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TRADITIONALLY PROTECTED FORESTS´ROLE WITHIN TRANSFORMING NATURAL RESOURCE MANAGEMENT REGIMES IN TAITA HILLS, KENYA

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ACADEMIC DISSERTATION
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Abstract

In Taita Hills, south-eastern Kenya, remnants of indigenous mountain rainforests play a crucial role as water towers and socio-cultural sites. They are pressurized due to poverty, shortage of cultivable land and the fading of traditional knowledge. This study examines the traditional ecological knowledge of Taitas and the ways it may be applied within transforming natural resource management regimes. I have analyzed some justifications for and hindrances to ethnodevelopment and participatory forest management in light of recently renewed Kenyan forest policies. Mixed methods were applied by combining an ethnographic approach with participatory GIS. I learned about traditionally protected forests and their ecological and cultural status through a "seek out the expert" method and with remote sensing data and tools. Both PRA- and RRA- techniques were applied - questionnaires, household- and expert interviews, focus group discussions and - mapping sessions, narratives, participant observation, farm and forest excursions and secondary sources were used for data collection. All together this included: 107 household interviewees, 257 focus group participants, 73 "key" informants and 87 "common" informants in participatory mapping. Religious leaders and state officials shared their knowledge for this study. My approach is inductive and aims to ground a theory on data. The data was analyzed through coding, conceptualizing and categorizing, as well as by using ArcViewGIS 3.2, ArcMap and SPSS 13.0 softwares. I have gained a better understanding of the traditionally protected forests and sites through examining their ecological characteristics and relation to social dynamics, by exploring their ideological aspects, and evaluating their strengths and hindrances as sites for conservation of cultural and biological diversity. My results show that, these sites are important components of a complex socio-ecological system, which has symbolical status and sacred and mystical elements within it, that contributes to the connectivity of remnant forests in the agroforestry dominated landscape. In this ethno-ecological study, 255 plant species and 220 uses were recognized by the tradition experts, whereas 161 species with 108 beneficial uses were listed by farmers in household interviews. Both these results suggest that the Taita people have a rich traditional ecological knowledge base. Out of the traditionally protected forests and sites studied 47 % were on private land and 23% on community land, leaving 9% within state forest reserves. A paradigm shift in conservation is needed; the conservation area approach is not the best option for private lands or areas trusted upon communities. The role of traditionally protected forests in community-based forest management is, however, paradoxal, since communal approaches suggests equal participation of people, whereas management of these sites has traditionally been the duty of solely accredited experts in the village. As modernization has gathered pace such experts have become fewer. Sacredness clearly contributes but, it does not equal conservation. Various social, political and economic arrangements further affect the integrity of traditionally protected forests and sites, control of witchcraft being one of them.

Tiivistelmä

Kaakkois-Keniassa sijaitsevien Taita vuorten alkuperäisvuoristosademetsillä on tärkeä rooli alueen vesitorneina ja sosiokulttuurisina paikkoina. Köyhyys, pula viljelymaasta ja perinnetiedon hiipuminen kohdistavat paineita metsiin. Tässä tutkimuksessa tarkastellaan Taitan asukkaiden ekologista perinnetietoa ja sen soveltamisen mahdollisuuksia alati muuntuvassa luonnonvarainhallintajärjestelmässä. Olen analysoinut etnokehityksen ja osallistavan metsänhallinnan oikeutuksia ja esteitä hiljattain uusitun Kenian metsäpolitiikan valossa. Olen soveltanut monimenetelmällistä tutkimusotetta yhdistäen etnografisia ja osallistavan paikkatiedon menetelmiä. Perinteisesti suojeltujen metsien ekologiasta ja kulttuurisesta statuksesta opin ”etsi asiantuntija”-menetelmän ja kaukokartoitusaineiston avulla. Sovelsin aineiston keruussa sekä PRA- että RRA- tekniikoita: kyselyjä, kotitalous- ja asiantuntijahaastatteluja, fokusryhmäkeskusteluja ja –kartoitusta, tarinankerrontaa, osallistuvaa havainnointia, pelto- ja metsäekskursioita sekä toisen käden lähteitä. Kaiken kaikkiaan tutkimukseen osallistui 107 kotitalouksissa haastateltua henkilöä ja 257 fokusryhmäläistä sekä 73 ”perinneasiantuntijaa” ja 87 ”tavallista kyläläistä” osallistavassa kartoituksessa. Myös uskonnolliset johtajat ja paikallisviranomaiset jakoivat näkemyksiään aiheesta. Tutkimusotteeni on induktiivinen ja tavoitteena on luoda teoriaa aineiston perustalta. Aineistoa analysoitiin koodaamalla, käsitteellistämällä ja kategorisoimalla, sekä ArcViewGIS 3.2-, ArcMap- ja SPSS 13.0- ohjelmistojen avulla. Valotan perinteisesti suojeltujen metsien ja paikkojen ekologisia tunnusmerkkejä ja suhdetta yhteisödynamiikkaan samalla tarkastellen niiden ideologisia näkökulmia sekä analysoiden niiden vahvuuksia ja heikkouksia kulttuurisen ja biologisen monimuotoisuuden suojelussa. Tulokseni osoittavat, että perinteisesti suojellut metsät ovat tärkeä osa kompleksista sosioekologista järjestelmää, joka omaa symbolisen statuksen ja pitää sisällään pyhiä ja mystisiä elementtejä. Peltometsäviljelyvaltaisessa maisemassa perinteisesti suojellut metsät yhdistävät pirstaloituneita suojelualuemetsiä toimien monien eläinlajien astinkivinä. Etnoekologisessa tutkimuksessa perinne-ekspertit tunnistivat 255 kasvilajia ja nimesivät niille 220 käyttötarkoitusta. Maanviljelijät kotitaloushaastatteluissa puolestaan nimesivät 161 kasvilajia ja niiden 108 hyödyllistä käyttötarkoitusta. Tulokset viittaavat Taitojen rikkaaseen ekologisen perinnetietoon. Tutkituista perinteisesti suojelluista metsistä ja paikoista 47% sijaitsivat yksityismaalla, 23% yhteisömaalla ja 9% valtion suojelumetsissä. Suojelualue-ajattelu ei ole toimivaa yksityisillä tai yhteisöjen hallintaan luovutetuilla mailla. Perinteisesti suojellut metsät esittävät puolestaan haasteen yhteisöpohjaisen metsänhoidon periaatteelle: yhteisön jäsenten tasavertainen osallistuminen jää haaveeksi, koska rituaalipaikoista huolehtiminen on perinteisesti uskottujen asiantuntijoiden tehtävä. Nämä ekspertit ovat kuitenkin käyneet harvalukuisiksi modernisaation kulussa. Pyhyyden voidaan selvästi nähdä myötävaikuttavan suojeluun, vaikkakaan nämä kaksi eivät ole täysin rinnastettavissa. Myös monenlaiset sosiaaliset, poliittiset ja taloudelliset asetelmat vaikuttavat perinteisesti suojeltujen metsien koskemattomuuden asteeseen, noitavoimien kontrolloinnin ollen yksi tärkeimmistä.

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This study has an anthropocentric approach, thus would not have happened without the inputs of the welcoming and friendly people of the Taita Hills. My most important companions have been my assistants, Mr. Mwadime Mjomba and Mr. Amon Mghanga, who both originate from my chosen study area and so lowered the language and cultural barriers between the local people and myself. I cannot thank you enough. I owe my gratitude to the wonderful Taita ladies, who keep up the households, take care of the field and children, sell their products on the market, and still have some time to share with a stranger knocking on their doors and asking questions. With no less warmth I remember the interesting talks and somewhat mystical excursions with the knowledgeable Taita men. I want to thank the families who accommodated us, and they practically accepted me as one of their own. Equally crucial to my everyday well-being was the smooth operation of the Taita Research Station in Wundanyi. I wish the staff there all the best. Other central actors include the local government officers, local village Chiefs, foresters, the local community-based organizations, and non-governmental organizations, like the East African Wild Life Society and Taita Taveta Wildlife Forum. Special thanks to Mr. James Mwang´ombe, Mr. John Mlamba, and Mr. Donald Mombo for introducing me to the complex socio-ecological issues of Taita.

Someone has stated that “more important than the length of a step one takes, is its direction”. During some phases of this study, when I was pondering hard over what would be the best direction for the next step, I got a few inspiring pushes. I am grateful to the Devestu graduate school staff and fellow students, as well as IFF-Wien for their guidance.

Last, but not least, I wish to thank my mother, who raised me to love knowledge and taught me the importance of sharing it, as well as my friends who seem to believe in me whatever I am up to.

On July 15th, in Helsinki

Nina Himberg

“At the beginning of my journey, I was naïve. I didn´t yet know that the answers vanish as one continues to travel, that there is only further complexity, that there are still more interrelationships and more questions.”

- Robert D. Kaplan, The Ends of the Earth: a journey to the frontiers of anarchy (1996: 7) -

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Abbreviations

CBD= Convention on Biological Diversity

CDTF= Community Development Trust Fund

CBNRM= Community-based natural resource management

CEPF= Critical Ecosystems Partnership Fund

CIFOR= Center for International Forestry Research

Danida= Danish International Development Agency

DFO= District Forest Officer

DFRD= District Focus for Rural Development

EAWLS= East African Wildlife Society

FA= Forest Act

FAO= United Nations Food and Agricultural Organization

FDA= Focal Development Area approach

Forest community = group of persons who have a traditional association with a forest for purpose of livelihood, culture or religion; or are registered as an association or other organization engaged in forest conservation

GIA= Goats intestine analysis

GoK= Government of Kenya

GPS= Global Positioning System

GRN= Government of Namibia

ICIPE= International Centre of Insect Physiology and Ecology

IFF= Faculty of Interdisciplinary Research and Post-graduate Education, Institute of Social Ecology, Vienna

ILO= International Labour Organization

KANU= Kenya African National Union

KEFRI= Kenya Forest Research Institution

KFMP= Kenya Forestry Master Plan

KFS= Kenya Forest Service

KFWG= Kenya Forest Working Group

KRA= Kenya Revenue Authority

KWS= Kenya Wildlife Service

LEK= local ecological knowledge

Local authority forest= any forest situated on trust land which has been set aside as a forest by a local authority pursuant to the provision of the Trust Land Act (RoK 2005)

LULC= Land use and land cover

MP= Member of Parliament

NGO= Non-Governmental Organization

PFM= Participatory Forest Management

RoK= Republic of Kenya

Sacred grove= a grove with religious or cultural significance to a forest community

TANACOP= Taita Nature & Conservation Project

TEK= traditional ecological knowledge

TPF= traditionally protected forest; area with forest characteristics

TPS= traditionally protected site; area with cultural and/or spiritual significance, with or without forest characteristics

TRC= Taita Ritual Complex

UNCED= *United Nations Conference on Environment and Development*

UNEP= *United Nations Environment Programme*

UNESCO= *United Nations Educational, Scientific and Cultural Organizatio*

1. Introduction

"When you are close to that tree, you are closer to the ancestors. Thus, when you are talking to the tree you are talking to the ancestors, and when you are claiming for some rain, the rains will come."

The above statement from a middle-aged Taita man brings forth his concern about the state of the local natural and cultural environments and entails his knowledge about the human connection with them. Indigenous forests are globally depleting despite various conservation and development efforts. Farmers face problems of droughts, soil erosion, water pollution and desertification. Both economic and population growth place enormous demands on natural resources. Kenya has an annual population growth rate of 2.7%, thus by an average one million people more every year inhabit the country (RoK 2010). An economic development plan – Vision 2030- targets a GDP annual growth of 10% implying that the country´s income per capita would double by 2018. Kenya has approximately 1.24 million hectares of closed canopy indigenous forest, out of which majority is managed by Kenya Forest Service. Forests are surrounded by densely populated areas, thus under pressure for settlements, timber and non-timber products despite their designation as protected areas. One key driver of deforestation and land degradation is the demand for firewood which accounts for 70-90% of all energy consumed. It has been estimated that 5% of the remaining indigenous forest area was lost between 1990 and 2005 (Diaz-Chavez *et al.* 2010). In sub-Saharan scale, forest loss is proceeding at a rate of 2.8 million hectares annually, particularly in areas with high biodiversity. In Afromontane areas the decrease is estimated to be 3.8% annually (Eva *et al.* 2006).

Fresh means for sustainable resource management are more often sought by sourcing from the traditional knowledge base of the people living in vulnerable areas. In some cases one traditional means beats a load of modern ones, while in other cases it might be outdated and even harmful to surroundings. For instance, traditional ecological knowledge has been applied in upgrading of livelihoods (Ramakrishnan 2007), nature conservation (Ylhäisi 2004, Berkes *et al.* 2000, Gadgil *et al*. 1993) and socio-cultural revival efforts (Mawere 2010, Laurie *et al.* 2005). The way people understand the ecosystems around them and their relationship with their environments is crucial for the area development. The perceptions and cultural traditions of local people define the future trajectories alongside policies and other external forces, and thus ought to be given more serious consideration qua regional and environmental planning.

In Taita Hills, south-eastern Kenya (see Figure 1), African traditional world views are mixed with Western thinking and Christian values. The Taita people strive to strike a balance between agricultural production and forestry. Fields are rather small in size, in average 0.4 ha (RoK 2008), and the forest relicts are needed for water retention and for practicing traditional rituals. Many questions are still answered by ancestor spirits in skull caves and prolonged drought periods reawaken the need for rainmaking rituals. These rites are done in secrecy,

sheltered by forest canopy cover and thick vegetation. However, quite a few land owners have sacrificed these sacred groves on the altar of food and timber production, or destroyed the places on the grounds of being pagan. Many elements affect both in a sustainable and unsustainable manner to the decisions of Taitas concerning natural resource use. Thus, world views, poverty and religion have impacts upon land cover.

I will scratch the thin crust which has grown to cover the rich traditions of Taita tribe. My study aims to find out how the traditional ecological knowledge of Taitas can be preserved and enhanced within the transforming natural resource management regimes.

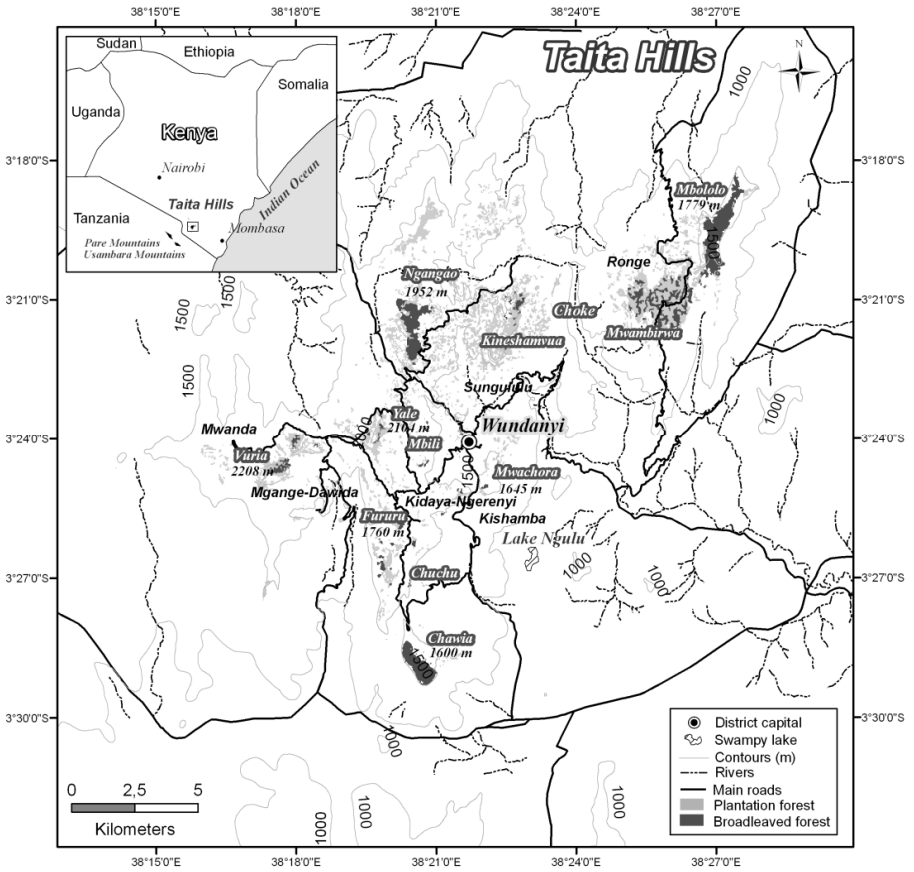

Figure 1. Kenya and Taita Hills with its forests (data based on Pellikka *et al.* 2009).

1.1. Status of traditional ecological knowledge and the fundamental role of "sacred"

In many parts of the world the holders and users of traditional ecological knowledge face significant challenges; continuing encroachment or expropriation of their lands, degradation

of their forests, and the erosion of their cultures, values, and traditional lifestyles. Most of the world's ''primary forests'' and biodiversity ''hotspots'' are located in regions with the highest diversity of indigenous cultures and their associated traditional knowledge and wisdom (Oviedo & Maffi 2000). Rural areas with a long history of integrating forestry and farming have also created a biodiversity that is closely connected to landscape patterns. Cultural landscapes fashioned by traditional practices often show a high level of habitat diversity due to the many different management forms and species introduced over the years to develop specific economic and social functions (Gupta & Gupta 2010, Anand *et al.* 2010). Indigenous knowledge of local communities in the former colonies now continues to challenge the dominance of Western value systems and provide alternative identifications of natural resource management.

Anthropologists have tried to show the epistemological difference between local and scientific knowledge by a range of binary concepts, like 'la science du concrete / la science' (Lévi-Strauss 1962), folk knowledge/universal knowledge (Hunn 1982), traditional knowledge/modern knowledge (Huber & Pedersen 1997). These dichotomies present local knowledge as practical, collective and strongly rooted in place. Local people have been seen as producers of endogenous knowledge concerning resource management, cosmological theories and medical cures. Consequently, less attention has been paid to the contested and hybrid character of such knowledge (Moore 1996: 2-3). A post-structuralist perspective would suggest that all knowledges are socially constructed, thus the analysis should focus on the processes that legimitize certain hierarchies of knowledge and power between local and scientific knowledges. Even if traditional ecological knowledge is rooted in the past, it is nonetheless, intricately connected to the culture and values of present people. "Intact cultures" are getting fewer, and societies are getting more complicated as they are contaminated by modernization, which presents challenges for studying their hybrid ways of knowing. Following Nygren (1999) there are two mainstream approaches among scholars to endogenous knowledge; firstly, constructing it as a scapegoat for underdevelopment and secondly; as a panacea for sustainability. It is important to distinguish between ancient and modern traditional knowledge, which blend and make a unified whole and genuine, practical knowledge. Scholars recommend looking at whether or not the traditional knowledge is still relevant or useful in current local or regional contexts (Rist & Dahdouh-Guebas 2006; Gadgil & Berkes 1991; Gadgil *et al.*. 1993).

For the purpose of this study it is useful to briefly consider some of the universal declarations concerning traditional knowledge and endogenous development. The 1948 *Universal Declaration of Human Rights* (United Nations 1948) guarantees fundamental freedoms of personal integrity and action and individual political, social, economic and cultural rights: However, being directed towards nation states it does not easily provide a basis for claims against multinational companies or individuals profiting from traditional knowledge (Haverkort 2010). The need to recognize the rights of indigenous and ethnic groups triggered off declarations like the *Declaration on the Rights of Indigenous Peoples* (United Nations 2008), which was in the making by the UN´s Working Group on Indigenous Populations since 1982 and adopted in 2007. The Convention 169 of International Labour Organization

(ILO 1989) states that indigenous and tribal peoples have the right to determine their own development priorities and to exercise control over their own economic, social and cultural development. Emphasis on both environmental conservation and importance of indigenous and local communities and their knowledge is endorsed by the Rio Declaration on Environment and Development and Agenda 21 (UNCED 1992). By the end of 1993, over 150 countries had signed the Convention of Biological Diversity (CBD), indicating that the issue of biodiversity conservation had moved from the scientific realm of biological research towards institutional development policy (Baydack & Campa 1999). The UNESCO *Universal Declaration on Cultural Diversity* (UNESCO 2002: 13-16) from 2001 is an international standard-setting instrument for preserving and promoting cultural diversity and intercultural dialogue. It states that: *"the defence of cultural diversity is an ethical imperative, inseparable from respect for human dignity; It implies a commitment to human rights, and fundamental freedoms, in particular the rights of persons belonging to minorities and those of indigenous people….. Creation draws on the roots of cultural tradition, but flourishes in contact with other cultures. For this reason, heritage in all its forms must be preserved, enhanced and handed on to future generations….. It asks for protecting traditional knowledge, in particular that of indigenous peoples with regard to environmental protection and the management of natural resources; and fostering synergies between modern science and local knowledge"*. Additionally, several other declarations, e.g. The Earth Charter (Earth Charter Commission 2001) and Potsdamm Manifesto 2005 (Dürr *et al.* 2005), support the well-being of humans and nature on a planetary scale. The UNESCO and the Man and the Biosphere Program have emphasized the importance of the sacred natural sites for biodiversity conservation (UNESCO 2003).

According to Sheridan & Nyamweru (2007), in Western scholarship, Africa's so-called sacred forests are often treated as the remains of primeval forests, ethnographic curiosities, or cultural relics from a static precolonial past. However, it has been pointed out that the importance of these forests within African societies still continues and that the socio-ecological dynamics is much more complex and wider than the "relic theory" suggests. The authors claim that the term "sacred" is too uninformative and overemphasizes the religious value at the expense of the social-political, environmental and symbolic aspects of these landscape features. They suggest "ethnoforests" as a more appropriate name. There seems to exist more variability in African landscapes than the Western term 'sacred' in its simplified form can hope to explain, thus scholars are correct to recommend cautious use of the term. Banjo *et al.* (2006) explain that religious beliefs, tradition, and culture are the products of logical internalization of human experience and learning. Historically, several religions have explicitly or implicitly prescribed teaching related to the duty of its followers toward the environment. Ecological wisdom in taboos, symbols and cosmologies of traditional societies transmit the knowledge of conservation to the younger generation, and help them manage resources better through religious or ritual representation (Anderson cit. Pandey 2003). Taboos are unwritten, orally transmitted traditional and social rules that regulate human behavior (Colding & Folke 1997, Banjo *et al.* 2006). Studies by Ylhäisi (2000, 2006) among the Zigua ethinc group in north-eastern Tanzania also show that pre-colonial communities established their forest protection systems for different reasons, based not only on local

beliefs but also on different secular and clearly defined environmental reasons. He uses the term "traditionally protected forests" for these indigenous forests whose existence is still based on the management systems of the precolonial society. The term is also most appropriate for the case of Taita Hills.

According to Cairns (2002) there has been a close linkage between human beings and nature conservation since the beginning of hunting and gathering societies. The relationship between humankind and earth has been based on a belief that the planet´s biospheric life support system is sacred. The historical links of sacred groves have been traced back to the pre-agricultural societies (Gadgil & Vartak 1975; Khumbongmayum *et al.* 2004). The concept of sacred (holy) has been undergoing intense scrutiny by comparative religion, since it is one of the most fundamental and debated concepts within the discipline. Sacredness can be seen as a boundary dividing religious and secular, but simultaneously bonding them in various individual and communal rituals. The concept is used for attributing things, phenomena, times and places sacred while valuing, thinking hierarchically about and framing things according to their meaning and significance. One element of sacredness that does not change, even if the contents of "sacred" alter, is the idea of placing aside, delimiting, demarcating, the forbiddance protecting boundaries, and breaking of the forbidden (Anttonen 2010; Keto-Tokoi 2010).

A complex relationship between culture, religion and nature has been shown to exist by scholars including Sheridan & Nyamweru (2007). About sub-Saharan Africa they clame that, sacredness does not simply equal "untouchable" or "conserved". Instead, "*the social, political and economic arrangements mediate cosmology and ecology, and in these institutional arenas Africans negotiate both spiritual values and pragmatic material goals"*. In other words, sacredness can be seen as culturally defined property that is usually linked to particular and pragmatic political and economic histories (Horning 2008).

1.2. Recent trends in Sub-Saharan African forest management - from the fines and fences-approach towards decentralization and participatory forest management

Loosening of a strict fines and fences- approach in forest management has in the recent past been a trend in sub-Saharan Africa. The Rio Earth Summit (UNCED 1992) and the World Summit for Sustainable Development (WSSD 2002) have elaborated on the need for environmental conservation, sustainable development and the integration of local participation. Subsequently, many countries have implemented strategies to address these concerns. Some of these strategies include the enactment of new legislation, the provision of incentives and the restructuring of the forestry sector (GRN 1996, GRN 2001, GoK 1994, RoK 2005). New concepts in forest management hitherto unknown in conventional forestry, such as participatory forestry, community forestry (Selener 1997, Saxena *et al.* 2001) and joint forest management (Misra 1997), have been developed and incorporated into forest policies and legislation.

1.2.1. Community-based natural resource management (CBNRM)

Community-based natural resource management is being increasingly promoted as a solution to problems of nature conservation. The driving forces behind the adaptation of this concept especially in Eastern and Southern Africa have been the threat of species extinction due to over-utilization of resources, the inability of the state to protect wildlife, land use conflicts between rural communities in resource areas and wildlife managers. There has also been a need to link conservation and development (Steiner & Rihoy 1995: 5). The principle of CBNRM is that of reforming the conventional "protectionist conservation philosophy" and "top down" approaches to development. In the background there is common property theory which discourages open access resource management (Ostrom *et al.* 1994) and promotes the resource use rights of local communities (Rihoy 1995: 39). Scholars including (Janssen *et al*. 2010, Ostrom *et al*. 1994) have shown that -where resource appropriators cannot communicate and learn about each other´s behaviour or do not share access to collective choice situations, the risk of overuse and potential destruction of an open-access resource is highest. Repeated face-to-face discussions and shared planning can lead to improved outcomes in the long term (Ghate 2004, Mwangi 2007, Shivakumar 2005). The basic idea of CBNRM is that local people must have power to make decisions regarding local natural resources in order to encourage sustainable development (Rozemeijer & Van der Jagt 2000).

The term 'community conservation' is used to describe a range of different kind of projects and programmes, including community-based natural resource management. Adams & Hulme (2001: 13) define community conservation as "principles and practices that argue that conservation goals should be pursued by strategies that emphasize the role of local residents in decision making about natural resources". The policy trend is toward devolving management of wild natural resources from state- centred control to local level authorities or local communities. According to Jones & Murphree (2001: 43-45) the community conservation concept has four main elements. The first is economic instrumentalism, which seeks to ensure that local communities maintain self-interest in woodlands and wildlife management. Secondly, devolution of authority over local natural resources to the local owner-guardians of the land is required. The third element is recourse to a communal property regime as the formal basis for regulating access to the resources. This goal requires the fourth element, which is typically a long process of policy development and legislative changes.

The two dimensions of community conservation; participation and concern for economic welfare, form a space where various conservation interventions lie. In one extreme there are biocentric practices emphasizing the intrinsic values of the nature, meaning "conservation for its own sake". In the other extreme the limits for human use of nature are imposed for utilitarian reasons and refer to anthropocentric ways of thinking as "wise use demands careful husbanding of resources for greater future human benefit" (Swanson & Barbier 1992). Community conservation equates with sustainable development, a policy commitment arising from the Brundtland Report (WCED 1987) and the UN conference on Environment and Development in Rio in 1992. The moral argument here is that, "conservation goals should contribute to and not conflict with basic human needs" (Adams & Hulme 2001: 15).

1.2.2. Participatory forest management (PFM) and governance of commons

The idea of local people's involvement and participation arises from the notion that local communities not only understand their problems best, but also have solutions. According to Lawrence and Green (2000: 64) 'participatory forest management' (PFM) is used as an umbrella term covering shared forest management, joint forest management, collaborative forest management and community forestry". Berenschot (1988) identifies different modes of local peoples´ participation in forestry: private participation, passive community participation and active community participation. Furthermore, participation means different things to different people. Arnstein (1969) differentiates participation into eight levels ranging from low participation, where manipulation is commonplace, to high participation, where control rests in the hands of citizens. He thus refers to participation as the degree of power to which the actors exercise over decision-making.

Following Berenschot (1988) private participation can take place in various activities, like farm forestry, agroforestry, tree nurseries and forest-based small sector enterprises. Farm forestry promotes commercial or subsistence tree growing by farmers on their own land either as pure tree crop or in combination with other crops. Small forest enterprises, like collection of non-timber forest products or "cottage industries" such as basket-making, do not necessarily require ownership to the land.

In passive participation people derive certain benefits from forests or may be involved to a limited extent in related activities, but without in any way sharing decision-making or management. This type of participation is exemplified by welfare and relief programmes and collaborative / joint programmes. In joint programmes the initiative and impetus comes from the promoting government agency (Berenschot (1988). The Joint Forest Management (JFM) approach was developed in the early 1980s and is based on the assumption, that the conservation of natural forests is best assured by official legal state control coupled with active involvement of local villagers. The usufructs from the forest are shared between a conservation agency and the local community. The official ownership and the overall responsibility for formulating and executing the management plan rests with a public forest management organization. Joint forest management between the state and the local community is mostly instituted through a village-level communal organization (Glover 2005: 25). However, in many cases of JFM forestry agencies have been unwilling to share their authority (Seymour & Rutherford 1993).

The essential components of active community participation are initiative and decision-making involvement. In its widest sense the involvement includes planning and goal setting, mobilization of resources, decision-making, implementation, management and administration, monitoring and evaluation as well as distribution of land, labour and other community resources. The lands can be under communal or customary ownership, public lands designated for community control or private lands pooled for cooperative management. Government has a limited role and most of the benefits accrue to the community (Berenschot 1988).

An important contribution to the contemporary discourse on the governance of the commons - resources that are collectively owned or shared among populations - like forest resources, comes from political economist Elinor Ostrom (see Zagorski 2006). She has observed a number of common-pool resources throughout the world and noticed that a number of them are governed by common property regimes, based on self-management by local communities. Her observations contradict claims that the common-pool of resources should be privatized or else face destruction due to collective action problems leading to overuse of the core resource (Ostrom 1990, Gibson *et al*. 2000). The IFRI (The International Forestry Resources and Institutions network) research program showed that the type of ownership of forests did not have a statistically significant relationship with any of dependent variables (in this case the number of stems, diameter at breast hight, and basal area). However, the involvement of at least one user group in regular monitoring of compliance with the rules related to entry and use patterns was signifantly associated with maintenance of or improvement in forest condition. Also regular communication between subjects increased cooperation as well as maximized attainable returns from their investments. Scholars state that, if the forest management is based on solely public ownership, the problems of resource overuse will not get solved. When the formal rules limiting access and harvest levels are not known to or considered legitimate by local resource users, substantial investment in fences and official guards to patrol boundaries are needed. These are expensive inputs and government owned "protected forests" may not be protected in practice (Ostrom & Nagendra 2007, Wollenberg *et al.* 2007).

In the early 1990s, development agencies introduced participatory forest management in sub-Saharan Africa (Matose & Wily 1996, Salomao & Matose 2007). By 2002 at least 35 African countries had enacted new forest laws or had them in draft, with the involvement of around 5000 communities and introduced more than 1000 new community protected forests (Wily 2002). The key objective was that, the governments who own and administer most of the forest resources (White & Martin 2002) would devolve powers to local communities. In the process, governments would improve forest management practices (Andersson *et al.* 2006) or institute ownership and rights over natural resources (Potters *et al.* 2001). In participatory forestry, such decentralisation would presumably enable communities to better manage their natural resources in an efficient, equitable and sustainable manner (Agrawal & Ribot 1999; Blaikie 2006). The key element in this assumption is that the government agrees to devolve powers to local communities to fully manage the forests. Unfortunately, this rarely occurs; the local communities to whom such powers are purportedly devolved are seldom allowed to dispose of the productive forest resources, nor are they able to resolve divergent interests between actors and institutions with which they interact (Agrawal & Ribot 1999). In the worse case scenario, participatory forest management may resemble a house built on shaky foundations leading to collapse (Ribot 2011). However, other development workers suggest that decentralisation functions differently depending on the types of powers that are decentralised (Ribot 2002) and that in specific contexts, decentralisation functions well when systems for accountability and resource transfer are in place (Agrawal & Ribot 1999; Andersson *et al.* 2006). The involvement of communities in forest resource management is considered a way of increasing democratisation processes

(Nygren 2005; Wily 2002), particularly when the communities elect their representatives and establish local institutions to make specific decisions. Such representations are also considered signs of democracy (Ribot 2006).

Persha *et al.* (2011) suggest that participation in rulemaking may be especially important in promoting positive outcomes in small forest fragments (< 200 ha), where greater challenges to achieving jointly positive outcomes across biodiversity and livelihoods already exist. They found that rulemaking participation is associated with a lower probability of less desirable outcomes, like unsustainable forest systems and those characterized by trade-offs and a higher probability of sustainable forest system outcomes. The scholars hail for further work conducted to understand the causal mechanisms that underlie such outcomes. However, one proposed mechanism is that rulemaking participation provides an opportunity for local forest users to contribute more specific and locally relevant information on forest resources and dynamics of use for a given forest, which in turn leads to the construction of rules that are viewed as legitimate and better suited for local forest conditions.

According to a case study conducted by Vihemäki (2004) in the East Usambaras, Tanzania (also belonging to the Eastern Arc Mountains like Taita Hills), the new laws and participatory approaches do not automatically solve the problems of forest conservation. There are many factors that can hinder the process. Many of the local people are not as powerful actors as the forest authorities and even if locals have some means to impact upon the management processes, their options to affect the strategies are fairly limited. This can even lead to hidden resistance towards conservation. There is also a risk that the initiatives made in the name of participation can help to shift or maintain the powers over resources into the hands of the local elites. Persha *et al.* (2011) found only limited guidance from existing scholarship on ways to better promote synergies across multiple forest outcomes through forest policy decentralization reforms. Schreckenberg & Luttrell (2009) focused on the impacts of participatory forest management on poverty in Kenya, Tanzania and Nepal, all in different stages of PFM. They pointed out that participatory approaches often provide a new decision-making forum and may reroute previously direct household benefits to the user group or community level. In order to provide rural people with a sustainable and equitably distributed stream of net benefits, poverty reduction should be adopted as a stated objective, and both subsistence and commercial use of forest products should be allowed. Appropriate PFM institutions, transparent and equitable means of benefit-sharing, and provision of sufficient support during establishment of initiatives were considered crucial.

1.2.3. Fines and fences in Kenya

After Kenya's independence, the pre-independence laws governing all the major forests carried over. Forest management entailed the enforcement, through policing and punitive actions, of laws to prevent illegal activities. Such management led to widespread conflicts between the people and the Forest Department as more forest reserves were being created amid rising population. To allay the rising discontent and conflict, the government had to introduce changes across the forestry sector. The changes were effectively instituted in the 1990s, even though Kenya had previously adopted the District Focus for Rural Development

(DFRD) strategy (GoK 1983) where government departments adopted a policy of decentralization. This strategy, however, dwelt on the administrative aspects of the government whereby local communities remained uninvolved. In what can best be described as the diffusion of administrative services (Agrawal & Ribot 1999, Oyugi 2000), the powers of the central government were devolved to appointees of the central government, namely to government departments in districts that aimed to bring development closer to the people, and thus improve the delivery of services, local development and management (Oyugi 2000). Already in 1975 elements of local participation were initiated, but solely on private lands (Burley 1982). In 1994, the government initiated the Kenya Forestry Master Plan (KFMP), which spelt out the need for reform in forest policy and legislation as well as the importance of involving communities in forest management (GoK 1994, Luukkanen 1996). The reform took time and administration delayed final enactment of the new law not least because of its permissive clauses in support of community interests and roles (Wily 2002). Subsequently, in 2005, Kenya enacted a new Forest Act. Under the Act, the Director of Forestry can confer upon communities all or some rights to the forest provided that such communities are registered as associations and apply for permission to participate in the management of state or local forests. Community participation in forestry in Kenya is outlined in the country´s Forest Act (RoK 2005). Like most government-instituted policies that outline agenda and activities for implementation (Agrawal & Gupta 2005), the Act defines membership, activities to be undertaken and penalties. The provisions of the Act require that the communities define management objectives and prepare management plans for approval. In so doing, the community's powers are limited since their plans must conform to the government's desires. This only confirms the observations of Agrawal and Ribot (1999) on devolutions in which communities are seldom permitted to exploit the resources of the forests for either commercial or domestic utilisation. Instead, such communities are allowed to institute reforestation activities using only indigenous tree species, or to set up activities, such as apiaries, butterfly farming or resin tapping, which do not threaten the wellbeing of the forest.

In effect, no powers are devolved; rather, the people engaged in forest activities are granted access, but with no rights over the use of resources. With specific reference to Taita Hills´ indigenous forest reserves, the management priorities include preservation and conservation (Mwang'ombe 2005).

Restrictions in these forests often fail to conform to the spirit of community forestry which, according to Agrawal & Gupta (2005) should enhance the participation of stakeholders in decision-making and in the accrual of benefits associated with a common forestry resource. In this case, the people engaged in forest activities safeguard the interests of the government by preserving the forest while making no decisions whatsoever about its management. Wily (2002: 24) looked at the progress and issues of participatory forest management on an African scale and concluded *that "it is apparent that local level participation only becomes meaningful when real power to manage is given. Failure to do so does little to alter the existing flawed management regimes, may exacerbate tensions between those who still control the forest and those that protect the forest and raises questions as to the purpose of*

local level participation in the first place". She also hails for a singular definition of manager instead of multi-stakeholder approaches. Too many interest groups engender competition, show weak decision-making and failure to perform that is generic to diffused responsibility.

Issues of forest management are as much matters of governance as technical management of woody biomass. Wily (2002) sees that PFM is a force for democratisation and paves the way for declamatory policies towards decentralization and more inclusive governance. Thus, it is empowering, not only for marginal rural dwellers but also for administrators who are released from the burdens of policing and shifting into technical advisory and monitoring roles.

In Taita Hills the authority regimes in forest resource management are currently double-layered; both national and traditional laws govern tree use. Three main designations of land tenure are distinguished in Kenya: government (public) land tenure, customary (communal, traditional) land tenure, and private land tenure (titling) (Pander 1995). When government declares certain land areas, like forests under its tenure, the procedure is announced in a nationwide gazette. In the government gazetted forest reserves community forest associations are recognized by the Forest Act 2005, but as mentioned above, safeguarding government´s interests is priority. Outside these gazetted forests, as the basis for private farm forestry and sound management of mini-catchment areas, are environmental management committees, steered by locally elected community leaders and recognized by both the traditional law and modern political framework. These exist at five scales; district level, divisional-, location-, sub-location – and village level. The members of committees may participate in the implementation of forest associations' activities, enabling wider involvement than "forest adjacent residents within a five-kilometre radius" entitled in the Forest Act 2005. Taita culture is the foundation of these committees, which are considered to be an extension of traditional environmental practices.

Councils of elders play an important role in forest management at a village level. Firstly, they create awareness of forest conservation within the local community. Secondly, they maintain and enhance social values traditionally attached to stable ecosystems (e.g. sacred groves). Thirdly, the council gives advices on rehabilitation schemes for land owners. Fourthly, they are the key forest development program implementers at village level, and fifthly, they make decisions (Mulu 2010).

The 2005 Forest Act defines a local authority forest as "any forest situated on trust land which has been set aside as a forest by a local authority pursuant to the provision of the Trust Land Act". Local authorities may enter into management agreements with companies, government agencies, a forest community, professional associations, educational institutions, NGOs, co-operative societies, or individuals (GoK 2005). These so called community forests or trust land forests are typical in the Taita Hills landscape. The local authorities who assist with the Kenya Forest Service are responsible of ensuring protection and management of these areas and inspection visits - conducted by the local Forest Officer and a Forest Conservation Committee twice a year.

Smucker (2002) points out how land reform in Kenya has continued to be guided by the so called "Swynnerton model" as proposed under the 1968 Land Adjudication Act. This sort of reform entails the adjudication of land rights to individuals, who are still often senior males of households, and the registration and titling of the parcels. The implication of these reforms for individual households and for changes in land use systems continue to be of central importance to rural development in Kenya. The process and impacts of land reform, currently focused in Kenya´s extensive semi-arid zones, proceeds within land use systems and ecological condition which is vastly different from the higher potential, upland zones of Central and Western Kenya, for which the land policy was designed. A comparable process took and is stil taking place in Taita Hills, even if the areas´ limitedness in agricultural productivity has been recognized.

The transformation of highland and savanna landscapes in East Africa has important implications for climate change and biodiversity throughout the region. Weak relationships were found (Migot-Adholla *et al.* 1994, Haugerud 1989) between land tenure status and investment in agricultural productivity in Kenya suggesting that, the individualization of land tenure may contribute to an aspect of security without fully encompassing the means by which rural households establish security of resource access within local social relations (Smucker 2002). With increasing land scarcity and high risk of conflicts, communal tenure is slowly but surely being replaced by private tenure (Galaty 1992). A new Constitution was passed in Kenya on the 4th of August 2010 declaring more justice for land owners and moderation for ethnic conflicts. The powers of the president shall be diminished and shifted to the parliament, and more decicion making powers devolved to local level. Enhanced civil rights and more stable political scene are expected (Glebova 2010).

2. Theoretical framework

2.1. Human relations and attitudes towards nature

The research questions formulated during my preliminary stays in Taita Hills are based on the obvious anxiety of the land users about user rights and about appropriate ways of management of natural resources at hand. Beholding of knowledge and simultaneous lack of appropriate knowledge on management issues was a topic which readily came up. The tone of speech about tree management and forests varied radically and suggested that the issue of traditional management practices was somewhat awakening contradictory mindsets. It seemed blurry whether Taita people considered traditional knowledge useful and accepted it or, if there were underlying factors restricting it. The more I spoke with people; the more obvious became their concerns about weakening Taita traditions and identity. True proud and cherishing of the traditional values could be interpreted. However rejection towards some elements of Taita tradition was also strong. After gaining tentative insights in to the human-nature relations of Taitas, the importance of a local and bottom-up approach as a field study method became more obvious. As a geographer I wanted to gain a better understanding of people´s actions as agents to land use change and their attitudes towards nature behind these

actions. Vartiainen (1987: 121) describes how various human and nature spheres form a geographical data matrix in which the 'contents' of places and areas get organized. A human ecological horizon opens and a classic geographical definition - 'earth as man´s home'- emerges. Environment, basis of which nature is and perceived by humans, is a basic concept needed for scrutinizing how man and nature meet on the surface of the earth.

A challenge posed for geographers is to find new conceptual and methodological tools for understanding the more and more complex human ecological systems (Vartiainen 1987). In the original conceptual context, human ecology refers to the relations between humans and nature and focuses on human adaptation to natural conditions on different areas of the world. The perceptions and attitudes of people towards nature have been in constant change during history due to societal ideologies, religions, breakthrough of scientific thinking and technological lifestyle. Nature has been given different meanings during different developmental phases of mankind, thus can be considered as a cultural metaphor (Haila 1991). For ancient Greeks nature was a master and to follow it was to stand in contrast to unnatural. Christian ideology brought in a counterpartner in supernatural for the natural thus, lowering the value of natural. Scientific thinking and again broke the pattern of seeing supernatural in nature. The basis and legimitation of western technical-scientific civilization may be still traced back to the story of creation in Bible whichs states that God gave man rights over nature (von Wright 1981). Haila (1991) sees the modern western perception of the concept nature as deriving partly from the Classical period and partly from the rationalism of the Enlightement. Nature is perceived as an external, solid and harmonious entity, which man can manipulate as long as is aware of and respects its laws. Following this ideology, development can be seen in terms of increasing knowledge and control over nature. The basis for this view has, however, already collapsed as nature is no longer stable and man has lost his priviledges in nature. (For a more lengthy review of prevailing attitudes towards nature see Haila & Levins 1992).

Pietarinen (1987: 42-55) has categorized attitudes towards nature into four groups: utilism, humanism, mysticism and naturism. In utilism nature is considered to be existing for human needs and well-being and natural resources for unlimited development. Science and technical solutions are believed to increase well-being and to solve problems related to it. Humanism emphasizes development of human intelligence and ethics, where nature is expected to provide for man who has a right to use it as a raw material for his sophistication and spiritual perfection. Responsibility for nature and its esthetical values are essential and the aim is to reconcile civilization and nature. Humanism relies on people´s rationality, intelligence and knowledge, whereas mysticism goes beyond the rational. To become one with something infinite and eternal is the aim of mysticism. Nature is considered spiritual, but so is human, thus differences between the two fades away. Nature represents sacredness and the pursuit of it is highly valued. Mysticism often prevails when a society is going through radical changes or a crisis causing uncertainty. Naturism denies any priviledged status of human in relation to nature. Man is considered a biological creature descending from other species and thus part of nature. Intrinsic functions and values of nature are appreciated and careless utilization of

resources by man not permitted. In Pietarinen´s categorization utilism represents an anthropocentric and naturism a biocentric extreme.

2.2. Traditional and local ecological knowledge

Data on Taita peoples' attitudes and knowledge concerning traditional ways of forest and farmland use have, until recently, not been widely available. The potential ways of combining traditional ecological knowledge (TEK) with modern farming and forestry methods are considered worth studying as this, sometimes hibernating knowledge, can add capacity to the local natural resource management system. According to McCall & Minang (2005: 343) "*indigenous knowledge is a measure of local community capability, with the potential to set community members on an equal status with outsider "experts", and maybe the only resource of which local groups, especially the resource-poor have unhindered ownership*". Also Ramakrishnan (2007: 93) sees a need to analyze traditional ecological knowledge and to integrate this with 'formal' knowledge to the extent possible so as to arrive at community participatory solutions.

An understanding of how environmental information is distributed and used is important mainly because it is through the evolution of our ability to cooperate socially that we adapt to our environments. The way people understand ecosystems around them and the way their intricate relationships with environment has sustained over time, have an undeniable effect on development trajectories (Casagrande 2004; Frake 1962). Luhmann (2004: 71-74) considers it important to ask: what kind of a structure a particular society has for processing environmental information. The ways of ecological communication differ between ancient and modern societies. Wheras ecological self-regulation of societies was in earlier times strongly based on mythical-magical perceptions, taboos and rituals, modern societies tackle environmental problems via other means, which have been developing since the invention of printing and the increase in peoples´ levels of literacy. In ancient societies, the necessary knowledge needed for survival, and skills for production existed. Societal units were able to cope with occurring periodical imbalances through religious self-regulation. However, according to Luhmann, those traditional societies regulated by rituals have not been programmed for growth.

According to Berkes (1993: 3)"*TEK is a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. Further, TEK is an attribute of societies with historical continuity in resource use practices; by and large, these are non-industrial or less technologically advanced societies, many of them indigenous or tribal*". Local communities may also have extensive cultural knowledge about local history, customs, beliefs and mythology (Goodland 1991: 305). Unfortunately, as McNeely (1992: 21) describes; "*The loss of cultures, or of traditional knowledge within cultures undergoing rapid change, is a problem which is at least as serious for humanity as is the loss of species*". Following Michaelidou *et al.* (2002: 610) local knowledge should not only be incorporated into ecosystem and community viability efforts, but the knowledge should also

be maintained. Avenues, through which environmental and cultural knowledge can be passed to new generations, should be established.

Following Berkes (1999), TEK includes knowledge, practices, and beliefs that are fairly well integrated with one another. It is dynamic and evolves as people build upon their experiences and observations. They experiment, learn from others, and adapt to changing environmental conditions over time. Traditional, thus, does not mean static and unchanged. TEK is place-based and geographically specific, and is most often found amongst societies that have engaged in natural resource use in a particular place over a long time period. McCall and Minang (2005: 343) explain how this kind of knowledge often has similar cognitive structures as scientific knowledge, for example technical knowledge about soil and water conservation, pest management, ethno-veterinary and ethno-medicine. Beyond TEK there is symbolic, metaphoric and visionary knowledge related to the land. This deep knowledge differs from scientific type of knowledge by its structures, but it may help to understand the land stewardship traditions.

There is a debate in the literature about what makes traditional and local ecological knowledge different from western scientific knowledge (see Agrawal 1995; Ellen and Harris 2000). Charnley *et al*. (2007) go along with the idea that separating traditional from scientific knowledge creates a false dichotomy, but not without recognizing some general distinguishing characteristics. Western scientific knowledge tends to be driven by theoretical models and hypothesis testing, and generated using the scientific method; not necessarily utilitarian; often generalizable and not always local; generated by research institutions; and documented and widely disseminated in written form. Traditional and local knowledge tend to be driven by a desire for utilitarian information that will help people survive and maintain a natural resource-based livelihood; generated through practical experience with the natural world in the course of everyday life; locally based and specific; and transmitted orally or through demonstration (Ellen & Harris 2000; Scoones & Thompson 1994).

Berkes (1993) lists nine ways in which TEK differs from scientific ecological knowledge: 1) TEK is qualitative; 2) it has an intuitive component (as opposed to being purely rational); 3) it is holistic (as opposed to reductionist); 4) in TEK, mind and matter are considered together; 5) TEK is moral (as opposed to value-free); 6) TEK is spiritual; 7) it is based on empirical observations and accumulation of facts by trial-and-error; 8) it is based on data generated by resource users themselves and; 9) TEK is based on diachronic data, i.e. long time series on information on one locality. Casagrande (2004) points out how conservation professionals should not assume that knowledge is synonymous with behavior or cultural importance, that indigenous classification is based on the same features as scientific classification, or that indigenous perceptions of habitats are homogeneous.

Charnley *et al*. (2007: 15) emphasize that new knowledge is created all the time, and indigenous people are not the only ones who have some ecological knowledge of value. This more recent local ecological knowledge (LEK) these scholars define as "*knowledge, practices and beliefs regarding ecological relationships that are gained through extensive*

personal observation of and interaction with local ecosystems, and shared among local resource users". This local ecological knowledge may eventually become TEK.

Symbolic knowledge combined with location- and resource-specific knowledge form a platform for local participation in resource management. However, there can be barriers against TEK involvement in resource management. A study by Phuthego *et al.* (2004) in Botswana shows that people consider formal education, "shallow democracy" and Christianity as contributing to the decline of TEK. Another challenge is to find ways to integrate scientific knowledge and TEK. In most cases the practical uses and importance of TEK are recognized, but how to operationalize it is often left wanting (Berkes 1993). Charnley *et al.* (2007) argue that integrating traditional and local ecological knowledge into forest biodiversity conservation is most likely to be successful if the knowledge holders are directly engaged as active participants in these efforts. Thus, conservation research could be strengthened by an ethnoecological approach that moves from the "passive participation" of local residents in the analysis of particular threats on already-defined resources toward "interactive participation" that allows for joint analyses on relationships between global and local processes on various measures of biodiversity across the landscape (Nemarundwe & Richards 2002). Although several promising models exist for how to integrate traditional and local ecological knowledge with forest management, a number of social, economic, and policy constraints have prevented this knowledge from flourishing and being more widely applied. This adds to Barrett and Arcese´s (1995) notion that whereas a favorable external environment supports and enables local communities and natural areas thriving, an unfavorable external environment can threaten ecosystem and community viability. Haverkort *et al.* (2003: 139) point out that romanticising indigenous knowledge, however, is not a good basis for endogenous development. They observed phenomena such as taboos against planting trees, gross inequalities between men and women and land use practices that have detrimental ecological effects qua the abuse of knowledge and power by local leaders. These kinds of aspects need to be observed and made to more strongly inform intercultural dialogue.

