Antidesma venosum	Euphorbiaceae	Tasselberry	Mpotolo
Alchornea cordifolia	Euphorbiaceae		
Alchornea hirtella	Euphorbiaceae		
B			
Balanites aegyptica	Balanitaceae	Desert date	*Mruguhu*
Barringtonia racemosa	Lecythidaceae		
Bersama abysinica	Melianthaceae	Winged Bersama	Mwangwakwao
Bombax rhodognaphalon (var. tomentosa)	Bombaceae	Wild Kapok	Mkaranga mti
Borassus aethiopum	Arecaceae (Palmae)	African fan palm	Mvumo
Brachylaena hutchinsii (b.huillensis)	Compositae	Silver oak	Muhuhu, mkarambati
Brachystegia longiflora	Caesalpiniodeae		
Brachystegia microphylla	Caesalpiniodeae		
Brachystegia spiciformis	Caesalpiniodeae	Bean-pod tree	Myombo
Breonadia microcephala (B. salocina)	Rubiaceae		Mgwina
Bridelia brideliifolia	Euphorbiaceae		
Bridelia cathartica	Euphorbiaceae		
Bridelia micranthra	Euphorbiaceae	Bridelia	Mkarati
Boscia sp.	Capparidaceae		
Burkea africana	Caesalpinioideae	Wild syringa	*Mkalati*

Genus	Family	Eng.Name	Swahili name *other name*
Byrsocarpus orrientalis	Connaraceae		
C			
Cadaba Farinosa	Capparidaceae		*Ndumwashigulu*
Calotropis procera	Apocynaceae	Sodom apple	
Carvalhoa campanulata	Apocynaceae		
Canthium mundianum	Rubiaceae		
Canthium oligocarpum	Rubiaceae		
Canthium schimperianum	Rubiaceae		
Canthium sylvaticum	Rubiaceae		
Carissa edulis	Apocynaceae	Simple-spined carrisa	*Mkabaku*
Cassia auriculata	Caesalpinioideae		
Cassia angustifolia	Caesalpinioideae		
Cassia abreviata	Caesalpinioideae	Long-pod cassia	*Mulimuli*
Cassia petersiana	Caesalpinioideae		
Cassia siamea	Caesalpinioideae		
Cassia sinqueana	Caesalpinioideae		
Cassia spectabilis	Caesalpinioideae		
Catunaregam nilotica	Rubiaceae		
Catunaregam obovata	Rubiaceae		
Cedrela mexicana/odorata	Meliaceae		Msedrela
Ceiba petandra	Bombacaceae	Kapok	Msufi pori
Citrus aurantifolia	Rutaceae	Lime	Mdimu
Clausena anisata oliv.	Rutaceae		
Clerodendron myricoides	Verbenaceae	Blue butterfly	
Clerodendrum schweinfurthii	Verbenaceae		
Clerodendrum sp.	Verbenaceae		
Clutia abyssinica	Euphorbiaceae		
Coffea engenioides	Rubiaceae	Nandi coffee	
Coffea kimbozensis	Rubiaceae		
Coffea pseudozanguebariae	Rubiaceae		
cola sp.	Sterculiaceae		
Cola clavata	Sterculiaceae		
Cola greenwayi	Sterculiaceae		
Cola microcarpa	Sterculiaceae		
Cola scheffleri	Sterculiaceae		
Cola stelacantha	Sterculiaceae		
Cola usambarensis	Sterculiaceae		
Combretum sp.	Combretaceae		
Combretum apiculatum	Combretaceae		
Combretum molle	Combretaceae	Velvet bush willow	*Mlama*
Combretum pentagonum	Combretaceae		
Combretum schumannii (C. stulhmanni)	Combretaceae	Forest tree combretum	Mgurure
Combretum zeyheri	Combretaceae		
commiphora Sp. (spiny)	Burseraceae		
Commiphora africana	Burseraceae	Poison grub Commiphora	Mturituri
Commiphora edulis	Burseraceae		
Commiphora eminii (subsp. Zimmermanii)	Burseraceae		*Itonto*
Cremaspora triflora	Rubiaceae		
Crossopteryx febrifuga	Rubiaceae		