According to Medley *et al.* (2010) studies of local knowledge systems about plants can provide an important step toward mapping "assets" (del Campo & Wali 2007) that have local meaning and relevance to collaborative and adaptive conservation planning. Scholars consider that identifying existing conservation-compatible practices and beliefs together with social organization strengths can be useful in preparing management plans and also incorporates local stakeholders in the scientific process. The ethnobotanical studies of Medley & Kalibo (2005) in Kasigau Mountain, also part of Eastern Arc Mountain chain and neighbouring Taita Hills, suggest that ecological patterns of diversity are human modified, showing both subtle and direct effects of utilization. Following del Campo & Wali (2007), archaeologists and paleoecologists have found interesting evidence that today's "primary" forests, often considered biodiversity hotspots, are actually anthropogenic (Denevan 1992, Erickson 2000, Heckenberger *et al.* 2003). In Kasigau, species richness in woody plants and local knowledge about trees show resource continua on the mountain that question the designation of diverse undisturbed forests and degraded human-utilized lands. Medley &

Kalibo (2007: 152) state that "*local knowledge, and particularly how conservation research explores local knowledge and integrates it with other scientific data, greatly matters for ecological measures and qualitative interpretations or biodiversity across space and through time*".

In this study I follow Berkes´s definition on TEK and also take into account the coexistence of LEK in all data which I came across. Migration in and out of Taita Hills has shuffled the ethnicities in the area, thus not all people belong to Taita tribe. However, most of the respondents (excluding many government officers) who participated in this study are Taitas by origin. They are rather (non-timber) forest product harvesters and agriculturalists than forest dwellers, which sets the framework for the knowledge they behold. However, forests, *mlamba*, always had their special meaning and uses for Taita people, the *Wadawida*.

Since I am using the term community in this study regularly, I wish to define it here as "*a geographically specific social unit such as a village or tribe where people identify themselves as community members and where there is some form of communal decision-making*".

2.3. Ethnodevelopment as a sensitizing concept

I felt the need for a sensitizing concept (see Bowen 2006) for this study to guide me through, and *ethnodevelopment* followed me furthest. As Rodolfo Stavenhagen (1986) suggested, "*development which takes into account the need to maintain ethnic diversity can be called ethnodevelopment*". Critique of development theory since the 1980´s led to the search for new development strategies and approaches. It has implied the rejection of externally imposed developmental models and the need to reduce the so called "dependency syndrome". The new approach included elements like the strategy designed to satisfy the fundamental necessities of the largest number of people rather than economic growth for growth´s own sake. The approach emphasized endogenous development over import-oriented development, a more respectful attitude towards the environment instead of destructive, participatory rather than technocratic forms of engagment and building upon existing cultural traditions (Stavenhagen 1986). Ethnodevelopment is claimed to be a radical concept since it turns the tables on the conventional conception of ethnicity as an obstacle to modernization (Thompson & Ronen 1986: 1). Ethnodevelopment is conceived as a dynamic, creative process, which will liberate collective energies for development rather than limit them. Following Nieuwkoop & Uquillas (2000) ethnodevelopment should build upon the positive qualities of indigenous cultures and societies to promote local employment and growth. A strong sense of ethnic identity, close attachments to ancestral land, and the capacity to mobilice resources, such as land, labor and capital, to achieve shared goals are dynamics fundamental to the ways in which people define their own processes of development. The Living Heritage Trust (2010) describes the concept in the following way: "*Ethnodevelopment places culture at the center of rural development planning. This approach demonstrates how indigenous or traditional culture, technologies, knowledge, organizational skills, and talents can be engaged for effective ecologically sustainable development which is also considered as a goal of current development theory*".

According to Hettne (1990), there are four main aspects of ethnodevelopment: Firstly, territorialism, secondly internal self-determination, thirdly cultural pluralism, and fourthly ecological sustainability (suggesting that development should progress with no sign). He claims that a process of development which threatens the ecological system of a region is therefore also a cultural threat against the ethnic group who call the region their habitat. Ethnic conflicts are worldwide and endemic to Africa. Economic factors are never totally absent from these conflicts and struggles over scarce resources, regional imbalances, infrastructural investments and labour market conflicts are also common. Government intervenes directly in the ethnic struggle through how it redistributes resources.

We should distinguish between functional and territorial principles of development (Hettne 1990); according to the former, development is a result of specialization and advanced division of labour between regions, whereas the latter states that the regions themselves are to be developed, not the larger functional system. The territorial approach is inherently cultural. Ethnodevelopment challenges the idea of nation states, since different communities in society are based upon different value systems. The different world views, interests and attitudes towards nature often clash causing conflicts over access to natural resources. The contents of a development strategy enforcing cultural variety and ethnodevelopment can easily be spelt out; decentralization, participation, rural rather than urban bias, territoriality, self-reliance (local resources) and ecological balance. The extents of these forementioned factors are in the focus of my study (see Figure 2).

I am carrying my own notion of ethnodevelopment throughout this thesis based on the following definition: *"Ethnodevelopment has a territorial approach, whereby traditional culture, technologies, knowledge, organizational skills, and talents are at the center of rural planning and may be engaged for ecologically sustainable development"*.

2.4. Development bewitched

An especially influential element associated with development issues in Taita, is witchcraft (*uchawi* in Swahili, *wusawi* in Kidabida); a cultural phenomenon which is not discussed openly and primarily with outsiders, like tourists or aid organization fellows. This socio-cultural element nonetheless still exists and cuts across most sectors of Taita life. In 2008 I came across James Howard Smith´s extensive book *Bewitching Development* with penetrating analyses focusing on the complex ways that development connects with witchcraft in Kenya and especially in Taita Hills. He uses the term witchcraft to refer to "*the destructive power of selfish desire, which sometimes causes fantastic things to happen ….. In Taita, witchcraft implied secretive and destructive… action that threatened and resisted the (imagined) peaceful and productive sovereignty of the group in question*". Thus, these powerful, social threats need to be controlled for the society to endure. Smith shows how notions of witchcraft can make sense of inscrutable social, political and economic processes in culturally sensible ways.

Witchcraft is a worldwide known phenomenon and “witch” or “sorcerer” translates a wide number of African words and concepts. According to Isichei (2004: 309-310) the witch is often thought of as an older woman and an astral cannibal who feeds on the life force of the living. Sometimes his or her powers are inherited, sometimes acquired, or she becomes a witch because she is tricked into incurring a flesh debt. A witch may be a shape-shifter or closely linked with an animal familiar. Witches traditionally have been hunted and prosecuted. The problem of evil is often identified with witchcraft in Africa. Whether witches truly exist or they are imaginary is debated by ethnographers as well as those living the places with this social problem. The descriptions vary from *“witches as real as murderers with modern bureacratic organizations”* to *“witchcraft being impossible and the fear of witchcraft being symbolic”* (Isichei 2004: 312). The social-anthropological interpretation of the concept is that witchcraft is both an ideology that explains human misfortune and an institution that regulates communal conflicts (Póks 1999). In early European village societies it functioned as a web of relationships between “malefactor”, “bewitched”, “witch identifier” and “healer”. It was believed that calamities spring from malefactors, enemies inside the community who are assumed to be able to harm humans and their economy as well as to bewitch them with supernatural powers. The scholars point out also the opposition powers in the web of relationships. Evans-Pritchard´s (1976) study (in the late 1920´s) on witchcraft of Azande (in then Anglo-Egyptian Sudan, Belgian Congo and Central African Republic) introduced a distinction between witchcraft and sorcery and defined sorcery as verifiable action including “white” magic with a positive aim and “black” magic with malevolent aim. According to this notion, the role of witch could be attributed to anybody, within the witchcraft web, who could fulfill the operational rules. Thus, to understand the institution one has to uncover the entire “sociology of prosecution” (term used by Alan Macfarlane 1999).

In the process of regulating communal conflicts witchcraft needs material assets like medicines and places for secret magical rituals. The medicines are often objects fashioned from trees and plants (Evans-Pritchard 1976).

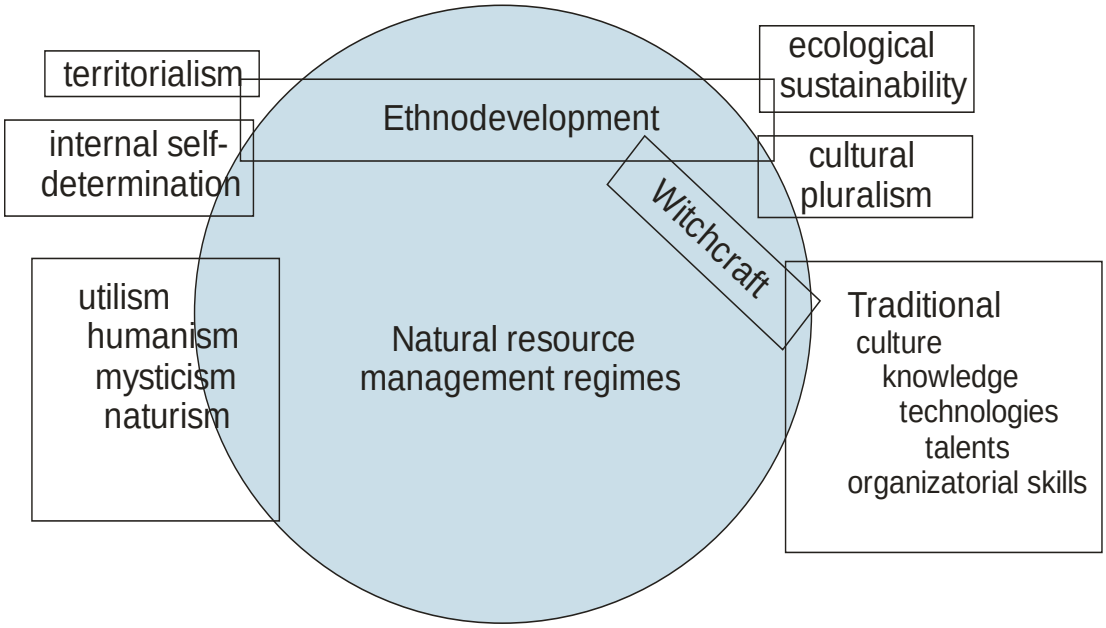

Figure 2. Theoretical framework of this study.

3. Traditionally protected forests in Africa

Sacred places are found all over the world and may consist of various artificial objects, like buildings, shrines and graves as well as natural ones like mountains, water source and trees (Dafni 2007). On the subject of sacred places, Turner (1979: 24) states: *"This place where other realms meet is also indicated by various forms representing a link or connection between the human and transhumant spheres, and usually set in a vertical dimension as a ladder, poles and pillars, trees and hills"*.

Traditional African ways of thinking and reasoning differ in many respects from the dominant international approach. David Millar (2004) argues that, the transfer-of-technology model, even after independence, still subjugated the African knowledge system and continues to do so. However, decisions about agriculture, health and nature management are still, at least marginally, based on the concepts of African traditions despite generations of western influence. Traditional worldviews and institutions play an important role and at village level the spiritual leaders are especially influential. Millar highlights the reawakening interests in the African knowledge system and recommends an endogenous development process that focuses on a blend between western and African knowledge systems. Haverkort (2010: 9) defines endogenous development as *"an approach that is complementary to the ongoing technological and economic global processes. It wants to address local needs and contradictions, use local potentials, enhance local economies and link them to international systems with optimal terms of trade. It supports co-existence and co-evolution of a diversity of cultures"*.

Africa is changing rapidly and a mix of dominantly traditional, dominantly modern and more hybrid subcultures exist. According to Millar (2004), some aspects of indigenous knowledge are expressed openly whilst other issues are secretive and hidden. Studies about African worldviews often either stress the positive aspects or strive to point out the limitations and negative aspects. Biases and Eurocentric prejudices have occurred in studies along the way and some have been corrected later on (Biko 1998; Coetzee & Roux 1998).

African traditional worldviews often have a hierarchy between divine beings, spiritual beings, especially the ancestors, men and women, and natural forces. The notion of time is cyclic and the magical powers are used both in negative and positive terms (Millar *et al.* 2006). These religious and philosophical entities can also be called "cosmovisions" and they give rise to various rituals and dictate the ways that nature is to be managed, how decisions are taken, problems solved, and how rural people organize themselves (Haverkort & Hiemstra 1999). Millar (2004) presents two examples of traditional cosmovisions, in Ghana and Zimbabwe, which collectively show, that land, water, animals and plants are not just a production factor with economic significance, but have their place within the sanctity of nature. Groves, mountains and rivers can be sacred (Gonese 1999) and Fig trees (*Ficus* spp. (L.) and Baobabs (*Adansonia digitata* (L.) commonly considered holy. Some animal species, like snakes, lizards, chameleons and birds, have spiritual significance and cattle, goats and chicken are mainly for sacrifices. From an African perspective conservation is not simply about ensuring balanced biological diversity. It also helps to preserve the relationship between the human, natural and spiritual world. Traditional institutions are the custodians of cultural activities. They are responsible for ensuring that rituals and ceremonies are performed in accordance with the strict procedures, rules and regulations laid down by the spiritual word. In this respect traditional institutions do not need to be taught about conservation. What they require is political, economical and social support to preserve their capacity to co-exist with nature.

Today more and more programs are farmer-centric, although many of these programs hardly address the African worldviews, belief systems or the traditional systems of land tenure. A general lack of information about the spiritual dimension of soil and water can be observed in the development literature but more traditional functionaries, like rainmakers, are hardly involved in rural development projects. However, the importance of sacred groves in relation to rainmaking, food security and health has been studied more and the role of spiritual leaders as protectors of these areas, often high in biodiversity, acknowledged (Millar 2004).

In accordance with African regional philosophies, Coetzee & Roux (1998) suggest that there are tensions between traditional and prominent modernity figures. This concern with the cultural reconstruction of Africa has many facets. It raises deep critical questions about metaphysics, epistemology, ethics, politics and the nature of African philosophy itself. There is a tension between the need to conserve what is good and useful in tradition and what is needed to modernize Africa´s cultures; between preferences for traditional agrarian communities and their value structures and the force of urbanization which follows in the wake of technological advancement. The tensions create a need for interdisciplinary

research, and for renewal requires reflection on education, government, social organization and religious practices among other areas.

Studies of sacred groves in Kenya and Tanzania, and their proximate areas, have been conducted (Kibet 2011, Kibet & Nyamweru 2008, Shangali *et al.* 2008, Ylhäisi 2006, Thugu & Tengeza 2005, Sigu *et al.* 1987, Mwihomeke *et al.* 2000). The significance of sacred forests for biodiversity conservation and the social dimensions of traditional institutions have also gained scientific attention also on a larger scale in Africa (Virtanen 2002, Campbell 2005, Sheridan & Nyamweru 2007).

The closest area to Taita Hills, in terms of both distance and cultural and topographical factors, would be North Pare Mountains in Tanzania. Both belong to Eastern Arc Mountain chain and have similar land use patterns and livelihoods. A study by Ylhäisi (2004) portrays the significance of traditionally protected forests (TPF) for conservation and their meaning for local ethnic groups in the North Pare Mountains. Outside the government forest reserves, traditionally protected forests and riverine forests are the last indigenous forest remnants, protected by the local Gweno ethnic communities. Local culture and religion retard the diminishment process and the elimination of forest patches. Considerable sizes of TPFs make them ecological stepping stones in corridors that connect the area´s fragmented forest reserves.

Before one enters local cultural environs they should consider their practices and procedures carefully. Lovett & Thomas (1988: 1) describe a Waziguan ceremony in Nguru Mountains, Tanzania, which took place as they conducted studies in local forests: *"Waziguas are superstitious and believe that bad luck will befall people who venture into the forests unless a ceremony is undertaken. This may account for the undisturbed nature of the forests. The ceremony which we underwent involved the sacrifice of a black chicken whose blood was put into an earthern ware pot containing the mashed leaves of a Composite and some other plants. The elder in charge of the ceremony wore a black cloth, and was male. Also participating were two elder women, and a young man who appeared to be an apprentice. The elements of the ceremony, being the body of the chicken, herbs, and some cut branches of Ficus thonningii (Blume) were then arranged in a line and ground maize husks (pumba) scattered over them in conjunction with repeated invocations. After the pumba was spread the Ficus leaves were dipped in the mash of blood and herbs in the pot and flicked over our feet and luggage by each of the elders and young man conducting the ceremony accompanied by the invocations. The guides and porters who were to assist us in the forest refused to enter it until this ceremony had been completed."*

Traditionally protected Kaya forests can be found about one hundred kilometers from Taita Hills. They are residual patches of between 10 to 400 ha and part of the once extensive lowland forest of coastal Kenya. These ecosystems are high in biodiversity and cultural historical value (Kibet 2011, Kibet & Nyamweru 2008; Nyamweru *et al.* 2007; Lehmann & Kioko 2005; Robertson & Luke 1993). In Kenya 50% rare plants are found in the Kaya forests. *Mijikenda* (nine sub-groups) people lived and used the Kayas as protective premises (from nomadic tribes like the Galla and Orma). In the 19th century the *Mijikenda* moved out

of the forests and settled in neighbouring land, but the governance of Kayas as a collective biocultural heritage continued. Mijikenda´s customary laws are based upon principles, which are common to many traditional societies. Firstly *equilibrium*, which refers to balance and harmony in both nature and society; secondly *reciprocity*, which stipulates that what is received has to be given back (e.g. material offered as sacrifices) and thirdly; *duality*, or that everything has an opposite which complements it (for instance good and bad spirits) (Mutta *et al.* 2009).

Destruction of vegetation around these sites is prohibited by the *Mijikenda* indigenous laws and whereas the surrounding areas are getting converted into farmlands, Kayas have relatively maintained their status, but the land management regime still leaves some space for misuse. The main threats are agricultural expansion and private property development. At present, over 50 patches have been identified in coastal districts of Kwale, Mombasa, Kilifi and Malindi (Thuku & Tengeza 2005). The indigenous land tenure system has preserved Kayas for generations and the government has started gazetting them as national monuments under the Monuments and Antiquities Act cap 215 of the National Museums of Kenya. They were also nominated as world heritage sites under UNESCO in 2008 (UNESCO 2011). Most of the Kaya forests are under patronage of local county councils, who play the role of a trustee on behalf of the community. Some leaders have, however misused the powers conferred upon them and this has led to unilateral decisions to excise or sell Kaya land without approval from the community. Following Thuku & Tengeza (2005: 2) a problem with trust land policy is that apart from being of colonial origin it vests a lot of powers in the local authorities denying the community the space for first-hand participation in decision making. It should also be noted that the traditional land ethics are set-out and enforced by the Kaya elders but are often overridden and rendered null and void in the face of western written law. There are traditional ceremonies to deal with defaulters, but modernity has disrupted the intergeneration transmission of indigenous knowledge and spirituality about land. It has been suggested that the traditional councils of elders, *Ngambi*, could be legally recognized and afforded more space in overall management of Kayas.

The habitat loss statistics (Githitho1998) show that despite the conservation efforts the communal ownership, Kayas are becoming eroded. Kibet & Nyamweru (2008) noticed differences in belief systems and attitudes to Kaya forests between Islamic and Christian people. Islam tends to accept traditional beliefs as long as they do not directly contravene Koran teachings; Kaya elders can profess the Islamic faith as well as carry out their Kaya ceremonial duties. In contrast, Christianity does not accommodate such an easy co-existence with the traditional religion. Many interviewees denied any knowledge or participation in Kaya rituals and, as “saved Christians” didn’t want to be associated with those issues. Those in the “born again” movement or charismatic churches are most likely to show hostility towards Kayas and perceive those traditionalists as evil (witches) or satanic. A clear majority of Kenyans declare Christianity as their religious affiliation in the population census survey; almost 32 million are Protestants, Catholic or other Christians, while 635, 352 people are Traditionalists and 4.3 million are Muslims (RoK 2010). I would suggest to keep these various belief systems in mind while looking at the statistics.

According to Virtanen (2002: 228) the size of sacred forests in general varies considerably. Data from East Africa shows a variation in average size from over six hectares to less than one. In Kenya all the sacred groves in a densely populated areas are less than 1.2 hectares. In Tanzania only one quarter of the sacred forests were less than two hectares in some areas, while in other areas over 70 per cent of the forest sites were smaller than that. Small groves seem to appear in areas with high demographic pressure. Campbell (2005: 153) summarizes that in western Africa, Ghana, approximately 1900 sacred groves have been counted in forest and savanna areas, ranging in size from 0.5 to 1,300 hectares. In the North Pare Mountains, Tanzania, the traditionally protected forests were mainly in the elevations where deforestation has been most profound. Deforestation relates to the altitude and the fact that most fertile lands were found between 1200-1400 meters. At this range were 77 per cent of TPFs and they seemed to be central for existence of some species since closed forests did not exist in government forest reserves at these elevations (Ylhäisi 2004: 119).

Darr *et al.* (2009**)** studied traditional forest perception and its relevance for forest conservation among Tiriki, who reside in vincinity of the Kakamega forest in Kenya.The cultural forests of Tiriki are valued in terms of their identities and old traditions. Scholars state that forest-related intangible values can be classified and hierarchically structured. Two forest types were differentiated: sacred and governmental. For instance, the structures and species, sizes and resource use rights differ. Also origins of rules, rituals performed, ways of protection, normal behavior, meaning and wishes concerning forests vary. The sacred forests had clearly more spiritual meaning and the traditional African religion was seen to play an important role in their protection, whereas government forests were seen as protected by foresters and forest guards and consequently more distant.

The government foresters and forest guards in Kenya in most areas are not able to control illegal activities in forests due to lack of equipment and poor infrastructure. A study by Sigu *et al.* (1987), conducted in Ramogi Hills forest, Western Kenya, suggests that forest conditions are superior when local institutions complement the rules of the central government. It is not the performance of either, but the complementarity of their system of rules that determines effectiveness at the local level. Their conclusion is that, recognition of indigenous rights and institutions associated with forest resource management and utilization can lead to successful practices, since people tend to abide by the rules from the local elders prescribe.

4. Research setting and justification of the study

I started my studies in Kenya by going for the fieldwork with a rather broad idea in mind: I assumed that a study on people´s perceptions of natural resource management would be accurate due to changes that recent forest law may bring. I had learned about Taitas and their surrounds during my study of ecotourism potentiality in 2004 and 2005, and learned about the transformation of land tenure and management, which has come to look like a complex system of overlapping traditional and modern regimes, values and practices. That study concluded that paying regard to the interdependency of the ecological viability and

community viability in Taita Hills is crucially important, and that would include recognition of the potential indigenous forest knowledge among Taita communities (Himberg 2008: 122-124).

During the first stages of my visits in Taita the locals told me about their tree use preferences and perceptions about forests which sounded like a lot of symbolical knowledge couched around technical and ecological talk. Thus, I began to focus on the underlying and "marginal" aspects of natural resource management and found out that it is not that marginal after all. I decided to look more carefully at what kind of traditional beliefs and practices currently affect the human-nature bond of the Taita people, and how it affects forest management potentially contributes to protection. I saw the need to map the size and condition status of the traditionally protected forests and sites, as well as wanted to understand the relationships, rights and responsibilities of various stakeholders on these areas. I also got inspired by the studies of Ylhäisi (2006) conducted in the Pare Mountains of Tanzania on traditionally protected forest as well as by the research results from the likes (e.g. Kibet & Nyamweru 2008; Nyamweru *et al.* 2007) who worked on the Kaya forests of the Kenyan coast.

I strive to contribute to the multidisciplinary research setting of the TAITA and TAITATOO projects (see University of Helsinki 2011) with qualitative and ethnoecological data. These projects have focused on the development and application of compiled geographic databases of land use and land cover for conservation and biodiversity studies. The information may assist in understanding forest use and its change over time as well as contributing to the decision-making processes, land use planning and forest rehabilitation schemes in Taita Hills. The voice of the Taita people and their knowledge and perceptions form the greater part of this study, which I consider important for combining enhanced livelihoods and nature conservation.

4.1. Research aims

My attempt is to answer the following questions in this study:

- How can traditional ecological knowledge of Taitas be applied within the transforming natural resource management regimes?
- How are the boundaries of integrity and conservation defined?
    - Does sacredness equal conservation in Taita Hills?
- What is the role of witchcraft in ethnodevelopment of the area?

4.2. Methods

I used a mixed-method approach (Caracelli & Greene 1993) in my study, thus combined different kind of data collection and analysis techniques. I applied both remote sensing and "near sensing". Participatory methods (Mikkelsen 2005, Laitinen *et al.* 1995, Pretty *et al.* 1995, Thomson & Schoonmaker Freudenberger 1997), ethnographic approach (Garson 2008), Participatory GIS and Geographical Information System applications (McCall 2006, Vajjhala 2005, Jiang 2003, Quan *et al.* 2001), interviews and secondary data analysis were also used. My informants come from various social classes and age groups including local farmers, traditional leaders and village elders, government officers, priests, NGO workers, members of community-based organizations and teachers. Table 1 summarizes the methods used.

Table 1. Compilation of methods used in this study.

Year	Theme	Methods	N
2006	Tree use patterns on farms Forest values	Household interviews, Institutional analysis, Focus group discussions, Pair-wise ranking, Participatory mapping on aerial photographs	57 households 47 focus group participants
2007	Traditional Ecological Knowledge Local land use categorization Benefits from and constraints on participatory forest management	Household interviews, Government Officer and NGO staff interviews, Ethno-histories (1st hand, 2ndhand), Ethnoecological excursions, Focus group (a) session on land categories, Self-completion questionnaire with focus groups (b), Institutional analysis, SWOT analysis, Secondary data analysis	50 households 35 focus group (a) participants 172 focus group (b) participants District Forest Officer and other state officials
2009	Traditionally protected forests and other sacred sites	Participatory GIS, Seeking out the expert, Participatory mapping (ground-truthed)(a), Participant observation, Participatory mapping (on paper)(b), Officer interviews, Secondary data analysis	73 "experts" in participatory mapping (a) 87 villagers in participatory mapping (b) District Cultural, Agricultural and Forest Officers and other state officials

The ages of informants varied from 11 years to ~104 years and they represented both genders. I have tried to avoid "conventional extraction" of information over a short time period (Nemarundwe & Richards 2002: 168) by taking the time needed to understand peoples´ perceptions on resource use and gathering "silent knowledge" (Nygren 2007) about the Taita area. I stayed in Taita Hills all together twelve months between the years 2006 and 2009. Before this I had become familiar with the area through field work for my Master´s thesis in 2004 and 2005.

4.2.1. Farmer interviews and participatory mapping of forest reserve values

A preliminary study was conducted in January-February 2006 among farmers living adjacent to the largest indigenous forest patches. My aim was to get familiar with the area´s land use, peoples perceptions about their forests, their awareness about the new Forest Act and about tree use patterns on the farms. I also strived to learn about best study practices among the Taita people; their daily schedules, attitudes towards visitors and willingness to engage in my research. A translator, who originates from the study area and fluent with Dawida, English and Swahili languages, worked with me throughout the research. Three transects were chosen for study, one starting from the Chawia forest boundary eastwards and two from the Ngangao forest boundary, towards northeast and west. Transect lengths were all together 8 km and the households along the transect lines selected from an aerial photograph. In total 57 farmers were interviewed in their homes by using questionnaires that included both structured and open-ended questions. After each interview respondensts were asked to draw a Venn diagram (Laitinen *et al.* 1995: 73-75) depicting who they thought were the most important stakeholders in forestry and agroforestry. The average age of respondents was 36.5 years and out of 57 people, 30 were men and 27 were women.

A forest value study, including a participatory mapping exercise, was done with focus groups in both the Chawia and Ngangao areas. The groups consisted of people engaged in forest or agriculture related activities and most of them were members of local forest associations. The aim of the exercise was to raise discussion about various forest values and come up with a categorization, ranking (pair-wise) and mapping of those values. The categorization was done through facilitated discussion with a group that included all participants, after which they were divided by gender into groups of 3 to 4. Aerial photographs were used for the forest value mapping and each group drew on their perceptions of both the presently existing forest values and, the values they perceived might exist in the future. The maps were then subsequently used as basis for TPF/S mapping and discussions.

4.2.2. Household survey of traditional ecological knowledge and participatory group sessions

Using semi-structured interviews a household survey was conducted in January-April 2007. Further to this various participatory tools, like key informant and focus group interviews, ethno histories (in form of spoken stories and written papers), ethno-botanical excursions and transect walks were used for studying traditional ecological knowledge of residents.

Secondary data concerning Taita traditions was also an important data source (Were & Soper 1986, Fleuret 1989, Mwandawiro 1997, Smith 2008).

The interviews probed various themes related to traditional and local knowledge about trees, their use and management and their symbolical and metaphorical knowledge qua forest use. The study was conducted along transect between the largest indigenous forest patches in Taita Hills (see Figure 3). Using aerial photographs the area was divided into 1 km² grids and households were chosen on a grid by grid basis. Otherwise the selection of interviewees was based on who was at home and welcomed us in when we knocked on their doors. We used mountain bikes and also did plenty of walking, so that remote farms could be reached. In total 50 households were chosen for the researcher-administered interviews. All the discussions were recorded digitally and transcribed verbatim. Out of the total number of the interviewees 32 were women and 18 were men (see Table 2). In some households more than one person attended the interview and their views are included in the data. The majority were young and middle-aged adults, plus women, who are crucial stakeholders in present and future natural resource management.

Table 2. Age composition of the household interviewees (in 2007).

Age group (years)	number
< 21	3
21-35	17
36-50	22
51-70	6
>70	2
total	50

The choice to study this particular area was based on the assumption that there may be more-than-usual traditional knowledge and practices applied to tree management along the least cost- corridor. I came up with this assumption after learning about the model which researchers (see Adriaensen *et al.* 2005) created to indicate the paths and corridors that certain endangered bird and butterfly species found most suitable to follow, while moving from one forest to another. I wanted to find out how the corridor area dwellers contribute to that biodiversity.

Four different groups were identified (Table 3) and related to the settlement history of the interviewees. Most of the informants had either lived all their lives on the same farm or moved within the same sub-location.

Table 3. Settlement history of the household interviewees.

Years lived on present farm/ origin	Number
< 20 / outside Taita Hills	3
All their lives on the same farm	15
< 20/ same sub-location	19
< 20/ different sub-location	13
total	50

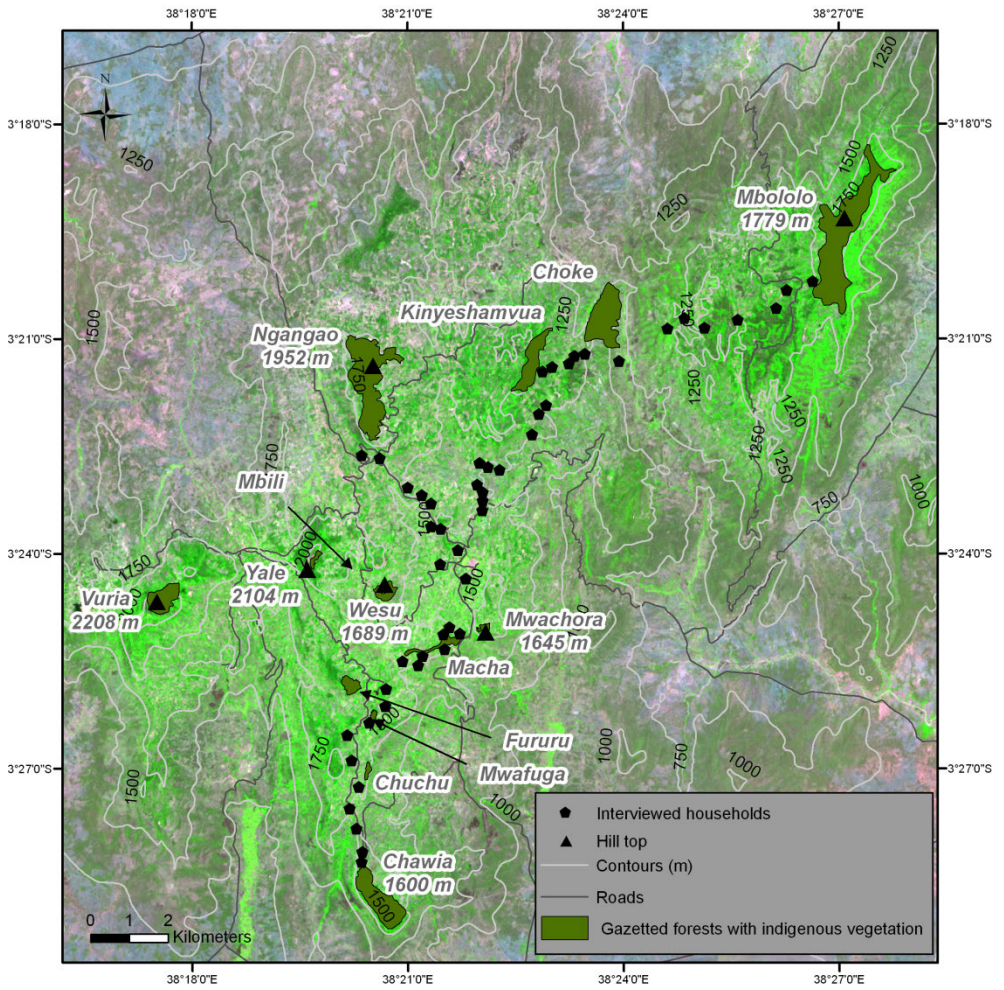

Figure 3. The 2007 household survey was conducted along transects following the least-cost path between the indigenous forest patches of Chawia, Ngangao and Mbololo. Participatory mapping of traditionally protected forests and sites took place within four areas: Mbololo-Choke, Central Dawida, Kidaya-Chawia and Mgange (see Figures 13 and 24-27). SPOT XS satellite imagery from 2003 was used in the background.

A *Multidisciplinary landscape analysis method*, developed by CIFOR (Sheil *et al.* 2002), was selectively applied in conjunction with making a participatory exercise with a group of local farmers (N= 35) from the Kidaya-Ngerenyi location. The first aim was to learn about their perceptions of land use categorization and traditional ecological knowledge attached to different land uses. Photographs and self-completion questionnaires, with structured and semi-structured questions, were used for the exercise. The second aim was to understand the possible differences in perceptions between the local users of the land and that of researchers external to the area who categorize the land use from their points of view. Historical timeline about tree use and innovations in Taita Hills was also created during this focus group exercise.

In order to understand the benefits and constraints of people's participation in forest management, a study among groups engaged in forest related activities was also conducted. Many of the people living around the forests, and who hitherto had informally depended upon those forests for their livelihoods, had formed forest associations and prepared management plans, as the Forest Act requires before the user can be conferred management rights. The plans require that the forest areas are divided into different zones and their conservation status defined. Depending on the forest, these are named as biodiversity conservation zone, utilization-, intervention-, non-consumptive use-, habitat restoration-, afforestation- or catchment protection zones (Kenya Forest Working Group *et al.* 2004; Mwang'ombe 2005). Firstly, a self-completion questionnaire was translated into Dawida language, for all respondents to complete individually. The design included 13 structured questions and 10 open-ended ones (see Appendix 8) Secondly, participatory tools including focus group discussions, institutional analysis and SWOT analysis (Pretty *et al.* 1995) were used. The data were obtained from farmers living adjacent to four remnant forests distributed across the four geographical areas of Ngangao, Chawia, Mbololo and Mwambirwa. Data were obtained from 172 respondents (Ngangao, N=35; Chawia, N=68; Mbololo, N=34 and Mwambirwa, N=35) during three thematic meetings. Three research assistants, familiar with the local languages of Dawida and Swahili, facilitated the interpretation of the questionnaires and discussions at each site. The respondents were selected based on their involvement in groups or community forest associations in various forest-related activities.

4.2.3. Participatory mapping of traditionally protected forests and sacred sites

Following the least-cost path (Adriaensen *et al.* 2005) data on use and restrictions of traditionally protected forests and sites was collected from January to May 2009 by using participatory GIS approach and participant observation. Both geographically accurate data and data based on peoples´perceptions were acquired. I decided to focus the study systematically on the least-cost corridor area in order to contribute to the data pool needed for understanding the landscape matrix and, to further local land use planning and forest rehabilitation schemes. The TPF/S areas were studied by seeking out the experts who were knowledgeable or responsible for managing the sacred sites, and learning from them. The borders of TPF/Ss and practices related to their use were defined by the experts and, under their leadership, GPS- receiver measurements were taken onsite (see Figure 13). A forest

condition assessment was made on each site (see Appendix 10) including an overview on soil and crown cover characteristics and an assessment of regeneration. The sites were further divided into four condition classes according to their characteristics. The assessment was applied from a manual on preparation of participatory forest management plans by Kenya Forest Service and Kenya Forestry Working Group (2007). Medicinal and other traditional uses of plants found on the sites were listed by the informants by using vernacular, English or scientific names. The traditional uses and past restrictions related to the site in the past as well as those ones pending were discussed. The data was noted down on an ad hoc form designed for the purpose and the discussions were recorded digitally. I was occasionally offered opportunities to attend traditional ceremonies conducted at the sites. Aerial photographs (orthorectified digital camera photo mosaics from 2004, see Figure 19) were used to plan the TPF/S mapping procedure, initially by myself in a bigger scale and then during the field work more detailed together with the expert groups. Aerial photographs were useful for the interpretation medium (6-12 ha) and big sized (>12 ha) forested areas consisting mainly of indigenous trees. However, for more detailed knowledge and understanding about the traditionally protected patches and their status, ground truthing (Robbins 2003) was obligatory. Previous studies (Kerkhof 1988; ICRAF 1992; Were & Soper 1986) concerning vegetation and vernacular names of plants in Taita were used afterwards for validating the species list, together with photographs, leaf-samples and consultation of local foresters and herbalists. In total 73 persons attended the participatory mapping onsite (see Tables 1 and 4).

The following factors were studied through participatory TPF/S mapping:

- location, size, total area of TPF/S;
- land ownership and management characteristics, legal status;
- vegetation characteristics and condition status;
- soil cover, crown cover, density of regeneration, dominant species, tree height;
- surrounding land use;
- timber species;
- other tree and shrub species;
- wildlife conflicts;
- non-timber forest products;
- medicinal plant species (part used/purpose);
- traditional tree use (other than medicinal);
- traditions concerning the use of TPF/S in the past;
- restrictions, rights and rules concerning the use of TPF/S currently;
- best management practices according to key persons and;
- oral and written narratives about traditions and plant use concerning sacred sites.

Table 4. Gender and age of TPF/S informants.

Age categories	Number of informants attending field visits	Female	Male	Number of informants attending TPF mind-mapping	Female	Male
< 20 years	**4**	**3**	**1**	**0**	**0**	**0**
20-40 years	**13**	**2**	**11**	**27**	**11**	**16**
41-60 years	**22**	**5**	**17**	**49**	**13**	**36**
> 60 years	**34**	**9**	**25**	**11**	**1**	**10**
Total	**73**	**19**	**54**	**87**	**25**	**62**

Another 87 area residents contributed to the five organized meetings, in which village maps illustrating traditionally protected areas were drawn and Taita traditions discussed. These were organized across five different locations, namely Mbololo, Choke, Wundanyi, Kidaya-Ngerenyi and Mgange-Dawida. Participants were divided into groups of 3-4 and asked to map and name the main infrastructural features, forest areas and traditionally protected sites in the villages on large papers. They also wrote down stories related to the sacred sites and some were told during the meetings. The intention of these meetings was to test the results already gathered during the TPF/S visits. I wanted to know from these new groups of people, where on village maps they would locate sacred sites, and whether their knowledge and perceptions would differ from what was learned earlier in the TPF/S sites with the expert groups. This was a time consuming, but very informative way to collect new data and triangulate the existing data. It was possible to add and accurately locate the features on mind-maps and transfer them to the GIS database layer by relating infrastructure, vegetation patterns and the already ground-truthed and named TPF/S. One principal translator, an agricultural professional from Kidaya, worked with me throughout the entire study period and helped compare, translate and confirm my field notes. His role as a mediator between us and the local village elders and other residents who we visited was also crucial when introducing ourselves and making our intensions known to locals. We used plenty of time for introductions to make sure that our informants understand what kind of research we were doing and express their views on how the results should be used. Official interviews on the latest cultural programs and trends in forestry were also done in spring 2009.

4.3. Data analysis

The study is based upon emerging data. My approach was Grounded Theory –type (see Koskennurmi-Sivonen 2007, Corbin & Holt 2005, Glaser 1992), thus inductive and idea was to ground a theory on data. Grounded Theory is a theory generating research methodology whose end product is an integrated theoretical formulation which provides an understanding about how persons, organizations or communities experience and respond to events that occur (Corbin & Holt 2005: 49). The theory here is defined as a set of concepts that are

integrated through a series of relational statements (Hage 1972 cited in Corbin & Holt 2005: 49). My intention was to avoid approaching the research questions or their answers from an overly western, scientific perspective; instead trying to distinguish the essential issues at stake while spending time in the study area. This is to avoid big cultural biases in the study, however, at the same time being conscious of the effect of the researcher´s personality and previous knowledge can have upon the analysis process. Very little data about current traditional ecological knowledge and practices of Taita people exist, thus building an understanding around the issue is considered useful. This approach supports the idea of Grounded Theory by focusing on data that has not been conceptualized before. Existing theories and research by other scholars concerning the themes that emerged from my data are also presented in the theoretical framework and reflected upon. However, in the spirit of Grounded Theory (Glaser & Strauss 1967: 37), this more thorough look at the previous theories was done after the completion of my own empirical analysis. Coding, conceptualizing and categorizing were applied to the qualitative data (Koskennurmi-Sivonen 2007, Charmaz 2006, Gomm 2004, Glaser 1992). The recorded audio data included various forms of information: oral narratives and announcements, in-depth interviews, household interviews, group discussions, discussions while visiting traditional sites and observations of traditional rituals. Also, written attribute data on the village maps and the data noted down on TPF forms were analysed as follows: the data was firstly conceptualized through open coding. Secondly, the connections and causalities between the various emerged concepts were scrutinized through axial coding. Following Strauss & Corbin (1990, 1998), a constant comparative method was used, thus each code was constantly compared to other codes to identify similarities, differences and general patterns. As the data was initially fractured into separate and distinct codes axial coding is to bring it back together in a coherent whole. Thirdly, a few core concepts were found and adjusted to the other concepts through selective coding.

The geographically accurate data, including various information on traditionally protected forest patches, were handled and analyzed by using ArcViewGIS 3.2 and Arc Map. Layers of both the ground truthed and the mind- mapped traditionally protected forests and sites were compiled on digital aerial photographs. Arc View Query function was used for cross-tabulation of the attribute data.

The data from the structured questions from the PFM community groups, who I met in 2007, was analyzed using SPSS 13.0 software for Windows. Frequencies and cross tabulations were generated and used to explain the trends observed; correlations between variables and preference rankings were performed based on the scores that the respondents provided. Answers to open-ended questions were coded and categorized using content analysis in order to elicit the various dimensions that respondents considered as benefits and constraints of participation. Only selected parts of the study are presented in this monograph and they serve the purpose of data triangulation (for the entire study see Himberg *et al.* 2009). By mixing various methods (Caracelli & Greene 1993; Greene *et al.* 1989) I used triangulation (see Mathison 1988) which completed the different data. The consistency of findings obtained with various instruments is tested through triangulation. The results from one method were

clarified and illustrated with the use of another method. The use of different instruments also initiated new research questions along the way which challenged the results obtained through previously used methods. Essential tools for analysis were theoretical sampling and data saturation (Koskennurmi-Sivonen 2007). As my understanding about the issues under study gradually grew I was able to establish more relevant and detailed research questions and collect additional data answering those. At certain points of the study additionl data did not provide anymore new information about or aspects on the issue, thus was considerd saturated.

5. Geography of Taita Hills

5.1. Landscape and its transformation

The Taita Hills, a mountain massif located in south-eastern Kenya, Taita District, (03 25´S and 38 20'E) in the middle of the Tsavo Plains, covers an area of 941 km^2 and has a topography ranging from 700 m to 2208 m above sea level (Pellikka *et al.* 2009) (see Figure 1). Within the Intertropical Convergence Zone, a long rainy season occurs from March to May and a shorter rainy season in November–December, but the mist and cloud precipitation is an all year-round phenomenon in the hills. Due to the orographic rainfall pattern, the southeastern slopes of Taita Hills receive more precipitation than the northwestern slopes (Jaetzold & Schmidt 1983). Indigenous mountain rain forest fragments on the hills accommodate a variety of endemic and threatened flora and fauna. Out of the twelve remaining indigenous forest fragments eight are smaller than 5 ha (Bytebier 2001). These ancient hills are the northernmost part of the Eastern Arc Mountain chain; one of the three massives belonging to the Eastern Afromontane complex classified as one of the world's 34 most important biodiversity hotspots (Conservation International 2007, Myers *et al.* 2000). The indigenous mountain rainforests in the hills represent the fragmented relics of some primitive and formerly widespread forest flora and fauna less likely to be found elsewhere in Africa today. Unfortunately these forests have suffered substantial loss of biodiversity and degradation of forest during the last decades (Wilder *et al.* 1998: 181); between 1955 and 2004 the decrease was 50% (Pellikka *et al.* 2009). They have been encroached upon and left small remnants on the peaks of the hills and ridges. According to information gathered from the local community and Forest department records (Kenya Forest Working Group *et al.* 2004), the clearing of forests for purposes of cultivation appears to have been going on for a long time. However, the major disturbances occurred in the recent past. For instance, in Ngangao, the second largest indigenous forest remnant in Taita, non-native tree species like *Pinus patula* (Schiede & Deppe ex Schltdl.), *Pinus elliottii* (Engelm.), *Pinus caribaea* (Morelet), *Cupressus lusitanica* (Mill.) Lindl. ex Parl), *Acacia mearnsii* (De Wild.) *and Maesopsis eminii* (Engl.) were introduced in the 1970´s (RoK 1971-1976), and Meru oak (*Vitex keniensis)* (Turrill) brought from Mountain Meru area more recently, in 1971 and 1973. *Acacia mearnsii* was initially introduced around 100 years ago in Taita for the purpose of producing leather tanning agent and the species has subsequently spread. Colonial plantations were also the main concern of the forest office then stationed in Wundanyi. Seedlings for *Eucalyptus* spp. (L´Hér.), *Pinus patula*, *Cupressus lusitanica* and *Grevillea*

robusta (A.Cunn ex R.Br.) were raised by the Wundanyi office and distributed free to the local farmers (Kenya Forest Working Group *et al.* 2004).

Firewood collection, fires and trails running through the forest cause disturbances on its margins, and the vegetation inside has been influenced by selective logging in the past. Dale (1939; cited by Kenya Forest Working Group *et al.* 2004) recorded *Ocotea usambarensis* (Engl.) as one of the dominant species in the Ngangao forest, but in more recent surveys, only a few mature individuals were shown to remain. Over thirty saw pits were found that probably fell into disuse after the Presidential decree banning the felling of indigenous trees in 1988. The disturbed areas are indicated by the presence of *Tabernaemontana stapfiana* (Britten), *Phoenix reclinata* (Jacq.) and *Maesa lanceolata* (Forssk.) Voigt, G. Don). According to Beentje (1988; 1990) the indigenous forests on the hilltops are classified as Upland Moist/Moist Forests and can be distinguished into at least three forest types: 1) *Ocotea* Forests with characteristic species such as *Ocotea usambarensis*, *Tabernaemontana stapfiana* and *Aningeria adolfi-friedericii* (Engl.) at (> 1,600 m a.s.l.) and 2) *Newtonia* Forests at (1,250 - 1,800 m a.s.l.) with *Newtonia buchananii* (Baker) G.C.C.Gilbert & Boutique), *Tabernaemontana stapfiana*, *Albizia gummifera* (C.A.Sm.), *Strombosia scheffleri* (Engl.), *Nuxia sp.*(R.Br.), *Rapanea melanophloeos* (Mez), *Xymalos monospora* (Baill.). *3) Cola-Craibia* Forests occur in drier parts of the moist forests with *Cola greenwayi* (Brenan), *Craibia zimmermannii* (Harms ex Dunn), *Garcinia volkensii* (Engl. (Ltb.) Kosterm.), and *Croton megalocarpus* (Hutch.) among others.

Figure 4. Taita Hills landscape as seen from Yale mountain peak (photo by Himberg 2009).

Results from Maeda *et al.* (2010) on agricultural expansion scenario indicate that, if current trends and driving forces persist, agricultural areas will occupy roughly 60% of the area by 2030 and will be consentrated on the foothills and lowlands of Taita. Such dynamics would increase the spatial dependence on distance to rivers and other water bodies. Although forest clearance is less widespread at present, past clearance have led to increased isolation of the remaining patches, edge effects, soil erosion and negative hydrological effects (Adriaensen *et al.* 2005). Forests in Taita Hills host critically endangered animal species, like birds, amphibians, reptiles and insects and their rate of decline for those is estimated to be 80% within 10 years (Bytebier 2001: 11). The fragmentation of the indigenous forests is already causing behavioral changes in the bird population creating a correlation between habitat quality, at the level of individual environments and genetic stress (Lens 2005). Bird species like *Apalis fuscigularis* (Moreau) (Taita Apalis), Zosterops poliogaster silvanus (Peter & Loveridge) (Taita white eye), and *Turdus helleri* (Mearns) (Taita Trush) are on the list of critically endangered species of IUCN. Also plants like; *Psychotria petitii* (Verdc.), *Psychotria crassipetala* (E.M.A.Petit), *Coffea fadenii* (Bridson), *Memecylon teitense* (Wickens), *Millettia oblata* (Dunn) *and Saintpaulia teitensis* (B.L.Burtt) (see Figures 5 and 6), are all threatened species in Kenya (Mwangangi & Mwaura 1993).

Figure 5. *Saintpaulia teitensis*, endemic species to Taita Hills, in Mbololo forest (photo by Himberg 2009).

A Presidential Directive in 1988 banned the cutting down of indigenous forests, while the conversions of indigenous forests into exotic plantations ended in 1984 (Beentje 1988, Mbuthia 2003). However, the big scale clearance of forests and cropland establishment in the

highland areas had already taken place before those measures due to favorable climatic and edaphic conditions, like high precipitation rates (Maeda *et al.* 2010: 9).

The three largest remaining forest fragments are Ngangao (120 ha), Mbololo (185 ha) and Chawia (86 ha) located in areas of high potential agricultural activity (Pellikka *et al.* 2009). The indigenous forests are important sources of water for the surrounding community as well as for those living in the lowlands further downstream. According to previous studies (see Adriaensen *et al.* 2005) environmental risks in Taita Hills could be diminished by creating forest corridors between the largest indigenous forest patches in order to promote dispersal of the endangered species. Increase in forested areas could be also beneficial to the rural livelihoods through enhancing soil fertility, water retention capacity and non-timber forest products.

Figure 6. *Memecylon teitense*, endemic to Kenya, in Ngangao forest (photo by Himberg 2007).

In a desire to plan a sustainable way forward, the Critical Ecosystems Partnership Fund (CEPF) funded stakeholders' workshop in February 2005 to discuss the conservation and management of Taita Hills forests. Participants included community groups, NGOs working in the region, relevant Government departments and institutions conducting research in Taita Hills. The two key resolutions from the workshop were; firstly to increase indigenous forest area and reduce degradation of remnant indigenous patches, and secondly; to increase the forested area in the surrounding matrix and convert plantations of exotic trees into indigenous ones. This would provide for human needs and increase the overall connectivity of the landscape.

Government statistics from 2008 for Taita District indicate that there are 31 gazetted forests covering 1,489 ha, and 48 non-gazzetted (local authority) forests covering 7,193 ha, in the area. These forest parcels cover 0,51% of the total District area (see also Table 5). The main forest products are timber, construction materials and herbal drugs while non-timber products include honey, medicines, water and mushrooms. All households are engaged in farm forestry and the average number of trees on farm is 50 (RoK 2008: 19-20). For a deeper understanding of the landuse patterns and landscapes in Taita Hills, it is worth looking back into the history and traditions of the Taita people.

Table 5. Government gazzetted forests in Taita Hills (Himberg 2009, Adriaensen *et al.* 2005).

Name of the forest	Main type of vegetation
Mbololo	indigenous
Ngangao	indigenous + plantation
Chawia	indigenous
Macha	indigenous + plantation
Mwachora	indigenous
Kichucheni / Chuchu	indigenous
Vuria	indigenous + plantation
Yale	indigenous + plantation
Ndiwenyi /Mwanfuga	indigenous
Fururu	indigenous + plantation
Mbili	plantation + indigenous
Choke	plantation + indigenous
Kinyeshamvua	plantation + indigenous
Modangache	plantation + indigenous
Boma	plantation + indigenous
Mwarungu	plantation
Ikuminyi	plantation
Mwaganini	plantation
Irizi	plantation
Mchungunyi	plantation
Mwambirwa	plantation
Mraru	plantation
Jaycee	plantation
Susu	plantation
Weni mbogho	plantation
Mwarunga	plantation
Ngomenyi	plantation
Shomoto	plantation
Wesu big rock	plantation
Weni mwana	plantation

Figure 7. *Zimmermannia ovata* (E.A.Bruce) is endemic to Taita Hills (photo by Himberg 2007).

5.2. Traditional land use and ownership patterns in Taita Hills

The traditional land holding system in Taita was designed to give each household access to a full range of environments in order to ensure a balanced use of varying natural resources. The plains, *nyika,* are for livestock grazing and hunting; the lower slopes, *wurindi,* for dry land cultivation during the long rains; the upper valleys, *mavongo*, for irrigated and rain fed cultivation during short rains and; water logged bottom lands, *mighunda*, for seasonal cultivation. Due to unreliable rainfall patterns it has been important to have a back-up system; crop failure on one site during a planting season may be compensated on another site (Wandera & Soper 1986: 78). Based on the tradition that the most important types of property are land and livestock, the land use is categorized into three: *nyika*, lowland wilderness area; *mlamba*, uncultivated virgin land (often forest) in the hills for firewood, thatching grass and grazing; and *mbuwa*, cultivated farm land (Maundu & Ogutu 1986: 56).

The land as a whole used to belong to the Taita community. The largest social unit regarded as a corporate land-owning body has been the great lineage *kichuku kibaha*, a patrilinear, but not exogamous descent group. Two or more such lineages formed a territorial and political unit, *izanga jimweri*, within which the boundaries of lineages might fluctuate a bit. Normally the whole neighborhood was linked through a network of matrilateral and affinity ties (Maundu & Ogutu 1986: 56, Harris 1978: 56). Oaths were taken by the lineage members to tighten the bond. The cultivated land was traditionally under individual ownership, whereas *mlamba* land belonged to the great lineage and formed its territory together with the cultivated lands of its members. These lineages also managed large tracts of *nyika*. Each lineage typically occupied its own cluster of ridges and the boundaries and entrances to the hills were protected by *fighis;* magical medicine buried underground and prohibiting intruders with bad intentions.

An individual came to obtain owner rights to land through their social position and relationships in four ways: Firstly, by being the first to occupy and clear an area of *mlamba* or *nyika* nobody had claimed before. Secondly, through purchasing when has been possible between members of the same neighborhood. Thirdly, people conquered land, but only during the initial period of settlement in Taita. Fourthly, rights to land could be gained through inheritance. In the patrilineage system ownership rights were vested in the family head and only sons could inherit ownership to land, while women were allocated land when got married and according to her seniority and energy in cultivation. Sometimes land was also allocated to unmarried daughters with merely usage rights and no rights of disposal. Sons usually got the share of that which their father had allocated to their mother. Some inherited more, because their mothers were hard-working. Sons stayed home until the birth of their second child and then built a house on the land given to them. Younger brothers looked to their elder brothers and uncles to ensure fair play. Plots were also loaned or leased temporarily for a payment of beer or produce. This brought flexibility into the strategic planning of livelihoods while family was growing. Due to population growth, desirable *mlamba* land was occupied more and more and brought into individual ownership. The same happened on large *nyika* areas leading to the diminishment of average land holding. The traditional system of father sharing his land among his sons still holds in Taita. However, nowadays, anyone can buy land with money, including women, although male are still prerogative in ownership while women predominate as holders of use rights in their capacity as wives and mothers as well as the growers of household food. (Maundu & Ogutu 1986: 57-58).

When it came to forestry, Taita people rarely used very large trees but selected the medium sized (between 15 to 30 cm diameters at breast height) hardwood trees for poles for the construction of their hut. This changed when the construction of the Uganda railway (1896-1901) (passing Taita) started, since the demand for sleepers and fuel rose dramatically as well as the demand for permanent sources of water for the steam engines. The mentality during that era is described as negative, since the church condemned and declared primitive the most respected people, *Warighiti*, then selected their own people as chiefs and administrators. A “hut cess” was collected from villagers and they were forced to work in tree plantations. A reluctant attitude against the administration continued for generations (Kenya Forest Working Group *et al.* 2004).

The various colonial land ordinances between 1902 and 1930 and the Crown Land Ordinance categorized land into Crown Land and Native Reserves (later at independence called trust land). A considerable chunk (62%) of the Taita Taveta area was gazzetted as Tsavo East and Tsavo West National Parks in 1948. Also a private Game Reserve and a hunting block excluding indigenous hunters as well as a sisal estate were established, alienating the original inhabitants and land users from the areas. Grounds for hunting and grazing were especially denied. Traditionally, hill tops, marshes and steep hills were never cultivated. After confining people into one “native reserve” area, the tradition of sub-division of land to offspring could not be controlled, thus land fragmentation was inevitable and marginal lands forced under cultivation. Improved medical care boosted population growth and forced many sons down the hill looking for land to cultivate (Ville 1994: 24). The post-independence

policies strived to land tenure reforms, but they did not consider that land alienation had already seriously disrupted the socio-economic set up of Taita people badly. In the early 1960´s the authorities started a land consolidation process, which turned out to be difficult since Taitas were not happy to shift from their place of birth or change fertile plots on the hills (like in the Mwanda transect- example plot illustrated in Figure 8) to less fertile ones downhill. However, land adjudication was pulled off, registering people land plots irrespective of their size. According to Maundu & Ogutu (1986: 65) in 1986 the average land holding per family in Wundanyi was 0,8 ha and less than 5% had more than 4 hectars. Presently, the average farm size in highland area is 0,4 ha (RoK 2008: 6), which is half of what it was previously.

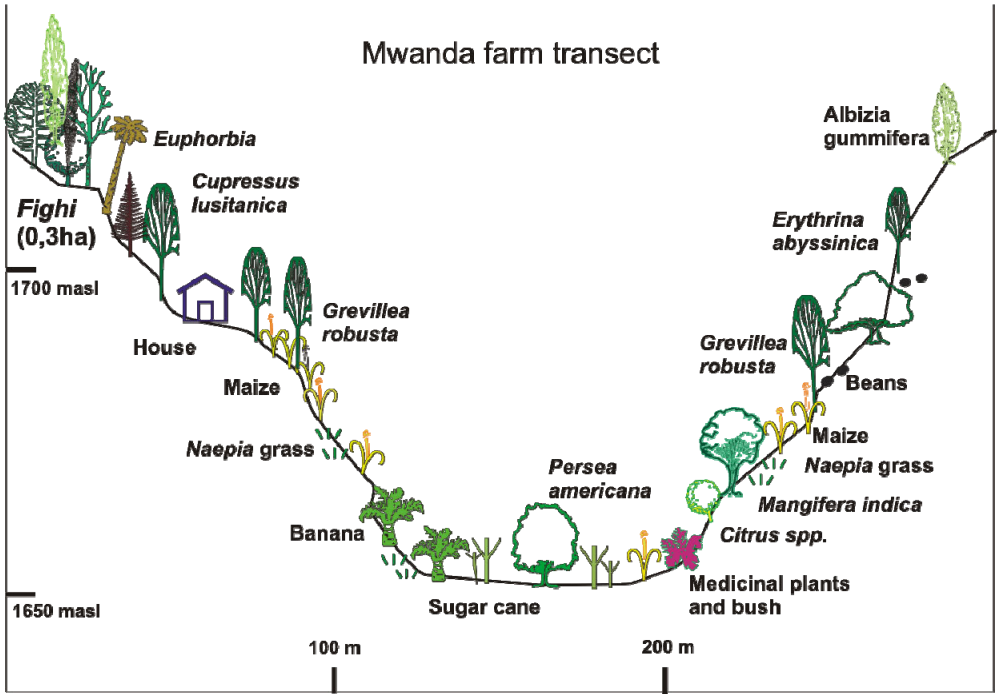

Figure 8. Mwanda farm transect passes by a sacred grove (*fighi*) and mixture of cash crops, indigenous and exotic trees, medicinal plants and crops for household consumption.

5.3. Economical realities in Taita District

Taita people (*Wataitas* in Swahili, *Wadawida* in Taita) are often defined as sedentary agriculturalists, since they practice agriculture intensively on their small landholdings and have a sophisticated irrigation system. However, as Smith (2008: 50) suggests, they can also be considered to be far from sedentary, because *wataitas* are people of diverse origins and with a history of long-distance trade networks. Taita is a Swahili word for the *Dawida* hills they occupy, but the local language name for people, *Wadawida*, also means “those who are passing”. The locals speak about themselves as people who are constantly moving and

occupying the cultural borderlands of the hot, Swahili speaking, Islamic and mercantile coast, and the cool, fertile, agricultural and Christian up-land. According to population census (RoK 2010), in 2009 273 519 people belonged to the Taita tribe.

Due to the erratic rainfalls, livelihoods from agriculture have always been uncertain and wataitas have a long history of off-farm income earning. They have been travelling since 1920´s along the road from Swahili port city of Mombasa. There are many adult males who have worked all their lives on the coast and only occasionally visited home in the hills.

The population of Taita and Taveta Districts grew from 90,146 in 1962 to over 300,000 in 2001 (RoK 2001). Small-scale farming for subsistence purposes and agroforestry are still widely practiced. Presently, the agricultural sector employs a majority of the people (95%) compared with only five per cent of those engaged in forestry-related activities. Maize and beans are the main food crops. An average farm size in highland is 0.4 ha (1 acre), compared with 1.3 ha in the midlands and 4.8 ha in lowlands (RoK 2008). The indigenous forest ecosystem in Taita Hills, like many others worldwide, is threatened by extinction due to the impacts of increased population, socio-politics and economics. Fast-growing, exotic tree species are commonly planted in the fields. However, with increasing population, the cultivable landholding per capita has been steadily decreasing (see Mogaka 2002: 14). A study by Soini (2005) concerning livelihood strategies in Taita Hills highlighted the need to supplement farm income by non-agricultural income. An earlier study by Fleuret (1985) on Taitas´ indigenous responses to drought showed that, limitations on the viability of ecologically-based risk management have been replaced by economic alternatives like migratory wage labor, which subsidizes local non-skilled labor and sales of farm produce. In the absence of enlargement and expansion of alternative economic activities, population increase is a major threat (Mogaka 2002: 14). The latest Taita District Development Plan for the years 2008-2012 (RoK 2008: 2) states that the vision for Taita should be *"a self reliant, highly productive, healthy and prosperous District"*. Furthermore, the mission and input from administration is *"to provide, promote, coordinate the efficient exploitation of existing natural and human resources towards achievement of high development in all sectors in the District"*. Presently, we know that Taitas do not have much stake in the District´s most productive industries, which are tourism in Tsavo National Park, gemstone mining and sisal production (Smith 2008: 51).

5.4. The bewitching of Taita development

According to Smith (2008: 69) a contemporary assertion is that life in Taita in the past was reasonably egalitarian, but there has also been a great deal of inequality vis-á-vis wealth and social and cultural differences in the pre-colonial period. During the colonial period actually, the Wataita identity increased. The internal diversity continues to be recognized through the divination system, or *wutasi*, which is the first step toward identifying causes of private and public misfortune. People were identified according to their imagined origins and attempts were also to unify them through religious practices. Throughout the 20th century many societies changed along with the divination practices, migrant wage labor, monetization, increased schooling, cash crops and establishment of system of administrative chiefs

enabling young men to surpass the authority of their seniors (Bravman 1998 cited by Smith 2008: 70). Many of the seniors of today acquired positions in the new independent government of the 1960´s and felt that it is their duty to expunge traditions associated with backwardness and resistance to Christianity. One of the most exposed examples of replacing traditional knowledge with modern education was building a library over a sacred grove, *fighi*, in the center of the district capital Wundanyi. The educated Taitas wanted to suggest that tradition was destructive and associated with witchcraft. Smith (2008) describes vividly in his book "Bewitching development" how changes brought about by development raise moral debates that wataita express in occult terms. Wolf (1983) mentions "society´s egalitarian *iriso*" (an evil eye) referring to envy. Also, as presented also later in this study, witchcraft has a cross-cutting influence on the everyday life of the Taita people in the capacity of social predispositions to assess other peoples 'attempts and achievements according to potential witch power elements in them. This causes jealousy, competition and fear as well as counter reactions to them.

6. Human-nature relationship in Taita

6.1. Livelihoods and world-views

Taita communities have traditionally laid down their norms regarding natural resource management, which were operating long before the government's intervention. These norms have been understood and implemented through traditional rites. According to Ville (1994) the Taita ritual complex (TRC) has been used for protecting territory and bringing rain. Actually, it used to be the base for the whole social structure, legal system and control of the yearly agricultural cycle. It controlled all circulation between the plains and the hills and strived to ensure proper dynamism and temperance in and through the environment. Plains and hills are seen as indivisible parts of the whole. The *kireti*, lowlands were considered dangerous due to cattle steeling thieves and wild beasts, whereas cool highlands were more safe. Danger was neutralized through ritual called *kufighika*, burying of magical medicines in strategic sites of the hills.

Following Njoroge (cited by Ville 1994) Taita people show positive and utilitarian attitudes towards wildlife although remaining conscious that animals are government property nowadays and none of the accrued benefits from tourism revert back to local communities. Taitas traditionally preferred to settle on the hills, while the plains remained busy with pastoralists like Omoro and Masai speaking people and hunters. The 19th century ivory boom and military troops´ game slaughter during First World War caused a decrease in elephant and other game populations, otherwise the government´s game laws and rules prevented excessive shooting, but also branded the indigenous hunters as poachers. Only few Taitas hunted elephants, since according to Taita tradition killing of elephant is a murder (Ville 1994: 23). Taitas have always used the plain areas, but concentrated in highland agriculture and those who nowadays are settled on the foothills are facing severe human-wildlife conflict especially with elephants entering and destroying the farms as well as injuring and killing people. Lowland settlers are dependent on the erratic rains and water flow from the hills.

People lack resources compared with the 19th century when they could be more self-sufficient with crops from the hills, and on hunt and keep bees. More fields and cattle have led to soil degradation (Gachambini *et al.* 2005).

Ville (1994: 25) suggests that we learned a lesson from Taita symbolic ecology claiming that *"plain and hill cannot be disassociated, that the dry lowland has its own way to feed the highlands"*. Keeping in mind the human-nature relationship this same metaphor in reverse order could end: *"…the highland has its own way to feed the lowland"* referring to the role of hilltop forests as water towers in the area (Himberg 2008: 57). Taita people´s interest in *fighis* partly reflects their growing concern about the vanishing forests, which Taita proverbs declare were "finished by silence", *kituri chemeriyee msidu.* Smith (2008: 53) who studied Taita traditions describes *fighi* in the following way: "*The drive from the plains up to the hills takes the traveler past more than one invisible barrier, or zone, radiating out from ritually protected indigenous forests. These forests are called fighi, meaning barrier, and they are highly contested physical markers…..When they work, they strive to ensure cultural distinctiveness and pure Taita moral values"*.

6.2. The evolution of Taita political culture during the land reform

In pre-colonial times and prior to agrarian reform and population increase, the most effective strategies were based on risk management through the exploitation of ecological variability (Fleuret 1989). There still are communities or families who live according to the management of multiple plots in different micro-environments, since their land is sufficient for it. Some of those were not affected by the land consolidation program and many have added to their landholdings through purchases. The cash for that is usually generated by urban employment. As elicited earlier, the greatest changes in the texture of Taita society were caused by the land reform program of adjudication, consolidation and registration introduced by the government in May, 1963. According to Wolf (1983), Taita was included in the program early, straight after Central Province since its well-watered zone had been identified as having high potential in pre-independence development plans and reports. Despite the awareness of population growth and the District´s restricted capacity to feed itself and meet demand from Mombasa market, the newly installed African administrators saw sense in making the District an example of agricultural progress. It was also a reward to Taita´s regional KANU (Kenya African National Union) for their earlier support. The public opinion was often negative and recommendations not to force residents to the change were given. However, eventually penalties to opponents were spelled out. Taita urban migrants fell victim to the land adjudication, thus absent. Those representing Taita in the big cities rarely originated from the highlands, since the education those times was better in the lower zone and employment opportunities according to that. Many of these urbanized Taitas were not genuinely familiar with highland traditions neither as reliant on cash-crop filler for survival.

Following Wolf (1983) even visual change in the landscape is obvious; the dense village clusters of one or more patrilineages are replaced by individual homesteads set out in their larger, clearly defined consolidated land-holdings. The changes involved one physical

resource accessible to a bulk of the population and provided the base for both subsistence and cash agriculture. It led to a profound alteration of residential, legal and informal social relations and it showed the most visible example of the post-colonial state´s intervention in local affairs. There were desires to retain common grazing land and pre-Christian shrines and sacred groves during the legal process and the issues were highly emotive even among the local "progressives", who were more following the transgression of society´s egalitarian ethos. People were told by the officials to "go and claim your plots and make borders" (Wolf 1983). Some hurried to get land surveyed, but many thought it was just a joke and could not been happening for real. Even if the cost and problems in land reform exercise made it unjustified in many Kenyan areas, the following factors increased its support: firstly, the rationalization of traditional land tenure, which had been cited as "one of the greatest obstacles to agricultural progress" (Ministry of Agriculture 1962: 47 cited by Wolf 1983), was still considered the way to better conservation and smallholder production. Secondly, external funding agencies insisted loan recipients to have land titles. Thirdly, there existed a demand from the residents for such titles, since the colonial land alienation had made security of tenure a sensitive issue (Gutto 1981: 53 cited by Wolf 1983: 178). The command character of the policy is said to have had major impacts on the political culture of Taita (Wolf 1983: 195). The de-popularization of public affairs happened while intra-lineage and neighborhood disputes increased, diverting attention from control of District´s critical resources.

6.3. From traditional agricultural practices to modern agroforestry

In his Agroforestry manual for Taita Taveta District Kerkhof (1988) explains how farmers in Mbololo moved from shifting agriculture to a state of sedentary agriculture with very little fallow. Trees on farms increased and on-farm tree nurseries have become more common. Wildings and seedlings were planted unlike in the past. This was boosted by the distribution centers whereby seedlings were stored and sold during the rainy seasons. Trees were planted on compounds for shade and intercropped trees mainly for fruits and timber. A key to success was control of livestock. Zero-grazing has become the main pattern. Earlier the area was largely dedicated to communal grazing, but today no stray animals are found where agroforestry is intensively practiced. In the central parts of Taita Hills woodlots on private land are more common than in Mbololo. Large parts of land are under *Eucalyptus* (L´Hér.), Pine, Cypress and Black Wattle (*Acacia mearnsii*) and the lots are often established through natural regeneration. *Grevillea robusta* has become an increasingly popular intercropping tree. Farmers with large pieces of land use some of their land for woodlots, because they don´t have the labor to cultivate the whole area for food crops. During dry periods and when the rains failed small scale irrigation was practiced long before colonial times. It is still used, presently modified with government and development organization interventions. Traditionally, furrows led from large streams straight to the fields and even small springs were exploited by using collecting basins, or *ndiwa* with a capacity of 80-100 cubic meters. Water was collected into the basin at nights and distributed in the mornings. For distribution hollowed logs were previously used, whereas nowadays galvanized pipe and bamboo

(*Sinarundinaria alpina* (K.Schum.) S.S.Chao & Renvoize and *Bambusa vulgaris* (Nees), see Figure 9) are more common.

The watering system was built and maintained collectively by the users and overseen by an elder of the lineage involved. Nowadays a chairman recognized by Ministry of Agriculture oversees and users´ origins are various. There have been water projects taking place in different parts of Taita Hills providing tanks and pipe networks. However, not all residents have felt equally assisted by the projects (Himberg 2007).

Figure 9. Bamboo sp.water pipe on a farm (photo by Himberg 2009).

Figure 10. *Fanya juu*- terracing on a steep terrain (photo by Himberg 2009).

According to Wandera & Soper (1986: 92-93) beekeeping was traditionally of considerable importance to both the Taita and Taveta people (see Figure 11), the main use of honey being the manufacture of beer for important ceremonies. Honey was also used for medicinal purposes or taken with food. Bee-keeping as a modern enterprise only started in the mid 70´s, but there is good potential for honey production in Taita Hills. In earlier times most men owned beehives, or *mwadu*, 10 or 20 or even more in the case of Taveta. The decline in beekeeping parallels that in sugarcane production and can be associated with other aspects of social change, particularly the decline in traditional ceremonies or land transactions requiring beer and the general discouragement of beer drinking by missions and government, which goes back to at least the 1930´s. Over 900 farmers in Taita have been involved in butterfly farming as both a livelihood and a conservation effort (Mwandambo 2008). The farming venture is jointly supported by Taita Taveta Wildlife Forum, National Museums of Kenya and Kipepeo Project of Gede in Malindi District. Butterfly pupae export markets are in Japan, Britain and USA. There exists nine butterfly species, for example *Cymothoea teita* and *Papilio desmondi teita* (van Someren) in Taita forests not found anywhere else in the world and the project aims to prevent their extinction.

Figure 11. Traditional bee-hive made out of a tree log (photo by Himberg 2009).

7. Results

7.1. Traditional ecological knowledge of Wadawida

In the next chapters I present the results that address my main aim – to better understand how traditional ecological knowledge of Taitas can be applied within the transforming natural resource management regimes.

7.1.1. Local land use categories versus scientific land use categories

I was keen to know how Taita people name and perceive their land uses and what kind of potential additional or contradicting aspects would emerge when compared with the scientific classification developed and applied within our Taita research project (see Clark 2010, Clark & Pellikka 2009, Pellikka *et al.* 2009). Perceptions of Kidaya and Chawia area residents about the direct and indirect values of different land use classes was studied by using selected data sheets applied from Multidisciplinary Landscape Analysis, a method developed by CIFOR (Sheil *et al.* 2002: 89, see Appendix 7). Before the landscape analysis exercise, the respondents were however, first familiarized with their home area through viewing an aerial photograph from a few years back. They were given loose instructions; asked to locate their villages and households as well as distinguish and indicate the various land uses they saw in the photograph. This was done in three groups, and they came up with

20 different land uses (see Table 6 below, classes I-XX.). The six land uses included crop production, three were for tree production, three also for non-timber forest products and two land uses were for ecological services. Fish farming was quite recently introduced into the livelihood in Taita. The land uses located closest to the residential areas (houses and yards) were poultry and rabbit farming, cemeteries and tree nurseries.

Table 6. Taita farmers´own land use classes mapped on an aerial photograph over their home area.

I. Maize production area	XI. Tree planting area
II. Vegetable production area	XII. Water catchment area
III. Forest area for firewood	XIII. Timber production area
IV. Livestock grazing area	XIV. Medicine fetching forest
V. Banana plantation area	XV. Fish farming area
VI. Zero grazing area	XVI. Poultry/ rabbit farming
VII. Cane production area	XVII. Soil erosion control area
VIII. Sweet potato production area	XVIII. Bee-keeping forest
IX. Residental area	XIX. Mixed farming area
X. Cemetery	XX. Tree nursery

For the next exercise I took landscape photographs of the twelve scientific land use classes. In the landscape analysis exercise, the locals were shown the photos and asked to name each landscape and to describe their use patterns and values (see Table 7).

Then the respondents gave the different scientific categories corresponding local names to produce descriptive characteristics and emphasize how these land uses were not only areas with certain physical features, but also places with symbolical meanings and uses. The descriptions and value scoring exercise highlights the difference between plantation forests and broad leaved closed canopy forests in hosting traditional elements. For instance, it is mentioned that in plantation forest, applying traditional management methods is impossible. The highest, direct, tangible values were perceived for Cypress and Pine forests, built area, *Kisachi* the mixed and disturbed forest, road and cropland respectively. Highest indirect values had *Msidu* the broad leaved forest, woodland, Grevillea plantation, *Kisachi* and swamp and water areas. Rocky areas also scored well, since they are perceived as sites for rainbringing and other rituals. Roads and bare land are considered a lot of work, thus challenging due to erosion and gullies, but simultaneously they are appreciated for logistical reasons and the road sides are the only allowed areas for cows and goats to freely graze.

Looking at the total scores, i.e. direct and indirect values combined, Pine forest and *Kisachi* score first and Grevillea plantation and swamp area were next. It seems that *Msidu* is valued for its ecological services and spiritual elements, but since most of the broad leaved canopy forests are either forest reserves or sacred groves with both limited access, no direct benefits were expected to derive from those. *Kisachi*- type of vegetation allows various uses, most importantly firewood collection and grazing, depending on its tenure being collective or private. *Kisachi* is a local land use class difficult to combine with the scientific classes. This mixed and degraded forest type falls somewhere between woodland and broad leaved closed

canopy classes. It is also commonly found in Taita, often in community forests. The results show how variation in forest type and production is important for Taitas and how big challenges these natural resource management practices pose to the local people.

Table 7. Local land use classes versus scientific land use classes.

Scientific Taita project land use classes (based on LCCS codes*)	Taita farmers´ perceptions of Taita project land use classes based on landscape photos
1.Cropland	*Matuta* (terraced area) *Isaka* (virgin land) *Mghondinyi* (hilly area) *Ngongodinyi* (Napier grass dominated field) *Ighachwa* (Lushango grass dominated field) Crop rotation and manuring practiced, soil degradation and overflow during rains are threats
2.Shrubland (20-70% cover)	*Chusu* (dry unfertile area burn- beaten for fertilizing) *Lwalenyi* (high area)
3.Thicket (closed shrubland >70% cover with emergent trees)	*Mlamba* uncultivated area, sometimes former forest, abandoned farm, waste land
4.Woodland	*Shamba ya mtu* (someone´s farm) with medicinal trees. *Isenge irughu* (wild banana forest) Ghosts throw rocks on people in the place. Perfect place for witchcraft practices, because isolated and private.
5.Plantation forest/needleleaved forest	*Kilembenyi cha midi ya mbao* (Cypress forest for timber and firewood) *Kilemba* (Pine and Eucalyptus forests) Area suffering from soil moisture loss. Impossible to apply traditional methods. *Midi riwale mbuwenyi* (intact Grevillea plantation) with soil fertilizing effect
6.Broad leaved closed canopy forest	*Msidu* (forested and dense bush) *Kireti* (indigenous forest) *Kilemba cha wapazi* (sacred ritual forest) with wild animals and fighis, sesos and shrines inside. Spirits are calmed down by making sacrifices. Restricted access and traditional penalties for breaking the rules. Important in soil erosion control and water catchment. Medicines and bee-keeping for livelihood
7.Grassland with scattered shrubs and trees	*Nyika* (lowland areas) used for livestock grazing and firewood collection
8.Bare soil and other unconsolidated material	*Chia mbaa* (road) *Kireti* (urban area with basic infrastructure) suffers from erosion and gullies. Trees planted for landslide prevention. Road sides are good grazing areas for goats and cows.
9.Built-up area	*Mizi na midi* (homesteads and trees) former *Mlamba* (raised and flat forest area) where ridges and farrows are used for drainage. Good site for burial.

10.Bare rock	*Kinyesha vua* (rainbringer) *Mbanga* (rocky cave area) Medicine men and rainmakers use the cliffs for rituals. Ancestors are drumming on the top during droughts.Falling rocks, big snakes and warthogs make the place dangerous.
11.Water	*Ndiwa* (reservoir, dam) *Iriso* (natural lake) Sacrifices made for drought eradication. Used for cleasing and healing of physical and spiritual problems. Soil friendly trees are planted around water areas. *Kichi* (water logged area, swamp) Sadu and Anaconda snakes inhabit. Wizards bath in the mud to streghten their powers.
12.Burned area	Forest fires have been a problem in Chawia and Mwambirwa forests due to jealousy and politics
13.Cloud/cloud shadow	-
14. -	*Kisachi* (mixed forest with indigenous and exotic species) Disturbed, but thick forest for hiding, rituals and grazing cattle. Planting of indigenous seedlings conducted by local people. Firewood and construction material fetched with village elders permission. Many community forests are this type.

The short history of Kidaya-Ngerenyi forests was compiled by the respondents adding a time frame for the land uses we presently see. The land management regimes shifted gradually from village elders more to government, forests were seen more in means of financial gain, and individual title deeds started to define households´way forward during the State independence. The time span stretches from the 1930´s and the village group estimated 20% of the indigenous vegetation from those days to still be existing. According to the group the total amount of indigenous trees had already been decreasing before land consolidation. Establishment of coffee farms and introduction of new farm species by settlers contributed to this (see Figure 12). A study based on remote sensing data by Pellikka *et al.* (2009) supports villagers´estimations: according to the change detection results, the decrease in indigenous forest cover of Fururu forest in Kidaya-Ngerenyi from 1955 to 2004 was 81%. In total the indigenous forest had decreased from 70.6 ha to 13.2 ha, but the whole forest area had decreased only from 70.6 ha to 62.1(12%) ha due to large eucalyptus plantations on the previously treeless areas.

Table 8. Forest history of Kidaya-Ngerenyi area according to the villagers.

1940´s-1989	Village elders decided upon forest use on community level
1930´s-1960´s	Total amount of trees decreased
1960´s	Forests were owned by communities
1963 onwards	Independence brought famine (no more access to forest products)
1963 onwards	Land adjudication, draining of areas for cultivation (by e.g. using Eucalyptus)
1970´s	Government started forest gazettement
1960´s-2000	Total amount of indigenous trees continued decreasing (The trees cleared during land adjudication were not replaced)
1980´s onwards	Price of Cypress (and timber in general) was rising
2000-	Approximately 20% of those indigenous trees from 1930´s are left

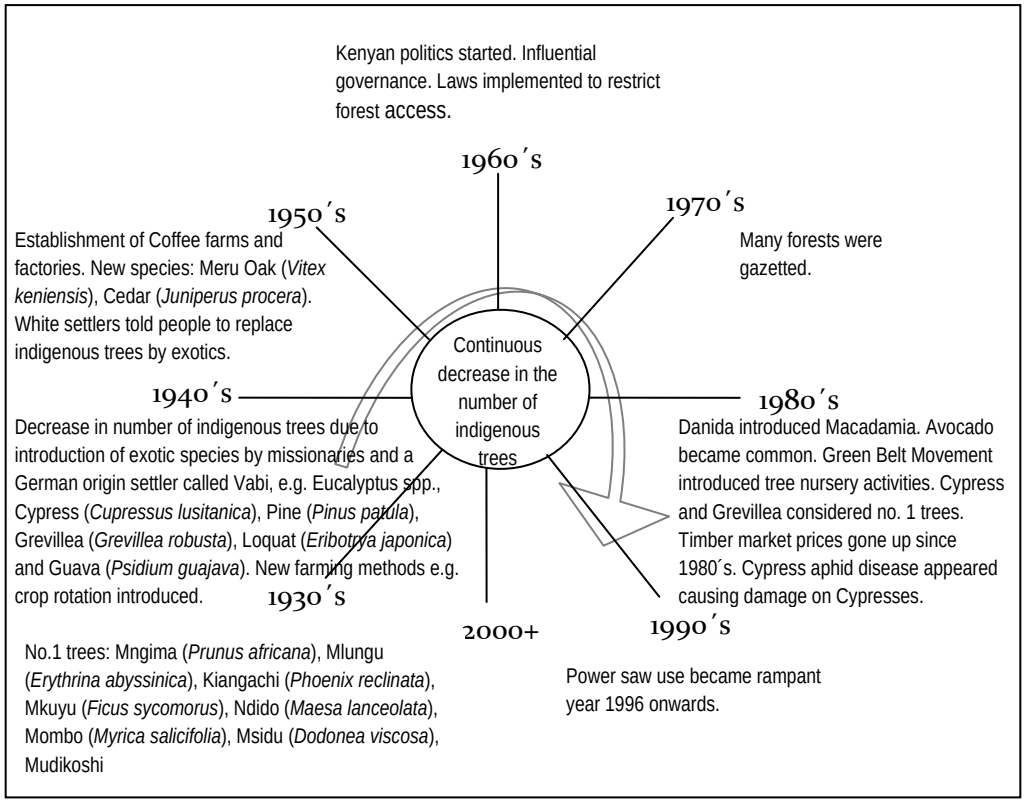

Figure 12. Changes in Taita agroforestry during 1930-2000 according to Kidaya-Ngerenyi area villagers.

7.1.2. Traditionally protected forests (TPF) and sites (TPS) in Taita Hills

The next step in my study was to gain more detailed information and understanding of the traditionally protected sites; their location, size and both physical and sanctity condition. Their status has been unknown at least for outsiders until recently.

Sizes and categories

The majority of the traditionally protected forest patches and sites are not gazetted. They are located on private plots, trust land or on public land, for instance on riverfront or road side. Thus, their management and conservation is mainly in the hands of the local residents. Basic functions of these sites are protection, defending, rain making and cleansing. The activities define the TPF/S category (see Table 11). Various activities can be conducted in the same TPF/S. Different tree species also may indicate the type. Participatory mapping with the expert groups in the field resulted in identifying 289 traditionally protected forests and sites (see Table 10 and Figure 13). These I call ground-truthed TPF/S, since we visited them. They all have their individual names, often characterized by the name of the clan they belong to. The names are not published in this study in order to respect the privacy of the sites.

However, I am presenting a few examples of locally known sites also with names and with permission from their managers.

Stationary, participatory mapping and discussion sessions were organized in Mbololo, Choke, Wundanyi, Kidaya-Ngerenyi and Mgange-Dawida and resulted in identifying 159 traditionally protected sites (see Table 12). These I call mind-mapped TPF/S, since they are based upon people´s mental perceptions and drawings on paper. Eleven out of the total number of sites were the same as the ground-truthed sites. Thus, the exercise showed that density of TPF/Ss is even higher than what we had found by the seeking out the expert-method and also that the sacred sites exist beyond the areas we visited. The exercise also confirmed many of the patterns learned earlier. The categories were mainly the same with some curiosities like the stone with marks memorizing respectable elders (see Figure 20).

Table 9. Areas of the ground- truthed and mind-mapped traditionally protected forests and sites.

	Area of the ground-truthed TPF/S (ha)	Area of the mind-mapped TPF/S (ha)
Sum	118,5	56,1
Mean	0,4	0,3
Max	15,9	8,5
Min	0,001	0,006

Table 10. Division of the ground-truthed traditionally protected forests and sites by size.

Size group	Hectares	number of TPF/S
1	-0,04	101
2	0,041-0,2	108
3	0,21-0,4	32
4	0,41-1,2	27
5	1,21-2,4	11
6	2,41-4	4
7	4,01-6	1
8	6,01-12	3
9	12,01-16	1
(47 are bigger than 0,4 ha in size)		

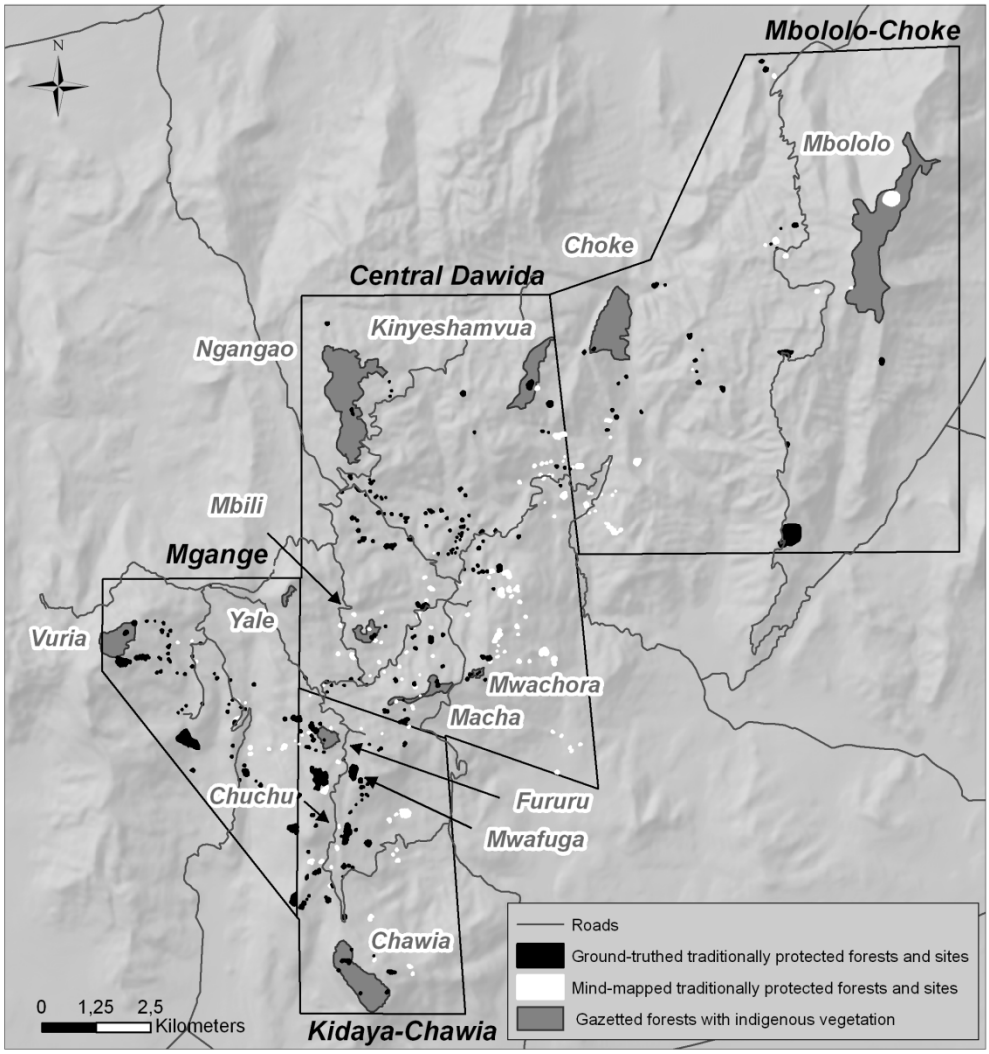

Figure 13. Traditionally protected forests and sites in Taita Hills. All together 289 ground-truthed and 159 mind-mapped TPF/S were found. Taita Hills is divided into four areas (see also Figures 24-27) for comparison. On the background SPOT XS satellite image (2003) and DEM interpolated with Survey of Kenya 1: 50 000 topographic map.

Field research resulted in the recognition of 289 important sites out of which 176 were described to be active. Activity refers to supernatural powers the place beholds as well as to people's engagement in practicing traditions in them. Non-activeness means that ritual use has ended and that powers have diminished. In some cases this has led to total abandonce and mismanagement of the place, but in others the sanctity has remained and the place taken care of and respected even if not actively used. The TPF/Ss were divided into 30 different

categories according to their primary use (See detailed descriptions of the categories later in this chapter). Out of the ground truthed 61% and out of the mind-mapped areas 86% were perceived as active.

Table 11. Categories of the ground-truthed TPF/S. Activity refers to supernatural powers the place beholds and to people's engagement in practicing traditions in them.

	total number of areas	active areas
Gate fighi	52	38
Skull cave	48	18
Sacred site for rainmaking	22	18
Cave for political hiding	2	0
Fighi for political power	2	2
Place for circumcision (male or female)	3	0
Dance ground	15	7
Law court	2	1
Wizard meeting ground	16	13
Rock for men who passed away	1	1
Sacred site for Goat´s intestine analysis and healing	7	7
Cattle Boma (shelter)	5	0
Judgement cliff	4	0
Seso / Mbaro	25	18
Fighi for protection	29	18
Fighi for medicines	7	6
Fighi for cleansing	7	6
Mmanga bell	6	4
Fighi for offering harvest	4	2
Cave for patients with contagious disease	2	0
Shelter	3	1
Fighi for defend strategy planning	5	2
Fingo stopper	1	1
Fighi for initiation	3	0
Fighi for thanksgiving	1	1
Sacred tree (individual)	13	10
Fighi for cleansing after war or crime	1	1
Traditional industry (clay pot factory)	1	0
Observation point/ control base fighi	1	1
Fighi for wealth maintenance/Mlalu snake site	1	0
Total number of areas	289	176

Table 12. Categories of the mind-mapped TPF/S. Activity refers to supernatural powers the place beholds and to people's engagement in practicing traditions in them.

	total number of areas	active areas
Gate fighi	4	4
Skull cave	42	42
Sacred site for rainmaking	11	11
Cave for hiding from enemies	2	0
Dance ground	8	7
Wizard meeting ground	9	7
Sacred rock	3	3
Judgement cliff	2	0
Seso	21	19
Fighi for protection	25	25
Sacred site for healing rituals	3	2
Fighi for offering harvest	3	3
Hut for offering harvest	2	1
Cave for patients with contagious disease	3	0
Observation point fighi	1	0
Stone with marks memorizing respectable elders	1	0
Sacred tree	3	3
Fighi for wealth maintenance	2	1
Sacred/important spring	7	7
Grinding stone	6	0
Black smith´s shop	1	1
Total number of areas	159	136

Description of various TPF/S categories

Gate fighis serve the need for protection. They are located in road junctions and at the strategic points along the boundaries of villages for "access control system". A pot with fighi medicine is buried underground controlling passing. The gate fighi can have various protective measures; detecting unwanted by-passers, acting as a judgement ground or settling complicated community matters.

Unwanted by-passers have been thieves, wizards and other bad-doers. One belief is that when a wizard walks through a gate fighi, his magic turns into water and cannot harm anymore. It is also believed that one cannot pass by a gate with a stolen cow. Taita people used to have big, common ranches with shelters, *Bomas*, for cows and gate fighis to protect them from cattle-steeling Maasais. One shouldn´t hold the animal by the rope while crossing the gate and on the way to breeding a by-pass was supposed to be used in order to avoid the animal becoming barren or dying. The gate fighi was believed to detect path-users´potential evil plans. Previously everyone had to use the path through the gate, otherwise they were automatically suspected to be a witch. If suspected, one had to taste some witch- revealing medicine from a pot. When found guilty, there exists an anti-medicine for evilness. For

example Fighi weni Mdinghi is described as *"a confession place for bad-doers. One has to confess and pay the price. Otherwise the same destiny will face one´s family. You have to give a "man for a man"* (village elder 70 years). The road junctions in Taita were strictly controlled in the past and permission for moving had to be applied from village elders.

Figure 14. Two *Mlungu* trees (*Erythrina abyssinica* (Lam.) mark a gate fighi (photo by Himberg 2009).

No cutting or fetching firewood was allowed on these sites. Most of the gates are still considered as sacred places even if the gateway is not always used in a traditional manner. However, nowadays dead and even live wood can be fetched with permission from a village elder. This might partly explain the degradation of the vegetation around gate fighis. Many of the gate areas have been destroyed to make way for new infrastructure or private buildings. However, those sites and their owners seem to have faced many problems, of which they blame the fighi powers. Often before constructing, medicine men have been consulted and specific rituals performed in order to avoid the negative consequences.

"Gate fighi serves the purpose to chase away the cow steeling Maasais. A black goat was put in a deep hole after feeding it with herbs and slaughtering it. Once, instead of a goat, a disabled boy of a woman had to eat the contents and he died and was buried as well. All because Maasais came to steel cows and had to be chased away by this ritual by people of Weni Ngulu. The mother cursed them and told that the next time this happens, someone from clan Ngulu has to be sacrificed. They failed to do that, but ever since Weni Ngulu families

have delivered abnormal children. They try to get rid of the curse, but it is difficult as the sacrificed has to be a child, not an animal" (middle-aged man in Ngangao)

Skull caves have been used for ancestor worshipping. Skulls, *Wangoma*, of recognized village elders were brought and stored in the caves until early 20th century (varies according to areas). Each clan have their own cave and in some cases several clans share a cave. Animal sacrifices and goat´s intestine analysis (GIA) are still conducted in order to seek advice for problems occurring in the community or at individual level. Healing powers for both physical and mental sicknesses have been sought through a soothsayer of spirits. In some cases an individual skull is believed to be the one able to help in distress. The goat meat is sacrificed without facing the most sacred spot in the cave. It is handed out to the spirits between ones legs without looking back. Many things in the society were manipulated through worshipping like the story of a village elder (female 70 years) describes:

Figure 15. An ancestor skull in a skull cave (photo by Himberg 2009).

"During Mwangeka´s regime our boys didn´t want to go to army and a medicine was used to make the recruiters not to choose the boys. The army car carrying the staff felled before reaching the village, because of fighi medicine and worshipping".

One skull cave recently was destroyed since the big rock, under which the skulls were held, dislocated and rolled down stopping in the middle of a newly built road. People consider the ancestors did not like the idea of the new road. The destiny of many skull caves has been that

skulls were stolen or destroyed because they were thought to be pagan. There are also several histories about people outside Taita stealing or buying the skulls and selling them to museums and collectors. In some cases the skulls have been taken with permission from the plot owner to schools for educational purposes. However negative consequences followed: the pupils had nightmares, visions and psychological disorders.

Many people reportedly went mad after playing around with the skulls. *"A young man became mad as he played football with skulls in 1984.The skulls had to be returned every time followed by cleansing and atonement"* (herbalist 50 years). In order to avoid misuse many skulls have been relocated i.e. taken to a safe place for worship. Skull caves are traditionally located in hidden places, since the rituals are supposed to be conducted in secrecy and the entrance is allowed for only nominated persons. The way to the site is often difficult to reach through steep terrain and thick vegetation. *"This used to be very important shrine for a large area and two clans. The rituals were last done in 1959, before the missionaries arrived in Bura. The surrounds used to be thick, indigenous forest"* (village elder 60 years).

Figure 16. Skull cave in Fururu forest (photo by Himberg 2009).

Sacred forests with rainmaking as their primary function are still actively used. The rainmaking ritual, *shomboke mdiemba*, includes ancestor worship and animal sacrifices conducted by an "expert" group of village elders. A cow, sheep or goat is sacrificed, the meat cooked without salt, partly eaten and the rest of it left for the ancestor spirits. Local brew,

bombe, made of sugarcane and the fruit of the *Mwasina tree* is drunk and offered and prayers are made. A black *kaniki* dress is worn by the men. A particular traditional medicine is prepared using herbs from forest and mixed with alcohol in a big pot. This would vapourise into the air. Sometimes a ritual dance is performed. Soon after the ritual a rainbow comes up even if it's a sunny day and it starts raining heavily. Before it starts, people have to leave the ritual place. One should not return there straight afterwards, because the spirits have taken over. Seeing the spirits as well as efforts to harm a sacred place can lead to one´s death. People have perished for example after returning to cut trees in fighis.

When the seasonal rains in Taita fail, there is a rule called *mudumba* that is, ordering people to stay inside and avoiding the farm on a particular day. An elder with a *gereri* (traditional horn) goes around announcing this. Meanwhile an expert group conducts a rainmaking ritual in a forest. The belief is that after everyone is inside when the rain falls. *"When I was a child 70 years ago, rituals were going on, but after Christianity it stopped. My father used to practice rain making rituals by the Msangarini School. A specific medicine was prepared for the big ceremony. The rain was called for Werugha and Sungululu people."* (A female 80 years). Presently, rainmaking may be hindered by lack of money, like explained by a middle-aged lady in Mgange: *"Many people attend the rainmaking ceremony, men women and children. It is a big event; sugarcane liquor and tea is drunk and meat eaten once per year. A white, a red and a black goat are needed every time. One hinderance is that people count nowadays costs and refuse attending. In the old days the mzee just named the one responsible of bringing the goats. But now the person might refuse by claiming being out of financial resources"*.

Figure 17. This well preserved fighi, called *Ndile*, is like an island sticking out from the farmland dominated landscape (photo by Himberg 2009).

Caves for political hiding are historical sites, where the Kenyan freedom fighters sought asylum and held strategic meetings before Kenyan independence. Famous politicians, like Jomo Kenyatta, Oginga Odinga, Bildad Kaggia, Zephania Mwakio, Ronald Ngala, Tom Mboya, Ochieng Ouko, Ouhius Nyerere Tanzania, Joseph Mucembi, Dawson Mwanyi, Mba Mengo, Woresha Mwangeka, Mbiyu Koinange, Sihyia Maugoa, Paul Ngei, James Gichuru, Jimmy Mbichi and Apolo Kilelu are believed to have stayed in Taita Hills´caves, like Kino in the Sungululu sub-location.

Fighis for political power serve the leaders and other people in need of boosting one´s grasp of power. Advices for success are sought from ancestors through rituals. Political meetings are held in the fighi. Members of Parliament are believed to reside close to fighis and use them regularly.

Sites for circumcision are still considered historically important, though the procedures for girls or boys are no longer practiced at these particular places. The operations have moved into hospitals.

Figure 18. A degraded cave site typically looks like this in the landscape (photo by Himberg 2009). A place for hiding was considered important generally in the times before modern constabulary. Everyone made sure they had a cave or a forest where to hide if a threat was to arise.

Dance grounds have had various purposes for Taitas. They are communal forums for socializing, entertainment or information. Some were used as a ground for redirecting orders coming from "central command fighis" while kidnapping of a maiden for marriage took place on another dance ground. For example *kinyandi* was for entertainment, whereby jingles gave rhythm for the dance. *Kishavi* dance included drumming. Traditionally Friday was the day for rest as well as for entertainment in Taita. Special dresses were used, *videmu* for ladies and *shuka* for men. Dancing took place also during various rituals, like rainmaking, and *Gonda* was performed while celebrating harvest time. After initiation of girls *kishatu* celebrated adulthood. Dance was sometimes also included in every day chores like maize grinding. A traditional court of law in Taita was a place like a cave e.g. *Mwanganzu* (Cave with many rocks) or meeting ground, where the criminal was doomed after being found guilty through obvious evidence or goats intestine analysis. Both wizards and common people were charged. The wizards were given truth serum as well as medicine which would kill them in case they would repeat their criminal action. Many of the judgements were capital punishments meaning that the verdict was executed by pushing the criminal down from a high cliff.

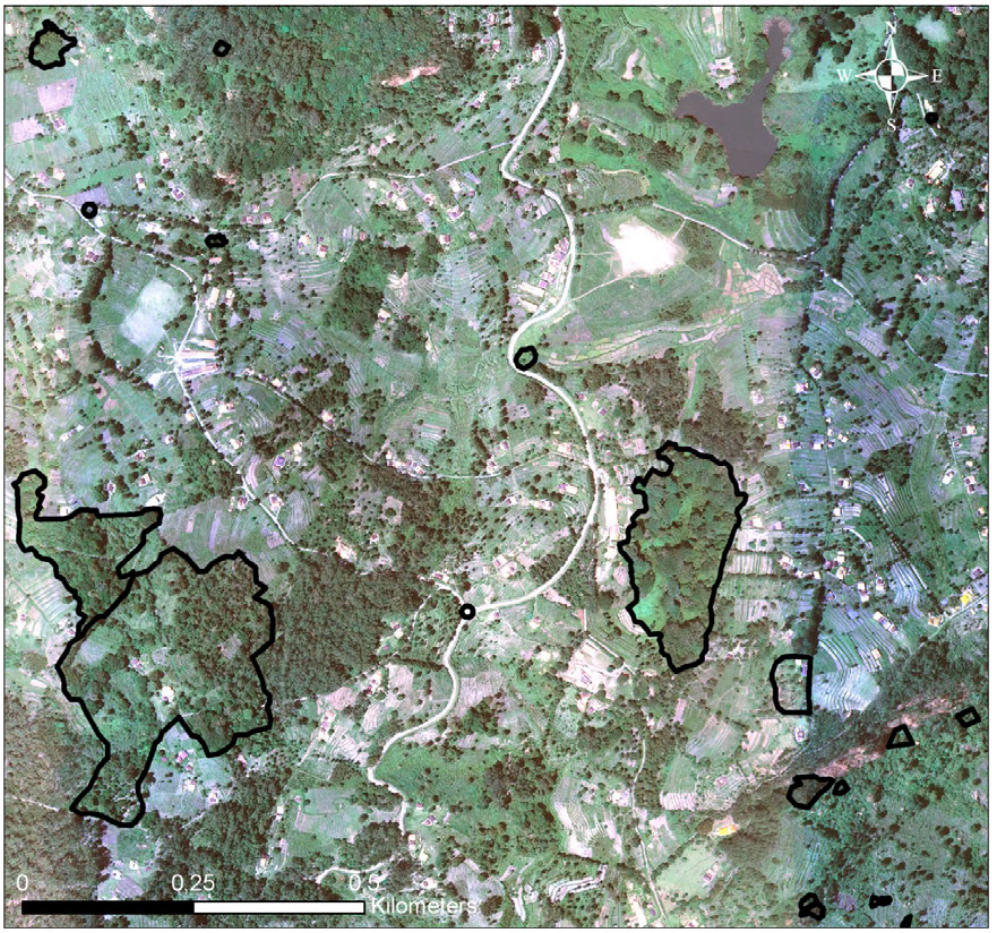

Figure 19. Aerial photo (orthorectified digital camera photo mosaic from 2004, Pellikka *et al.* 2009) over Kidaya-Ngerenyi sub-location with traditionally protected forests and sites indicated.