Genus	Family	Eng.Name	Swahili name *other name*
Croton sp.	Euphorbiaceae		
Croton megalobotrys	Euphorbiaceae	Large fever berry	
Croton sylvaticus	Euphorbiaceae		
Cussonia kirkii (C.aborea)	Araliaceae	Cabbage tree	Mgagigagi
Cussonia spicata	Araliaceae	Common cabbage tree	
Cussonia zimmermanii	Araliaceae		
Cylicomorpha parviflora	Caricaceae		
Cynometra alexandri	Leguminosae		
Cynometra fischeri	Leguminosae		
Cynometra schlechteri	Leguminosae		
D			
Dalbergia boehmii	Fabaceae		Mzeza
Dalbergia lactea	Fabaceae		
Dalbergia melanoxylon	papilionoideae	African Blackwood	Mpingo
Dalbergia nitundula	papilionoideae	Purplewood dalbergia	*Msinatemo*
Dalbergia vaccinifolia	Fabaceae		
Deinbolia borbonica	Sapindaceae		
Deinbolia kilimandscharica	Sapindaceae		
Dialium holstii	Fabaceae		
Diospyros mespiliformis	Ebenaceae	African ebony, Jackalberry	Mgiriti
Diospyros usambarensis	Ebenaceae		
Diospyros abyssinica	Ebenaceae		
Diospryos verrucosa	Ebenaceae		
Diplorhynchus condylocarpon	Apocynaceae		
Dichrostachys cinerea	Mimosoideae		Mkulagembe
Dombeya burgessiae	Sterculiaceae	Pink wild pear	
Dombeya rotundifolia	Sterculiaceae	White dombya	*Mtati/Mswayu*
Dombeya shumpangae	Sterculiaceae		
Dracaena fragrans	Agavaceae	Corn plant	
Dracaena steudneri	Agavaceae		
Draceana usambarensis	Agavaceae	Long leaved dragon tree	*Isare*
Drypetes gerardii	Euphorbiaceae		
Drypetes natalensis	Euphorbiaceae		
Drypetes usambarica	Euphorbiaceae		
E			
Ehretia Amoena	Boraginaceae		
Ehretia litoralis	Boraginaceae		
Encephalartos hildebrandtii	Zamiaceae		
Encephalartos lehmannii	Zamiaceae	Karoo cycad	
Englerophytum natalense	Sapotaceae		
Erythrina sp.(abyssinica)*(E.tomentosa)	Papilionoideae	Kaffir boom, red hot Poker tree	Msiviti
Erythrina sacleuxii	Fabaceae		
Erythrococea fischeri	Euphorbiaceae		
Erythrococca usambarica	Euphorbiaceae		
Erythrophleum guineensis (E.suaveolens)	Fabaceae		Bangawanga
Euclea natalensis	Ebenaceae		
Euphorbia bussei	Euphorbiaceae		
Euphorbia candelabrum	Euphorbiaceae		
Euphorbia cooperi	Euphorbiaceae		

Genus	**Family**	**Eng.Name**	**Swahili name** *other name*
Euphorbia tirucalli	Euphorbiaceae	Milkbush, finger Euphorbia	Mnyara/Mgovu
F			
Faurea saligma	Proteaceae	Beachwood	*Mfuka*
Ficus sp.	Moraceae		
Ficus bussei	Moraceae		
Ficus capensis	Moraceae		
Ficus exasperata	Moraceae		
Ficus glumosa	Moraceae		
Ficus ingens	Moraceae		
Ficus mucuso	Moraceae		
Ficus s(c)ycomorus (F. gnaphalocarpa)	Moraceae	Sycomore fig	*Mkuyu*
Ficus thonningii	Moraceae	Strangler fig	Mrumbapori
Flancourtia indica	Flancourtiaceae		*Mgola*
Flueggea virosa	Euphorbiaceae	Chinese waterberry, simpleleaf bushweed	
G			
Garcinia buchananii	Clusiaceae		
Garcinia Livingstonei	Clusiaceae		Mpekechu
Gardenia ternifolia subsp.jovis-tonantis	Clusiaceae		
Garcinia huillensis	Clusiaceae		
Garcinia volkensii	Clusiaceae		
Gossypium kirkii	Malvaceae		
Grewia bicolor/Grewia goetzeana	Tiliaceae		*Mkole*
Grewia tenax	Tiliaceae		
Grewia platyclada	Tiliaceae		
Grewia similis	Tiliaceae		Mkole
H			
Hagenia abyssinica	Rosaceae	Hagenia	*Mlanga*
Harrisonia abyssinica	Hedwigiaceae		
Hippocratea sp.	Celastraceae		
Hippocratea buchaninii	Celastraceae		
hippocratea volkensii	Celastraceae		
Holarrhena febrifuga	Apocynaceae		
Hugonia arborescens	Linaceae		
Hymenaea verrucosa	Fabaceae	Gum copal tree	Msandaruzi/Mnangu
I			
J.			
Jatropha curcus	Euphorbiaceae		
Julbernadia globiflora	Caesalpiniodeae	Julbernadia	Mhondolo/Mtondo
K			
Keetia zanzibarica	Rubiaceae		
Khaya nyasica (K. anthotheca)	Meliaceae	African mahogony	Mkangazi
Kigelia africana (K. aethiopum)	Bignoniaceae	Sausage tree	Mwicha
Kiggelaria africana	Flacourtiaceae		
L			
Lannea fulva	Anacardiaceae		
Lannea schimperi	Anacardiaceae		
Lannea stuhlmanii	Anacardiaceae		Msayu
Lannea schweinfurthii var.stuhlmannii	Anacardiaceae		Mtundu
Lasianthus pedunculatus	Rubiaceae		
Lecaniodiscus fraxinifolius	Sapindaceae		