Law court

Small community matters are still settled with the help of village elders on the judgment grounds. For example quarrels between husband and wife or bringing misbehaving children to heel.

Witch meeting grounds, *mwanjenyi*, are places for the community bad-doers. The majority of the sites are still considered to be in active use and despite the effect of Christianity, witch sites are generally feared or avoided to various extents. The witches gather on a central spot from distant places - the Mwanguwi site included wizards all the way from Ronge and Werugha. In most cases these places are close to water. They may have a double task, firstly to serve the witches during the dark hours of the day and secondly the "good-willed" community elders during daytime. These certain sites in a way witness the battle between

"good" and "bad". The wizard meetings may include dancing naked, singing and shouting with loud voice, training new witches and splashing with water. Water is considered a neutral means of communication and since the "king of the witches" is believed to live in the sea and all rivers eventually lead into sea, *"You have to go to the river to quench your thirst / Kumeria kau ni kuenda modenyi"*. Reflections from the water tell many things to wizards and act as a mediator of information, though *"You cannot bewitch water/Machi ndeghiloghwagha"*. When splashing the water, the reflections disappear.

Various stories tell about the activities of wizards as well as those who were "saved" into Christianity from being one. In Kilini in a private house a group of corps was found in the 1990´s after the owner, previously a wizard who was later baptised, passed away. The wizards are said to plan killings and harassment efforts by the water and wash themselves afterwards. They also have a capability to be invisible as described by an elder: *"One cannot see a wizard, just something black"*. Wizards appear in the evening after 8 p.m. When one passes by, it's better to look the other way. *"One cannot approach them otherwise they just start shaking with fear"*. They may also appear as owls and during their rituals they use owl sounds. It is believed that if an owl sits on your roof, someone will die the same day. Wizard tricks include spreading mental disturbance, confusion and diseases. One common nuisance for a victim is to be put under a spell of not being able to move, resembling paralysis. Wizards also cause common anxiety in villages or private harassment by dancing around households. Many churches have been built on wizard sites, thus creating conflict between the church and magical powers.

Wizards are also believed to open graves and steel pieces of bodies, since they need them for their rituals. The following history told by a 77-years old village elder about Kwa Wana cave in Ngangao forest describes this: *"The cave was frequently used by wizards, who used to excavate the corpse, then take it to the cave and boil with herbs. Some parts of the corpse, especially hands were used for slapping people at night. Hence confusing the victims and making them insane they were used as vehicles in transporting evil spirits and medicines. The wizards could come at the night of burial, smoke some medicine to put the people in sleep while excavating the corpse. They could take the corpse of any person regardless of their age. Having done so, they place the body into the ceiling of their house and smoke it for preservation. After a while it is taken to the cave for medicine production. This mixture was used for bewitching others. It was believed that once the mixture is put into someone's food, that victim will end up dying due to non-specific diseases"*. For example there is something called *mbaro* referring to bleeding caused by a cast of a witch. Areas well known for their very strong witches are Mwanda, Mgange, Kishamba, Mbale and Ronge. According to the village elder communities have tried to eliminate wizards by killing the ones who live among the community. This forced a number of wizards to relocate to areas where they were unknown, while some abandoned their practices after pleading for mercy from the community.

Witch doctors, *magangas*, are the counterforce of wizards and try to predict, detect and prevent their bad-doings. They are herbalists who use among other things goat´s intestine analysis (see later in this chapter) in their work.

"The wizards were given Mwalola and Mugulee in the traditional forests called Mwanjenyi. That was the ground where traditional dances were performed for joy by the entertainers to celebrate their day. When the wizard was given Mwalola he started uttering words telling the people for whom he had done evil deeds. When he had killed or be-witched ten people, he mentioned everyones names. And this made people furious. The wizard was given Mugulee, which was a very dangerous weapon or medicine. To form Mugulee, the witch doctors mixed plant roots, plant leaves of some tree called Mbaroo with some urine from an impotent or barren woman. So Mugulee was a Kiapoo for killing wizard" (Mlekenyi 2007).

Igo Mnuka stone by the road used to indicate the deaths of important men, who were taken to another area in Taita Hills. As they passed by, a mark was carved on the big stone. This procedure was last done around the 1920´s.

Figure 20. Igo Mnuka stone used to indicate the deaths of important men (photo by Himberg 2009).

Goat´s intestine analysis is a procedure through which the causes for an illness of a person or conflicts in the community can be detected. The analysis is performed by a medicine man, sooth-sayer *(Mundu-woo-lagua-au-mundu-woo-kaba-bau*) or other GIA expert in a fighi, seso or other private place, like in a house of the medicine man. The goal of the analysis is to seek healing powers, i.e. find the reason for the trouble as well as prescribe the solution for it. A reason for illness may be for example too low *daori* (dowry) payment. Analysis has been used also for requesting advices before going to war or leaving for a journey. The tricks for solving problems within community, *ndasanya*, have been crucial for unity and serenity.

Criminals can also be detected through goat´s intestine analysis as well as reasons for drought or irregular rains. A special brew made out of two types of sugar cane, black *Mwajuja* and striped *Mulu,* is used in the ritual and certain herbs and *Mukengera* grass must be collected from forest to be fed to the goat before its slaughter. *Mwanga* is a general name for a place where a family goes with *Mlamba Adansonia digitata* fruits, *Idadongo* leaves and *bombe* (local brew). The sick person is surrounded by a circle of family members and washed with this medicine. The GIA elders have to detect which *mwanga* is to be used. This was a way to get rid of the *mbara*; bleeding caused by a cast of a witch.

Cattle Bomas were animal shelters for certain clans. Often they were big caves covered with indigenous forest. They had a fighi medicine in a pot buried underground for protection, since cattle stealing was common in the past. Nowadays these are no more in use, since free grazing is not allowed and people have shifted into zero-grazing. Grazing cattle used to be communal and herds bigger. Protection of the cows used to be as important as protection of households.

Judgement cliffs are high rocks used for eliminating the criminals and trouble-makers from the society by pushing them off the edge. This judgement method was last used around 1960´s, before independence. Sometimes the guilty person was thrown down with a goat in order to keep the "criminal´s blood from contaminating" the judges. Thus, the sacrifice of a goat made amends for passing a death sentence. At every location, sublocation and village, people had their own village government or court managed by eldermen called *Wagosi*. These people are like the judges of today. They passed law to law brokers. The trial before sentence still showed some hope for the criminal. The uncle, *Awuyee,* of that person had the last word, and if he was to believe that the guilty one is capable to still become socially acceptable, this person would avoid the death sentence. So uncles are like advocates of today. There is a history about a particular charged person who survived the fall and was considered a wizard and was let go and left the God to decide upon his death.

Seso is a sacred site where someone has been killed in the past. For atonement, sacrifices need to be done regularly in order to avoid the spirit of the dead person returning to haunt. Ten generations need to follow the procedure (and due to this most of the sesos are still operating). Someone getting sick was often considered as a sign of a seso being neglected, thus healing powers are sought from the seso. Chicken, goat or sheep are sacrificed. The victim´s clan is responsible for the seso. The cameo of the tradition of Seso Mlechi reveals the procedure: *"A girl from Murugua clan was killed at this site since she was pregnant and out of wedlock. Thus Murugua clan members come to perform rituals in case illness occurs. Firstly, a sheep is suffocated with Mukengera grass and then slaughtered and chopped into seven pieces. These pieces are delivered to various spots, like one thrown down a cliff, some left by the Kiangachi trees and some by Muku trees. The offerings are thrown not facing the target site and one should not look back. The ritual is conducted between the hours of 12-15, but facing the sunset direction. Sometimes 20 members of Murugua clan attend accompanied by an expert elder. Last occasion was two years ago"* (male 50 years).

The curse does not affect people outside a given particular clan. This is why sometimes the sesos, which are located on land adjudicated to some private person outside the clan, have been destroyed or access to them is denied. Sesos on community land are more often preserved. According to traditional rules, in forested sesos only women who have passed menopause are allowed to collect dead branches for firewood though extraction of living trees is forbidden. Non-clan members are allowed to collect firewood and medicines but clan members must retain the highest respect for the sacred site. The haunting spirits cause fear and respect towards the sites (*mbaro*= spirits dwelling site). According to Mr. Mwambisi (2009) there was a lady who went to collect firewood, she was scared off by the spirits who told her not to collect the wood and return everything she had taken home from the seso. This happened in 2006. Ghosts are related to most of the sesos and they stop by-passing people. In the past, when women refused to follow men´s rules and was somewhat anarchistic, they were killed by the men. The caretakers of this Mararo seso believe strongly that, if they do not practice the ritual, someone will die. The site of the murder is set aside and the clan members sacrifice a goat regularly, cook and eat the meat without salt and nothing is supposed to be carried away from the sacred site.

One private land owner has tried to get rid of a forested seso on his compound, basically because he considers himself a good Christian and the seso resembles something pagan. *"I tried to burn it, but at the same time my family members started falling because of the spirits and I could not proceed. Still, I will try to cut the trees. Someone asked me for a permission to conduct rituals in the seso, so I allowed him, but for a payment"* (male 45 years). Another example of sacred site management is the Dojholonyi seso, which is on community land. The forest is well preserved, since considered sacred and actively used by traditionalists from Bura community. Ashes, bones and animal faeces splashed on the walls of a cave can be found on spot.

On some sites the interests of different users are conflicting, like at the Seso Shali of the Mnamu clan*:" A woman was buried alive standing with her child on her shoulders, because she got pregnant out of wedlock in 1913, and because men were always right those days! The Church Mission wanted to build a church here, but the clan did not allow, because of the seso. The whole clan is casted and the effects have to be managed through rituals"* (male 52 years).

Protection fighis are sacred sites designed for community protection and a control base. They serve a security purpose like the gate fighis, but also have further uses. For example Mraru forest has protected Ore-Kirombo-Mbololo-Mwakishalua-Ndile area from calamities from low lands and acted as an observation point. A pot with fighi medicine is buried underground at these protection fighis. Eating, drinking, dance and sacrifices may be conducted on site. The strategic location of a protection fighi gives it the responsibility for a certain area, thus when moving to the boundary of a neighbouring area one should consult the appropriate people there. One well-known historical site for protection is Mwagafa fighi in Wundanyi, which used to protect a large community area, but has been replaced by a coffee plantation by white settlers and later on by Government offices. Another strategically

located protection fighi was and still is to a certain extent, Gate Kitukunyi. It protected a large area from Kitunkunyi down to Mwagafa fighi in Wundanyi, controlling the traffic and acting as a judgment ground. Later on it became an office plot for the area Chief, before they moved to Wundanyi. On the yard still exists the grave of Daniel Mabenga; a traditional assistant chief and a freedom fighter from the area. He was in power until 1967-75 when the chiefs were told to have authority and to "give cain" and see that policies were implemented. Protection fighis exist on many scales. Besides community protection they secure individual households as well as their fields from bad spirits.

Mwagafa´s story, as told by a group of elders and family (Mwaita 2009) to this famous man, can assist in understanding the land regime development of the colonial period*: "Mr. Mwagafa had a heavy beard, that is were his name derives. The time when white settlers came, he was elected as commander of the central mountain area. Figis were protecting him. There were three paramount chiefs who reigned over the different hill tops of Taita at that time; Mwagafa, Mngalu and Mwagholo, who had made a mtero (blood covenant). For instance, they gathered for rainmaking in Shigaro, targeting the whole hill area of Taita. The white settlers tried to convince local people to plant coffee, but Mwagafa refuced and was tortured until he agreed. He would have wanted schools built instead. Wundanyi prison and the center used to be Mwagafas land which was grabbed by the administration, since high potential agricultural area. The coffee farms were established around 1870´s and when we (the interviewees) were children, we used to pick coffee.It started to become non-profitable because of the low market price already before independence. The DC office area was promised for a school area, but Mr Drulu (white man) denied. Coffee plantations came first.Then government of Kenya told farmers to plant it on their farms as well. During Mwagafa´s reign, no forests were to be cut; the coffee plantations and forests were separated. Only after land adjudication in 1965 forests were cut"*.

Fighi for medicines

Soothsayers, sorcerers, GIA specialists, wizards, medicine men, rainmakers and many others need to source their ingrediences most often from forests and shrub lands. *"This is a private forest full of indigenous trees. It was considered as a sacred forest where Teri clan used to collect their medicines. The forest is believed to have stocked medicinal plants hence the clan elders from this community used to frequently visit the forest to collect their herbal plants for medication purposes"* (male 46 years). Sometimes the recipe is complex and they need to travel long ways to find the plant or animal in question according to a medicine man: *"Mbale people used to come here, medicines were fetched also from Mbololo forest and lowlands"*. Some components have even gotten extinct or very scarce: *"The tree used for this medicine is no more around, but it used to grow along the riverbed"*.

Ngangao forest was under the care of the local community since 1975 until it was gazetted in 2000 through the government. During those days the community used to frequently visit the forest sourcing for medicinal plants they believed to be the cure for a number of human and livestock diseases. Medicine making fighi often acts as a vestibule where the herbs are collected and medicine prepared as well as the goat slaughtered before moving further to the

actual fighi for worshipping. As one of the informants explained: *"Goat sacrifice was conducted here before going up to Ngwa figi, mzee Owa and mzee Mugulu (medicine men) used to come and prepare medicines for health problems or for Ndasanya, meaning problem in the community, for example lack of unity"*(male 50 years).

"Mbingu was prepared by using traditional forest trees mixed with animal´s inner flesh. They selected elephant and tortoise meat and shell, because tortoise lives up to 300 years and elephant 200 years.There are 66 types of trees which make mbingu. 66 types of tree roots are fried and made in powder form. They are kept in a calabash to avoid water and water vapour from getting in. All 66 calabashes are kept together for giving selected people, who wanted to stay alive for long. When one was given Mbingu he or she never stayed sick until natural death. When wondering days came over one usually gets lot of problems and vomite and vomite almost 2 years, until that mbingu comes out. Then the person concerned dies immediately" (Mlekenyi 2007).

"There is a Ngataa medicine prepared to scare people. Some brown particles are taken to be mixed with traditional trees to form medicine. Such trees are: Mndana[1], Mnyama, Kilasoo[2], Kirumba[3], Mlungu[4], Kimbungu and Kidongadi[5]. When one took it and started talking, people became scared and even trembelling. He or she was like a lion, although mostly this was used by men. The problem with the medicine was that when one´s days are over he must be killed by a lion" (Mlekenyi 2007).

The knowledge ownership of medicinal plants is confined to the experts. Believes and rules exist for controlling the knowledge sharing. The plant names are not supposed to be said out loud, otherwise their effect weakens and the knowledge beholder may even die.

Forests protecting themselves

The sacred forests are believed to have been protecting themselves from disturbance by several means (see Figure 21). Unwanted entries were hindered by a fighi medicine buried at the center of the area, stones thrown at the intruder, trees calling *"Don´t cut me!"* They were also attacked by bees and army ants at the marginal area *Mbengenyi.*

[1] *Turraea holstii*
[2] *Solanum incanum*
[3] *Carissa edulis*
[4] *Erythrina abyssinica*
[5] *Cussonia spicata*

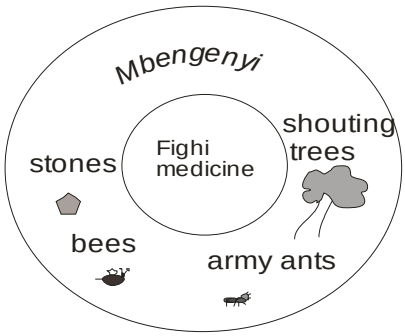

Figure 21. Illustration of forest self-protection means (originally drawn by a village elder)

Fighi for cleansing

Cleansing is done when a person is in need of healing due to some illness or a wrong-doing. Illness is usually considered to be a symptom of something previous, like a curse of a wizard cast upon the person. Mistakes made are supposed to be atoned by cleansing. Mr. Itambo (2009), a middle-aged, local man told me of a case of pregnancy out of wedlock: *"my father got a lady pregnant and didn´t undergo cleansing, so the child was borne handicapped"*.

"A sooth sawyer used to come and seek for healing powers. There is a pot inside the fighi and cleansing was done, also for children. This forest was associated with curing blood diseases. Specific medicines were found here. Firewood was not to be collected here by young people."

Cleansing, *kuora*, may be also needed for land areas, like fields and yards, if they happen to witness a wizard meeting. An elderly Taita lady explains:*"When I was a child (70 y ago) things were going on; dancing, rituals etc, but after Christianity it stopped. My father used to practice rituals by the Msangarini school (medicine preparing for rain making- a big ceremony).The rain was meant for Werugha and Sungululu area people. After the school was built, not much vegetation was left. Around the big Mvumu tree, the wizards used to come at night and afterwards cleansing had to be performed. The leaves of Mvumu were mixed with sheep dung in a calabash, then sprinkled with Mwang´ombe grass all over house and people, in order to prevent bad omen e.g. someone becoming a thief."*

Mmanga bell

The rituals are thought to still be going on in form of *mmanga*. This is a healing procedure whereby local brew is mixed with the soil under a *mmanga-* (a hidden cow bell) tree and a sick person is washed with it. A preferred tree is a *Mlungu* (*Erythrina abyssinica*). *Mmanga* cures diseases that cannot otherwise be cured in hospitals, namely e.g. barrenness, arthritis, and stiffness or social problems like difficulties to get married. *Njariri* is a coconut shell used for portioning local brew. *Mmanga* is serving a big clan and the bell is supposed to be kept close to the house and be pampered. "*People will get crippled or insane if the Mmanga is ignored. Barrenness of a man or a woman is caused by the Mmanga ignorance and one needs to please it to get cured. Mmanga can also affect livestock. Basically Mmanga is like*

your conscious telling that you should share and get together with other community members. The bell rings when there is a catastrophe coming up and the elders start preventive measures. You can also approach the sooth sawyers to get a roadmap" (village elder 61 years).

Mmanga was also described as clans´medicine; there is supposed to be one *mmanga* per clan. A few families are worried about their children since they didn´t learn about the *mmanga* and its healing powers. *Mmanga* is multipurpose type and has served the idea of extended family through a blood oath ritual. The male heads of families meet by the *mmanga* and make an oath of not going against each other or their families. The goal is to live in harmony and unity. *Mmanga* is also believed to have powers to get back the offspring who travelled away from Taita Hills in seek of work or further education. The family back home leave a piece of food in a basket after every meal symbolizing the hope for the return of the child.

Fighi for offering harvest

On the return from fieldwork a harvest offer was to left on a fighi. According to a traditionalist it could be something small or like in some places, a precise 1/10 of the day´s harvest. Also, before harvesting the heads of villages go around every farm and collect two samples of every crop and bring to a fighi for thanks-giving. Old men and women come to fetch the crops in the evenings and this was considered as a reward of being a village elder. Harvest offering was practiced until 1950-60`s, depending on the area. Celebrations were also organized in these fighis during harvest time.

Cave for patients with contagious disease

In the 1920´s *Mnyao* (said to resemble HIV- AIDS) and Leprosy epidemics swept across Taita Hills. Caves and forests were used for isolating infected people from others, since cure for those was, at the time, unknown. For example people with small-pox were tight in the cave and fed from a distance. If they somehow got cured they returned to the community, otherwise they perished in this mortuary. Skulls are a mixture of sick peoples and ancestors, since some of the caves used were skull caves. The site was left for one year time after the time of death in the belief that the germs vanish. Later on sacrifices in the cave could be conducted again. Some estimate that these procedures finished in the 1960´s.

Shelter

Villagers shelter in the caves when it is raining as well as hide from their "enemies".

Fighi for defend strategy planning

Clans used to have strategy meetings on how they will fight their opponents and even during natural calamities they meet at the same point and discuss how they shall deal with the prevailing situations.

***Fingo* stopper**

"A bag of medicines is buried under a pile of stones and healing powers are sought by a fingo. A group of men come with liquor in their mouths and count 1-2-3, then spit on the stones. Even if someone is really sick, will get better. The great-great grandfathers placed the medicine here" (village elder 61 years).

Fighi for initiation

These sites were used before marriage for initiation and rituals. A history of *Ngasu* initiation fighi in the Chawia forest suggests tells that a lady to be married was kept in a fighi for one full month for training of marital responsibilities (ngasu =secret). It is said that "*the walking style changes as she will be someone's wife. Leaking of any information was prohibited. The dress was like the Maasais´ having and beads were many"* (herbalist 70 years). The lady was told how to live and what to expect when married: how to choose different kind of dresses for different occasions. She had someone to serve her in the fighi. *Kirughuruni* was the final point before handing her over to the groom. After spending one month in Ngasu she was brought to a swamp for final polishing and beautification, including putting on the *kidemu* (wedding dress). The last ritual of this type is thought to have been conducted in 1952. On the other side of dam, men did their own initiation rituals, including cleansing.

Around Ngangao forest, there used to be round traditional houses where a *Kilambu* man entered and invited in a lady after another for a secretive training. Secrets were not to be told to anyone afterwards. Birth control was an important part of the teaching. After training a *Kishatu* dance was performed to celebrate adulthood. This was still going on in 1960´s. Ngangao forest has been an important home for trees named *Migulo*, parts of which were used for the initiation of boys and especially girls.

Fighi for thanksgiving

Thanksgiving was about sacrificing a rooster or a chicken and bringing the best harvest from the field, for example when a boy child was born. The dance celebration during harvest time is called *Gonda.*

Sacred tree

Certain individual trees and their surround are considered sacred. They have different ways of affecting the society ranging from environmental services to protective and spiritual functions. Certain species are important for the weather forecast, for example Mora (*Nuxia congesta* (R.Br.)) and Msuruwachi (*Albizia gummifera* indicate rains. "*We used to see signs of water coming to surface by the tree. This indicates approaching rains."* Mngima (*Prunus africana*) and Mkuyu (*Ficus sycomorus* (L.) are considered efficient in rain attraction (*Mdi ghwa vua)* and water protection and Mkuyu is often found in the centre of a rainmaking fighi. Mlungu (*Erythrina abyssinica*) is a tree of virtue and has a powerful protective function, thus these species are often growing by the roads and paths creating a network of security "check-points" in Taita Hills. There are some Mlungus which are said to be so

powerful that *"one could not swallow the saliva"* while passing by. Only exepted reason to cut a Mlungu is drum making and according to a legend the instrument has to be ready before the stems sprout. Some individual trees are shrines, like sesos and are given animal sacrifices. Old trees, like big Mvumus (*Ficus thonningii*), Mungoruses (*Calodendrum capense* (Thunb.) and Mlungus (*Erythrina abyssinica*) with crooked trunk, still command respect, even if they are becoming scarcer. Just to mention a couple, there is a majestetic Kilulu *(Ficus lutea* (Vahl) tree in Mgange called *Teri Wangombe*, which is never to be cut, and there is a meeting point for lovers by a more than 100 years old *Mvure*-tree in Sungululu. Mvumu is considered to be a tree of peace, thus quarreling around it is believed to give bad omen. These trees are locally called cultural trees or Taita trees referring to their importance in the Taita ritual complex.

Fighi for cleansing after war or crime

Cleansing is needed in order to get a "fresh start" for life after committing something immoral like a crime or killing at war. A village elder in Mgange casts his mind to the times Taitas were at war: *"People from war had to go through this Mbanga ya Mboi for cleansing before reaching home. Mboi means those who are from war."* A mother of a young man in Mwanda explained how she wished for a second chance for her son after he had stayed in prison: *"Cleansing was done in the river; all clothes were burned and a goat sacrificed while asking for healing powers."* There seems to be strict rules concerning the handling of sacrificed meat; no salt should be added and none of it should be carried away from the fighi.The severity of the wrong-doing influences the scale of the atonement: *"Recently a young man was brought here for cleansing, whereby three chicken were needed and those had to be waved seven times around his head"* (herbalist 70 years).

Traditional industry

An old clay pot factory in a cave is located on a private yard. In Mgange Nyika people used to make them for the purposes of storing water and tobacco. The small industry stopped in 1974 because of land consolidation, whereby the new land owner didn´t want the business on his yard. Grinding stones remain from times before grinding mashines and posho mills when maize was to be grinded by hand using a stone against a rock.

Figure 22. A grinding stone for maize (photo by Himberg 2009).

Observation point and control base fighi

Observation points were strategic locations on places with a wide view over the hills and plains. Their main function was protection from lowland calamities such as seeking strength against cattle thieves. The power is in the fighi medicine pot buried in the forest. For example one important observation fighi is *Mraru mwakishalua* looking down and eastwards over Ore, Kigombo, Mbololo, Mwakishalua and Ndile areas. Various tricks and magical means were used to chase away the enemies and for fighting to get back the stolen cattle: *"Brown and white chicken were slaughtered, the blood poured on potatoes and potatoes put in a basket and carried along to the battle. Before meeting the opponent, Taitas roasted the potatoes on open fire and as the enemy saw them eating, they thought Taitas can eat hot stones and must be invincible, thus ran away. Masais and Sagalla people were the enemies"* (middle-aged man)

Fighi for wealth maintenance - Mlalu snake site

Big snakes have been considered as fortune bringers in Taita. Some suggest that the story of the Mwamulake snake represents the issue of jealousy which hinders development in Taita. "*There was a great woman and a very big snake in Mwachora forest. That snake was called Mwamulake. The snake used to take care of the woman´s goats, like surrounding them as they were eating. And when the woman was harvesting maize and it was sunny, the snake made a big shadow over her to help her work more efficiently. If she didn't finish the work*

until evening the snake made the sun shine all through the night until she was done. Immediately she finished it became dark again. So the people in Mwachora forest were jealous of the woman as she had become very rich and she got animals and everything was processing well. So they decided to kill her. Having killed her the snake managed to jump from Mbengonyi down to Ngulu lake. Up today Lake Ngulu still causes fires around it and ghosts are seen naked dancing during hard times, when there is no rain. And that snake is believed to be there in Lake Ngulu even today and when it was at Mwachora forest for the woman, there was a river up there for taking water. Since the day snake shifted to Ngulu and the lake was formed, the water migrated down at the foot of the hill. The history of the snake happened in 1870" (Mlekenyi 2007). Mwachora forest used to be community-managed before its gazzettement in 1975. People have been avoiding the site where the lady was killed and left it like that since the 1870´s. Many people have also moved to the lowlands.

Thus, I hope these descriptions of various purposes of sacred sites helps us to at least scratch the surface and look into the local traditional mindsets and practices concerning Taita home surrounds. It is still important to bear in mind that most of the fighis are of a multipurpose type. The categorization used here as such is somewhat artificial, but meant to bring front the primary function of each one traditionally protected site. The illustration of Kwangovi village below shows how gate fighis are located around the village for protective measures. Different clans have their own skull caves, male and female used to have their own sites for circumcision, and there is a common judgement ground for performing traditional trials. There are particular sites for performing goat´s intestine analysis as well as for giving sacrifices during special yearly occasions, like harvest season. For reasons of confidentialty this thematic illustration is lacking geographic accuracy. However, in the next chapters the geographical patterns of traditionally protected forests and sites shall be tackled further.

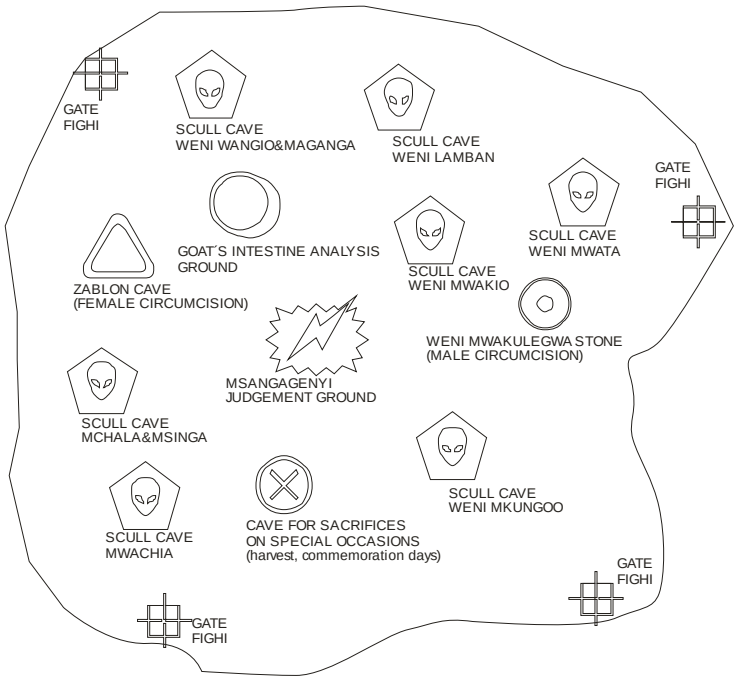

Figure 23. A mental representation of the traditionally protected sites of Kwangovi village in Sungululu, Taita Hills (not to scale).

Size patterns by TPF/S categories

The various types of traditionally protected sites differ from each other in number and size. The rainmaking fighis and medicine groves are biggest in average size (1,5 and 1,6 ha respectively) and the areas dedicated to rainmaking cover 32,6 ha in total. Protection fighis have similarly a big total coverage of 25,8 ha, average size reaching 0,9 ha. The smallest in size, but biggest in number were gate fighis and skull caves with 0,18 and 0,21 ha average and 9,2 and 10,1 ha total sizes respectively). Sesos are usually very small patches, but we also found some larger ones, thus seso sizes vary from 0,0008 to 2,5 ha giving an average size of 0,3 ha for 25 patches. Fighis used for defend strategy planning are few, but most of them large in size (1 ha in average). Small, but socially important sites are dance grounds and wizard meeting places, both found in all parts of Taita Hills. Thirteen sacred trees were named and the most common indigenous species were *Erythrina abyssinica, Ficus sycomorus and Ficus thonningii* with a unique purpose within the community. Many individual trees were also indicated as important along the way due to their environmental service function, but they did not have a sacred status as such. Fighis with a healing purpose are still used, some for cleansing and some for "diagnosing" through *goats intestine analysis* (GIA). Their average sizes range from 0,3 to 0,4 ha.

7.1.3. Traditionally protected forest condition assessment

The forest condition class was assessed through two phases. Firstly, detecting the forest condition characteristics on the plot and secondly, by comparing the characteristics to a forest condition class matrix. The characteristics include soil cover and crown cover condition and regeneration density as well as naming the most dominant species in regeneration. Density of seed trees was additionally assessed on shrub land. Out of the 289 sites, 165 (57%) were in very degraded or degraded condition, whereas 124 (43%) were assessed to be medium or good. The assessment is slightly misleading in the sense that not all sacred sites are supposed to be forested areas. For instance, judgement cliffs, law grounds, dance grounds and some of the wizard grounds are often on plain sites.

Table 13. Forest condition class *.

Condition (vegetation)	No. of sites	%
Very degraded	95	33
Degraded	70	24
Medium	60	21
Good	64	22
total	289	100
*Adapted from "A field manual on participatory techniques for community forestry" by W.J. Jackson and A.W. Ingles (1998).		

The level of sacredness of the site was assessed by the expert group concerned and reflects the status and condition of the site. Accessibility, disturbance, activity of usage and the level of prevailing spiritual and magical powers are some of the elements defining the site condition. After all, this assessment is based upon personal and subjective perceptions of the respondents. Out of 289 sites, 152 (51%) were perceived as very degraded or degraded and 137 (49%) were medium or good.

Table 14. Sacredness condition class.

Condition (sacredness)	No. of sites	%
Very degraded	61	20
Degraded	90	31
Medium	85	29
Good	52	20

Change in the condition and use of TPF/S in last 10 years

Out of the 289 areas studied, 204 were claimed to have been exposed to change during the last 10 years, whereas 85 areas have not changed. Change here refers both to vegetation cover and cultural use (sacredness) of the area. Out of the total size of 118,5 ha, 65,8 ha has not changed and an average size of a TPF/S within this group is 0,8 ha. The bigger group of changed TPF/Ss has approximately three times smaller average size of 0,3 ha and a total area of 52,7 ha.

The forest cover and cultural use were both divided into four categories (1=very degraded, 2=degraded, 3= moderate and 4= good) describing the condition assessed by the expert groups. These categories were cross-tabulated with the change patterns showing that the areas not exposed to change in last 10 years are in better condition both in terms of vegetation and cultural use than those changed ones. The average forest condition was 2,9 and 2,1 for non-change and changed areas respectively, whereas the cultural condition was 3,1 and 2,2 respectively for the same variables. The recent changes thus have been degradation from moderate to degraded.

The forest condition analysis in general shows that the very degraded and degraded areas are majority in number (165) and that their average sizes and total size (22 ha) are rather small. The 124 areas in moderate and good condition have bigger average sizes and total size (129 ha).

The sacredness condition of TPF/Ss was in majority of cases degraded and moderate (175) and the extremes are less (114). However, areas that preserved their sacredness best were 52 in number, with an average size of 1 ha and total area of 50 ha. In all, the condition tends to get better with an increase in size.

7.1.4. TPF/S tenure distribution and size

The connection between tenure status and size of TPF/S was looked at and nearly half (136) of the areas were privately owned with an average size of 0,2 ha (see Table 15). The largest TPF/Ss were found on trust land with an average size of 0,8 ha, and these community trusted areas covered 55,6 ha in total. Considerable TPF/Ss are also found inside the government gazetted forests with an average size of 1 ha. The smallest area sizes were for TPF/Ss on public amenity (average 0,15 ha) sites.

Table 15. TPF/S tenure distribution.

Tenure type	No. of sites	%	Average size (ha)
Private land	136	47	0,2
Community (Trust) land	66	23	0,8
Inside a gazetted forest	26	9	1,0
Public amenity (roadside, riverbed etc.)	60	21	0,15

7.1.5. Managers of the traditionally protected forests and sites

Seven different types of managers were found for TPF/Ss (see Table 16). Managing differs from legal land tenure right in that the manager of a sacred site can be also someone else other than the present owner of the land. It can be a community, a village elder, a private landowner who belongs to the clan responsible of the sacred site or a private landowner not belonging to the clan. Manager can also be government or county council for a public amenity. Wizards are the managers of some TPF/Ss and those sites rarely are touched by residents from other area. An eight category,"no-one", came from the data to refer to areas recently abandoned due to perishing generation of elder men responsible of traditions.

Table 16. TPF/S managers.

Manager	No. of sites	%
Community	58	20
Private land owner (not clan member)	44	15
Private land owner (clan member)	79	28
No one	4	1
Village elder	20	7
Government gazetted	25	9
Public amenity	55	19
Wizards	4	1

Land policy measures, like land adjudication in the late 1960´s, combined with population growth and scarcity of fertile land to be divided among offsprings have altered the management patterns of traditionally protected sites. Due to the policy, inhabitants were shuffled around Taita and given pieces of land often ignoring the traditional patrilinear and clan based land ownership system. This contributed to the degradation of many traditional sites. Presently, the private landowners who belong to the clan originally responsible of the

TPF/Ss, host areas with slightly bigger average size (0,3 ha) than those non-clan members (0,2 ha). Communities host biggest total hectarage of TPF/Ss and second biggest average size (0,9 ha). Many (60) sacred sites are on public amenity, e.g. by the roadsides and riverbeds, and are relatively small (0,15 ha) in average size. Since the village elders as managers are getting fewer, community occasionally takes joint responsibility of the TPF/Ss. Presently, 21 sacred sites out of the 289 visited sites are headed and managed by a group of elders or an individual village elder. Fighis are also found in areas where people are afraid to settle because of the consequences. Those are often set aside as no-mans land and potential community development areas trusted to the County Council. It is not uncommon for schools, churches or hospitals to be built on these sites. While conducting the participatory mapping with experts, they regularly also pointed to former TPF/Ss that had been replaced by a public establisment.

Comparison of the forest condition classes and managers (see Table 17) shows that the traditional sites on public amenities are not that protected but instead degraded. For example vegetation surrounding the gate fighis is often considered open access by by-passers even if traditionally the elders have set rules and restrictions for the use of these sites. TPF/Ss under private management were in degraded condition to a large extent: 70% and 58% of the sites looked afted by non-clan members and clan members respectively were in very degraded or degraded condition. However, a slight majority (55%) of TPF/S, with a village elder responsible, were in medium or good condition. Also 60% of community-managed sites were in medium or good shape. Most (92%) of the traditionally protected sites inside the government gazzetted forests did well, since gain a “double protection”.

Table 17. Managers and forest condition.

Manager	Condition class (% of all TPF/S under manager)			
	very degraded	degraded	medium	good
Community	24	16	26	34
Private land owner (not clan member)	35	35	19	11
Private land owner (clan member)	35	23	27	15
No one	-	25	50	25
Village elder	30	15	25	30
Government gazetted	4	4	22	70
Public amenity	62	32	4	2
Wizards	-	75	-	25

7.1.6. Differences between areas in the occurrence of traditionally protected forests and sites in the landscape

Most types of TPF/Ss can be found in all parts of the study area. However, there are differences in occurrence due to somewhat different cultural practices, natural conditions and land use policy histories in different parts of the hills. By looking at figures 24-27 one can clearly see variations between the Mbololo-Choke, central Dawida, Kidaya-Chawia and Mgange areas. The number and sizes by study area are indicated in Table 18.

Table 18. The number and size patterns of TPF/S by four study areas.

Study area	Size of the study area (ha)	TPF/S count	TPF/S average size (hectares)	min / max
Mbololo-Choke	8937	32	1,0	0.004 15,9
Central Dabida	6338	131	0,2	0.0008 1,8
Mgange	2253	65	0,5	0.003 10,2
Kidaya-Chawia	2441	61	0,5	0.004 7,4

Central Dabida has a dense occurrence, but sizes are minor and at first hand explained by the most urbanized land use.

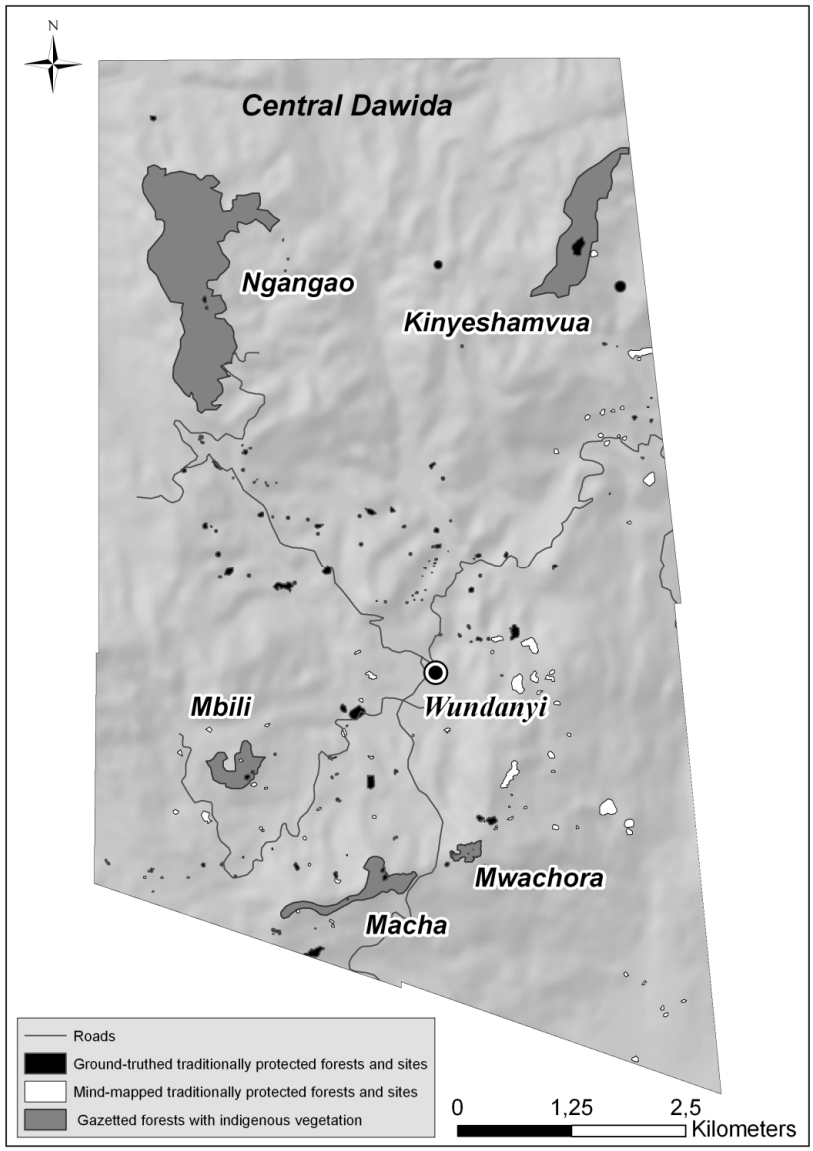

Figure 24. Traditionally protected forests and sites in Central Dawida.

Mbololo-Choke TPF/Ss are scattered, whereas Kidaya-Chawia and Mgange have more dense occurrence and larger sizes of TPF/Ss. Most of the Taita Hills area has a history of clearing indigenous forest or woodland into farmland. However, according to the assistant chief Renson Mwalombo (2009), Mwambirwa and Paranga valley areas, located between Mbololo and Choke forests were previously used as a vast community between Mbololo and Choke forests were earlier used as a vast community grazing area.

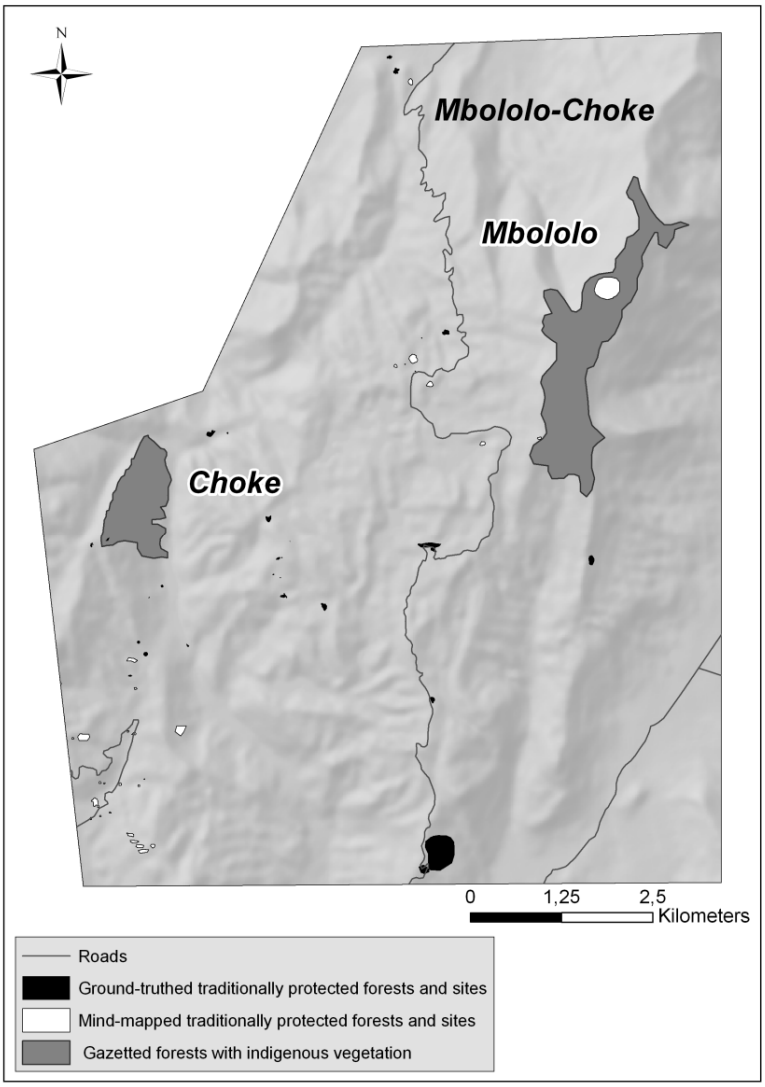

Figure 25. Traditionally protected forests and sites in Mbololo-Choke.

Presently, pines and eucalyptuses are growing there and some areas have undergrowth with indigenous trees. The region is known for its commonly occurring forest fires – the causes of

which are both intended and unintended. Vegetation was burned over for grazing purposes until 1958 when the government initiated a rehabilitation scheme that would turn the bushland into indigenous forest. The plan didn´t work out and the soil erosion got worse, thus a major pine planting operation was laurnched, though not without political and social motives behind it.

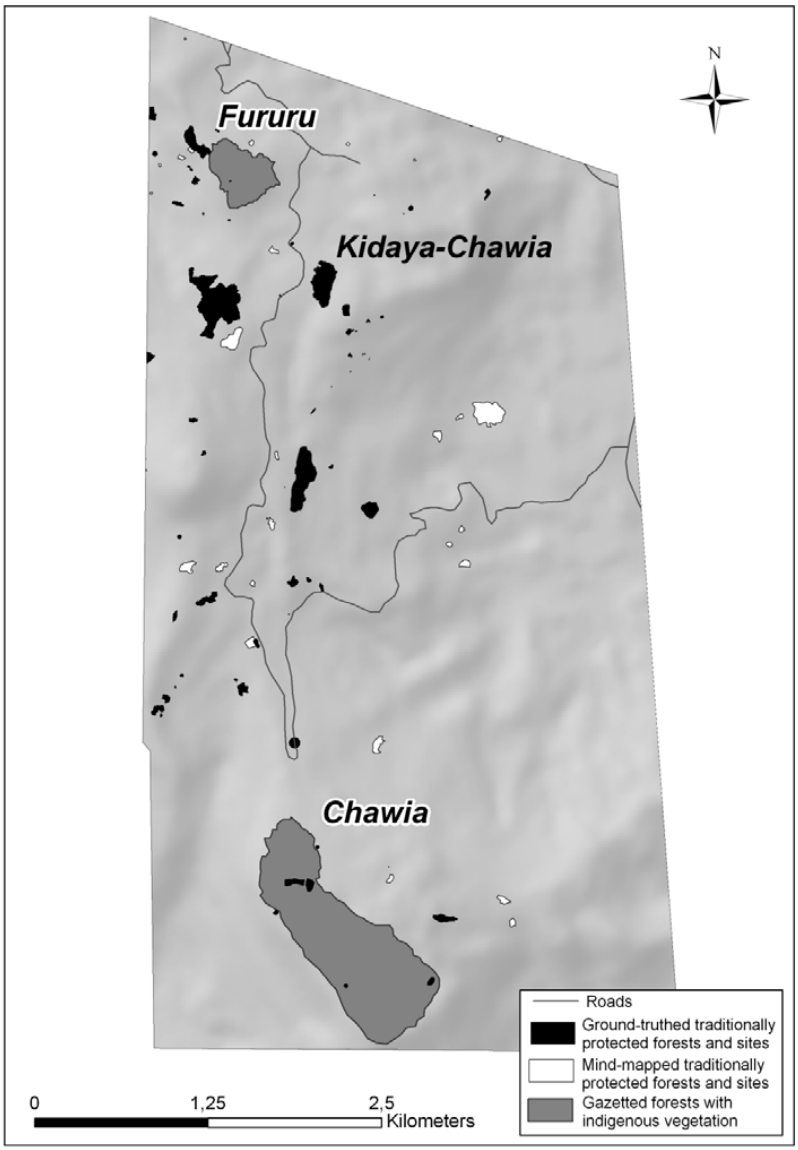

Figure 26. Traditionally protected forests and sites in Kidaya-Chawia.

Mgange and its neighbouring Mwanda areas in western and north-wesrtern part of Taita Hills, are commonly known to have faithfully retained their traditions. That was noticed

while conducting the study in the Mgange area. One could sense pride in informants´ talk about the sacred sites and the issue seemed to be less of a taboo than in other areas.

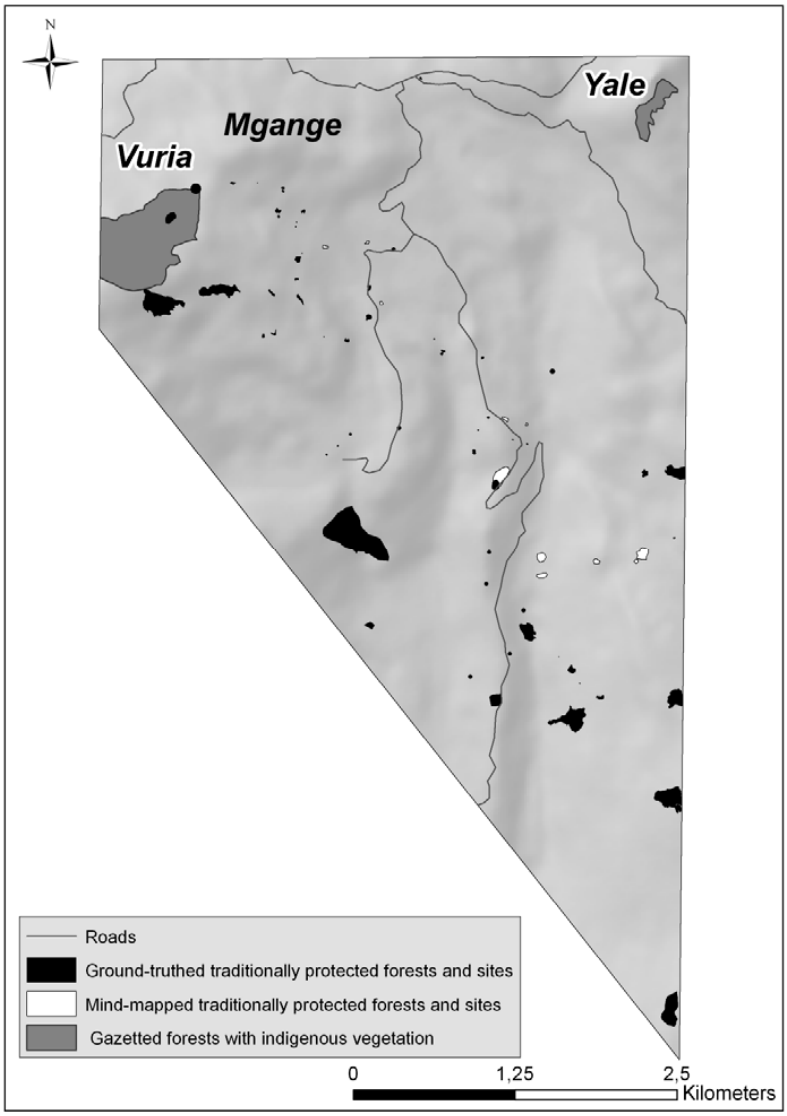

Figure 27. Traditionally protected forests and sites in Mgange.

The different parts of Taita do exhibit special characteristics when it comes to sacred sites and their valuation and management. However, the perceptions of TPF/Ss vary depending upon geographical scale and the historical background of the locations. Perceptions may vary from one village, homestead or valley to another but, the pattern of perceptions and attitudes towards TPF/Ss in Taita is heterogeneous and should not be generalized.

7.1.7. Current uses of plants found in traditionally protected forests and sites according to the tradition experts

In total 255 different species were indicated by the informants during the visits to traditionally protected forests and sites. Many of them have several uses. All together 220 uses were mentioned and they are divided into eleven categories (see Appendices 1 and 3). They range from traditional farming and construction techniques (Appendix 5) to medicinal (Appendix 4) and ritual purposes.

Technical solutions and construction

Species suitable for technical solutions and construction purposes were 71 and 38 respectively (see Figure 28). For example wood for beehives (*Ocotea usambarensis*, *Polyscias kikuyensis* (Summerh.), drums (*Ficus sycomorus*, *Melia volkensii* (Gürke), *Erythrina abyssinica* (Lam.), farm and kitchen tools (*Memecylon teitense*), hunting equipment (*Ehretia bakeri* (Baker), pipe for irrigation (*Sinarundinaria alpina*) (see Figure 9) and for toys has traditionally been used. Components for cosmetics and essential oils (*Santalum* sp. (L.), *Osyris lanceolata* (Hochst. & Steud.), leather tanning (*Ekebergia capensis* (Sparrm.), soap (*Dodonaea viscosa* (Jacq.) Royen ex Blume), shoe polish (*Acacia mearnsii*, latex (*Tabernaemontana holstii* (K. Schum.), arrow poison (*Acokanthera schimperi* (Oliv.) Benth. & Hook.f., *Rauvolfia rosea* (K. Schum.), preservative (*Tamarindus indica* (L.), and fibre for ropes and baskets (*Ficus thonningii*, *Ficus ingens* (Miq.) were found.

Pest control and food

Species for pest controll were: *Gnidia latifolia* (Hort. ex Meisn.), (*Lasiosiphon latifolius* (Oliver) Brenan (Oliv.) Gilli) for maize storage, and pesticides against army ants (*Mnuka*[6]) and moles (*Cussonia spicata* (Thunb.), *Ikowa*[7]. Timber (*Nuxia congesta* and poles (*Grewia villosa* (Willd.), bark (*Acacia* sp.) and grass (*Kivulevule* for roof thaching) are suitable for construction (where allowed to be fetched). Foodstuff species were 41, for example, fruits and berries (*Garcinia volkensii*, *Syzygium cuminii* (Linn.) Skeels, *Ehretia bakeri / cymosa* (Wild. ex Roem & Schult.), *Ficus sycomorus*, *Lannea rivae* (Chiov.) Sacleux), vegetables (*Solanum nigrum* (L.) Tausch ex Dunal), and tobacco (*Kumbaku*[8]), were found.

Firewood and charcoal

Thirtytree species suitable for firewood and charcoal were indicated: for example, *Acacia mearnsii, Gnidia latifolia, Prunus africana* (Hook.f.) (Kalkman), *Nuxia congesta, Syzygium cuminii, Cupressus lusitanica, Albizia gummifera, Croton megalocarpus, Combretum molle* (Engl. & Diels) R.Br. ex G. Don, *Maesa lanceolata,* and *Macaranga conglomerata* (Brenan).

[6] Vernacular species name
[7] Vernacular species name
[8] Vernacular species name

Environmental services

Thirteen species were considered focal as providers of ecological services, such as water retention (*Myrica salicifolia* (Boj. ex Baker) and erosion controll (*Rhus natalensis* (Bernh. ex Krauss), soil fertility improvement (*Croton megalocarpus*), degraded land indication (*Pteridium* sp. (Raf), rain-bringing (*Ficus sycomorus*), rain indication (*Erythrina abyssinica*, *Nuxia congesta*, *Ficus lutea*) and water protection.

Medicines for human use

Informants named 161 medicinal species and 86 human uses for them (see Appendix 4 for details). The diseases and disorders whereby the medicinal species are used are divided into the following 10 categories:

1. gastro-intestinal:
   stomach ache, emetic, indigestion, anthelmintic, laxative, flatulence, dysentery, constipation, anthelmintic for hookworm,
2. gynecological, andrological and urinogenital:
   prostate cancer, barrenness, excessive menses, contraceptive, syphilis, gonorrhea, abortion, cleansing of womb,
3. cardiovascular and blood diseases:
   hypertension, haemostatic, anti-coagulant, coagulant, purification of blood, nosebleed
4. pains and inflammation:
   eye infection, headache, analgesic, muscle ache, joint pain, toothache, antibiotic, mumps, hick-up stopper, sore gums
5. respiratory diseases:
   cough, flu, chest pain, whooping cough, measles, sour throat, asthma, pneumonia,
6. children diseases:
   hasten child learning to walk, umbilical cord healing, coagulation in circumcision
7. malaria and fever:
   anti-pyretic, malaria, typhoid, diarrhea, malaria prevention, yellow fever
8. skin diseases:
   sterilization of wounds, boils, skin diseases, abscess, rash, boosting wound-healing, cracks on skin after walking barefoot, scabies, itch and pimples, acaricide
9. brain and nervous system disorders:
   stiffness, nerve disorder, leprosy, epilepsy, sedative
10. other human diseases:
    splin problems, kidney problems, strains, “Nyago” , splinomegaly, choosing child´s gender, anti-poison, liver problem, anti-fungal, anti-poison for snake bite, “Mnyaya”(similar to HIV-AIDS), HIV, cancer treatment

Veterinary medicines

For veterinary purposes 23 species with 11 uses were indicated in six categories:

1. gastro-intestinal:
   anti-ectoparasites, deworming, ulcer, laxative
2. gynecological, andrological and urinogenital:
   goat medicine for labour
3. cardiovascular and blood diseases:
   coagulation boost when sheep tail cut
4. malaria and fever:
   anti-pyretic
5. skin diseases:
   sterilization of wounds, acaricide
6. other animal diseases: decrease of milk production, hepatic problem

Magical medicines for ritual purposes

The experts named 42 species for 34 ritual purposes and a few of the informants pointed out that there were even more traditionally important species on those sites, which were not supposed to be known by others than the accredited managers of the TPFs. These figures emphasize the importance of the traditionally protected forests as sources for medicines, both for somatic conditions and spiritual and magical means. The medicines for ritual means can be roughly categorized into five:

1. medicines for conflicts and warfare, for example making oneself bullet-proof or making an enemy lost his way,

2. medicines for protection, like the *Kiweto* for protecting cattle and women from thieves, fighi pot medicine (a secret mixture of species) buried underground in road junctions, and *Erythrina abyssinica* kept on the yard to maintain peace (see Figure 29),

3. medicines connected with social activities, for example *Crassocephalum mannii* (Hook.f.) (Milne-Redh.) to gain powers to win a court case, *Kigelia africana* (Lam.) Benth). for fermenting local brew, or *Ensete ventricosum* (Welw.) Cheesman) for healing community problems,

4. medicines for mystical powers, for example *Ficus thonningii* for cleansing from a curse, *Ngandu* (vernacular name) for gaining tolerance against witches, and *Phoenic reclinata* for storing power of lightnings, and

5. medicines connected with natural forces, like *Albizia gummifera* in rainmaking.

Figure 28. “Construction without nails” by using tree bark (*Acacia sp.*) (photo by Himberg 2009)

Figure 29. *Ficus thonongii* (Mvumu, on the left) and *Erythrina abyssinica* (Mlungu) have symbolical roles in maintaining social peace and order (photos by Himberg 2009).

7.1.8. The knowledge transfer according to village elders

Before the introduction of "New Agricultural farming technology", in early 1930´s, theTaita community had their own cultural and agricultural farming practices in place to address food security. The commuity had their own agricultural professionals, the wazees, who were the old men considered to be most knowledgable to tell what to plant when, how and where. Their timing, when it came to planting, was regarded as very accurate.These authorities were accorded due respect and no one was to go against their instructions.There was also a council of elders in place to deal with law offenders. Wazees can be regarded as traditional agricultural officers. They dealt with crop and pest management and sought assistance from medicinemen, for instance, during armyworm infestation in the farms (Mjomba & Mzee Mwakio 2009).

Threre is a general rule of knowledge inheritance among the Taitas that if one is given some traditional "baggage", be it knowledge or equipments or herbs, they have to receive and pass on the tradition. But if one throws it away, something bad will happen to them. According to the tradition experts, neglection and ignorance of knowledge inheritage occurs in most Taita families to some extent. It has been challenging for the elders to try to motivate their children to listen and learn about Taita traditions, with the Christian church declaring those activities pagan. All the while new innovations pushed their way into the hills bringing more efficient and economically beneficial solutions for agriculture and agroforestry. The elders still seem to have hopeful thoughts about boosting the knowledge transfer now for when grandchildren and great grand children are born. Times are different when compared with the mid- and late 20^{th} century; the elders hope that exposure to market forces, competition and awareness of environmental problems in Taita will bring the young generation back to the sources of traditional knowledge. However, they do acknowledge that modern education widens the gap between generations. From the outset the science- based world view taught at school collides with the more symbolical and spiritual tradition. On the other hand, however, there are individuals who were born into families with no traditional knowledge to inherit, but would be interested to learn about it. Those interested in careers in herbalism need to find a suitable herbalist and pay a fee (e.g. one cow) for access to courses (*Kukuwia*) that contain secret information. Thus, due traditional knowledge being held by the experts only, sharing does not happen so easily and plenty of information may be gone. This is especially true if the chain of knowledge breaks within a clan.

7.1.9. Traditional ecological knowledge of Taita households

I have studied both the "common people" and the "experts" separately in order to gain different views on values, knowledge and perceptions from different generations and the ownership that knowledge has. In the following chapters I have analyzed common people´s traditional ecological knowledge. Basically, a clear line could be drawn between the household interviewees - who are the "common people" in that they were not given the traditional knowledge "baggage" - and the wazees who were proud to present their knowledge and skills. The traditional division of powers and responsibilities in knowledge ownership is still apparent, thus there are people who are expected to know about these

issues, and those who listen and consume their wisdom. One cannot expect to gain very detailed information about Taita traditions from every household. However, the expertise is not necessarily bound to ones age. I met a few apprentices of traditionalists of many generations, who seemed sufficiently enthusiastic and skilled.

The average farm size of the 50 households was 1,4 ha (3.52 acres), ranging from 0,08 ha (0.2 acres) to 5,7 ha (14 acres). These farmlands cover all together 73 ha of the least-cost corridor area. There were 14 household (28%) who owned private forest – areas with trees rather than intercropping activities. Nine of the forests were less than 0,4 ha in size, the average being 0,6 ha. Five households had private forest across an area ranging from 1 to 20 km (the average being 2,5 km) from the farm, while four had small separate patches of trees on the farm. The rest had forest growing on 100-500 meters distance from the farm. Most commonly the biggest patches were furthest away from the house. The majority of forest owners had three or more tree species growing on their plots. Only two preferred monoculture with Eucalyptus.

Uses of beneficial plants and traditional methods on farms

In total 161 different plant species were listed by the interviewees. All together 108 uses were mentioned, and they are divided into eleven categories (see Appendix 2). Some species have several uses. They range from local technology to farming techniques and medicinal and ritualistic purposes. Local practices for wildlife combat are also listed.

Medicines for human use

The interviewees named 73 medicinal species and 27 human uses for those (see Appendices 2 and 6 for details). The diseases and disorders whereby the medicinal species are used are divided into the following 7 categories:

1. gastro-intestinal:
   parasites, stomach ulcer,stomach ache, diarrhea, ring-worms, heart-burn
2. cardiovascular and blood diseases:
   anemia, hypertension, iron booster
3. pains and inflammation:
   toothache, flu, antibiotic, analgetic, muscle cramps, joint pain, mumps
4. respiratory diseases:
   sore throat, cough, asthma
5. malaria and fever:
   fever, malaria, typhoid
6. skin diseases:
   external wounds, boils, chicken pox
7. other human diseases and conditions:
   fatigue, HIV

Veterinary medicines

For veterinary care the farmers mentioned 42 species with 15 uses, divided here into six categories:

1. gastro-intestinal:
   digestion problems, anti-wormer, diarrhea, lack of appetite
2. cardiovascular and blood diseases:
   anemia
3. pains and inflammation:
   antibiotic, analgesia, eye inflammation, foot-and-mouth disease
4. respiratory diseases:
   flu, cattle/chicken cough
5. malaria and fever:
   fever, milk fever, chicken fever
6. skin diseases:
   external wounds

Magical medicines for ritual purposes

1. medicines for protection, like *Erythrina abyssinica* as a sacred tree preventing bad things happening in the field.

2. medicines connected with social activities, for example *Datura stramonium* (L.) Thunb. used in truth-telling ritual during witch prosecution.

3. medicines for mystical powers, for example *Acacia seyal* (Delile) for witchcraft ritual, *Mwasole*[9] is considered as the heart beat of a shrine.

Pesticides, herbicides and wildlife combat

Fourteen species mentioned are used as pesticides, for example, against aphids (*Ekebergia capensis* (Sparrm.), *Croton megalocarpus* (Hutch.), caterpillars and ants (*Gnidia latifolia*, ash, vegetable pepper, *Jarambiri*[10], *Mboi*[11] and *Mwakuwawa*[12]), and as herbicides *Bidens pilosa*. Methods for wildlife combat are various: people manually chase away monkeys and baboons, use scare-crows, make noise with bells, have a watch-dog and cats, chase monkeys and small mammals with cross bows and traps, use thorny trees for fencing and *Kitangara* cages for chicks to protect them form vultures.

[9] Vernacular species name
[10] Vernacular species name
[11] Vernacular species name
[12] Vernacular species name

The most frequently mentioned useful trees and plants for the 50 households were the following: *Grevillea robusta* (42 mentions)**,** *Ficus sycomorus* **(**42), *Ficus thoningii* (31), *Persea Americana* (Mill.) (30), *Nuxia congesta* (29), Eucalyptus (28), *Azadirachta indica* (A.Juss.) (28), *Prunus africana* (27), *Cupressus lusitanica* (27), *Acacia mearnsii* (25), *Albizia gummifera* (20), *Mangifera indica* (L.) Blume (17), *Erythrina abyssinica* (16), *Aloe secundiflora* (Engl.) (16), *Psidium guajava* (15) *Ficus ingens* (12), *Macadamia tetraphylla* (L.A.S. Johnson) (10), and *Ocotea usambarensis* (10).

Majority of these species are multipurposal and suitable for intercropping and half of them are indigenous. The most important products mentioned were timber, construction material, firewood, medicines and fruits, whereas environmental services include water retention, fertilizing by fallen leaves, nitrogen fixing and rain attraction.

When asked about important factors in general for managing trees on farm (see Table 19), timber growing was most frequently mentioned (58%). The environmental services performed by the trees (rain bringing, afforestation, soil erosion prevention, atmosphere balancing, and land slide prevention) ranked second (56%), and availability of firewood (48%) placed third. Growing fruit trees (22%) and availability of building material (10%) lagged further behind.

Table 19. Important factors when managing trees on farm.

(Times mentioned by respondents, N=50)	
Timber	29
Environmental services	28
Firewood	24
Fruits	11
Management	8
Building material	5

Biodiversity conservation was discussed and the term itself was strange for majority of respondents (88%). After explaining the concept, people were asked to come up with ideas about what measures would be possible on their land for enhancing biodiversity conservation. Just under one third (30%) of the respondents would plant any type of trees and 16% would plant indigenous trees. Avoiding cutting “raincalling trees” was mentioned and 10% would avoid cutting trees in general. As a rule “if you cut one, plant two” was highlighted. A few people would enhance biodiversity by planting more exotic trees, like *Grevillea robusta, Cupressus* spp. and fruit trees and suggested that exotic trees should not be cut, because they attract variety of animal species. Also the introduction of new breeds of animals was thought to conserve biodiversity. On the other hand some mentioned that removal of exotic trees, avoiding burning of bushes and forests, enhancing insect businesses

and improving planting techniques on the field system as well as rehabilitating forests by planting nursery seedlings could add to biodiversity.

Species for firewood, charcoal and food

Twentysix species for firewood and charcoal were mentioned: *Juniperus procera* (Hochst. ex Endl.), *Grevillea robusta*, *Acacia seyal, Rhus vulgaris* (Meikle) *Ekebergia capensis, Eucalyptus saligna, Hoslundia opposita* (Vahl), *Acacia mearnsii, Prunus Africana, Myrica salicifolia, Nuxia congesta, Cupressus lusitanica, Albizia gummifera, Maesopsis eminii, Millettia oblate are used primarily for firewood and Acacia mellifera*, *Acacia polycanta*, and *Combretum molle* for charcoal. Fruit and berries from the trees are both staple food and for sale, for example, Tamarindus *indica, Carica papaya* (L.), *Psidium guajava* (L.), *Morus alba* (L.) Bureau, *Syzygium cuminii*, *Maesopsis eminii*, *Passiflora edulis* (Sims).

Species and methods for soil and water management

Soil erosion and water quality are controlled on riverbanks by buffer zones and species like *Nuxia congesta, Ocotea usambarensis*, *Rapanea* sp. and *Maesopsis eminii*. On steep slopes, e.g. *Osyris lanceolata* is suitable. The leaves of *Ficus sycomorus, Prunus Africana and* vegetable pepper, mulching, cow manure, ash (*mando*), and *Nginga* weed are used for soil fertilizing. Terracing, trenches (see Figure 10) and ridges facilitate drainage and control runoff. *Mkua*- stone walls and bamboo- pipes direct irrigation.

Historical farm transect portrays the change of preferred tree species

This list (see Table 20) of species describes the transformation of woody vegetation on farms under study over the last 50 years. It also reflects the level of ecological knowledge inherited by the respondents. The bigger font in the table also indicates the most frequently mentioned species. Percentages in the text refer to the amount of farms on which the species are or have existed.

50 years ago:

Nineteen respondents were not aware of how their plot looked 50 years ago or what used to grow there. Either they had moved there more recently or they had not learned from their parents. Twelve respondents described the areas as being either forested with indigenous trees or bushy woodlands, which they had, before settling there.

Out of those farms with owner´s recollection of species composition, *Nuxia congesta* (48%), *Ficus thonongii* (39%), Eucalyptus sp. (39%), *Terminalia brownii* (Fresen.) (26%), *Prunus africana* (23%), *Ficus sycomorus* (23%), *Erythrina abyssinica* (13%) and *Ocotea usambarensis* (13%), were mentioned most frequently existing on farms 50 years ago. In total 39 tree species were mentioned, although, most of them (64%) only on one to four farms.

Table 20. Historical farm tree transect (N=50).

Species on farms 50 years ago	20 years ago	Presently	In the future
Nuxia congesta, Ficus thonningii, Prunus Africana, Ficus sycomorus, Albizia gummifera, Terminalia brownie, Erythrina abyssinica	*Grevillea robusta, Eucalyptus spp., Nuxia congesta, Ficus thonningii, Acacia mearnsii, Cupressus lusitanica*	*Grevillea robusta, Mangifera indica, Nuxia congesta, Eucalyptus spp, Cupressus lusitanica , Acacia mearnsii, Macadamia tetraphylla*	*Grevillea robusta, Eucalyptus spp, Cupressus lusitanica, Nuxia congesta, Macadamia tetraphylla, Persea Americana, Ficus thonningii, Juniperus procera, Prunus Africana*
Maesa lanceolata, Cussonia spicata Acacia mellifera, Mangifera indica, Tabernaemontana stapfiana, Eucalyptus spp, *Ficus lutea, Ocotea usambarensis, Syzygium cuminii, Acacia mearnsii, Pinus patula, Commiphora eminii, Ekebergia capensis, Maesopsis eminii, Dodonaea viscosa, Myrica salicifolia,Combretum molle, Lannea rivae, Acacia polycanta, Rapanea melanophloeos, Acacia seyal*	*Persea americana, Mangifera indica, Phoenix reclinata, Ocotea usambarensis, Ficus sycomorus, Pinus patula, Erythrina abyssinica, Albizia gummifera, Eucalyptus* sp., *Lannea stuhlmannii, Tabernaemontana stapfiana, Acacia mellifera, Eriobotrya japonica, Macadamia tetraphylla, Hoslundia opposite, Lantana camara, Syzygium guineense, Croton megalocarpus, Maesa lanceolata, Rhus vulgaris, Calliandra calothyrsus, Psidium guajava, Morus alba, Syzygium cuminii, Terminalia brownii, Dodonaea viscosa, Myrica salicifolia, Maesopsis eminii, Cussonia spicata*	*Ficus thonningii, Terminalia brownii, Maesopsis eminii, Millettia oblata, Eucalyptus* spp., *Ficus sycomorus, Commiphora eminii, Prunus africana, Albizia gummifera, Persea americana, Erythrina abyssinica, Juniperus procera, Maesa lanceolata, Dodonaea viscosa, Eriobotrya japonica, Psidium guajava, Syzygium guineense, Croton megalocarpus, Citrus limon, Syzygium cuminii, Carica papaya, Passiflora edulis, Phoenix reclinata, Tamarindus indica, Podocarpus usambarensis, Morus alba, Ficus lutea, Lannea rivae, Calliandra calothyrsu, Bougainvillea, Catha edulis, Aberia caffra, Ensete ventricosum*	*Ficus sycomorus, Croton megalocarpus, Eucalyptus* sp.,*Citrus spp., Carica papaya, Ocotea usambarensis, Mangifera indica, Podocarpus latifolius, Catha edulis, Melia volkensii, Erythrina abyssinica, Cassia abbreviata, Passiflora edulis, Dombeya rotundifolia, Combretum molle, Rapanea melanophloeos, Juniperus procera, Osyris lanceolata, Myrica salicifolia, Millettia oblata*
Scientific name not known: Chusu, Porozi, Mtelele,Vighoi, Merezi, Mndana, Mrima	Scientific name not known: Msimamongo, Mboi, Mwojhowujho		Scientific name not known: Mahogany, Kidjo, Msunduru

20 years ago:

The awareness about farm species twenty years ago was less hazey than about 50 years ago. *Grevillea robusta* (40%), *Eucalyptus* sp. (36%), *Nuxia congesta* (28%), *Acacia mearnsii* (22%), *Ficus thoningii* (22%) and *Cupressus lusitanica* (20%) were mentioned most frequently growing on farms 20 years ago. In total 44 tree species were mentioned, out of which 70% only one to four times. The introduction and adaptation of exotic agroforestry species like Grevillea, *Acacia mearnsii* and Cypress can be seen clearly. Eucalyptus was introduced to moist areas for drying up soil for agricultural purposes and as it´s usefulness as timber was acknowledged it spread to many farms and community forests whether it was suitable for the physical conditions of the place or not. I was told how in the 1970´s to 1980´s education started to be more efficient in means of best practices in agroforestry and how before that the knowledge was kept only by a few village elders. Modern forest management practices became a topic of barazas more often, and district and local level government officers gave out information about the importance of water catchment areas and recommended tree species, often accompanied by representators of non-governmental organizations. Agroforestry innovations spread at a different speed throughout Taita Hills, but by the mid 1980´s Eucalyptus, Pine, Grevillea and Cypress were all well known and growing widely. While most of the plots visited had a history of clearing the area of indigenous forest or woodland into farmland, some had gone through conversion from dry bushland into plantation forest. The area reaching from Choke to Mbololo forest, i.e. Paranga-Ronge-Mwambirwa region, which was used traditionally as a vast community grazing area, is a case in point.

A general opinion from our respondents was that the total number of trees on plots decreased when compared with the situation 50 years ago. Many considered that indigenous trees were quite eagerly cut in the early 1980´s to make space for fast growing exotic species. This was enhanced by the introduction of power saw into the area and the rising market prize of timber in the 1990´s.

Presently:

Grevillea robusta (74%), *Persea americana* (46%), *Nuxia congesta* (40%), *Cupressus lusitanica* (34%), *Eucalyptus* sp. (38%), *Acacia mearnsii* (28%), *Mangifera indica* (28%) and *Macadamia tetraphylla* (24%) are presently most frequent tree species on the farms studied. In total 48 species were mentioned, out of which eleven are fruit or nut trees; Macadamias, Mangos, Guavas and Oranges being most common. All in all, more commercial woody food crops are grown today than 20 or 50 years ago.

In the future:

Increasing timber and firewood trees on farms is the future vision for most of the households. Nearly one third of farmers wish to add exotic species like *Grevillea robusta, Eucalyptus* spp., *Cupressus lusitanica* and *Macadamia tetraphylla*, whereas 28% wants to add only indigenous trees, like the *Nuxia congesta*, *Ficus thoningii*, *Terminalia brownii* and *Prunus africana*. The rest consider mixing exotic and indigenous as the best way forward. The role

of timber trees as future assets in hardship situations was also emphasized. Only one person would not have any trees on their farm. 74% of respondets expressed their will to increase the number of trees, whereas 12% plan to let the farm stay as it is. 10% stated strongly that Eucalyptus, Cypress and *Acacia mearnsii* "*make their land barren through glue poisoning the ground and Eucalyptus roots taking too much water*". There was a growing desire for more fruit production, like *Persea americana, Mangifera indica, Passiflora edulis and Citrus* spp. Many farmers were also very keen to learn about new species. In total 34 species were mentioned.

Tree management as a joint activity in households

It seems that the technical planning of a farm is gender related and in many households, the man's task. Other phases of tree management; choosing species, acquiring seedlings, planting, management during growth and decision to fell, were not so clearly gender related, since husband and wife both conduct the tasks and take along children and their grandparents (see Table 21). Forest officers had been consulted in a few households when choosing species and for gaining new management knowledge. However, several respondents (22%) emphasized the official procedure of applying for permission and consulting a forest extension officer for cutting trees. Many "others" also take part in different tasks; relatives, neighbours and wage- labour help out in tree management.

Table 21. Distribution of tree management tasks in households.

Number of households naming the primary stakeholder for task (N=50)						
Primary stakeholder	Technical planning	Choosing species	Acquiring seedlings	Planting	Management during growth	Decision on felling trees
Husband	18	9	10	6	7	11
Wife		9	6		4	4
All members of the family	6	7	15	20	17	8
Husband and wife together		7	5	6	4	7
Together with an officer		3	5	3	3	5
Men in the family	6					4
Women in the family	6					
Grandfather	3					
All adults				3	3	
Others (wage-labour, other relatives)	11	15	9	12	12	11

In most of the households, the farm tree management skills were learned from own parents (66%), elementary school (68%) and forest officers (64%). The grandparents had taught skills too, but to a lesser extent (52%). Friends and neighbours had shared information about management practices in 40% of the households. Non-governmental Organisations (Greenbelt Movement), Danida and KEFRI as well as community groups, were considered as knowledge sources by 22% of interviewees. A few respondents had been educated in a farming school and a few mentioned the Farmer´s field school system as important source for updated knowledge. This is a system whereby selected community members get trained by experts at an agricultural centre and then spread the knowledge through local settings to the colleague farmers.

Tree management as a joint activity in the community

Out of our 50 farmers 17 were participating in community forest management. The activities included: planting trees in forests, a merry-go-round system in tree management, and raising seedlings in group and private nurseries. We also discussed the boundaries of gazzetted and community forests, whereby the majority of respondents knew exactly where boundaries

were. Their knowledge derives from their own experiences, from authorities, like forest guards, clan elders and distinct boundary markings. However, 14 farmers did not know where the boundaries were situated and 6 knew only approximately.

7.1.10. Applicability of existing TEK according to the farmers

I wanted to know whether my respondents thought that there exists traditional knowledge in their community to be used more in natural resource management. 72% thought it does exist, whereas the rest did not. Some compared themselves to the others and considered that even if they themselves knew some things, others knew more. The types of knowledge mentioned included land management through choosing soil friendly tree species, fighi religion and taboos, medicinal plants and natural pesticides and herbicides. Those who denied the existence of traditional knowledge thought that *"only the wazees have the knowledge"*. Traditional methods nowadays also face prejudices: *"Especially the older know more than me. They use more supersticious means. Other people question these methods often. Village elder tells: "You´ll die next night, if you cut this tree", but the others respond: "let me see if I die!" If he doesn´t die, it proves the storie untrue"* (male 39 years). According to some traditional knowledge is decreasing because people adapt modern technologies since they are perceived to be easier. If modern techniques are too expensive, though, people are left with the older ones. For example instead of using piped water and chemical fertilizers, one uses the water retention, cow dung and fertilizing indigenous trees.

Domestication of forest trees

I requested whether it was possible to find useful, indigenous plant and tree species from forests and grow them on the farm. Some explained that it is impossible to extract anything from the gazetted forests. Six farmers said that they were satisfied with the species they have. Six other farmers knew of some useful species, but did not remember their names; while seven had no idea of such species. The listed plant and tree species were as follows: *Bidens pilosa* (L.), *Iwurugho*[13] and *Uthunga*[14], *Ficus sycomorus*, *Prunus africana*, *Nuxia congesta*, *Azadirachta indica*, *Kishatu*[15], *Ocotea usambarensis*, *Commiphora* sp., *Ficus thoningii*, *Syzygium guineense* (DC.) Guill. & Perr). *Lannea stuhlmannii* (Engl.) Eyles), *Erythrina abyssinica* and *Maesa lanceolata*. The benefits include medicines, timber, firewood and ecological services like water retention, soil erosion control and rain attraction.

Indigenous species with good market value

I further asked about indigenous tree species that have a big market value. *Prunus africana*, *Nuxia congesta*, *Ficus sycomorus* and *Albizia gummifera* were mentioned most frequently. These species are valuable for their timber and firewood and bark of *Prunus africana* can be sold by $2/kg (2007 price). Other valuable species mentioned were *Ficus thonningii* for firewood and medicine and *Newtonia buchananii*, *Melia volkensii*, *Syzygium guineese*,

[13] Vernacular species name
[14] Vernacular species name
[15] Vernacular species name

Strombosia scheffleri and *Maesopsis eminii* for timber. *Acacia mellifera* (Benth.), *Maesa lanceolata* and *Ocotea usambarensis* have potential market value as firewood or charcoal. The best revenue on the market may be gained from timber, secondly from the sale of medicines and thirdly from the sale of tree seedlings. A few respondests explained that it was difficult to get permission to lumber indigenous species whether they were on their own land or in community forests. Permissions from the forest office are given primarily for felling exotic, fast growing trees followed by control visits of an extension officer. A black market also exists and lures some people to lumber illegally in both community and government forests.

Some of the respondents also mentioned non-native species which have been more recently introduced to the area. They seemed to have difficulties to distinguish between indigenous and exotic species. On the other hand some respondents knew very clearly the difference between "Taita trees" and those "brought by the whites". Most commonly mentioned were *Acacia mearnsii* for firewood, timber and shoe polish tan, *Azadirachta indica* for medicine and charcoal, *Eucalyptus* spp. and *Pinus patula* for timber.

Use patterns of traditional medicines in Taita households

We also discussed forest products and it appeared that 58% of the respondents use medicines from nature (see Table 22). This is due to various reasons, one being poverty, since the medication from the forest is free of charge. Even when consulting a herbalist, the costs are often lower than in a pharmacy. Many people also perceive that natural medicines are more efficient, and heal with less side-effects. The attitudes towards communal health care can be quite critical: "*Natural medicines have no side effects like pharmacy products. Sometimes hospitals give wrong diagnosis and wrong medicines"* (female 42 years).

Some said that they use the medicinal plants for religious purposes, like rituals and worshipping. There are still herbalists and medicine men who practice their traditional occupations and give people instructions on specific use of local medicines. As a testament to their professionalism acknowledged herbalists have acquired a licence from the District administration. However, the attitudes towards traditional healing vary, some considering it pagan or related to witchcraft with some valuing and truly believing in its positive effects. One of the interviewees expressed her belief in traditional medicines in the following way: "*Indigenous trees are still believed to have medicinal value. Only pharmacies made people ignorant. At some point we were told that indigenous trees are evil and devil. Only today we know that they truly have medicinal value"* (female 49 years). In the next household we were told that the family does not use either traditional or western medicines, but believes that through prayers God will heal them. In many homesteads the respondents considered it important to emphasize that they are firmly faithful Christians whether they were users of traditional medicines or not. A few who got all their medicine from the pharmacy commented that they are safer. Some of those mixing traditional and western medicines take traditional ones only in the case of an emergency. This is also related to lack of financial resources and to situations where western medicines were considered less effective.

Out of all traditional medicine users, 20 used them for all family members, whereas nine treated only themselves. One reason for avoiding treatment for family members is weak knowledge about the right dosage for children. Some use it for family only as first aid before getting to a pharmacy. Using their knowledge of herbs, 12% of respondents operate small scale medicine businesses to help local people, whereas 10% used traditional medicines for spiritual purposes. According to one respondent: "*They bring good luck, chasing away bad luck. They protect. They are secret, over 10 species, which we use in sacred places. They grow in forests and if you plant those on the field, they won´t work effectively*" (male 57 years).

Table 22. Use of traditional medicines in Taita households.

Number of respondents N= 50	%	Use patterns of medicines
0	0	rely 100% on natural medicines
11	22	more than 50% from nature
5	10	50/50
13	26	less that 50% from nature
19	38	gets all medicine from pharmacy
2	4	are not using any medication

7.1.11. Patterns of traditional knowledge inheritance

I asked my interviewees whether they had inherited traditional knowledge from ancestors, to pass on to the next generation. Thirtyseven declared to have something to share, out of which twenty-four had a lot to share and thirteen only little knowledge. I also asked them to mark on a scale from 1 to 10 which value would best describe their level of knowledge compared to all the traditional knowledge available. The average value from my 50 respondents was 3.6; 0.5 being the smallest and 9.99 the highest given value. A lady (42 years) described the knowledge transfer system and its importance in the following way: "*Yes, I am going to tell my children. The experts are there to know. The common man is not supposed to know so much and the experts are not supposed to tell secret things. These experts are still selected by the village elders. Although it is decreasing compared with the old days. Ancestor knowledge is for example not cutting big indigenous trees, because used for conducting rituals. But only experts know exactly how. One boy tried to cut two years ago a branch from that tree and was very badly injured. After investigations they discovered, that this boy didn´t know about the tradition. That is why it is important to tell children.*"

Parents consider that it is often difficult to teach traditions to their children due to generational gaps and children´s lack of motivation towards the "old things". Some parents

have already given up and state that they shall teach their children only if they ask for it. Many also feel that they don´t know enough to tell their children. The usefulness of traditional knowledge clearly divides opinions, especially when it comes to fighis and rites: "*Fighis are not useful anymore, so it is not worth telling my children about them. I was already used to modern facilities. Reviving those Fighi things is accuward"* (female 36 years). Or: *"Yes, I know more than others around here about traditions and magic. It is good to know about these things, because they really help! For example in protection of land, people, property, conflicts, drought and enemies"* (male 42 years).

The types of traditional knowledge parents have shared or are planning to share with their offsprings vary from spiritual and societal knowledge to environmental knowledge. The following topics were listed: Stories, myths, local lifestyles, fighi systems, traditions and magic concerning protection of land, people and property; places out of bounds unless for sacrificing something; shrines, prayers for gods, prayers for rains and cleansing; skull caves, sesos and initaitation rituals. Seedling raising and crop rotation practices, value of local trees in land management i.e. soil conservation and rule not to cut big, indegeous trees, because used for conducting rituals.

Grandparents had taught 17 of the respondents about indigenous species whereas 14 mentioned their parents. There were nine persons who had never learned about indigenous varieties and six of those who learned only through their own experiences. A majority (35) of knowledge sources mentioned were from people within the family whereas minority 13 was from outside (officers, school, groups, and neighbours). One respondent also mentioned elders as a source.

Traditional institutions

We talked about traditional institutions and to what extent they are still working in Taita Hills - 26 denied this. The remaining 24 answers can be categorised into five groups. The first group explained that there are traditionalists and institutions in Taita, but nowhere close by their place of residence: *"There are some traditional groups still deep in that religion, but not close here"* (female 32 years), and *"I heard there are some rainmakers, but have not seen them"* (male 60 years). One reason for few traditionalists in the area was said to be shortage of land: *"Most medicine men and sorcery experts ran to Nyikas (lowlands), because there is a conflict over land between inlaws and new generation"* (male 48 years).

The second, "We have them here"- group spoke more proudlyof medicine men and witch-doctors, their magical capacities and rituals, like rainmaking and burial procedures, as being necessary from time to time. Some of the gate fighis are still considered to be effective and protective. Traditional laws and measures were taken into use, especially for unsolved issues according to contemporary rules: *"The old men respect and use the fighis. Some old men were fighting over some land plot and they eventually solved the case through a traditional practice of goat´s intestine analysis"* (female 36 years). Dancing traditional dances and drumming is still common on weekends.

The third group suggested that the traditional institutions were here before, but are nowadays all lost. They existed before independence and those times "*when eldermen used to blow trumpet for calling rain"*. Some stated that even if some group of traditionalists or fighis would still exist, they would not have any powers left.

The fourth category of respondents took the view that the expert traditionalists are scattered and work mostly individually nowadays, instead of meeting in groups and taking decisions within the board of elders.

Figure 30. Herbalist, Mzee Mwairo used to know the herbs on his field and in the surrounding forests. "*The challenge lies in knowledge transfer to the next generations"* (*In Memoriam*) (photo by Himberg 2007).

The fifth category was comprised of people who represent the "come-back of traditions". They know someone or are themselves involved in cultural revival projects. For example *Kishavi*-group, which was started in late 2008 encourages traditions, and states calling back the spiritual powers as their mission. A 22-year-old man explained to me: *"Most people are willing to adapt, some are scared though. We believe that old men are dying and the traditions should be preserved. We have 30 group members, both male and female. Wazees (old, respected men) are teaching us. Most of us are 20 to 35 years old."* Another group I was informed about was *Thimas,* in the Mbale area, who are striving to revive and teach traditional housing and tool making skills as well as Taita cooking.

The tools used for studing traditional ecological knowledge varied and they differed on some parts with experts and the common taitas; for instance, different questionnaires were used (see Appendix 9 and page 31) and the contexts were also different. Most of the information with experts was collected while visiting the traditionally protected sites, whereas the household interviews took place at peoples´ homesteads or on their farms. Thus, the results reflect the resource use area that the respondent is most familiar with, although the division is not so clear. The common people did have knowledge about the resourses from sacred and other forests. Similarly the experts shared their comprehensive knowledge about resource use. Some tendencies may be distinguished from the data, while looking at the acknowledged species lists (Appendices 1 to 4). Household interviewees listed 73 ethnomedicinal and 41 ethnoveterinary plant species, while the experts came up with 160 and 23 species respectively. This may be partly explained by the fact that some of the experts were herbalists or medicine men by profession and specialized in human health. However, out of the 73 species for human medication, indicated by the household interviewees, 34 overlapped with those of the experts. The species for rituals were mastered by the experts and as the other data also shows, that type of "secret knowledge" is, according to tradition, supposed to be kept exclusively by them. The species listed in this study are permitted for publishing since, according to the informants, it is still general information and for these plant components to become effective more detailed knowledge about dosages, mixtures and higher powers would be required.

The farmers again seem to master the knowledge of useful species in soil and water management as well as pest management. Both farmers and experts had detailed information about species use for construction purposes, and the experts stood out with a list of 71 species for traditional technical solutions, ranging from leather tanning to methods for attracting bees into beehives.

7.1.12. Ethno is often not efficient enough

The household tree use patterns showed the importance of multipurpose character of species. The majority of trees on farms were multipurposal and suitable for intercropping and half of them were also indigenous. Crucial products gained were timber, construction material, firewood, medicines and fruits. Environmental services included water retention, fertilizing, nitrogen fixing and rain attraction. All in all, more commercial woody food crops are grown today than 20 or 50 years ago. In most of the households, the farm tree management skills were learned from parents, elementary school and forest officers. The grandparents had taught skills too, but to a lesser extent. The knowledge sources thus had been both official and inofficial as well as traditional and scientific. The majority of people were not familiar with the concept of biodiversity. In the meantime, practical means and measures enhancing biodiversity were known and applied. However, for most Taitas the biodiversity values (i.e. those acknowledged by the scientific community) of the indigenous forests and their endemic species were not known. From a local individual point of view, it was difficult to perceive the values of forest products as part of a larger, worldly initiative. When it came to

traditional knowledge the level of self-respect was rather low. In many households informants compared themselves to the other villagers and considered that even if they themselves knew some things, others knew more.

The indigenous trees with the highest market values were, according to farmers - *Prunus africana*, *Nuxia congesta*, *Ficus sycomorus* and *Albizia gummifera*. The most frequently trees grown on farms also included exotic trees, namely; Grevillea, *Mangifera indica*, *Eucalyptus saligna*, *Cupressus lusitanica*, *Acacia mearnsii*, *Macadamia tetraphylla* and *Ficus thonningii*. The best revenue on the market can be gained from timber, secondly from the sale of medicines and thirdly from the sale of tree seedlings.There is more demand than supply for indigenous tree seedlings in Taita despite the issue that "Taita trees" are perceived to be slow growing thus not desirable for timber production. This perception also lingers in people´s minds. The traditionally protected trees are not managed like the modern ones to maximize their growth and it appears that native species in general are left to grow naturally without hastening procedures like pruning. Their timber potential has not been taken into serious consideration. Before a sustainable ratio of indigenous and other trees exists, exraction of biodiversity supporting species is not either a recommended practice.

Whereas the tradition experts stated that they primarily count on the old techniques and methods in natural resource management, the common Taitas generally considered up-to-date techniques more efficient and desirable. Due to often higher costs of modern methods, people felt sometimes forced to apply the traditional ones.However, despite the preference of for example agro-chemicals, some farmers also expressed their worry about potential long term hazards of these products and pondered whether they should turnto using the 'good old' organic methods despite the risk of gaining lower yields.

7.1.13. TEK and fighis exist, but 'not in my backyard'

One of my main findings is that there was an extensive body of traditional knowledge sustained by the Taita eldermen and women though the number of those most knowledgeable traditionalists has become very low. The majority of common people estimate their traditional ecological knowledge and skills to be mediocre "low" but still many are willing to pass it to the next generations, they are doubtful whether their input is enough to make any difference. The traditionalists, however, are proud of their knowledge and certain of its important impacts upon society. Thus, there are heterogenous ways of knowing and valuing in Taita Hills. Due to this heterogeneity, people were careful in giving statements about their world views and knowledge. It was common that the interviewees lifted themselves above the issues discussed as if they were looking at the Taita Ritual Complex happening without being part of it themselves. One example was when we discussed the existence of traditional institutions and some assumed an air of "not in my backyard" stating that traditional activities exist, but nowhere close to their milieus. Further important findings include the patterns and the roles of traditionally protected forests and sites in the landscape matrix. The physical pattern is denser than what meets the eye and rather few people live in areas with no TPF/S. In most cases however, a by-passer is not aware of the symbolical and spiritual essence of the sites on the landscape.

7.1.14. Three spheres embodying Taita tradition

The traditionally protected forests and sites can be considered as relicts and manifestations of the earlier prevailing and presently marginalized Taita ritual complex. TRC is embedded in the vast sphere of traditional ecological knowledge of the Wadawidas as illustrated in the Figure 31 below.

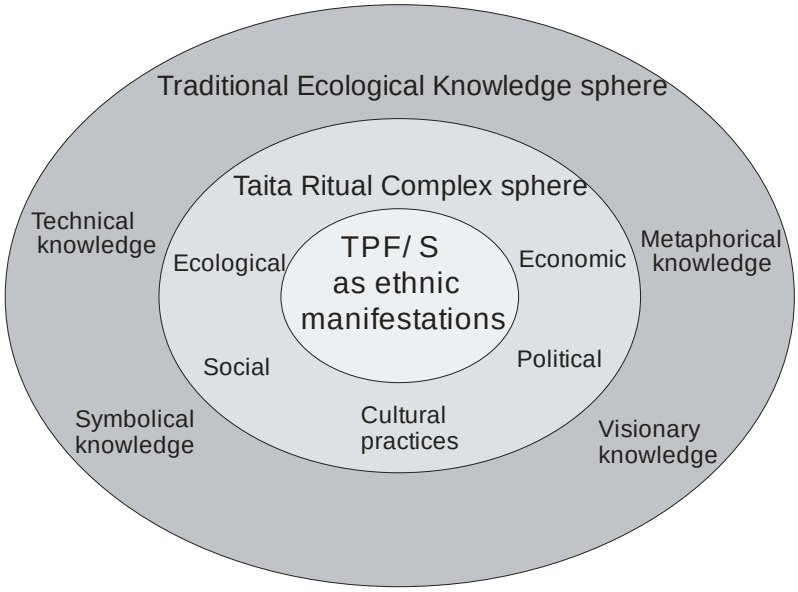

Figure 31. The three spheres embodying Taita traditions.

7.2. Seeking out the boundaries of integrity and conservation

In the following chapters I strive to find answers to my research question "How are the boundaries of integrity and conservation defined?" The results introduce perceptions of various informants including members of community-based organizations, officers, priests, village elders, other villagers and traditionalists.

7.2.1. The process of getting used to the idea of participatory forest management in the Taita Hills

Community-based organizations´ perceptions of forest values

Two focus groups consisting of local people engaged in forest management and conservation participated in the forest value-mapping sessions in Ngangao (on February 24th, 2006) and in Chawia (on February 15th, 2006). A participatory management plan for Ngango forest had already been drafted and one for Chawia forest was in preparation. The participants were people living adjacent to the government forest reserves and concerned about their status and management options. The goal of these excercises was to brainstorm to learn about various forest values. The participants were asked to come up with specific valued elements within their forest environments; name, and weight, and then prioritize them. Weighting and prioritizing was done using pairwise ranking whereby the elements were placed into a matrix pairwise and voted against one other.

The results of Ngangao area (see Table 23) show that ecological services like athmosphere balancing, rain calling and water catchment scored highest with the forest reserve status on top. The forest as a place for learning about the environment and as a means for income through ecotourism was considered important. Water, herbs and honey were the highest rated tangible products from forest. Also wage employment through forest activities had been established. Non-tangible benefits like leisure and spiritual use of the forest were acknowledged even if outranked by the environmental services above. Firewood did not score high, since its collection was very restricted and the option for timber harvesting was only deemed to be an interim measure connected to future rehabilitation schemes.

In Chawia the environmental services of the forest also scored highest and the conservation and rehabilititation for future generations was emphasized (see Table 24). Participants´ own efforts as managers of tree nurseries and planters of seedlings in the forest, was included in the list. The marginal opportunities for fetching dead branches for firewood was appreciated and the collection of fruits and honey was said to be trivial. Butterfly farming was only taking baby-steps in 2006 and the idea of ecotourism still seemed new and blurred. The cultural and spiritual values (e.g. sacred sites) were acknowledged, but only a few in the group came forward as being active in these areas. It was more referred to as older generation´s duty.

Table 23. TANACOP (Taita Nature and Conservation Project) priorities for Ngangao forest management in 2006.

Pair-wise ranking scores	
1. Forest reserve	270
2. Atmosphere balance	233
3. Rain calling	224
4. Water catchment	210
5. Education	209
6. Water yields	197
7. Ecotourism	154
8. Herbs	134
9. Employment	120
10. Bee-keeping	110
11. Cultural and spiritual values	69
12. Firewood	66
13. Leisure	62
14. Timber	59
15. Grass	29
16. Stones	27

Table 24. Chawia Environment Group´s priorities in 2006.

Pair-wise ranking scores	
1. Atmosphere balance	344
2. Rain calling	325
3. Water catchment	300
4. Tree nurseries	275
5. Rehabilitation	246
6. Soil erosion prevention	223
7. Firewood	172
8. Timber	145
9. Fruits	142
10. Bee-keeping	129
11. Sericulture	116
12. Cultural and spiritual values	68
13. Ecotourism	56
14. Not measurable values	39
15. Aesthetic values	25

Ignorance of the contents of Forest Act 2005

I conducted interviews and Venn diagramming with local farmers adjacent to Chawia and Ngangao forests in 57 households in 2006 to find out who they consider important stakeholders in forest and tree management issues. The magnitude of importance was

expressed on the diagram on a three-level scale and the closeness on six-level range. The positive and negative quality of the actor was expressed by white and blackshades. It became obvious that the forest office and the agricultural office play a big role in the lives of the farmers. Information spread out through village meetings was effective and inputs from the higher level expected. People also expect material resources, e.g. seedlings, from Government to be handed out. Additional outside assistance for resource management has come from non-governmental organizations like Green Belt Movement and Plan International. At the beginning of 2006 when the Forest Act was still awaiting for its implementation, the interviewees' awareness about the participatory aspect of the law was still weak. They understood that the new system would emphasize the conservation of forests, but not many were able to perceive their own role in it. Common perceptions of the new law was that it shall force people to conserve. The next level of outside forces included God who is believed to bring rain and climate change. The results gave a strong impression that people perceived outside forces as determining their future.

In the Chawia area (N=20), in total 26 stakeholders were mentioned in positive context and 8 in a negative context. At the time, the very recently established Forest Act scored first both in positive importance and closeness. Agricultural officer scored second and local residents and area Chief third. Other important stakeholders who people felt they could easy approach were the East African Wildlife Society and Wangari Mathai (Green Belt Movement and a Nobel laureate). Some did not know how the Forest Act would eventually affect them, but felt that it would bring about a big change. Some were aware of the participatory approach of the law and considered it as a welcome change. Negative feedback was sent to the then area Councelor and area MP (Member of the Parliament) who was blamed for not taking forest management issues seriously or even presenting them in the Parliament. Fellow local people appeared also in the negative context, since some appear to ignore replanting and cut trees illegally.

In Ngangao (N=37), 17 actors were listed in a positive context and 5 actors in a negative context. The agricultural officer and community-based organizations were considered the closest and most important actors to forest management. Also the area Chief and District Forest Officer scored high. The Forest Act was perceived to be less important when compared Ngangao people with the Chawia. More prejudices were targeted towards the new Act. The respondents emphasized their own community group effort, like tree nurseries, and on the other hand blamed some community members for not being responsible enough in resource management. Government institutions got negative feedback from not being actively fighting the problem of human-wildlife conflict on forest margins. Additional stakeholders, with minor influence, mentioned in the diagrams included the following: Kenya Wildlife Service, Iombonyi institution, Cross-border Biodiversity Project, Group Men, old people in general, Nyiota, Sub-Chief, Women finance group, Ministry of water, Muameni group, FDA (watershed management projects), KRA, Danida, Plan International, agribusiness members, District Forest Officer, Kwanjiro water project, forest guards, Provincial administrator and schools.

We officers need to educate people

In an interview the District Forest Officer (DFO) (2007) perceived that Taita people learn easily about what the government and its departments are doing and follow whether it is good or bad in a long run. People take heed of authorities´ actions. When industrial forestry was the policy, and Eucalyptuses, Pines and Cypresses were introduced in Taita Hills for plantations, farmers also copied the idea on their farms. Similarly, the officer sees that when people are shown examples with indigenous trees, they adapt the ideas. At the Kenya Forest Service, tree nurseries exotic seedlings have been phased out gradually and the indigenous variety offered instead. *"Sometimes you find people doing illegal activities, who do not know the value of the vegetation. So the first step is to educate people."*

According to the DFO (2007) people are lacking knowledge about the possibilities of optimizing indigenous species growth. For example *Prunus africana* and *Melia volkensii* (Gürke) offer good quality timber and grow rapidly when weeded and pruned. People are adviced to plant indigenous trees, but many say it takes too much time and the challenge is to make them think in the long term. Even if the indigenous trees are rarely harvested, they are left in the shadows of the exotic ones; both literally and in terms of management, many seem to consider, that only non-native trees need and benefit from pruning and other measures and that local trees can cope on their own. Lack of well documented information about the management of indigenous trees is said to be one of the reasons why people neglect them. Whenever there is some new knowledge available, people do get interested. For instance, villagers were flocking around the forest department office to learn about the catchment value of Sandalwood (*Santalum* sp. (L). However, research results tend to take longer when it comes to trees compared with agricultural crops. The responsibility on knowledge production in large scale is on Kenya Forest Research Institute, KEFRI.