Genus	**Family**	**Eng.Name**	**Swahili name** *other name*
Lettowianthus stellatus	Annonaceae		
Lonchocarpus bussei	Fabaceae		
Lonchocarpus capassa	Fabaceae	Lilac tree, Rain tree	Mvale
M			
Maerua angolensis	Capparaceae		
Maerua tryphilla	Capparaceae	Maerua, Small bead bean	Msingizi
Maesopsis emminii	Rhamnaceae		*Msira*
Mangifera indica	Anacardiaceae	Mango	Muembe
Manilkara discolor	Sapotaceae	Forest milkberry	
Manilkara mochisia	Sapotaceae	Milkberry	Msapa
Manilkara sulcata	Sapotaceae		Msezi
Manilkara zanzibarensis	Sapotaceae		mgambo
Margaritaria discoidea	Euphorbiaceae		
Markhamia acuminata	Bignoniaceae		
Markhamia obtusifolia	Bignoniaceae	Golden bean tree	Mtarawanda
Maytenus mossambicensis	Celastraceae		
Maytenus senegalensis	Celastraceae		
Melia volkensii	Meliaceae		
Memecylon cogniaux	Melastomataceae		
Memecylon myrtilloides	Melastomataceae		
Milicia excelsa (Chlorophora e.)	Moraceae	Rock Elm, African Teak	Mvule
Millettia angustidentata	Papilionoideae		
Millettia dura	Papilionoideae	Milletia	*Mhavi*
Millettia oblata	Papilionoideae		
Millettia usambarensis	Papilionoideae		
Mitragyna rubrostipulata	Rubiaceae		
Monanthotaxis buchananii	Annonaceae		
Monodora grandidiera	Annonaceae		
Mussaenda monticola	Rubiaceae		
Mussaenda tenuiflora	Rubiaceae		
Myrianthus holstii	Moraceae	Giant yellow mulberry	*Mfutsa/Mkonde*
N			
Neoboutonia macrocalys	Euphorbiaceae		
Newtonia buchananii	Fabaceae		Mnyaza
O			
Ochna sp.	Ochnaceae		
Ochna cyanophylla	Ochnaceae		
Ochna holstii	Ochnaceae		
Ochna oxyphylla	Ochnaceae		
Ochna usambarensis	Ochnaceae		
Ocotea usambarensis	Lauraceae	Camphor	Muheti
Olea capensis	Oleaceae	East african olive	*Ngwe*
Olea chrysophylla	Oleaceae		
Oncoba spinosa	Flancourtiaceae		
Ormocarpum trichocarpum	Fabaceae		
Oxyanthus speciosus	Fabaceae		
Oxyanthus haerdii	Fabaceae		
Ozoroa obovata	Anacardiaceae		
Ozoroa insignis (Heeria reticulata)	Anacardiaceae	Tropical resin tree	Mwalika
P			