Education is adapted by the Kenya Forest Service as the protection method outside the gazetted forests. In cases where culturally important area is under threat on county council land and the conservation means are not sufficient enough, the Forest Service sometimes takes over. Officers remind people about the sacredness of forest patches and the consequences, like bad omen, believed to take place if they are damaged. This usually makes older people worried and others are reminded about the legalities concerning cultural historical sites. Youth is said to be the most difficult to convince about the value of these sites. As the DFO put it:"*Different generations need different tools"*. A simple example he uses in village meetings is comparing forests to a sponge holding a lot of water and releasing that water slowly into streams. By reducing the sponge one reduces the volume of water. If the officer has two older men in the audience, one with thick hair and other bold shaved, he shall ask, which one will retain more water poured from a bowl over their heads and then add; *Let´s not shave our forests!*

The youth is easier to approach straight forward with resource management education since their knowledge base from school is of the scientific kind. They adapt for example recommendations for tree species on farms, but say that it is not enough that he or she knows, as long as the father, head of the family does not know. Officers suggest to pass the

knowledge to the parents, but there is a traditional setup hindering the knowledge flow upwards to the elder member of the family. The *mzee* should know better, not the other way around. However, one is able to acknowledge the transformation of the pattern of decision making power between men and women in farm and household issues. Women´s importance in household maintenance and agriculture is acknowledged throughout this study. It has always been undeniable, but due to increased need for off- farm income generation, even more responsibility and workload lies on the female while the male head of the family often stays outside the village or outside Taita working.*"Unfortunately, within a very traditional cultural setting, women are pushed aside in Kenya. But this is dying a natural death very soon. There has been a lot of lobbying by ladies – whether men want it or not. I assume unequality is one reason why we are lagging behind. Some traditions are good, but without women in major decision making we will not progress"* (DFO, male officer 2007).

According to the DFO when it comes to indigenous forests there are sustainability aspects that the residents living adjacent to the forest would need to learn to understand better. They value the forest for water catchment and rain attraction functions, but profound and detailed management skills are lacking. For example how to harvest timber and remove firewood in a sustainable way or how much bark one can remove from *Prunus africana* without killing the tree. The mentality of "mining", that had some space to develop during the last decades, needs to be changed. An illustrative example of the existing, but hibernating ecological knowledge, comes from a village meeting where an officer was explaining the concept of sustainability to the villagers and an elder man stood up telling: *"There used to be a tradition of piercing an artery of a cow and taking some blood. But one should not take more than one bowl of blood. If one took two or three bowls, the cow collapsed"*.

Community group dynamics sometimes causes groups to break or dysfunction. One reason according to DFO is inconsiderate management and use of financial resources. It has proved challenging to manage community groups where members engage themselves into activities with different level inputs. Educating people is challenging in Taita Hills due to jealousy and hierarchies within communities. There exists negative competition between farmers which creates tensions that hinders people learning from one other. This is partly political and partly about pursuing dominion. It is also one reason why community groups disintegrate from time to time. According to DFO these power dynamics are often kept in secrecy and it is difficult for the Government officers, who often originate from other parts of Kenya, to gain in-depth understanding of the communities. Furthermore, by the time the cultural understanding has grown, the officer is transferred to another area.

There exists a need for technology transfer in agriculture and agroforestry in Taita Hills. Farmer-to-farmer extension has been boosted with Farmers Field School-system, whereby an agricultural expert follows and instructs a farmer on his or her field through the whole cycle of crop production. Eventually, as the farmer has gained enough information, he or she will be certificated and allowed to train other farmers for a fee. Unfortunately, some space for jealousy is also left in this system; some farmers do not understand the concept and are not willing to pay the instructor since he or she got it for free in the first place. The DFO thinks that these kinds of reactions are partly due to the Government´s long time top-down

approach, which has made people reliant upon what Government commands and offers. Consequently, communities have become dormant, waiting for help from outside. However, some attitudes have changed and people are assisting themselves while waiting for external assistance, for example since the Community Trust Fund was established, applications have been pouring in and many small scale projects have taken off.

Presently, the use of both Government and private forests is controlled by Forest Department by guarding and licencing. According to the Forest Guard (2009) of Susu and Fururu forests, without this system the trees and forests would be in danger, because locals would lumber at damaging rates to support their own needs. He considered Taita people were not responsible enough to manage their forest resources by themselves.

The baby steps of the Forest Policy in 2007 - awareness and working without proper tools

A year after the Chawia and Ngangao areas household interviews further follow-up studies among people engaged in forest activities focused on benefits and constraints of participation in the conservation and management of Ngangao, Mbololo, Mwambirwa and Chawia forests. The main results are presented here, and more detailed description about them may be read in the article published earlier (see Himberg *et al.* 2009).

At the time of this study, the groups had yet to be granted their user rights and were prohibited from extracting any forest resources from the reserves. They were accorded only some rights and not yet fully-involved in different phases of the management process. They were, however, allowed to implement certain activities that eased the pressure on the forests and enhanced conservation. The specific activities included informing the Forest Service about unauthorized entry and general protection measures and information management like awareness creation and education among the local population. Ecosystem improvement activities, whereby some of the members were involved in raising indigenous tree seedlings for reforestation, supported forest enhancement, while income-generating activities such as bee-keeping, butterfly farming and sericulture, resin tapping and tree nursery business, represented alternative forest livelihoods. These offside activities can be seen as "software" for the people's immediate financial gain, which was modest in the absence of their rights to manage the forest resources in full scale. Some members are directly employed as guards, tour guides or research assistants. The latter two are new opportunities that have arisen from recognition of the threat to the forests despite their status as areas of biodiversity. Consequently, the constant presence and activity of tourists and scientists from international and national institutions in Taita Hills generate employment opportunities.

Out of the various forest conservation initiatives voluntary tree planting and tree nursery activities were the most frequent (40%). The possibility to get organized into groups, associations and committees including the responsibility taken for forest conservation was considered as an important recent developmental step. With regard to alternative forest based businesses, 56% had been exposed to such incentives. A few people mentioned increased education and growing awareness of conservation issues. Forest conservation and

rehabilitation was expected to contribute to increasing precipitation and reflect a traditional belief according to which forests "attract" rain. At the same time 28% of the respondents considered that forest related activities should generate income, and increased job opportunities were expected. A minority of 12% brought up their expectations of forest products as directly extracted benefits.

As looked at the motivating factors for participation the highest response was on the "will to conserve" at 52%, access to forest products at 46%, income at 36% and employment opportunity at 32%. Here employment referred to an appointed job given by an outsider person or institution, whereas income is the money earned from one's own efforts, such as with tree nursery management and beekeeping. Only 4% considered social prestige as a motivating factor. Further analysis by cross-tabulation to compare motivation preferences by gender showed significant differences between men and women (Chi square test); men considered employment ($p = 0.025$) and income source ($p = 0.007$) their main reasons for participation. Men also felt that social prestige motivated them, whereas this factor was not notably meaningful among the women. More men than women were gainfully employed and all types of jobs were more frequent among the respondents over 30 years old than those younger. The frequency of response on the question about tangible benefits showed that water resources elicited a response rate of (67%) and others included employment (45%), income from butterfly farming (40%) and ecotourism (37%). 14% of the respondents, reported deriving no tangible benefits from participation in forest conservation.

A correlation analysis was performed between the motivating factors and the benefits accrued. The total number of responses (N) was 852. The r was calculated as 0.047, and proved to be significantly higher than the computed r, which was 0.034 (in a two-tailed test with N = 852, $\alpha = 0.05$, $1/\sqrt{N}: = 1/\sqrt{852} = 0.034$). This indicates that correlation existed between the motivating factors and the benefits the people derive from participation. When the motivation factor "will to conserve" was cross-tabulated with the tangible benefit "water resources", a two-sided asymptotic significance of the chi-square statistic ($p = 0.044$) showed a relationship between the two. Other higher correlations were found for forest products and butterfly farming. The most preferred benefits for domestic use were water, medicinal plants and firewood.

Both men and women ranked water as the first forest product, but ranked subsequent products differently. The women ranked medicinal plants higher than firewood, whereas the men ranked firewood as the second most important item, followed by medicinal plants. Mushrooms and forest use for leisure were appreciated especially by women whereas men ranked timber fifth important.

Most commonly mentioned traditional practices in forest management were the following: use of herbs and medicinal plants (14%) and favouring of indigenous tree species (23%); knowledge of traditional methods in pest and disease control, fertilization and environmentally friendly tree species (14%). According to tradition, trees are planted after cutting and elected village elders supervise logging activities. There are traditional laws,

governing how trees should be cut and which ones should not be cut. Preferably only dead wood should be used. Technical knowledge and skills learned for conservation and management was common. The majority of respondents mentioned forest improvement skills (58%), like raising seedlings, planting indigenous rather than exotic species, water catchment area conservation, fire prevention, seed identification and collection from forests, use of traditional plants for pest control and soil erosion control. Those who had recently gained knowledge on the techniques of nursery building and management amounted to 12%. Less frequently mentioned was traditional knowledge and skills upon income generating activities (4%), like butterfly farming and bee-keeping.

Respondents had opinions on how the forest management system should be improved. Most frequent initiatives (24%) concerned more profound and extensive involvement of the various stakeholders. People would like to see more teaming up of non-governmental organizations, officers, area residents and religious leaders. The forest adjacent residents should be more widely involved and granted the authority as before to conserve the forests. "More widely" referred to the number of people and their different socio-economical backgrounds. The lower number of forest adjacent residents when compared with members of the organized groups had not gone unnoticed. Additionally, "as before" meant the period before establishment of forest reserves and had a strong sense of "our forest" in it. Transparency in conservation activities was also demanded. The transition of responsibility for forest conservation and management practices should ideally start from the communities upwards to government and then to other stakeholders. Some respondents (16%), however, felt the need for assistance in order to conduct their conservation work properly. This included capacity building in modern forest management skills, education on planning and management strategies and easier access to hands-on conservation inputs, like seedlings and fertilizers.

Efforts to conserve forests for ecological services, namely for water catchment and biodiversity maintenance were considered important. Sustainable future use of forest products, especially firewood and medicinal plants were emphasized. However, shortcomings, such as inadequate access to updated information about management practices and legal rights, hampered participation. The respondents viewed this as working without proper tools, which, they stated, may gradually lead to unsuccessful conservation efforts, and felt that the government still prohibits full community participation.

Fears, expectations and experiences of participation

To better understand the power dynamics of various stakeholders an institutional analysis exercise was conducted with the participatory forest management groups of Chawia, Ngangao and Mbololo-Mwambirwa. The results showed that the Forest Act, the Ministry of Forest and the implemented regulations were perceived ambiguously by the informants. The Act was considered a crucial step forward, but at the same time too restricting and paternalistic. The most visible and positively perceived stakeholder in the analysis was ICIPE (International Centre of Insect Physiology and Ecology). It had been contributing through its programs as an initiator and sponsor for beekeeping, butterfly farming and silk

moth rearing. However, unreliable markets related to these businesses was perceived as a threat.

Other important stakeholders in the area were the East African Wild Life Society and the Greenbelt Movement. The former has been coordinating and facilitating forest conservation and livelihood activities and preparation of the participatory forest management plans. The latter contributed to the establishment, advisory work and monitoring services of tree nurseries. Market for tree seedlings included schools, churches, hospitals and individuals locally. Community Development Trust Fund (CDTF), a joint initiative of Kenyan government and the European Commission, was considered as an important source of funds for community-based organizations. However, frustration and unmet expectations also emerged while dealing with the state administration, like social services and Ministry of Wildlife as well as with some non-governmental organizations and research projects in the area. The groups seldom got responses from donors, and were not aware enough of the purposes of ongoing research activities in the area. They also felt barehanded and left alone in the human-wildlife conflict, whereby the farmers on a close range from forests suffer from noteworthy crop losses due to damages animals cause.

The groups prepared a SWOT-analysis on participatory forest management. The results are presented in the table 25 below. The respondents felt more empowered than before and expected economical opportunities through the new management system. The value of biodiversity could be harnessed to serve livelihoods, such as ecotourism. However, people felt the need for continuous education on management issues, which had been limited. Elements of dissatisfaction arose despite the democratic election of the associations´ executive committees. Participation was differentiated and committees have been known to pursue other interests or to overlook their members´ interest while making certain decisions that cause the rest of the members to feel they have the upper hand or that decisions lack sufficient transparency. Challenges were seen in the implementation of equal legal rights and of benefit sharing mechanisms both inside their groups and in other adjacent forest populations.

Table 25. The strengths, weaknesses, opportunities and threats according to the community groups engaged in forest management, and living adjacent Ngangao, Chawia, Mbololo and Mwambirwa forests (Himberg *et al.* 2009).

STRENGTHS	WEAKNESSES
• Forests´ ecological services; water chatchment, rain attraction, fresh air, place for leisure • Feeling of empowerment through formation of community groups – "We can now make decisions and ask questions" • Capacity building in many activities has taken place	• Lack of unity • Lack of transparency among stakeholders in resource sharing leading to prejudices and uneven distribution of benefits • Ignorance • Lack of commitment of members • Insufficient knowledge about management techniques and legal rights • Income from forest products not benefiting the forest itself or the community in large • Human-wildlife conflict unsolved • Lack of funds • Time consumption • HIV-AIDS occurrence affects implementation of plans • Forest fire outbrakes
OPPORTUNITIES	THREATS
• Larger markets for forest products • Unique, endemic flora and fauna as attraction for tourism related businesses • Commercial use of medicinal plants • Access to forest resources; seedlings, medicinal plants, resin, sites for apiaries and butterfly farms • Improved soil fertility leading to increased food production • Establishment of research centre and employment opportunities	• Unpredictable weather conditions • Over supply on the butterfly market sector causing competition and blockade • Conservation efforts going wrong, because of lacking management capacities • "We are insufficiently equipped to fully engaged in forest conservation"

People´s participation is needed

In 2007 after the concept of participatory forest management had been recently launched, it appeared still to be unknown or at least not properly acknowledged. Officers complained that various local associations interpreted the concept differently. Even after community groups were formed, some people still wondered about the individual benefits. An obsessive mind set of seeing forests only in terms of agricultural relation was believed to exist. The District Forest Officer took part of the blame for the offices admitting that, when the concept came in, the information was delivered in a biased way across some areas. The message was

perceived by the local communities somewhat like: *"these are now our forests and we can take over them"*.

A trail project for rehabilitating the government owned hill top forests (Adriaensen *et al.* 2005) started in 2007 in cooperation with Kenya Forest Service, East African Wildlife Society and local, forest adjacent residents. The DFO gave credits to people who had been earlier taking part in voluntary enrichment planting around Chawia forest, the Sagalla area and the Mwambirwa forest. In 2006, 20 000, 4000 and 15 000 seedlings respectively were planted. Residenst living adjacent to forests have also started reporting more eagerly to the office set up to deal with illegal or suspicious activities. However, there is a tendency that groups start and a lot of people get excited about the activities, but over time some drop out or their priorities change (usually if something else seems more profitable).

There is a widely excepted vision about management of Government forests according to the recent Forest Policy – away from the defence-approach or fines-and-fences state of management – towards wider participation. *"Even if somebody tried to enter the forest and voluntarily plant a seedling, he was to be arrested. But it is better now. We are like a big family"* DFO (2007). Guards patrol the gazetted forests but the manpower available is not enough to prevent illegalities from happening. The forest guards complain that and the people living adjacent are aware of it. Still, with wider awareness and participation, the penalties for illegal forest behaviour are set higher and stiffer than before.

In general both farmers and traditional experts in Taita perceive that the best management option of traditionally protected sites should be community based. However, there are also local histories showing the necessity of other institutions coming in, like the gazzettement of Chuchu forest in 1984: *"Good that government took over it, as it was under community before, but leaded by a top "wizard", who wanted to destroy it and people were afraid of him. However, in general would be better if the forests were community owned as we know how to appreciate them. The government officers coming from other parts of Kenya do not appreciate the forests as we do"* (male 35 years).

Ecotourism business oppotunities

The management zones of Mbololo forest are noted down in the Participatory forest management plan for Mbololo and Mwambirwa forests (2005). However, during our excursion on the site in 2009 it became obvious that the implementation was only taking baby steps and that the identification of various zones was blurred although we were accompanied by a representative from local administration as well as a tradition expert. Plans do, however, exist and special emphasis was put on the idea of establishing ecotourism activities, like nature trails and an observation tower, in the forest. Tourist guides have also been selected and recruited from the local villagers and trained for the purpose with the help of Taita Taveta Wildlife Forum and East African Wildlife Society (EAWLS).

Taita Hills entrepreneurs have had some bad experiences of losing competition against big-scale tourism on lowlands that may hinder some from going for tourism-based enterprises.

Another statement I heard from business minded local people was that individual thinking should be encouraged, since people tend to go "too much with the flow". With business ideas in Taita, it is often the case that if one succeeded with a fresh idea, soon too many enterpreneours copied it in the same village and the business died due to oversupply.

Resettlement "master plan"

A policy-change vision I came across with officers was about complete change of settlement in Taita. It is a more radical suggerstion in that people would move from upper, rain-fed areas to the foothills and lowland areas where irrigated agriculture would be launched after rehabilitating the water catchment areas and gaining higher water yields from the hills. The forest areas would be used for butterfly and fish farming, ecotourism and non-timber forest products.*"I think right from the beginning the policy was wrong. In dry areas the policy should be for irrigated agriculture, not rain-fed. There is not enough rain for that"* (DFO 2007). DFO, however, was not the fist one to envison something like this. Wolf (1983) conducted an interview with a senior Coast Ministry of Agriculture official in Mombasa in 1980. His following comments resembled the ones of District Forest Officers from 2007*: "Land consolidation in Taita?! What problems! As far as agricultural planning is concerned, I think the best thing that could have been done was to remove everyone from those hills and make the whole place a government forest!"*

7.2.2. Lack of resources on the governing level

The District Forest Officer (2007) stated that the County council does not have foresters, forest guards or environmental officers, and yet they are the managers of trust land forests. This has made possible illegal activities like the Sandalwood (*Santalum* sp.) trafficking and charcoal burning. The Forest Department is demanding more balanced structures and collaboration between KWS, County Council, Rangeland officers and Environmental officers. *"At the moment we are just mining and mining and do not know about tomorrow"* (DFO 2007). He thinks that everything comes down to management and lack of capacities to perform it properly. One hindrance is lack of manpower at the Forest Department: more extension officers would be needed to take care of tree felling licenses and instructing farmers on their fields. At the same time the penalties have been set higher to meet the actual damage caused by illegal activities to the vegetation.

If the voluntary inputs and activities of area residents are needed for more sustainable resource management, so is needed innovativeness from Government employees as well. For example logistics is a problem due to lack of funds and officers responsible for field control visits and education rarely have efficient means of transportation for their use. Still, they are expected to fulfil their duties. It happens, that after getting a licence to fell certain trees on a given farm the owner fells some other trees instead. The officer rarely has resources to come back and check up on what owners have done.

7.2.3. Concern about environment

The state of the Taita environment was a concern which cross-cut the majority of my interviewees´statements. In some cases it was based on notions of changes in the proximate environment and some were knowledgable about changes and problems on larger regional and global scales. Also there were extreme reactions to management practices like when people in some areas in Taita reacted very strongly to the problem with Eucalyptus trees drying out soil (see Figure 32). Officers had to retain those persons to prevent them from travelling to Mbololo area to cut down Eucalyptus trees. The frustrated people accepted after negotiations that the reforestation had to be done gradually. This was concern for those living on both the lowlands and the highlands. A village elder told me how they used to go fishing in the Voi River for a good catch, but now the water level has sunk to such an extent that it doesn´t always reach the Tsavo National Park. The wild animals need to move upstream which causes human-wildlife conflicts on fields.

Figure 32. Eucalyptus and eroded soil (photo by Himberg 2009).

Elephants search for water and eat farmer´s cabbage, maize and sugar cane on their way. *"Traditional forests are very few; all has changed into modern forest. Everything has been turned up-side-down. This has made even birds to fly away. People are now planting (seedlings) to get forests back. Traditional values are not enough for sustainable protection; other motives are needed, for instance education and warning examples of lowering water*

tables.'Never cut a living tree'-rule used to be well enforced, but the population growth and human needs have led people to ignore their own natural resources" (village elder 71 years).

Two driving forces for degradation of traditionally protected sites and indigenous forests kept on constantly popping up in discussions; firstly, Christianity and secondly; the slow growth of indigenous trees. *"People dislike traditional trees, because they take a long time to grow. That is why they have destroyed the traditional forests and also because of religion. They have planted fast growing Mkongo (Eucalyptus), Msumbesu (Cypress), Mngamu (Acacia mearnsii) and Grevillea trees. With these, people cannot go for Mulimu (ancestor spirits) and sacrifice, thus there are many dangers surrounding people"* (female 56 years). The issue is tackled by the local Forest Office nowadays and instructions on both economically and ecologically suitable indigenous species are distributed. Species which the Forest Department for instance recommends include *Acacia* spp., *Melia volkensii*, *Terminalia prunoides* (M.A.Lawson) (for lower zone), and *Prunus africana*, *Albizia gummifera*, *Lannea stuhlmannii* (Engl.) Eyles) (for higher zone) and *Commiphora* spp. (Jacq.). The District Forest Officer (DFO 2007) described the change as follows: *"The previous forest policy was not very good. Forest Department saw the forests only in terms of timber production. All efforts were geared towards plantation forestry. We can now expect changes for the better, although it takes some time before we see the difference. A tree crop is a long term crop. If one is very ambitious, one gets frustrated."*

Changes that the DFO witnesses are firstly, the priority now is the forest conservancies, which was not the case earlier. The forests used to be managed by administrative borders instead of their ecology and edaphic conditions. Secondly, Kenya Forest Service shall be advising Kenya Forest Board on the best silvicultural practices based on field experience and less politically influenced opinions affect decision making. More various stakeholders will be involved; research institutions, county councils, communities, instead of the Forest Department exclusively. According to the officer, the gazzetted sacred areas are respected and protected by forest guards. The existence of myths and believes are recognized. Traditional clans used to roam the forest reserves and the sacred sites still retain their users. Permission to practice rituals is at the forest guards´discretion but they tend to allow elderly men to use the forests for traditional purposes. However, I was also presented with contradicing opinions related to access by some of the eldermen.

The Community Development Trust Fund has offered new possibilities for community groups to apply for funds for various activities and businesses. For example the Taita Environmental Management Alliance was planning to plant new seedlings, like *Juniperus procera* and *Ficus thoningii*, around encroached sacred sites. Throughout the Hills trends like conservation, rehabilitation and tourism from Ngangao and Kasigau have been emulated. Ecotourism has been a key motivator for people to form Forest Associations. A worry has grown about disappearing species of birds and butterflies since people have understood the importance of those for the tourism business.

7.2.4. Tradition revival needs efforts

In Taita ritual complex *"the environment was divided in good and in bad – also people were categorized as good or as bad*" (Mwairo 2007). Tradition experts complained about the diminishing valuation and use of ethno medicines. One reason goes back to the days when both bad-doer wizards and benefactor medicine men were more often seen entering forests sourcing for plants, but later on due to religious change without making any discrepancy that anyone entering forest could be seen as a wizard and a pagan. Taking natural medicines is still considered as a sin by some. The user rights and practices in Taita Hills forest reserves are known to be stiff and controlled. For instance in Arabuko-Sokoke forest reserve on the coast, the medicine men have a special permanent licence for entering and fetching medicines. In Taita, medicine men do not feel entitled to practice their occupation, because moving in and out of forests is always open to various interpretations. Similarly traditionalists need a permission letter from forest office for conducting rituals, which contradicts the very quiddity of secretive chores of elders.

According to Mzee Mwairo (2007) (see Figure 30), Taita was more united before and in some cases cross-clan problems could be more easily solved. Nowadays it is possible to solve only family and single clan issues through rituals, like Goat´s intestine analysis (GIA), whereby ancestor spirits and the God give the solutions via the sacrificed animal. There are a number of people seeking GIA assistance from Mzee Mwairo, all middle-aged or beyond. He charges 100-200 Kenya shillings per analysis. His worry is the difficulty to pass his knowledge onto his grandsons, who are not willing to listen. His illiteracy means that he is unable to write down his knowledge, but secret things are not to be written down, instead they should be passed on orally to those who will then apply them. He estimates that 70% of Taitas who belong to church undergo old rituals as well. In the central parts of Taita Hills, the practices are done in secrecy, but areas like Mbololo are considered more open in this sense. *"I remember the rule never cut a living tree and by doing the cutting we destroy our nature. I still believe that by cutting a tree intentionally one starts bleeding, like cutting one´s own skin. One can thus be taken for cleansing if that happens"* (Mwairo 2007). An obvious tendency among interviewees is to name missionary work and rooted Christianity as the main reason for degradation of the Taita ritual complex. Some fought against the change, like Mzee Mwairo, who explained how he got cured from a sequeale of a serious accident in Mombasa in the 1940s with the help of herbal medicines. He has followed the same path ever since and refused to give up to the missionaries.

Boys traditionally have to go through circumcision to become full members of the community. Cast persons and exclusion from community has been common in Taita. There were different categories of cast people bringing bad omen, namely; girls giving birth out of wedlock, witches, thieves and people with severe contagious diseases. These were all deported. Thus, forests were needed as places for social events, for storing cast persons, for young men´s seclusion and for herbal medicines used in rituals. After the diminishing of these practices, the functions of forests also changed, although not completely.

There are practices that should be revived according to the traditionalists, in order to avoid "bad consequences" happening. These are mainly rituals concerning atonement by sacrificing for ancestor spirits and haunting spirits of *sesos* (see chapter 'Description of various TPF/S categories'). Also availability for certain plants needed for traditional uses are, according to a herbalist, scarce: *"One cannot find traditional trees for medicines unless travels to the lowlands. The few forests growing those trees are guarded and not accessible. We need to revive the traditional forests."* Also the knowledge base has gotten weaker according to two middle-aged interviewees: *"My grandparents were tree medicine specialists, but no information was left behind." "People should be educated on the use of herbal medicines. Why to travel all the way to Nairobi while one can find cure here in Taita."*

Traditions, which the District Forest Officer (2007) recognized to be typical of Taitas are use of herbal medicines, hunting small game and bee-keeping. Hunting is an activity colliding with Kenya Wildlife Service policies, since it is also illegal outside conservation areas. Forest guards report regularly of snares found in small forest patches, but Taitas know it is not commercial hunting but dinner and some excitement for the day. Bee-keeping has always been there, but it is now more prominent since the traditional log-hives started to be replaced by straw hives. Despite the availability of modern hives, many elders want to hold on to their traditional methods of using special tree for log and smoking the hive to attract bees.

Traditional belief that forests attract rains is incorporated into environmental education given out by the Forest Department. Like the DFO described: *"People here relate water issues with the forests, even if it isn´t actually true that forests cause the rains. But because the people believe it, I think we should use it. Every time we hold a village meeting, we ask: Do you want to reduce the rains? - and they say: No! –and we ask: What should we do then? – and they respond: Let us plant some more trees!"*

7.2.5. Fear factor in land tenure

Big areas of sacred sites are cleared for construction purposes. Since these areas are problematic due to their sacredness and people´s fear about consequences of moving on a possibly "haunted" plot, they are usually demarcated as *mtengos*, communal development areas. I noticed during the participatory mapping in the field that schools, churches and village or town halls have been built on TPF/Ss all over Taita Hills. I heard the statement *"trust land is no-mans land"* from several people. This seems to reflect various aspects of land tenure and management. The responsibility collectively trusted upon the users, in some cases, seems to be no one´s responsibility. This works in two directions; firstly, it highlights a few poorly managed community forest areas. Secondly; in the forementioned *mtengos* the traditional "baggage" of a sacred plot is avoided by the successors as well as by a potential buyer from outside the clan. This is due to a belief that sacred sites "insist" management and if not taken care of, they will claim something from the clan responsible. This can cause fear and uncertainty amongst many families, who think that it is better to avoid residing at a sacred place, since their traditional knowledge is inadequate to "go by the book" and if one does not respect the rules, something dreadful may happen. However, disqualifying one from

traditional responsibilities does not seem to work everytime as supported by several stories; some pupils of schools built of a fighi *"started suffering from psychological disorders"* and *"churches were fighting against vandalism caused by witches"*. Fear and respect towards sacred sites are intertwined and personal attitudes towards their ownership and management vary from personal to communal. The fear-respect factor however, seems to weaken along with shared responsibility.

Within the TPF/S village mapping session in 2009 included 45 villages in total. While drawing the maps, groups also discussed and noted down management preferences of the sites they identified. Representatives from 24 villages expressed a preference for returning government forest areas with sacred sites to community management. They perceived the areas and usage rights as still belonging to certain communities and responsible clans. They were also frustrated about the mismanagement of the areas by the Forest Department and believe that it would be better taken care of, if it would be the communities´ responsibility. The villagers would prefer to gain user rights for herbal medicines and various non-timber forest products. At present a common trend in Taita is scheming for ecotourism ventures. Group discussions about various management opportunities showed that the idea of National Museums of Kenya protecting the sacred sites was considered possible by most of the people. Many had heard about coastal Kaya forests and welcomed the idea of also declaring the sacred sites of Taita as cultural historically important. A middle-aged man in the Kidaya mapping session put it like this: *"When ever Government takes over, the people are left out! The sacred forests taken by the Government earlier should be given back to the community, like Fururu forest, which we cannot access even for medicines."*

Customary law applies in community forests. In the Mgange area no cutting of living trees is allowed, but collecting medicines and fallen branches is for everyone. Permission for timber for a communal purpose may be granted by the village elder. For example in case of preparations for funerals the village elder will come and show which trees can be harvested. If someone is caught cutting a living tree in the community forest without permission, the punishment is the fetching and planting of 20 seedlings, and in the case of a dry season, he or she also has to water them under the surveillance of the village elder.

A difference between indigenous and present ways of forest protection according to a village elder and teacher Mzee Zumbo (2009) is that the forest used to protect "itself". To the community this is a zone for no man to enter, because important, secret things are inside and not to be seen. A 28-year-old Taita man explained to me: *" When I was a child there was a story going around that if one enters the forest, one gets lost and there is a place inside with water opening which sucks one in"*. Also certain trees are still left standing, because they are strongly believed to cause bad omen if disturbed. Collective responsibility is an attempt to ensure that every common man fear to enter the forests. Zumbo perceived that the current approach of naming individual agents representing Government (forest guards) has not been as reliable and efficient as the indigenous, community-based approach. Herbalist, Mzee Masaka (2009), on the other hand, was not that worried about the future. He complained about the difficulties of transferring the knowledge to the latest, ignorant generation, but he

still counts on the capacities of fighis to protect themselves: *"Even if the new generation would not want to protect the place, whoever wants to destroy the place, will run mad"*.

During a TPF/S mapping session in Mbale, a highly topical issue was raised up by the participants. A skull cave was causing bewilderment among the residents, especially the confused plot owner: *"We have a skull cave and we are planning to destroy it as it causes us lots of problems, like people dying around us. We have abandoned ancestor worshipping and are now facing the calamities. We are tired of seeing the skulls here! Thus, if Nina and Mwadime (us researchers) want to carry them away, permission granted"* (male 45 years). According to the informant, the problems started recently; soon after the village elder responsible for sacrificing at the site passed away and no-one knows how to continue the practice. Fear attached to rituals also spreads vis-á-vis trend of using powers in a destructive way. *Kutasa,* meaning instead of seeking blessings from higher powers, rebellion calamities, like a death of a neighbor, was ordered. This instilled fear in people and led to a fading out of the skull cave rituals.

Those people, who do not experience fear, but instead only show respect towards traditions, look back to the "good old days" and state that the Taitas used to be safer due to *Fighis* (magical medicines located on strategic locations protecting villages), *Mbingus* (medicine for healthy, long life), *mteros* (blood covenant) and many other social and magical means.

Customary law concerning land, enforced side –by-side with Government laws is still functioning. Traditionally, land was passed from one generation to another according to the request of a father and the boundaries were marked by using plants like *Isaye* (*Dracaena steudneri* (Engl.), by placing stones and burying ownership information underground in Calabash- bottles. On the foothills of Taita, the information was hidden in termite hillocks. Officially, the land is divided through land demarcation with the Office of Lands involved and handing out title deeds. In order to avoid paying demarcation fees and sometimes to avoid hassle and hostilities within a family, people often followed the customary law instead of the modern law. The population pressure with perhaps some prejudices made many elder men, including medicine men, move to lower parts of the Taita Hills. The next generations have the need for cultivable land and if the family still has ancestor landholdings on the *nyika*, the upper zone plots with higher rainfall with better chances for irrigated agriculture are left for the young families.

7.2.6. The coexistence of Christian church and Taita ritual complex

There are people who cherish both Christianity and traditional religion and who are proud to pass on traditional wisdom to their children. However, one problem with knowledge sharing is "brain drain" from Taita Hills to bigger towns. If a child is taught some traditions that they don´t apply they will be forgotten. Also, Taita is described as a cultural melting pot where people are getting inflicted by new life systems and consider old ones useless. This is also evident in the way that Taita language is spoken impurely by younger generations. Literature about Taita traditions is wanted in order to fill some gaps that young and middle aged have in their knowledge. *"For example I am a Christian, but I don´t regard traditions useless. In*

fact, I see them very valuable, as did our grandfathers and we own them my roots and therefore cannot discard them" (male 40 years).

I talked to a middle-aged teacher Mwashuma (2007), who is very knowledgeable in Taita tradition through their inheritance and systematic talks with ritual experts. He had also taken studies on African religion in college to deepen his understanding. He learned that African monotheism helped Christianity to initially take root before the belief systems mixed together. When harder times occur, traditional rituals are taken more into use, as some feel that Christianity is "not enough". He stated: "*As much as I believe in Christianity I also join the clan people as the usher of all African religions for solving some of the problems"*. Thus, the religious mixture can go beyond the mainline churches and Pentecostals mixing with the Taita ritual complex; also inputs from other originally African religions are involved.

The District Forest Officer (2007) described the cultural transition in a following way: *"When colonialists came around they considered everything that had to do with the culture of black people primitive, and wanted to impose another culture. It did not work too efficiently since Taitas had own strong culture, but we are still in a transition phase, not here neither there, but somewhere in between. People are confused and that´s why you can see a Christian who is crossing to the other side, but at the same time pulled back to the traditional."*

I got an estimation from a middle-aged Taita *mama* concerning the ratio between Christians and traditionalists in whole Kenya and she figured that ¼ would be completely "saved" whereas ¾ would own a mixed world view.*"I was saved in year 2000. Jesus talked to me where I went wrong. But still, I want to protect our own culture. Even bible tells about people, who used their traditions, so it supports the idea."* Mzee Masaka (2009), a herbalist and strong traditionalist also goes to church and believes that he can worship the same God in church as well as in a fighi. He is not of the view that being a Christian would mean abandoning his traditional culture. The fighi rituals bring more dimensions to his world view; rainmaking he considers necessary.

Before the modern education system, children were taught by elder men and women, boys and girls separately, boys in forests and girls indoors. They were given the "Taita etiquette". Some recall that youngsters´ behavior used to be better in those days; children respected their parents well, virginity of girls was highly valued, and families who brought up girls of good moral reputation until marriage age were rewarded by the community.

We spent an evening visiting pastor Maghanga (2007) in Kidaya and interviewed him about the relationships between his parish and the Taita traditions and the Taita people and nature. He is a *mdawida* himself and comes from a family of a traditionalist grandfather and an evangelized mother. The following is what I learned from him: Taitas seem to have accommodated Christianity in their souls and that has changed the ways of living. Traditionally ancestors were worshipped, some under trees, by lakes or some in caves, but it stopped as soon as people got to know the "real God". The church has not forced people to stop the rituals; instead they have decided themselves and they do not feel the urge anymore

after finding out there is a Christian God. People have moved from natural settings into church buildings. Not all tradtions are abandoned, since some are still important and go along with the Bible: respecting and never going against ones parents and the tradition of paying dowry when marrying. People practicing magical means, medicine, and witchcraft or worshiping ancestor spirits are not driven out from the church, but they stay away since they choose not to hear the gospel. Sometimes they are followed and given counselling, but not told to abandon their tradition. Some are afraid of coming to the church, knowing that the path they are following is not the right one. The church takes small steps, showing people love and concern and eventually they throw away the old things. Pastor Maghanga did not have any exact figures on how many people in Taita still practice traditional religion, but in his parish there were a few.

He does not see any big differences in different Christian churches´ approaches to the toleration of traditional religion. *"There are Catholics and Anglicans all believing in Christ. We have not forgotten or ignored the topic, and we have the Coast Interclerics Group with Catholic, Anglicans and Muslims, since 2006, sitting together and discussing which elements of Taita traditions should be retained and which abandoned. For example, polygamy has to go, although Muslims want to hold on to it"*.

According to the Pastor, Taitas have abandoned various traditions that affect the environment. Some of the traditions did protect the forests. Now we see people destroying forests. These traditions were based upon not entering the forests: *"People were threatened that if one step into that forest will become an outcast. We also believed that you´ll meet some strange people and ghosts there. And immediately as we abandoned those beliefs, I´m sorry to say, we started destroying our forests. For example, where now exists the Farmer´s training centre, used to grow very strong forest. Since it was destroyed it we never had enough rain again. Up to late 1960´s we had a lot of rains"*. Another reason for forest depletion was the demarcation of land in 1960-1963. After the land was demarcated everybody was given his or her portion of land. Sometimes one was given a plot, for example a fighi, where one is not supposed to step in, but since that was your portion you got to go and destroy it in order to make a living. Economic crises, like the one in the 1970´s, have contributed to increased lumbering on farms as well as expanding families with a need for a plot to settle in.

No steps have taken yet in Pastor Maghanga´s perish to raise the topic of nature conservation, although he considers it important. However, he does encourage his parishioners to plant more trees on their farms as he has not seen any positive development in energy consumption patterns of Taitas: *"There is charcoal, we get it from the low zones and it is expensive. Some cut Grevilleas for firewood and that is destructive. We have been crying over electricity over 40 years, but the cost is too expensive. Who is capable to pay 35000 for 10 houses electricity? You need your own transformer. Also gas is expensive, because we go to get it from Voi or Mombasa. In the rural areas very few people have the knowledge on gas cooking. They are afraid of explosions and fires. People are used to firewood"*.

The Pastor considers it important to record Taita history including the traditional beliefs and practices, but only selected elements of the culture are worth keeping alive. He doesn´t think traditions are a threat to Christianity anymore, but that some are very restricting and useless; for example the one that husband should not sleep with his wife just before planting season starts.

While talking with the farmers in different parts of Taita, opinions about parishes´ level of laissez-faire towards taita ritual complex varied quite drastically. In some churches pastor Maghanga´s opinions would have sounded perhaps too progressive, while in other parishes the "taboos" were even more openly discussed. In some areas people avoided using traditional medicine openly so as not to be seen by the church elders. "*When any Christian is seen visiting witch-doctor´s house, he or she will be chased away from church. So ¾ of us go to treatments, but hidden. I personally go overnight*" (male 57 years). Some plant components and detailed knowledge is lacking sometimes when one wants to prepare a certain medicine for health or ritual purpose, thus people travel for miles to get help. Taita Hills has always been known for skilled herbalists and soothsayers, so people from upcountry and the coast visit them. Similarly, Taitas pay visits to Kenyan coast and Moshi in Tanzania for special treatments.

The dialog between the church and traditionalists still goes on, as illustrated by one of our participatory TPF/ S mapping sessions held in 2009: *"The fighis and shrines have been fought against from every corner by Christianity, but I think it will persist. For example people in Kasigau believe their god stays on the top of that mountain and nobody goes there, nobody. – Yes, the church sees that people who revive cultural traditions are suspicious. One pastor wanted mbenge ya mrangi (skull cave) to be cleared as considered it to be satanic"* (traditionalist). The response from a church elder was following: *"We are not against past as long as the tradition is helpful, but some of the traditions are demonic and those we want to get rid of!"*

7.2.7. Integrity of the traditionally protected forests and sites according to households

"When going gets tough economy runs down conservation"

I had read and heard from a few elders about the old Taita wisdom: "never cut a living tree" and asked my respondent´s opinions about it during the household interviews in 2007. All but two people knew about the wisdom and had views about it. The most common opinion (19 households) was that the wisdom still holds, but it has been replaced by new laws and restrictions.

"When I grew up this place was very green and people respected the nature even without any (official) laws and norms. Today government is the only way and very strong one" (female 68 years).

Some (9 respondents), however, thought that it is often ignored. When asking about reasons for the ignorance, poverty, greed for money and shortage of land were most commonly sited.

As one of the respondents put it: *"People love money more than trees"*. Other reasons were; firstly the fact that most of the traditionalists who would know and uphold the wisdom have passed away and people are lacking detailed knowledge about the best practices in managing indigenous trees. Secondly, an increased market price for timber increases lumbering. Many households in Taita are dependent on farm production as their sole means of livelihood and timber resources are considered as future assets. In other words when the going gets tough the *"economy runs down conservation"*. Thirdly, two respondents stated how Taita people envy each other and there is competitiveness over living standards between neighbours and a general need to replace the old with the new. Fourthly, Christianity is seen as a contributor to ignorance since according to traditional belief something bad would happen to the person who cuts down a living tree, but like one middle-aged female respondent, many nowadays trust that *"nothing bad happens, because Jesus solved all the problems"*.

I learned about traditional restrictions, sanctions, believes and norms and how they are applied to natural resources. Out of 50, 33 respondents mentioned the existence of sacred places. Shrines were considered as still important by 22 respondents, and 4 thought that the features of indigenous tree species, like water retention capacity, rain calling and medicinal value, should be better appreciated. However, in nine households it was perceived that fighis are completely ignored by Taita people. The skull caves were said to not be in use anymore and many are in a degraded condition. Four people described the situation as "*conscious forgetting*" boosted by the Church. The following are some of the quotes from the respondents:

"It was believed, that if you cut a fighi tree and try to burn it, it will move backwards and you won´t success. Even wild animals did not approach fighi, because they were afraid of it" (female 60 years).

"Fighis are there in Mwaguwi and Mghambonyi. If you enter the forest, it protects itself by sending bees or throwing rocks. Mbenginyi is a marginal area around the forest that has army ants and bees guarding. People do not respect them as much as before because of Christianity. Young generation is not told about traditions" (male 55 years).

"There is Mongonyi, preserved for ritual activities. Fighis are gone, because people think they are evil and Christianity has taken place having deep impact. Fighis had too strict rules and they were considered too restricted. Christianity and fighi religion did not agree, but collided. Church gives more freedom - you can go anytime" (male 59 years).

"I don´t know... – yes, there are fighis. A belief exists that if you go inside, you start bleeding from every hole. Some people believe still, not all. Those who do not believe, have no business in fighis anyway" (female 28 years).

"There are still some people practicing. No site development, for example industrial, can be done in Mwambirwa unless some rituals are conducted first. With this peoples´ minds are influenced" (middle-aged male).

Out of the 50 respondents, 33 said that they have a sacred and traditionally protected site of some kind in the vincinity of their household. Most of them were known by name, some only by location and some only had heard about them. Fighis for rainmaking and gate fighis were most commonly mentioned, followed by skull caves and sesos.

When asking about respondents´ personal belief grounds, ten people said that they appreciate and go along with the traditional norms and restrictions they know about. There were twelve respondents who thought that, even if they do not personally follow the traditions, some living close by do. Nine people perceived that no-one believes in fighi powers or rituals anymore and three denied that these sort of things ever even existed.

As a researcher it was challenging to perceive the levels and aspects of people´s valuation towards something. I strived to understand the importance of various elements of traditionally protected forests to the respondents by using a continuous scale bar with two extreme values: "not important" and "very important". Respondents indicated the level of importance by drawing a mark on the line.

A common view among the respondents was that since the majority of the ritual experts are gone, the sacred sites have lesser use. A few respondents explained that they do not know about fighis since they never lived close to them and some stated that they denied "fighi religion" a long time ago (Table 26). Some perceived that all people in Taita respect the fighis, independent of one´s present world view. The respect can be also fear-like. In one household I was told that: "*Many accidents happen close to fighis. We pray the powers to stop. We believe strongly in powers, but hope them to disappear. The fear prevents us touching the areas"* (middle-aged female). However, in the next household the safety aspect was of opposite kind: *"It is widely believed, that they (fighis) protect from accidents on these bad roads. Accidents rarely happen"* (female 38 years). Quite a few respondents gave similar estimations about the Taitas´ belief ground*: "There are 50% Christians who deny fighi religion and 50% who receive it, at least accept to listen about it*".

Table 26. Religious importance of TPF/S.

not important			very important	
24	3	5	1	11

N=50, 6 no comment

The ceremonial importance of sacred sites (Table 27) has been decreased partly due to the fact that some of the rites are nowadays conducted in homesteads. There is a problem of gaining the bad reputation of a wizard in some areas, if seen entering the traditionally protected forests. The concepts and "occupational images" of a wizard, a herbalist, a

medicine man and a witch-doctor are confucing to many Taitas nowadays and some think they are all bad-doers. Today the most well known and accepted ritual is rainmaking.

Table 27. Ceremonial importance of TPF/S.

not important				very important
30	5	1	3	7

N=50, 6 no comment

The importance of traditionally protected forests for biodiversity is restricted by their character (Table 28). According to many of the respondents, even if big, indigenous trees grow there, the strong spirit powers inhibit "anything" from survival. Animals are to avoid fighis and only certain big snakes and birds inhabit the sacred sites.

Table 28. Importance of TPF/S in hosting plants and animals.

not important				very important
14	4	5	3	19

N=50, 5 no comment

The aesthetic importance divided opinions again and the sacred sites were perceived as emotion awakening places rather than objects to look at on the landscape (Table 29). Some thought that their security function makes them beautiful while others thought they were scary and demonic places. The leisure function of sacred sites was acknowledged by some, who use them for relaxing under the "green shade". Depending of the type of sacred site, they are described to be more or less visible on the landscape. Many are located in difficult to reach areas and some can be easily missed without special knowledge of the location. People have built around and on many sacred sites. There are several stories going around about the poor destinies of those who did not respect the Taita ritual complex. According to history, some of those who flouted the traditional procedures went mad, lost all their property and family or died.

Table 29. Aesthetic importance of TPF/S in the landscape.

not important				very important
20	5	4	4	13

N=50, 4 no comment

A common rule is that no water is supposed to be in a fighi (Table 30). However, there were few respondents who shook off their ancestor´s spirits: *"These particular trees assist us locals in terms of rain, firewood, conserving wildlife and water table. One gets medicines and research has been done. Relics of religion are in there"*.

Table 30. Importance of TPF/S as water sources.

not important				very important
38	1	1	1	5

N=50, 4 no comment

7.2.8. People are so ignorant

"People are ignorant, since they think fighis are something from the past. Even if one could get a cure for snake poisoning from his own yard, he rather dies than takes something from the past" (elderly female).

According to the Distict Cultural Officer (2009), the problem of the traditionally protected forests is that it is "nobody´s responsibility" as many of them are located on trust land area, which is not really managed by county council and the traditionalists are getting fewer every year. The conservation ideologies have been modified with new generations. The values of new generations might be worldlier, which would suggest that gazettement would guarantee better conservation status. On the other hand, people like unrestricted access to the area and its use without heavy bureaucracy. The new law and participatory process is time consuming. Before the Forest Act 2005 there wasn´t laws concerning traditionally proteted forests on behalf of cultural or forest policies, only traditional laws. Neglection and ignorance are challenges that the Cultural Minister has noted. He emphasized the importance of forest patches for catchment areas and for lowlands as well as for their cultural-historical value. The local government has recently launched a mission to revive Taita traditions and induce awareness about related cultural issues.

7.3. Does sacredness equal conservation?

As regards to participatory forest management, the role of traditionally protected forests is paradoxal, since a communal approach suggests equal participation of people, whereas management of the sacred forests and sites has traditionally been the sole duty of the accredited experts in the village. However, TPFs contribution to conservation should not be doubted. Sacredness is at the center of this study. As people value things and consider them sacred, they gain integrity. Traditionally protected forests of Taita Hills used to be considered sacred by general consent, but this has changed over time. The things that Taita ritual complex sanctify have become marginalized while Christian religion has gained a more central role as a base for people´s existence and identity. In other words, different things are sacred for people nowadays than in the past. A thinning of communal affects the feeling of unity and may lead to non-compliance to common restrictions and rules.

Privatization of land has proliferated: almost half of the ground truthed TPFs are now located on private plots. The management of those depends on the land adjudication and inheritance history and on the present owner´s belief grounds. However, even if legally the owner, whether residing on their original clan land or not, may decide in the first hand upon his land, this study showed that it is also common that the management of a TPF/S is also responsibility of the original clan members. Further to this, I found out that the TPF/S on community land were in the best condition and the biggest in size covering 56 ha in total. On the contrary, the integrity of a TPF/S on public amenity had been commonly threatened and condition degraded as a result. The most common opinion among local people was that, forests in general and especially TPFs would be better managed if they were the responsibility of communities. Customary law applies in community forests and traditional, where strict control measures have also been applied. Fear towards fighis is still a reality to many Taitas, though, as discovered in this study, it weakens *qua* with shared responsibility. As long as a legitimate, knowledgeable person manages a TPF/S the ownership doesn´t matter that much, but as soon as the site looses its traditionalist host, its future existence becomes uncertain.

While seeking out the boundaries of conservation the weaknesses of the fines and fences – approach showed that: due to its restricted capacity, the forest department's ability to safeguard the integrity of the state forest reserves was poor and also largely ineffective when it came to the control of forest management practices on private property. The public sector welcomes local people to participate in guarding and maintenance work partly because these "volunteer workers" fill the gap of manpower which the forest department cannot afford. According to local people engaged in forest management group activities, the limits of conservation and integrity are strict. Only after first letting the forest provide ecological services and rehabilitation schemes shall be conducted, also timber and non-timber forest products may follow. The recent decades have clearly shown the impacts of top-down approach in natural resource management; local forest users addressed a lot of expectations to governmental stakeholders and clearly expressed their disappointment when certain expectations were not met. At the same time people have dutifully followed the instructions

concerning changing trends in forestry and agriculture given from above. A general pattern of thinking, at least during the time since state independence, has been that outside forces should determine the future more. During the last half a century, natural resources 'mining' also got a stronger foothold. The illegalities continue and even the penalties have been set higher, indicating that there still are people operating with commercial, even extractive, mindset and they seem unwilling or able to change their attitudes. Those who previously supported and encouraged commercial forestry now have to control and ban people from over doing it. On a positive note, howver, the latest changes in the development approach included in Kenyan policies have brought up tentative signs of ending dormancy; also Taita people were eagerly helping themselves within the framework of decentralized decision-making and funding opportunities. They are hailing for tighter multi-stakeholder teamwork and more transparent dynamics within the community-based groups. Capacities that need to be further boosted are: modern forest management skills, project planning and managerial skills, hands-on conservation inputs, knowledge of legal rights. Stakeholders providing those inputs, like ICIPE, Greenbelt movement and East African Wild Life Society were thus highly appreciated.

When we conducted the participatory mapping of the traditionally protected forests and sites, I asked the informants to indicate the shape of the "boundary for sacred area". In most cases, it was obvious to them. The boundary could be visible or psychological. Even many of the severely degraded sites were still claimed to be sacred. These notions helped me to answer the following research question *"Does sacredness equal conservation in Taita Hills?"* and the answer is that it doesn´t. Sacredness definitely contributes to conservation, but does not equal it. There are various factors, including sacredness, that affect the integrity of a TPF/S. The pressures on and off the traditionally protected forests and sites are presented in the Figure 33 below.

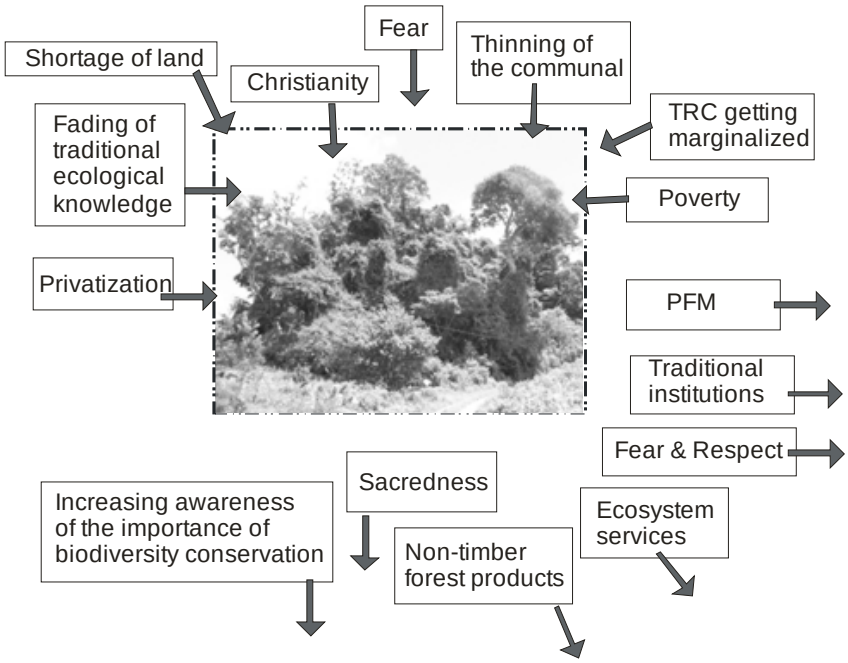

Figure 33. Pressures on and off the integrity of traditionally protected forests.