Genus	**Family**	**Eng.Name**	**Swahili name** *other name*
Pandanus stulhmannii	Pandanaceae		
Parkia filicoidea	Fabaceae	African locust bean	
Pavetta crassipes	Rubiaceae		
Pavetta holstii	Rubiaceae		
Peddiea volkensii	Thymelaeaceae		
Pericopsis angolensis (Afrormosia a.)	Papilionondeae	East African Afrormosia	Mbanga
Phoenix reclinata	Arecaceae(Palmae)	Wild date palm	*Bukindi*
Phyllanthus reticulatus	Phyllanthaceae		
Piliostigma thonningii (Bauhinia t.)	Caesalpiniodeae	Camel's foot tree	Mkichikichi
Polyceratocarpus scheffleri	Annonaceae		
Polysphaeria parvifolia	Rubiaceae		
Prunus africana	Rosaceae	Red stinkwood	*Mwiluti*
Pseudolachnostylis maprouneifolia	Euphorbiaceae	Duiker berry	Muguruka
Psychotria brucei	Rubiaceae		
Psychotria eminiana	Rubiaceae		
Psychotria goetzei	Rubiaceae		
Psychotria lauracea	Rubiaceae		
Psydrax obovata	Rubiaceae		
Pterocarpus angolensis	Papilionondeae	African Teak, Bloodwoood	Mninga
Pteleopsis myrtifolia	Combretaceae		Mwindi
Q			
R			
Raphia farinfera	Arecaceae		
Raphia vinifera	Arecaceae		
Rawsonia uluguruensis	Flacourtiaceae		
Rauvolfia caffra	Apocynaceae	Quinine tree	Mkufi
Rhus africana	Anacardiaceae		
Rhus longispina	Anacardiaceae		
Rhus natalensis	Anacardiaceae		Mkumba
Rhus vulgaris	Anacardiaceae		
Rinorea sp.			
Ricinus communis	Euphorbiaceae	Castor bean	Mbarika
Ricinodendron heudelotii	Euphorbiaceae	African nut tree	
Rinorea elliptica	Violaceae		
Rinorea ilicifolia	Violaceae		
S			
Sapium ellipticum (Shirakiopsis e.)	Euphorbiaceae		
Sapindus saponaria		Soapberry	
Schrebera alata			
Schefflera abyssinica	Araliaceae		
Schefflera goetzenii	Araliaceae		
Schefflera spicata	Araliaceae		
Sclerocarya birrea subsp.caffra	Anacardiaceae		Mng'ongo
Scorodophloeus fischeri	Fabaceae		
Securidaca longipendunculata	Polygalaceae	Violet tree	*Mluka*
Schefflerodendron usambarense	Fabaceae		
Senna siamea	Fabaceae	Thai cassia, Kassod tree	Mjohoro
Sorindeia madagascariensis	Anacardiaceae		
Spirostachys africana			Mchalaka
Steganotaenia araliacea	Apiaceae		

Genus	Family	Eng.Name	Swahili name *other name*
Sterculia africana	Sterculiaceae	African star chestnut, Tick tree	*Mluze*
Sterculia appendiculata	Sterculiaceae	Tall Sterculia	Mfune/Mgude
Sterculia quenquloba	Sterculiaceae	Egyptian plane tree	Mkweranyani
Sterculia tragacantha	Sterculiaceae		
Stereospermum kunthianum	Bignoniaceae		Mtafuna panya
Strophanthus eminii	Apocynaceae		
Strychnos sp.			
Strychnos cocculoides	Loganiaceae	Corky bark, Monkey Orange	Mtonga
Strychnos henningsii	Loganiaceae		
Strychnos potatorum			
Suregada zanquebarica			
Syzygium guineense	Myrtaceae	Water berry	Mzambarai,Mzambarau mwitu
Syzygium owariernse	Myrtaceae	Water berry	Mzambarau ziwa
T			
Tabernaemontana pachysiphon(T.holstii)	Apocynaceae	Giant pinwheel flower, Pua	
Tamarindus indica	Caesalpiniodeae	Tamarind	Mkwaju
Teclea nobilis	Rutaceae		*Muzo*
Teclea simplicifolia			
Tectona grandis	Verbanaceae	Teak	Msaji/Mtiki
Terminalia brownii	Combretaceae		*Mpoke*
Terminalia sericea	Combretaceae	Silevr terminalia	*Mpululu*
Trema orientalis (T. guineensis)	Ulmaceae	Pigeon wood	Mgendagenda
Trichilia dregeana	Meliaceae	Forest mahogony	
Trichilia emetica (T. roka)	Meliaceae	Cape mahogony	Mkungwina
Turraea fischerii	Meliaceae		
Turraea holstii	Meliaceae	Honeysuckle tree	
Turraea robusta	Meliaceae		
U			
Uvariastrum hexaloboides	Annonaceae		
V			
Vangueria infausta	Rubiaceae	Wild medlar	Mviru
Vangueria tomentosa	Rubiaceae		
Vernonia subligera	Asteraceae		Tughutu
Vernonia amygdalina	Asteraceae		
Vepris glandulosa	Rutaceae		
Vepris lanceolata	Rutaceae		
Vepris stolzii	Rutaceae		
Vitex domiana (V. cuneata, V. cienkowskii)	Verbenaceae	Black plum	Mfudu
Vitex keniensis (V. kenyansis)	Verbenaceae	Mero oak	Mfuu
Vitex mombassae	Verbenaceae	Smelly berry vitex	Mfundumaji
Voacanga africana	Apocynaceae		
W			
X			
Xeroderris angolensis	Fabaceae		
Xeroderris stuhlmannii	Papilionoideae	Wind pod	Mnyinga
Ximenia caffra (X. americana var. caffra)	Olacaceae	Large sourplum	Mpingi

Genus	**Family**	**Eng.Name**	**Swahili name** *other name*
Xylotheca tettensis	Flacourtiaceae		
Y			
Z			
Zanha africana	Sapindaceae		
Zanthoxylum chalybeum	Rutaceae	Knobwood	Mjafari
Zanthoxylum deremense	Rutaceae		
Zanthoxylum gilletii	Rutaceae		
Ziziphus mucronata	Rhamnaceae	Buffalo thorn	Mgugunu

Appendix 7: Wealth class indicators

The following wealth class indicators were identified by the villagers during the PRA sessions in the six villages:

Site 1

Maseyu village (JFM)			
Indicator	**Poor person*) Uwezo mdogo**	**Middle wakawaida**	**Rich person Mwenye uwezo**
Farm size	1.5 acres	3 acres	100-200 acres
Livestock	none	2-6 chicken	20 chicken, 4-10 goats
Type of house	Thatched	Thatched	Bricks
Farming tools	Hand Hoe	Hand Hoe, Panga, Axe	Traktor
Assets	None	Bicycle, moderately priced radio	Bicycle, Traktor, milling maschine, Mobile phone
Age	Old person	Relatively young	Relatively young
Type of bed	Made of ropes and wood	Bed with matress	Bed with matress (more than one)
Economic activities	Provides service to others, e.g. burning charcoal, farming, i.e. cultivating land for somebody else.	Charcoal Burner (10-20 bags per month), does petty trading (vegetables, tomato, cassava)	Charcoal seller (buys 200-600 bags), is a middleman, Petty Trading (simsim, cassava, maize). has employees (Bwana Mifugo, Bwana Shamba)
Access to Health services	Highly depends on collected traditional medicines; are being served freely by traditional healers.	Buy traditional medicines	Any
Access to Communication	None	Able to pay others to use their mobile phone	Mobile phone
Recepients of support	Some are offered medication allowance by their landlords	Afford going to government hospitals	Go to private hospital in Morogoro
Fulwe village (non JFM)			
Criteria	**Poor person*) Uwezo mdogo**	**Middle wakawaida**	**Rich person Mwenye uwezo**
Farm size	< 2 acres	10-5 acres	20-50 acres
Livestock	Chicken 1-5	Chicken 10-5	Chicken 100-50

	Goats 0	Goats 5-2	Goats 20-10
Type of house	House made of thached grass	House made of poles and dirt floor	House made from bricks
Farming tools	Has handhow, panga, axe	Renting tractor, handhow, labour	Large milling maschine and tractor
Assets	none	Bicycle, radio	Milling maschine, car, motorbike, tv, radio
Type of bed	Bed made out of ropes	Normal Bed and matrass 3-4 feet	Normal bed, matrass 6 by 6 feet
Economic activities	Burning charcoal	Sales person (small business) sells charcoal	Shop, hotel, bar
Health services	Kleine Apotheke, traditional healer	Government hospital	Private hospital
Schooling of children	Going to see only	Government school	Private school
Access to communication	Pays to use phone of others	Cell phone either husband or wife (one person in family)	Cell phone both husband and wife

*) a poor person was considered lazy, often drunk and to be a thief.