7.4. The role of witchcraft in ethnodevelopment

The witchcraft phenomenon of today has been the subject of wide attention in Kenya as well as in neighbouring Tanzania. In February 2009 the largest newspaper in Kenya, The Daily Nation, carried a report about witch-hunting amongst the Mijikenda community in Kenya´s Malindi District. The report claimed that the segregation of elderly people has been disguised as a witch-hunt. Naming someone as a witch has traditionally been a way to get rid of them, often without a legal case. The hatred and fear against witches still exists among communities and those causing harm are considered for elimination. Firstly, the problem arises from the fact that ignorant people confuse medicine men, witch doctors and wizards and suspect good -willing herbalists of throwing bad casts. Secondly, the tradition is misused on purpose for local politics and self-seeking. Recent cases (Nyassy 2009) of human rights violation occurred as many elderly people have been killed as accused ´witches´ without any relevant proof. Witchcraft is publicly defined as the use of certain kinds of alleged supernatural or magical powers. It is also defined as a form of sorcery or the magical manipulation of nature for self-benefit. A social explanation for lynching can be that most old people are excluded from their communities and are deemed not to be useful because of their limited ability to work. Many elderly people even turned to using chemicals to dye their hair for fear of being branded as witches. The belief in witchcraft is said to be deep rooted in the community and it has seriously affected development and caused the deaths of many innocent people. Similar cases have also been reported in Burkina Faso and South Africa.

Another hair-raising phenomenon has occurred in Tanzania in recent years where several albino people have been murdered in order to be sacrificed during certain witchcraft rituals. According to Isichei (2004: 310) in the forementioned cultures the witch has become "*a supernatural capitalist profiting from the labor or zombie slaves*". This topic was brought up during my field work, because the Taitas seemed worried about the safety of the people with albinism in their communities.

7.4.1. Jealousy and development

A common notion among informants was that unity among Taita people has decreased and individualization has rapidly increased. *"We don´t see us as a big family, but as nuclear families."* With firmly rooted market economy and land ownership based on title deeds and more and more have financial deals instead of inheritance, competition arises and along with it at times, jealousy. Macadamia nut production is a case in point; jealousy and competition between farmers hinders willingness to technology transfer which has led to poor marketing and discontinuous production chain. There are too few producers per area for an economically sound, jointly organized distribution of goods to areas outside Taita Hills. As explained earlier, witchcraft and dual (good-bad) powers are typical elements of Taita culture. Out of all the traditionally protected forests and sites 25 were indicated as meeting places for witches and 20 of them were perceived to be presently active, thus, despite religious change these mindsets are still entangled in everyday life of many people. The means are still used in "correct" and "incorrect" ways; the traditional expertise is not originally supposed to be used for suspicious and harmful purposes, especially not where money is involved. However, the herbalists sometimes face demands followed by bribes from their customers for immoral activities, like prescribing a harmful or lethal medicine for a foe.

The present system of Forest Department controlling tree management on farms through licensing has led to a vicious circle of lurking. The officers do not have enough financial and technical recourses to extend the system to control tree felling, thus some land owners do as they wish with their trees (including illegalities), though the neighbors may report them to the Department. This is said to create tensions within and between neighbourhoods and communities and decrease unity. Therein, poverty creates jealousy and frustration: *"There should not be such a big gap between the haves and have-nots. With that gap the conflicts and jealousy will remain"* (District Forest Officer 2007). Taita ritual complex used to be based on decisions and inheritance determined by lineages. Communal ways of life was prevailing and the interest of a collective subject often overran the one of private subjects. Kenyan neoliberal politics and privatization have changed the regimes. I listened to a local village chief complaining about "lack of unity" in their village and wishing for more old-style cooperation or *harambee*-spirit among area residents. The will to strive forward and scale up one´s household with modern facilities, educate the children well, and maximize crop production, is very strong among Taitas. However, all this demands monetary inputs that places big demands on more and more common nuclear families and especially heavy workloads on the women.

There is both healthy and unhealthy competition existing among business minded Wadawidas; new opportunities for small scale loans and grants are anxiously awaited and applied for and sound businesses ideas are copied with small modifications to the next village. The notion of witchcraft and magic obviously remains and continues to have its impact on people´s perceptions about success and failure. It seems that less people know their neighbour. When it comes to business prejudices and jealousy are rife. Success is still seen through "Taita tradition glasses" with a mindset: `it could be witchcraft afterall´. There are two aspects to this: firstly, this phenomenon is said to be a crucial hinderance for entrepreneurship and economic development in Taita, since individuals are afraid to get accused of using witchcraft if being notably successful, and secondly; jeaulousy acts as a counter-productive force when striving towards cooperation and networking. This might be one of the reasons why for instance the forementioned Macadamia-production chain is fragmented and the farmer-to-farmer extension system is said to be sometimes malfunctioning. In this sense traditional knowledge can be accused of being a scapegoat for underdevelopment, while at the same time the magical can mean success for those engaged in the Taita Ritual Complex.

8. Discussion

In this study I gained answers to all my research questions. The purpose of this work is to increase understanding upon the use patterns and valuation of forest resources in the Taita Hills. I have examined the topic from anthropocentric and biocentric perpectives by studying both human and ecological variables as well as those variables that link natural and human components (e.g. use of ecological services, collection of firewood and medicines). Furthermore, I used the concept of ethnodevelopment to reflect upon the data. This concept served well on the mission to study perceptions related to change in time as well as to space and place. The empirical data has carried most weight in this study, and some new concepts emerged through induction. Some of the notions resulting from this study might be applicable in other contexts or areas, however, bearing in mind that my aim has been to scrutinize place-based and geographically specific knowledge, and to present Taita Hills as a case, rather than to strive for generalizations. Ethnodevelopment suggests that, traditional technologies, knowledge and skills can be engaged in ecologically sustainable development (The Living Heritage Trust 2010). This study supports Berkes' (2000: 1256) observation that, the practice of traditional ecological knowledge differs from that of scientific knowledge due to dependency on social mechanisms. My study also claims that traditional ecological knowledge is a strategic resource, which has not been used to its fullest potential in the Taita Hills.

8.1. Challenges of the methods used

One of the challenges in conducting a study using participatory methods is time management; one is not able to assess in advance precisely how long it will take to gain the a sufficient amount of data. Fortunately, the more time one spends in the study area, the easier this task gets. Participant observation is often used as a method when deeper understanding

of social dynamics is required. I considered the method a useful and rich way of learning, although I agree with Gomm (2004) as he states that "being a participant observer is like being an adult baby". Like a curious child I still have many unanswered questions. I always remained an outsider even though I got wonderful insights to everyday life of Wadawida families and also had the chance to witness traditional ceremonies that were only allowed for selected members of the local communities. The dilemma of the researcher´s subjectivity and objectivity followed me throughout the study, but at least I learned that without getting very close to the people and their everyday activities, the whole pondering of the dilemma would have led nowhere. I relate to Ardener´s (1989: 212-21) idea of "the experience of relativism not as a form of anti-objectivity but as our only mode to objectivization". Hervik (2005) suggests, that "through shared social experience of people´s lives, thoughts and sufferings, we gain insight into the collective beliefs stored in cultural models. A space is created where shared reflexibility becomes an essential tool for gaining cultural knowledge". Thus, my person with all the previous experiences and knowledge was present in every encounter and I used it as one "tool" in sharing social experiences and reasoning with the local people.

I found the mixed-methods approach useful, because complex socio-ecological systems pose challenges to the researcher by showing themselves in a different light depending on the angle one is looking from. By using various tools and methods I was able to triangulate my data and gain reasonably reliable results. (Laitinen *et al.* 1995: 56-58) list biases that may occur in studies conducted by using participatory methods: a road bias, a seasonal bias, biases related to peoples age, health, wealth and power, a gender bias, a bias related to politeness and a bias caused by expectations. I took measures to avoid biases, however, a study without any kind of bias is an illusion. I strived to minimize the so-called "roadside bias" by preparing enough time and being stubborn enough to hike and bike to distant places. I aimed to maximize the heterogeneity of my informants, on the basis of age, gender, prosperity and power. The various group gatherings were organized through consulting village elders and area chiefs, who, in most cases, announced my research agenda openly in village meetings and invited people to participate. For focus group discussions participants were screened before being selected. Those who are in poor health, very old or engaged in household chores are often marginalized from this kind of activities, thus I compensated for their absence from group meetings by doing household visits. The "seek-out-the-expert-method" proved to be a very useful and interesting way of outlining the network between the key stakeholders in traditional ecological knowledge. The most knowledgeable experts were the hardest to find, because they often don´t have the loudest voice within their communities. However, this does not mean that the traditional experts lack authority regime; the manifestations of their power are different from the commonplace procedures. Gender bias did not beset this study, mainly because Taita women seem to be very active and aware of things happening around them. During household interviews, women of different ages were easy to target as they are still mainly responsible for home and farm maintenance. Most effort and time was put into avoiding the creation of false assumptions and expectations among the informants. In this, my local assistant, who explained in every convergence and occasion our purpose for the study, was invaluable. The places that we visited ranged from

private lands and houses to sacred sites, thus the introduction to the mutual understanding of means of cooperation was every time unique, sensitive and time-taking.

Like Dwyer & Limb (2001: 4-5) suggest, ethnobotanical research provides an important opportunity to validate "situated" and "local knowledges". However, no botanists or ethnobotanists with academic degree took part in this field study. The accuracy of the botanical data, as regards vernacular names and scientific identification, has some gaps even if the best traditionalists were leading the participatory mapping of TPFs and foresters were consulted. The primary purpose of this study however, was not to produce a comprehensive ethnobotanical database of each TPF plot, but instead to show which plants are currently recognized and considered valuable by the Wadawidas. It can be assumed that the traditionally protected forests host more plant species than listed in this study. While entering into these small, green islands straight from the fields or yards one senses a dramatic change of environment; the microclimate, sounds and light are different and often butterflies are the first animals catching one´s eye. Thus, the remnant patches and their need for restoration and connectivity to larger forests patches are worththy of further ecological examination.

I have chosen to present my results mostly in a general manner and strived to avoid individualizing the data. This applies both to the household interviews and TPF/S data. I discussed with every TPF informant about the publicity aspect of the data collected and agreed upon the "privacy settings" of each site. Permissions were granted for the data to be presented here, and the maps are adjusted to give an idea of the sizes and locations of TPF/S in relation to each other and to the largest indigenous forest remnants. The detailed attribute data, however, like the tribal names, and location specific information concerning species and rituals shall remain the property of the author and the selected scholars engaged in Taita Hills research. This relates to McCall´s (2006) notion of the need to question the necessity of data accuracy in participatory GIS approaches. He points out that reality is frequently ambiguous and we should remember, in cases where it is misleading, to represent it in a precise and accurate way. For instance, during the ground truthing exercise of traditionally protected forests, I asked the experts to indicate the boundary dividing the sacred and non-sacred areas. In most cases it seemed like an easy task for the experts though at times they needed to negotiate and compromise their slightly different views. The data based on perceptions, even if collective, are always fuzzy. However, PGIS offered useful tools to gain indepth understanding of peoples´ symbolical and socio-ecological knowledge and perceptions. The "accurate" measures of the sizes and the frequency of occurrence in the landscape yielded us new information about the potentials of TPFs in cultural rehabilitation and biodiversity conservation.

New conceptual and methodological tools are constantly needed for scrutinizing the complex systems of human beings and their environments. I found the grounded theory approach challenging and suitable for the research setting and analysis, because my aim was to conduct a bottom-up style study. In Strauss´s & Corbin´s (1998: 56) words: "*Although we do not create data, we create theory out of data. If we do it correctly, then we are not speaking for our participants but rather are enabling them to speak in voices that are clearly understood and representative*". The strength of grounded theory coding is said to derive

from concentrated and active involvement in the research process (Charmaz 2006: 48-59). Through focused coding I was able to move across various data, like the interviews and observations and compare people´s experiences, actions and interpretations. The coding condensed the data and provided a handle on them. The biggest challenge of the grounded theory approach in this study was to avoid invoking or relying on earlier concepts. According to Charmaz (2006) those preclude openness and new ideas that emerge as events are coded. Since I had been interested and already well-read on the topic of this study, it would be biased to state that my approach was pure grounded theory. Instead, my existing awareness and knowledge of previous concepts and theories were embedded in the research setting and the analysis, even if marginally. On the other hand, ethnodevelopment as a sensitizing concept worked well for the analysis. As Bowen (2006: 2) explains: "*a sensitizing concept gives the user a general sense of reference and guidance in approaching empirical instances. Whereas definitive concepts provide prescriptions of what to see, sensitizing concepts merely suggest directions along which to look*".

Triangulation of the data contributes to the validity and reliability of this study, although in a data set this heterogenous some thin sections can be also found. I sought further comfimation of some issues by using alternative tools or unknown, but helpful, informants due to schedual errors, lack of transportation or unavailability of informants. I was fortunate to get several opportunities to travel to Taita Hills for field work, but despite that I was eventually left with some questions. For example, a more profound study on the traditional management regimes and dynamics of community forests would be essential for the future planning.

8.2. Tradition pragmatism

The scholars (Rist & Dahdouh-Guebas 2006; Gadgil & Berkes 1991; Gadgil *et al.* 1993) recommend distinguishing between ancient and modern traditional knowledge, which blend to make a unified whole and genuine, practical knowledge. However, it would be biased to set any milestone in time where ancient stopped and modern started, since change has occurred gradually. Instead I see on the one hand certain "immaterial" and "deactivated" elements of traditional knowledge that live only in oral narratives, and have become folklore. On the other hand there are practical elements that are still applied in the everyday lives of the Taita people. Fading of both is a threat which has only recently been taken into account in the area. There is plenty of relevant and useful traditional ecological knowledge which could be more widely distributed and applied, especially in the enhancement of remnant forest management activities. Nygren (1999: 282) emphasizes the "*necessity of analyzing local knowledges as heterogenous ways of knowing that emerge out of a multidimensional reality in which diverse cultural, environmental, economic and socio-political factors intersect. Local knowledge repertoires can be seen as a result of knowledge encounters in which local and global, and traditional and modern are intricately intermingled*". Wadawidas are currently confused about the best practices in natural resource management. High, individual inputs in sustainable management are expected from them that are controlled by the Forest Department. On private farms, permission for felling a tree is

granted by a forest extension officer, thus the system of instructions and rules is still steered from top-down. This also means that the knowledge recommended to be applied is the knowledge of the "ruling party". Illegal activities take place in forest reserves and farms, thus supporting the notion of Ostrom & Nagendra (2007) on expensive inputs needed for guarding and low level of protection when formal rules are not considered legitimate by local resource users. I ask the same question as Nygren (1999): "*Are we expecting to see a gradual marginalization of alternative knowledges, or can there be a symmetrical coexistence between these diverse forms of knowledge?*" The relative status of the different components in these knowledge encounters is what matters.

The participatory forest management groups should consist of both the experts and common Taitas in order to include traditional knowledge in the tool box for sustainable management. This has been still until some extent hindered by taboos and fear of getting claimed to be old fashioned or in the worst case a witch. Although underestimated and undervalued by many Wadawidas, traditional ecological knowledge can be seen as an asset for participatory forest management. A general hesitation and embarrassment overshadowed the discussions about traditions, since they are, according to public opinion (or at least what people perceive to be public opinion), "something from the past" and not as good as the latest knowledge. The very character of TEK, having the division between experts and common people poses a challenge for its survival. Apprentices are hard to find and the most skilled TEK beholders are getting scarce.

Traditionally protected forests and sites act as justifications for ethnodevelopment. They support the elements of territorialism for those who still reside on land belonging to the great lineage. TPF/Ss act as manifestations of cultural pluralism at both local and national scales. The Taita ritual complex was tailored to serve ecological and community sustainability needs according to the best knowledge from the past. Presently, the remnants of TRC are intertwined with modern knowledge which can contribute to further development of best practices if applied wisely. The traditional and local ecological knowledge, including the 161 different species of plants with 108 uses listed by the farmers and 255 species with 220 uses listed by the tradition experts speak for themselves. However, the fact that many TPF/Ss have vanished suggests changes in priorities and values over time. Many Taita traditions and practices have been superseded by Christian and western ones, although fragments of the original Taita ritual complex still remain. Its cultural-historical value has been recently acknowledged by the policy-makers, who have brought in the official reference point for justifying cultural pluralism.

Witchcraft is a crucial element affecting ethnodevelopment in Taita by acting as a counter force to productive and collective actions. Witchcraft represents selfish desire at somebody else´s expense, whereas ethnodevelopment is defined as dynamic, creative process, which is supposed to liberate collective energies for development. Also cultural pluralism and internal self-determination belong to ethnodevelopment. This seems like a paradox and creates inconsistency in concept definition, since *Wadawidas* perceive their lives surrounded by witchcraft although fighting against it. At the end of the day, fundamental is the way in

which people perceive their own process of development, and that they have the chance to make decisions upon it.

The merged data in this study is of various kinds that reflects the complexity of the human-nature relationship of the Taita people. The present existence of traditionally protected forests and sites may not be taken for granted; nor should their preservation in the future be seen as definite. The transformation of the Taita peoples´ world views has had impacts on land and resource use and the process is ongoing. The defining authorities for world views and ethnodevelopment during the last century have included many "-isms": colonialism, post-colonialism, neoliberalism, free market economy, globalization, and Christianity. The forest policies and land use policies of the last decades have had a crucial impact on natural resource management. Members of the Coast Interclerics group use their authority to define how the future of the Taita ritual complex might look like. TRC may exist as long as it fits Christian moral, or like the Priest put it: "*We are not against the past as long as the tradition is helpful*". Similarly, the recent forest policy devolves powers and recognizes cultural-historically valuable places and local capacities, thus allowing tenure and practices within framework defined by the government. It is as if the goal is to pick up those elements best suiting present societal needs out of the TRC and let the rest go to waste. I would like to call this "tradition pragmatism" (see Figure 35). To apply the knowledge owned and to adapt to change are supposedly parts of any development process, but when it comes to ethnodevelopment, what matters is the authority defining what is kept and what is let go. This leads us to the following question: whose attitude towards nature counts most?

8.3. Review of prevailing attitudes toward nature

The basic attitudes of the Taita people towards nature have followed various trajectories and twists over time depending on the ideologies and policies thet were introduced into the area. When looking through the classification by Pietarinen (1987) one may notice that the human-nature relation, dating back to the precolonial times, is characteristically closest to mysticism and humanism. If we imagine the basic nature attitudes - utilism, humanism, mysticism and naturism on a continuum, then utilism represents the anthropocentric and naturism the biocentric extreme. Before modernization and missionaries Taita attitude would settle midway in the continuum, sliding thereafter closer to the utilism end due to growing population, market economy, globalization, and top-down approaches in natural resource management policies. During past decades the forest policies reflected strong will for economic growth and man´s authority over nature, however, recently started shifting towards the more conservation-orientated end of the continuum. Conservation organizations and international science communityencourage to take steps in the direction of biodiversity preservation, whereas majority of people in Taita Hills go on with intermingled teachings and perceptions leading their lives.

During this study a solid notion was established: present practices concerning land use and the Taita ritual complex are intertwined. People often associated even the most technical elements of TEK with symbolical and metaphorical aspects. Another notion was the dual

attitude towards traditions, particularly among the "common people"; the first reaction of many informants was embarrassment and denial, but underneath the surface more varied perceptions were found, including respect, fear, appreciation and gratitude. It seems as if *fear* and *respect* together with *traditional* and *scientific ecological knowledge* form an aggregate for nature conservation on Taita Hills. The fear and respect factors moderate with time and science education, thus the proportional weightings of the aggregate are in constant flux. However, this combination seems not to be completely solid, since illegalities still occur and people engaged in forest management felt like they were "working without proper tools".

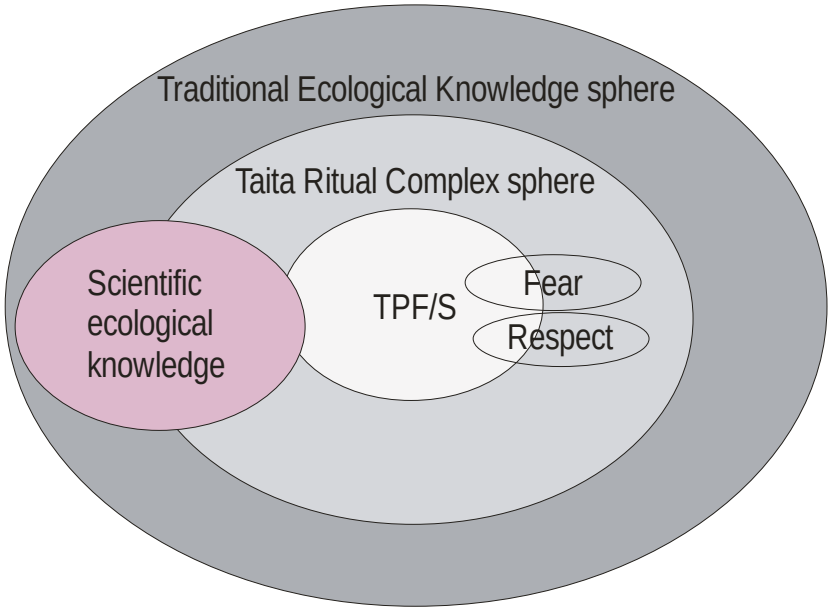

Figure 34. Basis for nature conservation in the Taita Hills.

The level of engagement and belief ground of Wadawidas in theTaita ritual complex varies. There are those who are living it to the full as well as those who deny its very existence, and thus avoiding all the manifestations of it. There are different ways of perceiving traditions. In particular younger community members, with little experience of the traditional practices, had an ad hoc interest and appreciation towards their heritage: for the purposes of cultural revival projects. They saw the whole issue from a distance, but with a local point of view at the same time. They are worried about permanently loosing something culturally valuable. And there are reasons to be worried, because the negative kind of fear towards TPF/Ss, caused by confusion and lack of knowledge about best traditional practices, has already led to a loss of both many cultural heritage sites and biodiversity in Taita Hills. This adds to Casagrande's (2004) notion that, knowledge is not necessarily synonymous with behavior or cultural importance.

Cultural pluralism (Hettne 1990) is one of the key factors in ethnodevelopment. In Taita Hills it is, nowadays, more common to express ones religious beliefs in public than during the most frenzied missionaire period. A prevailing practice, however seems to be that those conducting traditional rituals or collecting herbal medicines were expected to do it in secrecy in order to not highlight themselves or the tradition that they embodied. Taita ritual complex is still considered a taboo. Some of the experts I conducted the TPF visits with suggested that we should do it a subtle way, so as not to cause a fuss or disrespect among the local residents. In other areas some tradition experts made an entrance to "their" territory and fired away with everything they knew, as also to inform the random people who were close-by. The issue of cultural pluralism is complex, since we have two major, prevailing, intertwined, but also competing world views in the area, within the same tribe.

The dominance changed many decades ago in the "critical mass" to favor Christianity as the wide openly professed and practiced religion, but Taita ritual complex has a wide socio-cultural base. Those socio-cultural aspects are still a matter of debate and the authorities like policy makers and church elders want to come up with guidelines for 'best practices'. With or without the authorities, peoples´ use of traditional practices tends to be erratic. The growing worry about the impacts of climate change and the practical notions of the Taita people about irregular rain patterns and prolonged droughts, has again occupied traditional rainmakers. However, some farmers complained that the results of rainmakers´ work are not as remarkable as before. Mystisicism is said to be prevail when people and nations go through big changes and phases of uncertainty (Pietarinen 1987). For Wadawidas the future of their environment seems blurry and the "infrastructure for the best way forward" is still under construction. Individuals strive to make the best out of their situation under the prevailing conditions, but from time to time they feel helpless when facing challenging secular matters. It is during this time that they seek guidance and powers from higher beings. For most traditional Africans the notion that, adoption of a new technology does not simply mean abandoning what they have been doing or what they believe (see Haverkort *et al*. 2003). Adoption means, therefore, doing both things side by side. It is, thus, a question of survival in a diverse and risk-prone environment.

8.3.1. The fear works in two directions

Traditionally protected forests and sites have faced "cumulative uselessness": their functions diminished, the need for agricultural land increased, traditional knowledge about TPF management decreased leading to feelings of insecurity and fear towards the sites, and modern knowledge and practices substituted many functions. Their existence divides opinions and the conservation value in them is in some cases beaten by prejudices and fear leading to mismanagement and even destruction of a site. However, the fear works in two directions; it also forms the very base for forest preservation in the traditional setting. Some of my informants did not worry about forest depletion, since they count on "forests protecting themselves". Tens of stories about individuals´ dramatically failed efforts to enter or encroach traditionally protected forests were noted.

As part of the original ecosystem TPFs promote biodiversity and sustainable land use. They hold intrinsic cultural-historical value even though their usefulness is presently debated by the Taitas. Traditionally protected forests under community management offer people both spiritual and earthly benefits. Often the sites are used for leisure purposes and for the fetching of medicinal plants by the "common people" on their outskirts; the most sacred core areas inside are approached only by the experts. This is the traditional way of tenure and it still works well in some sites in Taita. The largest similar areas were established as forest reserves excluding local people from management by totally denying or restricting user rights leading to disempowerment. This state of incapability lasted for years and has now arrived at the point where the contribution of local people is again welcomed.

8.4. Forests are valued through their contribution to the fields

Local people´s rights to their ancestral lands were neglected under the land adjudication, "the great shuffle", of the 1960´s, even though some who were fast and aware of the changes, got to reserve themselves land areas originally belonging to their clans. Taitas are no forest dwellers, but agriculturalists, who went through transformation from hunters and shifting cultivators to peasant farmers in agroforestry. However, the forest ecosystem has always been one part of their livelihood, supporting the overall balance between the natural and human worlds. A Taita farm is typically a diverse socio-ecological entity including land uses dedicated for both secular and spiritual or symbolical purposes (see Figure 8). For the most part, the traditional ecological knowledge concerning indigenous trees can benefit agricultural production. Trees and forests are seen and valued through their contribution to the field. Elements of ecological management practices are included in TEK, as in methods for pest management and fertilizing, which are based on use of local plants instead of chemicals. Drivers for people distancing themselves from these methods include decreasing knowledge and a need to intensify agriculture. The need for soil improvement has grown as there is less space for fallow and farmers consider chemical fertilizers as more efficient than the traditional ones. Cost of the chemicals is, however, a big burden for many farmers and during periods when they cannot afford agro- and veterinary products from a shop, many rely on traditional methods. Rocheleau *et al.* (1989: 14-15) remind us that the scientific community and development agencies have not invented agroforestry, instead these land use practices are age-old and have been applied by millions of farmers and herders. The combination of trees and shrubs with crops, pastures or animals on the same land unit has been Taita land use pattern also ever since migration to the hills. What has changed are the species; non-native, fast growing and commercial. Wadawidas have knowledge of indigenous, beneficial species even if the exotic species have replaced the traditional ones to large extent.

8.5. Fundamental species

Several tree species have important roles in the yearly agricultural cycle in Taita Hills; *Nuxia congesta, Ficus lutea and Albizia gummifera* indicating rainfall as well as *Prunus africana* and *Ficus sycomorus* "for attracting" rains. *Erythrina abyssinica and Ficus thonningii* have

symbolical roles in maintaining social peace and order. *Phoenix reclinata* is a divine tree storing the power of lightnings whereas Kidongadi *Cussonia spicata* (Thunb.) protects from witchcraft. *Terminalia brownii*, *Ocotea usambarensis* and Mombo *Myrica salicifolia* among various other tree species have medicinal uses. Garibaldi & Turner (2004) found that in human cultures all over the world that plants and animals form the contextual underpinnings of culture. They have fundamental roles in diet, as materials or as in medicines. These species can be considered cultural icons, since they feature in ceremonies, language and narratives. Mandondo (1997) explains how parts of nature are protected under traditional norms according to two premises; the controls can be either space or species-based. Species-based controls are often linked to beliefs about spirits and their dwelling places. Additionally, through religious control some species are protected for their utilitarian values, such as medicines and provision of environmental services. Space-based controls over larger areas, like sacred forests, offer an ecosystem scale for conservation. Most of the TPF/S categories in this study would fall under the space-based control or could be seen as including elements of both control systems. Clear examples of species-based control are sacred trees and fighis for medicinal herbs.

As species are essential to ecosystem functions as keystone species, cultural keysone species are essential to the human sphere. The concept can assist in reinforcing and studying the relationship of local communities to place. Garibaldi & Turner (2004) argue for new methods and approaches that actively address both ecological and cultural concerns and that the cultural keystone species concept should be considered in conservation and restoration efforts, because it targets a finite number of species. Although ecologically influential species must also be conserved, it is the *"dynamic association between cultures and the organisms they rely on most heavily that may see the most immediate reward of conservation or preservation efforts"* (Garibaldi & Turner 2004: 13). Based on the results from Taita Hills, it is easy to agree with these scholars, since they state that identification and appreciation of the complex relationships of cultural keystones to each other and to their habitats may be their most valuable contribution to conservation and restoration efforts. Cultural keystone species play more than one role, and often this role is supported by other non-keystone species.

The role of traditional methods in conserving medicinal plants in Udzungwa Mountains (part of Eastern Arc hotspot area in Tanzania) includes social control of access (sacred groves), domestication, sustainable collecting and storage. Endemic species are rarely used (Shangali *et al.* 2008). Domestication of certain socio-culturally important plant species also takes place in Taita - household-specific and group tree nurseries with indigenous seedling production have become more common, indicating that people are interested in enhancing the composition of native species in their surrounds. Most common seedlings in group nurseries were recorded by Ruotsalainen (2008). Species like *Prunus africana*, *Juniperus* sp, *Nuxia congesta*, *Dovyalis abyssinica* (A.Rich.) Warb., *Syzygium guineense*, *Erythrina abyssinica*, *Grevillea robusta*, *Morus alba*, *Albizia gummifera*, *Croton megalocarpus* (Hutch.), *Passiflora edulis* and *Milletia oblata* were found to be the most popular. Similarly, the native tree species that the majority of the household interviewees considered useful for

having on their farms were the following: *Ocotea usambarensis, Ficus sycomorus, Ficus ingens, Erythrina abyssinica, Prunus africana, Nuxia congesta, Albizia gummifera,* and *Ficus thonningii.*

Shangali *et al.* (2008) compared the list of eighty three medicinal plants found on the Udzungwa Mountains to other studies in the Eastern Arc Mountains, and concluded that the number of overlapping medicinal plant species in different mountain blocks is less than 25% and those that do overlap are used for different purposes by various ethnic groups. The lists of medicinal plants found in Taita Hills were compared with the lists presented in Shangali *et al*. (2008) describing medicinal plants from Udzungwa (Shangali *et al*. (2008), Kokwaro 1976), Shambaa in East Usambara (Ruffo *et al*. 1989), Shambaa in West Usambara (Schlage *et al.* 1999) and Waluguru in Uluguru (Hamisy *et al.* 2000) all belonging to Eastern Arc Mountain block in Tanzania. Twentynine medicinal plant species (8%) and 49 genera (13%) found in Taita Hills overlapped with the 379 species recorded on Tanzanian side, and there was a 72% congruence of the medicinal uses of the species. In this comparison only those Taita species with scientific names known were used and it may be assumed that the number of overlapping species is higher. Similar patterns of traditional herbal health care were found, for example, in Taita Hills and Udzungwa Mountains: Firstly, medicines were extracted from one species or a mixture of several. Secondly, bark, roots, leaves, fruits and whole plants were used to prepare medicines. Thirdly, traditional knowledge is mastered and transfered by the elderly orally to selected members of the younger generation, although many healers are passing away with no heirs to their knowledge. This study shows that traditional medicines are important in primary health care of Wadawidas and people get them from forests, grow in their own yard, consult a herbalist or buy from another villager who collects medicinal plants for sale. Reasons for relying on traditional medicines are better affordability and availability compared with modern medicines. This result is in line with realities of many rural communities also in Tanzania (Mwihomeke 1994) and according to estimations 70–95% of the world's rural population rely on traditional health
care (Harman 1988, Hamilton 2004). However, distress is not always the reason for choosing traditional cure in Taita Hills, instead many perceive that the herbal medicine simply is more effective. On the other hand, some gradually distance themselves from using traditional medicines due to fading knowledge about it within the family.

8.6. Alienation from *mlamba*

Just before the end of millennium, the Institute of Economic Affairs (1998) in Kenya described how government land tenure has been associated with widespread inequity qua distribution of land, destruction of natural forests and catchment areas, and loss of prime land to infrastructural development. On the other hand communal land tenure has also been associated with ecological collapse in the absence of regulatory mechanisms among resource users (SIDA 1993). Signs of both these unsustainable developments can be seen in Taita Hills. However, manifestations of the more justified version of state ownership of natural resourses, whereby it would bring about collective societal interests in common pool resources (Murphree 1993), also exist. The renewed Forest law has made a crucial

contribution to this. The neighbouring Tanzanian government has, since early 1990´s, promoted participatory forest management as a major strategy for managing natural forests. Both joint forest management and community-based forest management are currently either operational or in the process of being established accross more than 3.6 million ha of forest land and in more than 1,800 villages. Blomley *et al.* (2008) studied 13 forests over 1997-2007 in five regions across eastern, central and northern Tanzania and suggest that, forest areas managed jointly and community-based are recovering when compared with forests managed by the government alone or under open access regimes. Community involvement is correlated with improving forest condition, indicated by a greater number of trees per ha, a greater mean height and diameter of trees, as well as declined levels of tree cutting over time.

In Taita Hills, the area of non-gazzetted trust land forests (community forests) (7193 ha) (RoK 2008) is almost five times the area of the government gazzetted forest reserves. Their management is trusted to local County Councils and adjacent residents. However, trustland was described as "no-mans land" and there are no forest professionals provided by the County Council, thus the regular management responsibility is upon communities and their council of elders or an individual elder. Community forests are used for gaining timber and construction materials for collective needs and special occasions like building a community hall or for a funeral. Herbs and firewood may in most cases be collected and forests used for leisure. The use, however, has some traditional common rules, like "if you cut one tree, you should plant two" and complying with the rules is up to the motivation and knowledge base of the community and their elders. Best practices according to the elders are enforced, but also often overridden by the western law. The description "no-mans land" reflects a somewhat loose engagement of both community members and County Council, in the sustainable management of resources. In the coastal Kaya forests the problem with trust land policy seems to be that it vests a lot of powers on the local authorities denying communities the space for first-hand participation in the decision making process. However, it has been suggested that the traditional councils of elders are legally recognized and accorded more space in the overall management of Kayas (Thuku & Tengeza 2005).

From an outsiders point of view the power dynamics among the Taita village elders and other villagers as well as the decision-making processes within the traditional council of elders is challenging to understand. This applies both to outsider experts like researchers or NGO workers, as well as to local administrative officers, who rarely originate from Taita. The rotational system of Government employees´ posts the office-holder in a location for a few years after which they will be transferred to a new place. Officers regret that they don´t understand the dynamics of the communities where they are posted, and when they start to they are moved on to another location.

Only some of the community forests have the "status" of a traditionally protected forest, and the majority is lacking the symbolical use and element of sacredness. However, the 66 TPF/Ss found in this study within community trusted forests are large by their average size (0,8 ha) compared with TPFs in areas under other land tenures, and dominated by indigenous vegetation. Other community forests I visited in search of the TPFs were in majority

plantation forests (with Eucalyptus, Cypress or Pine) or mixed forests with both indigenous and exotic species. This *Kisachi* land category was described by the villagers as disturbed but the forest was thick enough for hiding, rituals and cattle grazing. Indigenous seedlings have been planted by local people in some of them. Firewood and construction material can be fetched with village elder´s permission. The traditional protection statuses of different forest patches vary from strict total ban on use to mild regulations in Taita. These findings are similar to Ylhäisi´s (2006: 6) who divided the traditionally protected forests of the Zigua ethnic in Tanzania into two categories: 1. forests with sacred, supernatural, ritual and spiritual elements and 2. profane, functional forests protected for the needs of the community. The sacred forests were and are the most important and they have had the strictest prohibitions on access and secular utility. Items which are sacred are treated with reverence and must be protected from the profane. This division applies also in Taita Hills and partly explains the varying biophysical and sacredness conditions of the TPF/Ss. In some cases the profane forests have sacred patches inside them - for example the *Kisachi* type of forest allows entering, hunting and firewood collection, and tree felling for special community needs, but it also has an off-limit core area for ritual purposes. The TPF/S with strictest protection statuses are rainmaking forests, scull caves, sesos, and fighis for protection, medicines, cleansing and initiation.

A common challenge for communities is to find a knowledgable person to take the lead in forest management after they loose a respected village elder. Household interviewees do not speak on behalf of comprehensive participation in management of community forests, since out of 50 respondents only 17 participated in trust land forest management and 20 did not or hardly knew about the boundaries of community and government forests. “Alienation from *mlamba*” occurred at the first place due to land adjudication and later due to gazzettement and other local level restrictive measures during recent decades. Simultaneously modern methods of farm forestry have increased. As people are invited again to participate and contribute to the management of their adjacent forest reserves, some feel like they have lost their touch to say anything of being expected to work without proper tools. According to Wadawidas, applying traditional ecological knowledge in plantation forests with exotitc species is impossible. Also Smith (2008: 12-13) discovered that most Wadawidas seemed to feel that they had lost control over both tradition and modernity - that the local and the urban had turned against them and left them to fend for themselves.

8.7. Integrity and sacredness

I do not see the traditional ecological knowledge and the Taita ritual complex either as a scapegoat for underdevelopment nor as a panacea for sustainability. They have served and will contribute to both progressions; however, their role needs to be scrutinized carefully. Like Michaelidou *et al.* (2002) suggest, useful knowledge should not only be incorporated into ecosystem and community viability efforts, but avenues through which TEK can be passed to new generations should also be established. The best way forward may vary according to the area, because even within Taita there are differences in local peoples´ attitudes towards traditional forests and sites. The laissez-faire attitudes from different

parishes towards Taita ritual complex also vary, even if the world views in Taita area are already mixed, and to express that openly still poses social threats. People in Taita Hills have a strong will for success and it seems that along with the history they have acquired a role as "providers" in means of natural resources, especially food crops, and social capital within the larger Taita and Taveta areas. Thus, a strong drive and many expectations for development exist. However, relatively often the narratives of the interviewees in this study got a dramatic twist describing promising plans gone wrong due to witchcraft. Smith´s (2008: xii-xiii) similar notion supports this, as he describes his first journey to Taita, on which he expected to get away from what he took to be a derivative, elite discourse about development and to find something authentically "cultural". However, he noticed that development or *maendeleo* was exactly what Wadawidas wanted to talk about and that the concept had become their historically derived word for a promise constantly threatened by the manipulative actions of others, epitomized in witchcraft.

The notions in this study about the relation between conservation and sacredness support previous work by Sheridan & Nyamweru (2007) and Horning (2008) who found that sacredness does not simply equal untouchable or conserved. Sacredness is, rather, culturally defined property linked to pragmatic histories, and social, political and economic arrangements that mediate cosmology and ecology. When compared with coastal Kaya forests (Kibet 2011; Kibet & Nyamweru 2008; Nyamweru *et al.* 2007) described in chapter 3, TPFs in Taita Hills face similar threats in agricultural extension and private property development. The land management regime still leaves space for misuse. While land privatization is important for livelihoods, it also poses threats to the TPFs; if the owner gets tired of the responsibilities that come with a traditional site or is incapable of taking care of it, he may destroy the place or sell the land to an outsider who then may convert the area into agricultural land without hesitation. Thus, the fear of the consequences from destruction of an ancestral site works to a certain extent, but some have solved the moral problem by delegating the actual procedure. Like the example earlier shows, even my assistant and I were offered the duty of carrying away ancestor skulls from a skull cave, which the villagers did not know how to manage. Similar claims have been made in Tanzania, where newcomers to villages are sometimes allowed to do things that locals could not do, leading to destructive measures (Ylhäisi 2007). In India, Sinha (1995: 284) suspects, that Muslims are "hired" by Hindus to cut trees from sacred forests that have been traditionally protected by Hindus, in order to avoid moral problems.

Similar trends can be seen when comparing traditionally protected forests in Taita and in Mkata, Tanzania. According to Ylhäisi (2007) there have been severe illegal cutting of forest, and more and more villagers neither respect indigenous regulations nor accept indigenous penalties in Mkata. However, positive development occurres as central government allows elders to protect TPFs and village governments to create by-laws. The younger generation seems ignorant about the TPFs in their village, but as in Taita Hills, they are interested in learning about their own history and values. The challenge for the local administrators and teachers, who have a great influence on attitudes, is to raise awareness. In areas where fear causes destruction of sacred sites, the importance of other beneficial effects,

like ecological services, of the site should be better highlighted. Several authors indicate (Fairhead 1993, Millar 1999, Ylhäisi 2003) that sacred groves can be an important starting point for conservation and rehabilitation of forests. Very few local people seem to understand the connectivity value of small forest patches in the landscape or their contribution to biodiversity. This sort of knowledge is still mainly held by the scholars and outside experts and only arriving to Taita through joint conservation and education programs. Taita Hills have a heterogenous mixture of landcover types that can provide sustainable resources both for environmental protection and economic growth if their management is appropriately planned and people inhabiting those areas included into the planning and implementation processes. The resource management policies in Taita Hills need to take into consideration the human-resource relation and peoples´ sense of places. This is what Nazarea (1999) calls “situated knowledge” about local places, and explains how people perceive their environment and estimate their latitudes of choice and opportunities for challenge and refutation. This is where I see the time and place for a discussion forum, whereby traditional ecological knowledge and the latest scientific knowledge should meet and strive to recognize potential interfaces.

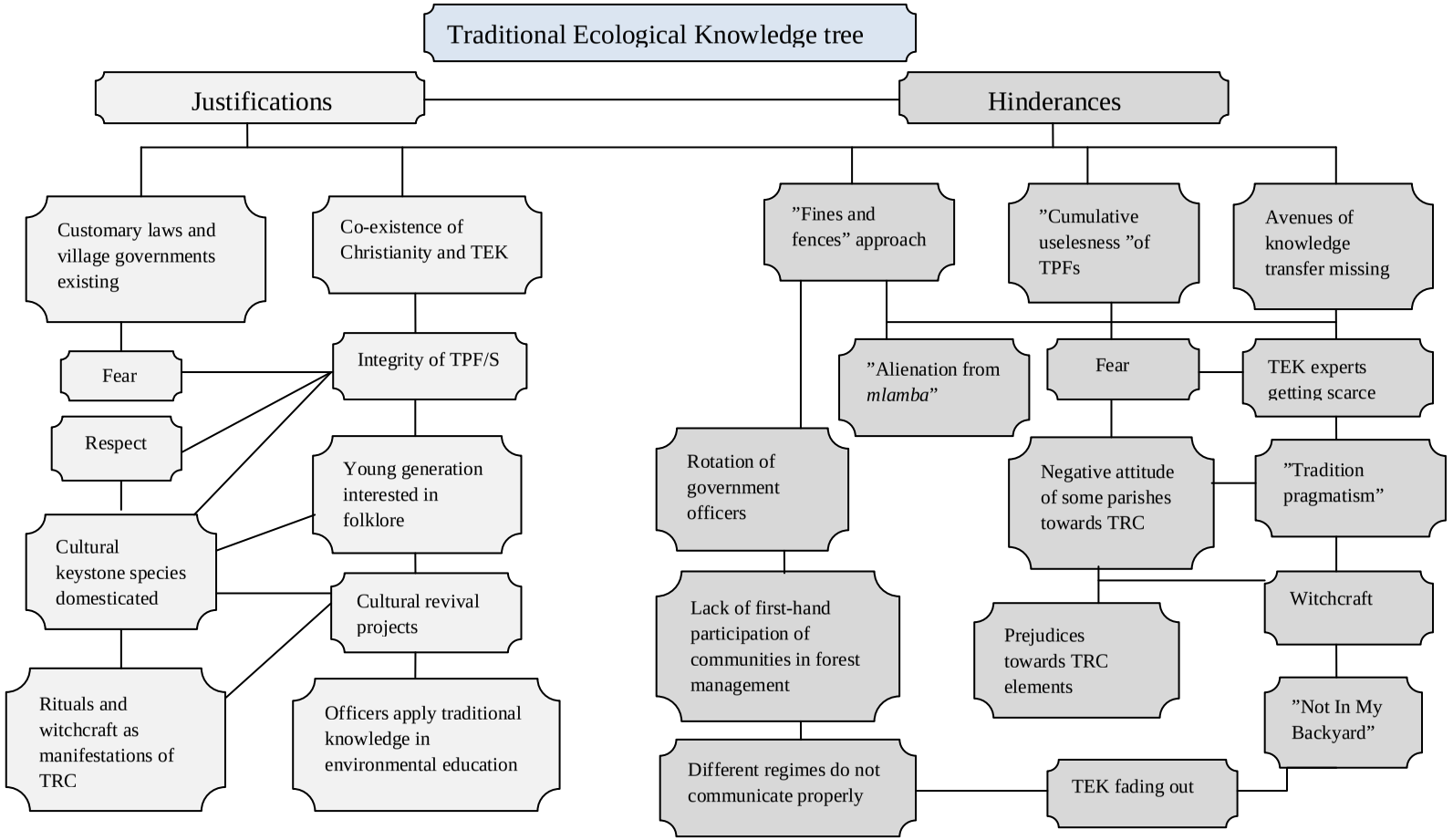

Figure 35. Traditional Ecological Knowledge tree highlights the connections between the factors affecting TEK preservation and enhancement in natural resource management in the Taita Hills.

Conclusions

This study has highlighted the importance of the socio-cultural features of an area, which may prove useful in drafting guidelines for sustainable natural resource management. Wadawidas perceptions of their cultural-historical sites are heterogenous, and the Taita Ritual Complex affects their mind-sets and actions more than outsiders may think.

Traditionally protected forests and sites represent complex socio-ecological system and have symbolical status and sacred components in them. They may act as models for people in biodiversity conservation and contribute to the connectivity of remnant forests in the agroforestry dominated landscape. Out of the traditionally protected forests and sites studied 47 % were located on private and 23% on community land, leaving 9% within state forest reserves. A paradigm shift in conservation is needed; the conservation area, or the so called fines and fences approach is hardly functional on private or communal lands. Many Taitas are annoyed by the paternalist approach in farm forestry brought in by the resent Forest Act. Illegal logging happens on farms despite the restrictions and licensing system due to poor government resources for extension services and control.

It is important that Taitas become more aware of rich biodiversity and their local forests. The existence of the forest has been taken for granted and before the lemming rush of scientists into the forests, the biodiversity value of the indigenous and endemic species was barely known to the residents. There is a need to educate all community members, both young and old, on the changing roles of forests and their continuing importance. However, the majority of people involved in this study expressed their worry about environmental crisis, real and imagined. They have experienced concequences of unsustainable field management practices and deforestation. They have also aimed to adapt to irregular and less predictable weather patterns; some by searching the latest information about management methods, and some by resorting to spiritual means in a rainmaking ritual.

Positive news for the Taita area with agriculture-dominated landscape tends to inform scholars' assessment of agroforestry as having potential to be more efficient carbon storage sites than forests. The contribution of agroforestry to the carbon balance should not be underestimated (Kanninen 2011). The term agroforestry still seems to have a strong connotation towards agriculture undermining the focal impact of the trees, thus, using another term, like "evergreen agriculture" is tempting. In many cases agroforestry has had more positive impact on people's livelihoods than forestry (Luukkanen 2011). This is especially the case if the forest resources are scarce and if management rights are unequally distributed and level of knowledge is low.

Several challenges for the forest management in Taita Hills remain: Firstly, the implementation of the participatory management plans for the forest reserves need to be hastened and the various user groups need to be heard more carefully. The principles of participatory forest management and ethnodevelopment may work side by side as long as the participation is sufficiently active to include various stages from initiative to rulemaking and decision-making. As Berenschot (1988) stated; participants´ involvement should include

planning, goal setting, mobilization of resources, implementation, management and administration, monitoring and evaluation as well as distribution of land, labour and other community resources. Presently however, capacity building is needed and wanted by the community members in management and administrative issues. Involvement should also include all forest adjacent people equally. For instance, the Chawia forest reserve has had a management plan since 2006 stating the rights for a forest adjacent resident to use certain management zones for cultural purposes. The traditionalists, however, claim that they are regularly denied access by the forest guards. Wadawidas are a heterogenous group of forest users, thus the rights and responsibilities should be flexible enough to offer every stakeholder a meaningful role and benefits. There is a risk of emerging, hidden resistance towards conservation (Vihemäki 2004) if the power structures grow biased and expectations are not met.

Secondly, I wish to emphasize the importance of optimizing tree management on private lands. Even if the reforestation and afforestation efforts are crucial in the forest reserves and people´s participation is needed, a big responsibility of biodiversity enhancement rests upon the shoulders of the land owners inhabiting the areas between the watertower hill tops. By increasing indigenous tree species on farms and by sustaining, and in some cases upgrading, the existing traditionally protected forests and sites, positive change could be enhanced. This venture however, needs inputs from the various stakeholders with knowledge of efficient management of indigenous species with big potential for environmental services, combined with a good market value. One myth or generalization, hindering people from growing more indigenous species on farms is their slow growth. There is still room in many households for education about optimal ways of tree management. The traditional ecological knowledge is plentiful, but it could be made to be more financially beneficial. Sanchirico and Siikamäki (2007) noted that many environmental goods and services are left out of the marketplace, because they are not easily traded and priced. Crops or timber are easy to market, unlike the environmental services on one´s property, such as providing wildlife habitat or protecting rare species. The scholars state that without economic rewards, landowners have little incentive to engage in such activities. Furthermore documentation of traditional knowledge on e.g. medicinal plants and their uses is also important in order to protect the intellectual property rights of the local people, especially in this era where commercial products are developed based on indigenous knowledge (CBD 1992).

Ways of supporting best practices for restoring landscape connectivity were discussed in a stakeholder's workshop in Taita (CEPF & EAWLS 2005). One goal set was to increase forested area in the landscape matrix and to convert plantations with exotic trees into indigenous ones, simultaneously providing for human needs. These can be seen for instance in revenue accrual for farmers who have harvested old and neglected forest plantations, financial compensation for nurturing regenerating forest and planting indigenous seedlings, improving water catchments and encouraging agroforestry on their farms. The latest knowledge conserning environmental importance of the fighis could be made more available for those Wadawidas who perceive particular forests so scary that they are willing to destroy them. Communities would also need wider encouragement from the markets and financing

institutions for initiatives supporting sustainable resource management. The government should introduce external incentives to further encourage conservation efforts, as is done elsewhere with the Payment for Ecosystem Service (PES) (Clements *et al*. 2010, Turpie *et al*. 2008, and Alpízar *et al.* 2007). Both private land owners and communities may benefit from accessing the PES interventions. Through this opportunity also those who do not perceive the cultural values of TPFs might see some financial potential in them. Such incentive schemes could encourage Taita communities to ensure sustained conservation of the forests and support both local livelihood and national and global interests. However, as Sommerville *et al*. (2010) state: community-based conservation interventions can only be successful in the long term if their aims and activities are accepted by local people. Fairness of the distribution of the costs and benefits of the intervention are the key determinants of acceptability. Challenges thus remain for PES: it does not always address individual opportunity costs, and often has biases in power dynamics of the beneficiaries within communities. Due to these complexities, a successful implementation of PES needs development of sound and context-specific socio-ecological research, which could guarantee a realistic connection between payments, services and economic benefits. The scholars (Muradian *et al.* 2010: 1205) wish to define PES as "*transfer of resources between social actors, which aims to create incentives to align individual or collective land use decisions with the social interest in the management of natural resources"*. Both monetary or non-monetary transfers are embedded in social relations, values and perceptions, which are decisive in conditioning PES design and outcomes. The transfers could thus take place through a market as well as through other mechanisms like incentives or public subsidies. I found that in Taita Hills sacredness does not equal conservation even if it contributes to that, hence complementary systems for supporting conservation thinking and sustainable natural resource management are needed and wanted.