Site 2

Mwalazi village (JFM)			
Criteria	**Poor person** **Uwezo mdogo**	**Middle** **wakawaida**	**Rich person** **Mwenye uwezo**
Farm size	Large 30 acres, outside the village and up to 5 acres inside village	1-2 acres	Up to 0.5 acres
Livestock	40 goats	10 goats	0 goats
Type of house	2-3 good houses, iron sheet and burned bricks	1 small good house, iron sheet and bricks	House made out of makuti, poles and mud
Assets	Bicycle, mobile phone	Mobile phone	none
Transport	Are mobile, Bicycle	Are sometimes mobile	Are not mobile
Education	Children go to secondary school	Children go to primary school	Children do not go to school
Economic activities	Big business	Kiosk	No business
Access to Communication	Buy expensive phones	Buy ordinary phones	Do not own phones
Main source of income	Large scale farming Large businesses	Farming, Small businesses	Selling labour, casual labourers; Chicken; Small scale farming
Ngongolo village (non JFM)			
Criteria	**Poor person** **Uwezo mdogo**	**Middle** **wakawaida**	**Rich person** **Mwenye uwezo**
Farm size	0.5 acres	2-3 acres	3-4 acres
Simsim harvest	0.5 bags	2-3 bags	8 – 10 bags

Livestock	Goats max. 3 Chicken max. 5	Goats max. 10 Chicken 10 - 20	Goats 20 – 50 Chicken 50 – 100
Type of house	Poles and mud	Unburned bricks Grass roof	Up to 6 rooms, Iron sheet Wooden door, bricks
Economic activities	mining	Kiosk, burns charcoal, mining	Shop Milling maschine
Health services	Not able to do so	Sometimes able to do so	Take patients to hospitals far from village
Schooling of children	No school	Vocational training	Private school
Access to communication	Uses phones of others against payment	Cell phone	Cell phone

Site 3

Milawilila village (JFM)			
Criteria	**Poor person Uwezo mdogo**	**Middle wakawaida**	**Rich person Mwenye uwezo**
Farm size	Up to 1	2 acres of cassava	4-5 acres Pinnapple, organges, pepper
Livestock	Mifugo kuku 100-50 Mbuzi 20-10	Mbuzi 5-2, Kuku 10-5	Chicken 1-5 Goat 0
Type of house	Thatched grass	House made of poles and dirt floor	House made from burned bricks
Livestock			Over 50 goats
Assets	none	0 or 1 bicycle	10-20 bicycles, for rent
Economic activities	Anafanya vibarua	kiosk	shop
Health services	Needs to go by foot, depends on traditional healer (mganga wa kienyeji)	Can rent bicycle to bring his patients to hospital	Takes care of patients easily
Schooling of children	Do not complete primary	Government school	Private school
Woodlots	Under 10 trees	30-40 trees	Up to 100 trees
Logo village (non JFM)			
Criteria	**Poor person Uwezo mdogo**	**Middle wakawaida**	**Rich person Mwenye uwezo**
Farm size	1 acre, rented	Land size 3-4 acres, owned	Land size 10 acres, owned
Type of house	Roof makuti, walls poles, fito and mud, floor mud	Roof makuti, wall burned/nud bricks, floor mud	Roof iron, wall burned bricks, floor cement/mud
Livestock	None	Goats 6-7 Chicken 10 Ducks 1	Goats 18-20 Chicken 30-40 Ducks 5-6 Rabbit 0-3
Income	No savings, no harvest,	Saves 10,000	Per year:

	Hired labour, paid daily TSs 800 to 1,000	Simsin 3 buckets Maize 2 buckets Organges 5,000 Cassava 5 bags	Saves 20,000 Simsim 10 buckets Maize 1 sack Oranges 20,000 Cassava 20 bags
Food	1 per day and not sure of it	2 meals per day	3 meals per day and selective
Bicycle	0	1	3
Economic activities: small business brick making	No business, casual labourer	Small business, 2,000 to 3,000 bricks burned	Small business, shops, 4,000-5,000 bricks burned, sells at 50 TShs every 2 months
Health services			
Schooling	Primary up to standard 4	Primary only	Primary to secondary, able to pay school fees
Access to Communication	0	0	Mobile

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