Thirdly, I see work in community forests as having the greatest potential. Their status varies a lot, ranging from monoculture plantations (*Kilembenyi cha midi ya mbao-* type) to disturbed indigenous patches (*Kisachi-* type). The backgrounds and world views of local people involved and the differences between their communal and individual identities also differ and affect their engagement in forest management activities. In legal terms the trust land forests are directed and controlled by the County Council, who does not have forest expertise. Considering these challenges, the need for enhancing the forest extension services with high expertise and inputs is emphasized. The forest policy still governs and controls people´s rights to trees in all tenure systems. It is participatory, but still a joint venture, within legal frames and multiple stakeholders. More profound and extensive involvement of various stakeholders is claimed by Taitas themselves. They would like to see more teaming up of non-governmental organizations, community-based organizations, officers, area residents and religious leaders. Chruches in Taita could consider natural resource management issues as more important to their agendas. Church mission and other religious organizations from outside may also want to emphasize this theme as part of their livelihood programs.

Fourthly, the transition of responsibility in forest conservation and management practices should start more from the communities upwards to government and then to other stakeholders. Kumar (2002) assessed the net social benefits of joint forest management for local communities in India and showed that the regime reflected the social benefits of the rural non-poor, leaving the poorest in the village as the net losers. He suggests that the management plans should include compensatory mechanisms to help the poorest. Engaging the land and forest users in both ecologically and culturally sustainable ways needs further efforts in Taita Hills. Along with the extension services providing advice and guidance based on updated, scientific information, there could also be community-based extension services and 'indigenous training schools' providing traditional ecological knowledge. The knowledge exists in plenty, even if the experts are scarce and the knowledge scattered. Thus, only the actors for implementation have yet to be named. Mawere (2010: 213-214) argues that exploration of this kind of knowledge is a potentially productive indigenous knowledge system that, for a long time, has been conceived as diabolic by Western colonialistic civilization and whose developmental essence has remained shrouded in mystery. The knowledge system often embodies a hidden genre of 'moral epistemology' that could contribute, in multiple ways, to resolving Africa's development dilemmas, if opened up to wider debate, and integrated into mainstream expert science. The common Taitas tend to underestimate the knowledge they behold, thus traditional ecological knowledge would need a 'profile-lifting'. In this context, we need to consider the witchcraft phenomenon and regularly emerging jealousy which is embedded in the Taita culture. The forest management system should be developed as transparent and equitable as possible and participants from all different strata in Taita Hills should be included in rule- and decisionmaking in order to avoid biased competitive positions and jealousy rising. The current joint and multi-stakeholder approach in this sense poses challenges for the future performance.

The forest policy encourages efforts in managing indigenous forests on sustainable basis for cultural use and heritage (RoK 2005: 271). Therefore, the state should also provide support for community incentives contributing to the preservation of cultural inheritance. Community-based conservation and development groups working on ethno-ecological issues should be recognized, and given powers to regulate resources. Here we can also call upon the international community, National Museums of Kenya, East Africa Natural History Society as well as the local and national private entrepreneurs. Some of the traditionally protected forests could be highlighted as key examples of national heritage through declaring them national monuments or natural heritage (see National Museums and Heritage Act 2006 by RoK 2006) for public awareness and education.

Fiftly, the existing conservation-compatible, symbolical and technical traditional knowledge together with social organization strengths of Taita communities should be incorporated while developing management plans. The participatory forest management groups should consist of both the experts and common Taitas. The stakeholders ought to avoid creating boundaries between local people´s ecological knowledge and scientific knowledge. Instead, a comprehensive and problem-based approach is recommended for tackling complex

environmental challenges. Diverse knowledges are needed in the common “data pool” for getting ahead in the urgent process of climate change mitigation and adaptation.

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Appendix 1. Traditional use of plants (trees, shrubs, herbs and climbers) found at the traditionally protected forests and sites of Taita Hills. The data was recorded during participatory mapping from local informants consisting of village elders, medicine men and young people knowledgeable about traditions. Eleven use categories were found. See also appendix 3 for details.

Use category	Recorded uses	Number and vernacular names of species	No. of uses
Fodder	fodder for cattle, rabbits	**18** Angel trumpet, Desmodia, Isangasha, Kishatu, Lukina, Mafundo, Mamboleo, Mbogholollo, Mkalala, Mkungo, Msaigembe, Mshoshote, Mukurumbutu, Mwaghare, Nyasi, Red oat grass,Seria, Wakesho	**2**
Food	fruits, berries, power drink, salad, vegetable, tobacco, lemon grass for tea, fermentation of beer/brew, seeds, yams, berries for birds	**41** Delema, Kiangachi, Kilangoni, Kimbungu, Kiungu, Kumbaku, Loquat, Maduma, Madumaghangoruse, Makilumi, Makumbo, Marughundi, Mbogholollo, Mburungu, Mdaidai, Mdajandaja, Mdana, Mdodo, Mfenesi, Mngima, Mnyanga, Mnyinya, Mnyvnya, Mokazi, Mrimbo, Msambarau, Mshoshote, Msurubali, Mughorogho, Mukorowo, Mukuyu, Mngoli, Murarandasi, Msubali, Mwasina, Mwembe, Ndunda, Nuanga, Rikot, Seria, Tangawizi	**12**
Construction	timber, roof tatching, fencing, poles, construction without nails, furniture, poles for traditional taita houses, woodcarvings, granary construction	**38** Cedar, Chamsidu, Chusu, Grevillea, Isangasha, Jacaranda, Kiangachi, Kikongori, Kivulevule, Luno, Mkungo, Manyadoo, Maria, Mbiribiri, Mbunduki, Mdana, Mfuu, Mgarasu, Mkalamke, Mngala, Mnuka, Mrahani, Msaigembe, Msambarau, Msimu, Msumbesu, Msuruwachi, Mtaranganga, MualeMukigara, Mukurumbutu, Munyanga, Mwafwa, Mwalufigho, Mwamasungu, Mwingo, Ndido ya kisaga, Red oat grass	**9**
Technology	bee-hives, drums, natural toilet paper, cosmetics, leather tanning, basket weaving, broom-making, essential oil, scented wood, weaving ropes, food storing, toothbrush, making sourmilk, soap, catching fish by poisoning the water, butterfly attraction, poison for hunting, sap, handles for farm tools (e.g.hoe), ornamental, fibre, shoe polish,	**71** Baki, Irisojangondi, Ivurugho, Jacaranda, Kiangachi, Kideu, Kijulu, Kilangoni, Kilulu, Kipapa, Kirumbutu, Kisasha, Kishoe, Luafambo, Lufumo, Lumbi, Machanyale, Manyodoo, Maria, Mbiribiri, Mbogha, Mbughobugho, Mchuko, Mdaio, Mdana, Mgarasu, Mghungachuma, Mgombe, Mgungunyi, Mkaju, Mkondoyi, Mkonge, Mlungu, Mmeru,	**52**

	pearls for beads, arrow-making, bows, preservative, dye, sand paper for polishing, window frames, fibre for mat and ropes, latex, termite resistant wood, bee attraction, arrow poison, comb making, whistle, broomes, wooden toys, cooking sticks, bird-trapping, Lungo (flat basket) -making, mortar and pestle, ink, pot decoration, lubricant for machines, boundary marking, making a watch-dog fierce, attracting bees to the hive, silkworm production	Mmosi, Mngamu, Mnyananyi, Mrangi, Mraringa, Mrimbo, Msasha, Mshagosha, Msherembe, Mshoshote, Msidu, Msimu, Msoko, Msumi, Msungu-sungu, Mtaranganga, Mtoritori, Muachanyama, Mukangu, Mukorogho, Muku, Mukungo, Munganga, Mushundunulo, Mwafwa, Mwama, Mwamabemba, Mwarufu, Mwarufuru, Mwawusungu, Mwingo, Mvudi, Mvumu, Mwyino, Ngungua, Ngoli, Seria,Waru	
Fuel	firewood, oil, charcoal, biofuel	**33** Baki, Calliandra, Cedar, Chamsidu, Delema, Grevillea, Jacaranda, Kiungu, Mbiribiri, Mbonu, Mbughombugho, Mchemeri, Mdana, Mgarasu, Mngamu, Mngima, Mora, Mrahani, Msambarau, Msumbesu, Msuruwachi, Mukigara, Mukungo, Mukurumbutu, Mukuyu, Mwaghare, Mwama, Mwarombo, Mwemberi, Mwesi, Ndido, Ndundu, Seria	**4**
Soil management	water retention, soil fertility improvement, degraded land indicator	**7** Mukuyu, Mora, Kidongadi, Lusu, Mombo, Mukigara, Seria	**3**
Water management	rain-bringer, rain indicator, water protection	**9** Mukuyu, Mulungu, Kiavua, Kidongadi, Kilulu, Mkongorosho, Mlende, Mlimangondi, Mora	**3**
Ethno-medicine	50 medicinal uses, prostate cancer, sterilization of wounds, anti-pyretic, eye infection, barenness, boils, skin diseases, headache, cough, flu, mumps, splin problems, strains, chest pain, stomach ache, blood pressure, abscess, whooping cough, “Nyago”, Malaria, typhoid, diarrhea, diabetes,measles, splinomegaly, analgesic, emetic, indigestion, anthelmintic, choosing child´s gender, excessive menses, muscle ache, joint pain, hemostatic, rash, anti-poison, liver problem, toothache, anti-coagulant, sour throat, malaria prevention, stiffness, laxative, contraceptive, hasten child learning to walk, antibiotic, coagulant, anti-fungal, ambilical cord healing, nerve disorder, coagulation in circumcision, swollen glands, asthma, syphilis, snake bite anti-poison, hick-up stopper, hypertension, gonorrhea, yellow fever, boosting wound-healing, “Mnyaya”(similar to HIV-AIDS), flatulence, HIV-AIDS, emetic for ingested	**161** Atare, Atari, Baki, Camphor, Cedar, Desmonia, Dungulu, Guava, Ishari, Isuruwi, Ivurugho, Kibhari, Kidegedege, Kidongadi, Kififer, Kifuchagombe, Kihatari, Kijulu, Kikongori, Kilangoni, Kilemachovu, Kilembajo, Kilimangondi, Kimbungu, Kipapa, Kirugana, Kisorongo, Kituma, Kitunguu, Kiwumba, Klasu, Lonyi, Lumbi, Lundu, Lungua, Luno, Lunua, Lusoka, Madumbu, Mafundo, Mbarachoka, Mbavio, Mbinu, Mbiribiri, Mboghololo, Mboi, Mbonu, Mbughobugho, Mbule, Mburisonga, Mburungu, Mcunguya, Mdana, Mdandawasi, Mdigwuaroshi, Mdikoshi, Mdomoko, Mdongu, Mdughudu, Mdungua, Mfirifiri, Mganingani, Mgarasu, Mgunga, Mgungunyi, Mikifindi, Milimangondi, Mjafari, Mkalamke, Mkama, Mkengera, Mkinyi, Mkochokocho, Mkungo, Mlemachovu, Mloi, Mlungu Mnganingani, Mngima, Mninja,	**86**

	poison, purification of blood, for cracks on skin after walking barefoot, dysentery, sore gums, abortion, pneumonia, antimicrobial, kidney problems, cleansing of womb, scabies, constipation, nosebleed, leprocy, anthelmintic for hookworm, itch and pimples, cancer treatment, gender balancing, acaricide, epilepsy, sedative	Mnjamanjama, Mnuka,Mnuka-masi, Mnyamani, Mnynia, Mnyvnya, Mombo, Moringa, Mosu, Mourbain, Mrahani, Mraringa, Mrimbo, Mroreka, Mrughundia, Mrumbawasi, Mrundurundu, Msambarau, Msasha, Mshiga, Mshoshote, Mshuluti, Msigha, MsimuMsisina, Msoko, Msua, Msufi, Msunduru, Msungusungu, Msuruwache, Mtaranganga, Muachanyama, Muama, Muasa, Mubachabacha, Mudikoshi, Mudumbua-ngomdi- munda, Mukangu, Mukigara, Mukiromboshe, Mukumbi, Mukuro, Mukur, Mukuyu, Mundendele, Munje, Murugaso, Musu, Mwadodi, Mwafwa, Mwaghare, Mwakwawira, Mwama, Mwamabemba, Mwambombo, Mwangole, Mwasa, Mwemberi, Mwesi, Mwesu, Mvumu, Mvunde, Ndashi, Ndido, Ndunda, Ngandu, Ngidi, Nginga, Ngoli, Njundu, Oleani mbudukua, Passionfruit, Risojangondi, Rukaramba, Rumbawasi, Seria, Sodoma-apple (Kilasoo), Suruwi, Towe, Wild Banana, Wild onion	
Ethno-veterinary	useful for zero-grazing cows´ digestion, anti-pyretic, sterilization of wounds, anti-ectoparasites, goat medicine for labour, decrease of milk production, hepatic problem, coagulation boost when sheep tail cut, deworming, acaricide, ulcer	**23** Delema, Kijulu, Kishatu, Kituma, Lukuku, Lukundukundu, Mdomoko, Milimangondo, Mkorombosha, Mlemachovu, Mngima, Mnjanga, Msembele, Msemberi, Msisina, Mwakwawira, Mwavwa, Mwunde, Mwuwughogho, Ndido, Nginga, Rugaramba, Wamea	**11**
Pest management	natural pesticide for crops, pesticide for storaging maize, army ant prevention, mole killing	**6** Ikowa, Ludi, Mbiribiri, Mkomborosha, Mnuka, Nyarambiri	**4**

Rituals	cleansing from a curse, rainmaking, boundary and sacred site indication, protection herb of the army leader kept in a calabash in order to become bullet-proof, prevention of bad omen, meat protection from animals, Kiweto made land perform fire and protect cattle and women from Tanzanian thieves, makes enemy lost way, revenge for cheating: hidden under creater´s mattres and hinder urination, ghost repellent, fighi pot medicine, Goats Intestine Analysis, detection of outsiders and bewitching in the community, prevention of bad dreams, suffocation of a goat to be sacrificed, power to win a court case, removes bad spirits, tolerance against wizards, fore-seeing, healing community problems, making oneself invisible, against bewitching by someone outside Taita, plants around household bring peace, sacred tree, oath-taking, fermentation of Bombe (local brew) for worshipping, house cleansing, walking stick for elders indicating leadership, leaves used by burial, grass ensuring successful singing, scaring people, calabash for Bombe, storing powers of a lightning	**42** Idadongo, Isaye, Isengerughu, Kiangachi, Kifufuto, Kilemachovu, Kirugana, Kirumba, Kituma, Kiweto, Klasu, Kuchakucha, Lukuko, Lusoka, Lusuluawarumu, Madugudhu, Mararo, Mboghololo, Mdighwmbaro, Mdongu, Mkenga, Mkengera, Mkomborosha, Mlamba, Mlende, Mnjwa, Modi, Mosi, Msembele, Mshiga, Msuruwache, Muakoshi, Mughule, Mukengera, Mutanyakesi, Mwarufu=Chao, Mwasina, Mwiriwiri, Mvumu, Ngandu, Wakesho	**34**
Total number		**449 (255 different)**	**220**

Appendix 2. Uses of beneficial plants (trees, shrubs, herbs and climbers) on fields and close by forests according to Taita households. See also appendix 6 for details.

Use Category	Recorded Uses	No. and vernacular names of Species	No. of Uses
Fodder	cattle	4 Calliandra, Nginga, Napier grass, Lushago	1
Food	fruits, nuts, vegetables	19 Avocado, Imbo, Isengerughu, Kighoi, Kimbungu, Kirumba, Liquat, Macadamia, Mango, Mchicha, Mkwachu, Mpapai, Mpera, Msabibu, Msambarau, Musizi, Mzunga, Orange, Passion	3
Construction	timber, fencing, boundary marking	34 Camphor, Cedar, Grevillea, Keiapple, Kirumbutu, Kishatu, Mango, Mbuchi, Mbunduki, Mdana, Mkange, Mkungu(e), Mkuyu, Mngala, Mngamu, Mngima, Mnyadi, Mora, Mosi, Mrimwa, Mrumbawasi, Msimu, Msumbesu, Mungala, Musangano, Musekiavai, Musizi, Musu, Mwavwa, Mwojhowujho, Mziri, Nginga, Podo	3
Technology	beautifier, basket-making, shade,toothbrush, resin, leather-tanning, beautyfier, medicinal soap	14 Kiangachi, Madughakwaru, Mbuku, Mbunduki, Mlezenyi, Mngamu, Mpera, Msabibu, Msambarau, Mshomoro, Mughulo, Mwavwa, Mwarubaini, Mvumu	8
Fuel	firewood, charcoal	26 Boniface, Cedar, Grevillea, Iti, Kidenya, Kimbungu, Mgorusa, Mkeresu, Mkungu(e), Mngamu, Mngima, Mnyama, Mombo, Mora, Mrumbawasi, Msimamongo, Msumbesu, Msuruwachi, Mukongo, Mukulumba, Musizi, Mwama, Mwavwa, Mwojhowujho, Ndido, Podo	2
Soil management	nitrogen fixing, soil friendly, water retention, soil erosion control on riverbanks, soil erosion control on steep slopes, tree leaves as fertilizer, planting yams on river-sides, mulching,calcium booster, cow manure, weeds,e.g. Nginga buried underground for fertilizing, Mwemberi, planting trees, terracing (*matuta*), Nepia grass, Mboi+ash+water for fertilizing,	35 Calliandra, Cowpeas, Grevillea, Isengerughu, Kijulu, Kilulu, Kongodi, Mango, Mbirimbiri, Mginga, Mkuyu, Mlungu, Mngamu, Mngima, Mngungunyi, Mnyadi, Mombo, Mora, Mpera, Mrimwa, Msidu, Msimu, Msuruwachi, Mukhorogho, Mukongo, Musizi, Muuku, Mwama, Mwemberi, Mvumu, Ndido, Nginga, Mboi, Sugar cane, Yams	22

	trenches, ridges facilitating drainage, intercropping, crop-rotation, burning bush for ash and mixing it with soil (*mando*)		
Water management	rain attracting tree species, trees which suite riverbeds, *Mkua*-stone walls to direct water to the fields, buffer zone between field and river, ancestor spirits guard all springs, trees planted around pond, tapping from roof, tapping from bedrock water output, Bamboo stems as pipes for field irrigation, digging ridges for runoff control	8 Bamboo, Mdighwavua, Mukongo, Mungala, Musizi, Musu, Mwavwa, Mora	10
Ethno-medicine	toothache, anti-parasite, sore throat, stomach ulcer, anemia, flu, fever, stomach-ache, antibiotic, analgesia, muscle cramps, malaria, diarrhea, power drink, hypertension, cough, mumbs, jointpain, ring-worms, typhoid, heart-burn, iron booster, first-aid (external wounds), asthma, chicken pox, HIV-AIDS, boils	73 Avocado, Baki, Dowe, Genjeka, Iti, Iwurugho, Jarambiri, Kidongadi, Kijulu, Kilulu, Kimbungu, Kipapa, Kishagha, Kishatu, Kishoe, Kisuchi, Kongodi, Lemon, Luno, Mafundo, Manyodo, Mbaramchoka, Mbaro, Mbinu, Mbobwe, Mboghobogho, Mbuchi, Mbuku, Mchicha, Mdana, Mdongu, Mgono, Mkungu(i), Mlezenyi, Mlungu, Mndimu, Mngala, Mngamu, Mnukamasi, Mnyadi, Mnyama, Mombo, Mora, Mosi, Mpera, Mrumbawasi, Mshari, Mshigha, Mshungumulu, Msidu, Msimbiri, Msisina, Msoko, Msumbali, Msunduru, Msurubali, Msuruwache, Mtunguru, Mudikoshi, Mughalala, Mugharaso, Mungala, Musu, Mwachanyama, Mwakuzema, Mwakwawira, Mwama, Mwarubaini, Mwavwa, Mwemberi, Mzunga, Nginga, Passion	27
Ethno-veterinary	Anemia, fever, antibiotic, foot-and mouth disease, digestion problems, antiwormer, milk fever, analgesia, flu, diarrhea, cattle/chicken cough, chicken fever, first aid for wounds, eye inflammation, appetizer	42 Baki, Boniface, Calliandra, Iti, Kidongadi, Kilulu, Kipapa, Kishatu, Kishoe, Lukundukundu, Lumbi, Mbirimbiri, Mbobwe, Mboi, Mchovu, Mkange, Mlemachovu, Mlungu, Mngima, Mora, Mrahani, Mrimbo, Mrumbawasi, Msembelele, Msemrere, Mshigha, Msidu, Msimu, Msoko, Muababa, Mudikoshi, Mwarubaini, Mwavwa, Mwimbo, Mwindiguku, Nginga, Nzarambinzi, Papay, Rukaramba, vegetablepepper, snail shell roasted and crushed, Mrimbo+Mngima+Mlungu barks	15
Pest	pesticide against catepillars, aphids and ants,	14	2

management	herbiside	Ash, Jarambiri, Mbirimbiri, Mboi, Mnyadi, Mnukamasi, Mododi, Mrindawasi, Mwakuwawa, Mwarubaini, Nginga, Garlic, Indigenous tobacco, Mbirimbiri+vegetable pepper+Mnukanuka	
Wildlife combat	People chasing baboons/monkeys manually, watch dogs, cross bows/traps,scarecrows, extra fruits trees for monkeys to eat, one dead monkey to scare away the others, poison arrows, *Kitangara* cages for chicks to protect them from eagles/hawks, bells, thorny trees for fencing, cats for rats		10
Rituals	witchcraft rituals, sacred tree,truth-telling plant, prevention of bad luck on the field, No trespassing-sign	5 Kidenya, Mlungu, Msimamongo, Mughule, Mwasole	5
Total		**274 (161 different)**	**108**

Appendix 3. Plant species (trees, shrubs, herbs and climbers) found and identified by the tradition experts at the traditionally protected forests and sites of Taita Hills. In total 293 species were listed.

Vernacular name	English name	Scientific name	Part used	Use
Atari		*Craibia zimmermannii* (Harms ex Dunn)	bark, stem, leaves	deworming,fever, hypertension (human), constipation (animals)
Baki		*Memecylon teitense* (Wickens)	leaves	malaria,fever, firewood, hoe handles
Calliandra	Calliandra	*Calliandra calothyrsus* (Meisn)		
Chamsidu/ Mkufi/ Mwafu		*Newtonia buchananii* (Baker) G.C.C.Gilbert & Boutique	bark boiled	timber, firewood, nitrogen fixing,fodder
Chusu	Bracken fern	*Pteridium* sp. (Raf)		used for brushing away army ants, leaves left along the compound
Coffee		*Coffea arabica* (Benth)		drink
Delema				vegetable, biofuel
Desmodia			twigs,bark	fodder
Dowe/Towe		*Commiphora* sp. (Jacq.)		
Garingari				used in beehives to attract bees
Gedu			roots	
Grevillea/ Mlevulia	Silky oak	*Grevillea robusta* (A.Cunn ex R.Br.)		timber,firewood
Guava		*Psidium guajava* (L.)	leaves, fruit/ oil/bark	typhoid, dysentery, antibacterial, diarrhoea/ anti-inflammatory/ ring-worms, ulcer/ diabetes, hypertension,toothache
Irisojangondi				seeds for decoration
Isangasha				

Isaye		*Dracaena steudneri* (Engl.)	leaves	boundary marking,sacred plant
Ishari			stem	
Isengerughu	False banana	*Ensete ventricosum* (Welw.) (Cheesman)	leaves, fruit	cleansing, food
Isuruwi			leaves crushed	flu
Iwurugho			leaves sniffed or boiled	cough, flu, natural toilet paper
Kiangachi	Wild date palm	*Phoenix reclinata* (Jacq.)	leaves, sap	sap for sugar drink, leaves for mats and baskets, divine tree storing powers of lightning
Kiavua				
Kibaridi		*Plectranthus* sp. (L´Hér)		
Kideghedege		*Aloe lateritia* (Engl.)	leaves	
Kidenya		*Acacia seyal* (Delile)		
Kideu				soil improvement, rain attraction
Kidongadi		*Cussonia spicata* (Thunb.)/ *holstii* (Harms ex. Engl.)	roots, leaves, bark	medicine for splinomegaly, malaria, emetic, diarrea, painkiller, protection from wizard´s touch, pest management (against moles)
Kidumba				
Kififa	Stinging nettle			
Kijulu	African Sandalwood	*Osyris lanceolata* (Hochst. & Steud.)	bark	cosmetics, cow fever, stomach ache, scented wood and essential oil.
Kikongori/ Chungia		*Harrisonia abyssinica* (Oliv.)	roots,leaves	poles
Kilangoni			fruits,bark,leaves,sap	bird-trapping
Kilasoo/Mndongo	Sodoma Apple	*Solanum incanum* (L.)	sap,leaves,roots,bark/ fruit	nerve problems, stomach rumlbes, stiffness, toothache, ear ache /disinfection of umbilical cord,
Kilemachovu			leaves, bark	fever, stomach ache, wounds, rituals

Kilembajo			roots	
Kilimangonde		*Vernonia* sp. (Schreb.)		blood coagulant
Kilulu		*Ficus lutea* (Vahl)		rain indication by shredding leaves
Kimbungu		*Rhus vulgaris* (Meikle)	fruits	medicine for exessive menstruation, fruits eaten
Kipapa	Aloe	*Aloe secundiflora* (Engl.)	roots boiled,leaves	cosmetic, "40 medicinal uses", fever, chest pain, stomach upsets, headache
Kirumba		*Carissa edulis* (Vahl)	leaves,fruits	fruits eaten, medicinal, prediction of seasonal rains
Kirumbutu		*Melia volkensii* (Gürke)		fodder, bee-hives,door frames, firewood, timber,drums, insect repellent
Kisambura			whole plant, leaves and roots	rituals, communication to ancestors
Kisasha				sand paper
Kishatu			leaves	fodder, fencing, medicinal for cattle
Kishoe		*Ficus ingens* (Miq.)	inner bark	fibre for basket
Kisorongo/Kiwalanga		*Euphorbia candelabrum* (Tremaut ex Kotschy)	leaves warmed	rash, asthma, bronchial conditions
Kituma				used for checking the intestines of goat
Kiungu				fruits, firewood
Kiwetoo				ritual medicine for making land to be fire and sea for defend purposes
Kivulevule				grass for taching
Kiwumba			bark boiled	timber, against poisoning
Kuchakucha	Shy grass			you can make yourself invisible by placing it in your pocket, or put someone to sleep while steeling something
Kumbaku /	Indigenous tobacco			tobacco
Liquat		*Eriobotrya japonica* (Thunb.) Lindl.		fruits eaten
Loko				

Lonyi			whole shrub burned	mosquito repellant
Luafambo /Lwafumbo		*Asparagus africanus* (Lam.)		decoration, birds use nest making, soap
Ludi				poisonous for cows, inside forest, pesticide
Lukina				fodder for cows
Lukuku grass				cows to decrease milk production,first aid for wounds
Lumbi		*Euphorbia heterochroma* (Pax)		decoration
Lun			roots boiled	pain killer, malaria prevention, fencing
Lunua				medicine for muscle ache, stiffness mixed with Mdana and Klasu
Lushango				
Lusu/ Lusu luawarumu	Bracken fern	*Pteridium* (Raf.)		indicates barren land, fallow, associated with spirits, protects from them, tubas eaten have special magical bewitching power
Machanyale				beads for decoration of handicrafts (whiteish colour)
Madoma				water protection
Madugudhu				walking stick given for elders as a sign of leadership (has to walk around with it for 7 days to show off)
Madumaghangoruse (yams for birds)	Wild onion		onion crushed and liquid used	vulnerary after walking barefoot
Mafundo				fodder for rabbit, sore throat
Makilumi				vegetable
Makozi		*Garcinia volkensii* (Engl.) (Ltb.) Kosterm.		
Mamboleo	Macdonald eye			fodder for rabbit
Mangole				
Mararo				used in burial ceremony
Maria				pearls for beads, construction instead of nails

Marughundi	Lemon grass			tea
Mbada				
Mbagharasa				
Mbalasi				
Mbarachoka		*Heteromorpha trifoliata* (Eckl. & Zeyh.)		anti-malaria
Mbeka	Wild Mulberry	*Trimeria grandifolia* (Hochst.) Warb.		medicinal, butterfly host plant
Mbinu		*Senna didymobotrya* (Fresen.) H.S.Irwin & Barneby	leaves/roots	poisonous, roots boiled for purgative
Mbiribiri / Mjarambiri		*Gnidia latifolia* (Hort. ex Meisn.)	bark, fibre, leaves	firewood, attracts bees to the beehive when smoked with Mwarufu, pest control, anthelmintic
Mboganburi				
Mbogha		*Grewia similis* (K.Schum.)		rope-making
Mboghobogho		*Vagueria* sp. (Juss.)		firewood, emetic medicine
Mboghololo				medicine for goats, for human diarrhea or if bewitched by someone outside Taita
Mboi			leaves	pest management, livestock fever and digestion problems, headache
Mbombole				
Mbonu	Castor plant	*Ricinus communis* (L.)	seeds	oil, contraceptive for women
Mbule			whole plant	headache
Mbundugho				rituals
Mbunduki	Mexican weeping pine	*Pinus patula* (Schltdl. & Cham.)		timber
Mburisonga			leaves	hastenes child to start walking, muscle ache
Mburungu				toothache, fruits
Mchuko				cooking sticks
Mdaindai				berries

Mdaio	Mulberry			cleansing, silkworm production
Mdana		*Ehretia bakeri* (Baker) */cymosa* (Wild. ex Roem & Schult.)	roots	firewood,poles, arrows, bows, soil friendly, mucle ache, tooth ache, power drink, berries eatable
Mdayondayo		*Capparis fascicularis* (DC.)		fruit
Mdi ghwa roshi		*Clerodendrum johnstonii* (Oliv.)	leaves boiled	general weakness
Mdizi				
Mdodo	native banana	7 different native species are grown in the area		
Mdughudu			leaves crushed	foot athletes fungal infections
Mengecha				
Mfenesi	Jack fruit	*Artocarpus heterophyllus* (Lam.)	fruit	fruits eaten
Mfirifiri	Croton	*Croton macrostachys* (Hochst. ex A.Rich.)	seeds	laxative
Mfurusa				
Mfuu	Meru Oak	*Vitex keniensis* (Turrill)		timber
Mghunga chuma		*Newtonia* sp. (O.Hoffm.)		arrow-making
Mgombe		*Buddleia pulchella* (N.E. Br.)		decorative
Mgondoyi				arrows, bows
Mgudhughuhudhu				
Mhungu				combs, arrows, shields, drums, wooden toys
Mjafari		*Zanthoxylum holtzianum* (Engl.) (P.G.Waterman)	leaves, roots, bark	ulcer, cough, mixed with tea
Mkaju/Mkwatu	Tamarind	*Tamarindus indica* (L.)	bark,roots,twigs	medicinal, firewood, construction, nitrogen fixing, seeds as preservatives
Mkalala				fodder
Mkalamke		*Ozoroa insignis* (Delile)		timber,furniture ,medicine
Mkenga		*Markhamia zanzibarica*		planted around houses to bring peace

		(K. Schum.)		
Mkengera	Herb	*Commelina Africana* (L.)		used in GIA, haemostatic when umbilical cord cut
Mkonge	Sisal			fiber for ropes
Mkongo/ Manyodoo	Camphor	*Ocotea usambarensis* (Engl.)	bark,roots	timber, drums, beehives, medicine for chest pain, swelling, tumours, whooping cough, measles, *"nyago"* (strong muscular contractions, stomach pains and disturbed breathing), malaria, back-ache
Mkongorosho				rain indication by smell
Mkorombosha		*Crassocephalum mannii* (Hook.f.) (Milne-Redh.)	whole plant	court case winning, livestock fever
Mkochokocho		*Crotalaria axillaris* (Dryand.)	leaves	leaves for fever
Mkuyu	Sycamore fig	*Ficus sycomorus* (L.)		Sacred tree, firewood,soil erosion preventor no.1, rain bringer, cough, beehives, berries, drums
Mlagha				
Mlando	Sweet potato			
Mlemachovu		*Ormocarpum kirkii* (S. Moore)	leaves	livestock stomach cleansing, human stomack pain
Mlende				seeds spread by wind indicating rains, used for rainmaking procedures
Mlezenyi				medicinal
Mlimangondi				bee attraction, rain indicator
Mlungu		*Erythrina abyssinica* (Lam.)	bark,roots	medicinal, sacred tree for protection, beehives, drums,predicts rain when flowers, marker for special places, gonorrhea, body swellings and burns, malaria, distensions, mumbs, splin problems, not to be used for firewood, only exception for old women who use it for burning the clay pots to be very strong
Mmbogha				

Mmeru				latex
Mmila nyonyi				
Mmosi		*Trema orientalis* (L.) (Blume)		
Mndana		*Turraea holstii* (Gürke)	roots/leaves fermented	painkiller/ nerval disorder, laxative, menses cycle, fodder
Mndayondayo				
Mndolondolo				
Mngala		*Rapanea melanophloeos* (Mez)		medicinal, timber
Mngambo				
Mngamu	Wattle tree	*Acacia mearnsii* (De Wild.)		firewood, tanning, shoe polish called *Kiwi*
Mnganingani		*Uvaria acuminata* (Oliv.)		laxative
Mngima		*Prunus africana* (Hook.f.) (Kalkman)	leaves/ roots, bark	”50 medicineicinal uses”, animals, rituals, making milk sour, /prostate cancer, timber, firewood
Mngomba				
Mngungunyi				soil fertilizer
Mnjwa		*Acacia horrida* (Willd.)		sacred tree
Mnuka				pesticide for army ants, hemostatic when speep tail cut and during male circumcision
Mnuka-masi		*Ekebergia capensis* (Sparrm.)		emetic, dysentery, tanning
Mnyamanyama/Mbada				cough
Mnyamanyi	Finger Euphorbia	*Euphorbia tirucalli* (L.)	milk from leaves	yard tree, eye infection, swollen glands
Mnyanga		*Garcinia volkensii* (Engl.) (Ltb.) Kosterm.		fruits
Mnyinya			leaves	stomach upsets, vegetable
Modi				keeping off spirits by pouring plant on charcoal and smoke spreading
Mokazi				berries
Mombo		*Myrica salicifolia*	bark	cough, asthma,stomach upset, analgesic,

		(Boj. ex Baker)		respiratory diseases
Mora/Mgaraso		*Nuxia congesta* (R. Br.)	leaves, bark	firewood, soft timber for construction, erosion control, rain indication by insects on leaves excreting fluid which showers down and proceeds rainy weather
Moringa	Horse raddish tree	*Moringa oleifera* (Lam.)	leaves, fruits, seeds	"praised miracle tree", vitamin and iron source, treatment of hysteria, HIV, conjunctivitis, rheumatism, toothache
Moriwangombe				
Mpera/Msasa		*Psidium guajava* (L.)		Shade, windbraker, fertilizer, fruits, hypertension, typhoid, toothache, firewood
Mrahani/Mkongo	Eucalyptus	*Eucalyptus saligna* (Sm.)		timber, firewood, fencing poles, leaves for cosmetic purposes
Mrangi	Bamboo	*Sinarundinaria alpina* (K.Schum.) S.S.Chao & Renvoize	stem	used as water pipes on fields for irrigation
Mraringa		*Trichilia roka* (Chiov.)		medicinal, pot decoration
Mrimbo		*Tabernaemontana holstii* (K. Schum.)	bark,leaves	livestock, human medicine, latex for bird-trapping, fruits
Mrokoti				
Mroreka				chest pain/ intestinal infections, snake bite, syphilis
Mrughundia			roots/ bark	blood purification
Mrumbawasi / Osmain		*Ocimum suave* (Willd.) / *Hoslundia opposite* (Vahl)	leaves chewed	haemmorroids, stomach problems, hick-up stop, cough, cleansing
Msaigembe			leaves	poles, fruits for birds, fodder
Msambarau	Java plum	*Syzygium cuminii* (Linn.) Skeels	fruits	fruits eaten, timber, firewood, shade
Msangana		*Strombosia schefflerii* (Engl.)		timber
Msasha	Sand paper tree	*Cordia ovalis* (R.Br. ex DC)		sand paper for wood polishing, medicine for gonorrhea
Mseghembe		*Schrebera alata* (Welw.)		painkiller, anti-poison

Msembelele / Mukiromboshe		*Lobelia gibberoa* (Hemsl.)	leaves	livestock East coast –fever, rituals
Mshagosha				mortar and pestle carving
Msherembe				whistle
Mshigha		*Lannea stuhlmannii* (Engl.) Eyles	bark boiled	barrennes, boils, skin diseases, headache, curses, cough
Mshoshote		*Grewia villosa* (Willd.)		fruits, fodder for goats, poles, arrows, firewood, body swellings
Msidu=Msabuni		*Dodonaea viscosa* (Jacq.) Royen ex Blume	stem/ leaves	tools, dye, soap, toothbrush
Msidu omodeni				
Msimu		*Commiphora eminii* (Engl.)		fencing
Msisina		*Aspilia mossambicensis* (Oliv.) Wild	leaves, roots	sore eyes and gums, ulcer of animals
Msoko		*Cassia abbreviata* (Oliv.)	pods, roots	hypertension, haemostatic, yellow fever, typhoid fever
Msua		*Cassia singueana* (Delile)	root bark	anti-malaria treatment
Msufi			bark boiled	antibiotic orally /externally
Msumbesu	Cypress	*Cupressus lusitanica* (Mill.) Lindl. ex Parl.		timber,firewood
Msumi				village protection, boundary marking, shade
Msundule/Jacaranda		*Jacaranda mimosifolia* (D. Don)		poles, ornamental, firewood
Msungu-sungu		*Acokanthera schimperi* (Oliv.) Benth. & Hook.f.		medicinal, arrow poision
Msunguya				
Msurubali				fruits
Msuruwache		*Albizia gummifera* (C.A.Sm.)	inner bark	timber, firewood, sacred tree for rainmaking, dental care, acaricide
Mtanyakesi				a twig helps to win a court case

Mtaranganga/Migaragara	”wait-a-bit”	*Capparis tomentosa* (Lam.)	leaves,bark	fencing, local brew fermentation, painkiller
Mtende				
Mtoritori				fiber, lubricant for machines
Muale	"palm tree"			grainary construction
Muama				keeps up fire
Muanjeri				
Muasa		*Vernonia lasiopus* (O. Hoffm.)		malaria prevention
Mudikoshi			roots crushed	antibiotic for wounds
Mudimbisi				haemostatic
Mudumbua ngondi munda / Kilimangondi				
Mughule/Mwalola	Angel´s trumpet	*Datura stramonium* (L.) Thunb.		used for ”truth telling” in court cases and for wizards (hallucinogen
Mugogolinyi				only few in Taita existing
Mukalala				
Mukangu		*Cassia longirasemosa* (Vatke)		fever, painkiller, abortifacient, ornament, broomes
Mukhorogho/Muhorobo		*Lannea rivae* (Chiov.) Sacleux	tubers, bark	inner bark and fruits eatible
Mukigara	Croton	*Croton megalocarpus* (Hutch.)	bark	stomach upsets, pneumonia, manure for field, fencing, firewood
Muku	Cedar	*Juniperus procera* (Hochst. ex Endl.)	leaves fresh, bark boiled	timber,firewood, stomach ache
Mukulumba		*Acacia polyacanta* (Hochst. ex A. Rich.)		firewood, charcoal
Mukumbi		*Olea africana* (Mill.)		sore throat, antimicrobial, kidney problems
Mukuru			roots	diarrhea, dewormer
Muloga shoshoti		*Grewia similis* (K.Schum.)		toothbrush
Mundaio		*Acacia* sp. (Mill.)		
Munganga		*Ocotea usambarensis* (Engl.)		camphor scent wood

Mungoli /Mungule				salty vegetable
Mungorusa/ Gorusa	Parasol tree	*Polyscias kikuyensis* (Summerh.)		erosion controll, beehive-making
Mungungunyi				berries, smells like bedbug
Munje				gonorrhaea
Munyanga		*Garcinia volkensii* (Engl.) (Ltb.) Kosterm.		poles for traditional houses
Murarandasi		*Hoslundia opposita* (Vahl.)		fruits
Murugaso			bark	yellow fever
Mushaulo	Wild onion		onion crushed and liquid used	vulnerary after walking barefoot
Mushundunulo				handles for farm tools
Musizi	Umbrella tree	*Maesopsis eminii* (Engl.)	fruits	timber, firewood, fruits
Musu		*Syzygium guineense* (DC.) Guill. & Perr.	bark boiled/fruit	fever, timber
Musubali				
Muuku		*Terminalia brownii* (Fresen.)	bark, roots/ sap	timber, firewood, stomach ache/ toothache, poison for hunting, yellow fever
Mwadodi		*Agauria salicifolia* (Hook.f. ex Oliv.)		ulcer, scabies, poisonous for goats
Mwaghare		*Commiphora baluensis* (Engl.)		typhoid, termite resistant wood, fodder
Mwakochokocho				
Mwakiwawira			leaves, stems	flatulence, livestock fever, soil fertilizer
Mwalafigho				arrows, cooking sticks
Mwama		*Combretum molle* (Engl. & Diels) R.Br. ex G. Don		bee attraction, fodder, firewood, charcoal, construction, abortion, antidote for snakebites, leprocy, fever, pain, anthelmintic for hook-worn
Mwamabemba		*Rauvolfia rosea* (K. Schum.)		itching and pimples, arrow poison

Mwamasungu				latrine construction
Mwambombo		*Maytenus buchanii* (Loes.) R.Wilczek		cancer treatment
Mwamchumbichumbi				
Mwarombo				firewood
Mwarufu	Blue Gum	*Eucalyptusglobulus* (Labill.)		smoked for bee- attraction and to chase away bad spirits
Mwasemia				
Mwasina	Sausage tree	*Kigelia africana* (Lam.) Benth.		fruit used for fermenting traditional brew *Bombe*, holy tree used for praying ancestors
Mwawusungu				carving, tools
Mwavwa/o		*Millettia oblata* (Dunn)	bark raw/roots boiled, leaves	acaricide, pig wounds/stomach ache, timber, firewood, construction, carving, graining
Mwembe	Mango	*Mangifera indica* (L.) Wall. Blume, Thawaites		fruit
Mwemberi/ Mvudi		*Lantana camara* (L.) / *trifolia* (L.) Cham	leaves,roots	firewood, anthelmintic, hepatitis, rheumatism, toothache, cough, berries eaten, dish-washing soap
Mwengecha		*Psychotria crassipetala* (E.M.A.Petit)		
Mwesi				firewood
Mwesu		*Teclea mobilis* (Del.)	leaves,roots	pneumonia, anthelmintic
Mwingo				carvings, combs, gives charisma and political power
Mwiriwiri				cleansing rituals
Mwondi				
Mvumu	Strangler Fig	*Ficus thonningii* (Blume)		sacred, peace-making tree, basket making, leaves used for cleansing house, water retention, milk preservation, sore throat, wounds, constipation, nosebleed, firewood, carvings, fiber for carpets and

				ropes, latex
Mvunde				sterility, anti-poison for snake bites
Mwyino				whistle, ink from berries
Ndandangoma				
Ndido/ Ndido ya Mlevi		*Maesa lanceolata* (Forssk.) Voigt, G.Don	bark	fever of humans and animals, charcoal,firewood
Ndido ya Kisaga	Lemonwood	*Xymalos monospora* (Baill.)		timber
Ndunda	Black night shade	*Solanum nigrum* leaves (L.) Tausch ex Dunal	leaves	vegetable, stomach upsets, malaria prevention
Ndundu		*Macaranga conglomerata* (Brenan)		firewood
Ndundu II		*Croton macrostachys* (Hochst. ex A.Rich)		firewood, charcoal, timber, medicine
Ngandu			roots dipped into water	HIV treatment, increases wizard tolerance
Nganga / Mfuluti	Whistle tree	*Psychotria petitii* (Verdc.)		
Ngidi		*Ochna holstii* (Engl.) */ovata* (F.Hoffm.)		
Nginga				acaricide, emetic
Ngoli	Whistle plant		whole plant	blood purification
Nyanga				berries for birds
Nyarambiri		*Lasiosiphon latifolius* (Oliver) Brenan (Oliv.) Gilli		pesticide for maize storage
Nyasi	Nepia grass			
Rikot				fruits
Risojangondi				laxative
Rukaramba	Black jack	*Bidens pilosa* (L.)	leaves	first aid, used as iodine
Sandalwood	Sandalwood	*Santalum* sp. (L.)	leaves chewed	hard wood, cosmetics, cough
Seria		*Rhus natalensis* (Bernh. ex Krauss)		soil erosion controll

Tangawizi	Indigenous ginger		spice, medicinal for joint pain
Wakesho / Mghulo			cleansing
Wamea			medicine for washing animals from fleas
Wandanda		*Tinnea aethiopica* (Kotschy & Peyr.)	erosion control on slopes, shade, ornamental, food, fodder, firewood, charcoal, tannin, toothbrush, stomach upsets
Wangombe		*Capparis tomentosa* (Lam.)	
Wawuzu			

Appendix 4. Traditional **medicinal** plant species found at the traditionally protected forests and sites. Additional, important medicinal plants listed by Taita herbalists are included. Plants found only on lowlands, are indicated with (LL). In total 179 species were listed.

Vernacular species name	Scientific name	Part used	Use
Atari	*Craibia zimmermannii* (Harms ex Dunn)	leaves,bark,stem	high blood pressure,fever,deworming
Baki	*Memecylon teitense* (Wickens)	leaves	malaria, fever
Dungulu		leaves smoked and inhaled	headache
Idadongo		leaves	cleansing
Isaye	*Dracaena steudneri* (Engl.)	leaves	veterinary medicine (goat), labour relief
Isengerughu	*Ensete ventricosum* (Welw.) Cheesman	roots,sap/seeds	prophets use for praying, fore-seeing and healing community problems/ eye-infection
Isuruwi		leaves crushed	flu
Iwurugho		leaves sniffed or boiled	cough, flu, natural toilet paper
Kiachi+elephant dung		smoked	measles
Kiangachi	*Phoenix reclinata* (Jacq.)	sap	beer making for rituals
Kibhari		leaves	anthelmintic
Kidongadi	*Cussonia spicata* (Thunb.)	leaves,bark pressed on the painful location,roots for malaria	diarrhea, splinomegaly, painkiller, emetic,malaria, protects from wizard´s touch
Kihatari			Choosing gender of unborn child; Kihatari+Mwingo +Kisundi (Commiphora) + Munganingani for a boy / Kihatari+Mundonga for a girl
Kimbungu		bark boiled	children eat fruits, stomach ache, exessive menses
Kififer		leaves fresh	muscle ailment, joint pain

Kifuchagombe			stomach ache
Kifufuto		whole plant	protection herb for the leader of the army,bullet-proof while herb kept in a calabash
Kijulu	*Osyris lanceolata* (Hochst. & Steud.)	bark	cosmetics,cow fever,stomach ache, scented wood and essential oil
Kilemachovu		leaves, bark	fever, stomach ache, wounds, rituals
Kilimangonde			blood coagulant
Kipapa	*Aloe* spp. (L.)	roots boiled, leaves	cosmetic, "40 medicinal uses", fever, chest pain, stomach upsets, headache
Kirugana		leaves/ roots, bark	STI's treatment/ good for bad omen
Kishatu		leaves	fodder for goats, anti- ectoparasite, medicine for calves who drank too much milk and throat swollen
Kisorongo	*Euphorbia candelabrum* (Tremaut ex Kotschy)	leaves warmed on fire, boiled	rash, asthma, bronchial conditions
Kitunguu ngoruse			asthma
Kiweto= medicinal wind			medicine, which made the land perform fire and protect cattle and women from Tanzania
Kiwumba		bark boiled	against poisoning
Lonyi		whole plant	mosquito repellant
Ludi		leaves	poisonous/like Furadan(pesticide)
Lukuku		leaves	cows to decrease milk production, first aid for wounds
Lukundukundu		leaves	cholagogue for animals
Lukundukundu+Mbogholol+pepper			
Lumbi	*Euphorbia heterochroma* (Pax)		HIV-AIDS

Lundu		leaves with honey	anti-purgative, stifness
Lungua		leaves chewed	sour throat
Luno		roots boiled	painkiller, malaria prevention
Lusoka+Klasu+Mdongu			all parts used for stiffness, in war makes enemies lost their way
Lusu luawarumu		whole plant	shrub to revenge cheating; is hidden under the cheater´s mattress and that person won´t be able to urinate anymore, ghost repellent=Lusu+Mdighwmbaro fighi medicine
Madumaghangoruse		onion crushed and liquid used	vulnerary after walking barefoot
Madumbu			fever
Mafundo			sore throat
Mbavio		leaves with water	fever
Mbeka	*Trimeria grandifolia* (Hochst.) Warb.		medicinal
Mbinu	*Senna didymobotyra* (Fresen.) H.S. Irwin & Barneby	leaves,roots	poisonous, roots boiled for purgative
Mbirbiri	*Gnidia latifolia* (Hort. ex Meisn.) Gilg	leaves	pest control and anthelmintic, bee-keeping
Mboi		leaves	headache
Mbogha		bark	rope weawing
Mboghololo		leaves	fodder, fruits, diarrhea
Mbonu	*Ricinus communis* (L.)	seeds	contraceptive for women
Mbughobugho		bark, roots	diarrhea, eye cleansing,big leaves used for covering food
Mbule		whole plant	headache

Mburisonga		leaves warmed on fire and placed on knees	hastenes child to start walking, muscle ache
Mchemeri		bark	
Mchunguya		roots	asthma
Mdana		roots+sugar	mucle ache, tooth ache, power drink,berries eatible
Mdijhwmbaro		whole plant smoked under a blanket	fighi medicine in the fighi pot (one of the secret mixture)
Mdikoshi		roots	wounds,hemostatic, ntibiotic
Mdomoko		bark with cold water	fever H/A
Mdughudu+Mrimbo		leaves crushed	foot athletes fungal infections
Mfirifiri		seeds	laxative
Mganingani		leaves	stomach ache
Mghunga		bark	
Mgidi			
Mgungunyi		roots;stem	toothache, toothbrush
Mikifindi			cough
Mkinyi		roots (roasted and boiled)	stomach cleansing
Milimangondo		leaves	hemostatic when sheep tail is cut, bees like, rain indication
Mjafari	*Zanthoxylum holtzianum* (Engl.) P.G. Waterman	leaves,roots,bark	ulcer, cough, for tea
Mkama		leaves	cough
Mkengera	*Commelina Africana* (L.) Mirb.	whole plant, leaves	used in GIA, hemostatic when umbilical cord cut
Mkinyi		roots boiled	laxative
Mkongo/ Manyodoo	*Ocotea usambarensis*	bark, roots	swelling, tumours, whooping cough, measles, *"nyago"* (strong muscular

	(Engl.)		contractions, stomach pains and disturbed breathing), malaria, backache
Mkorombosha		whole plant	livestock fever
Mkulumba (LL)			
Mkuyu	*Ficus sycomorus* (L.)	bark	cough, chest diseases
Mlamba(LL)	*Adansonia digitata* (L.)	roots, bark	medicinal, sacred
Mlemachovu	*Ormocarpum kirkii* (S. Moore)	leaves	stomach pain, livestock stomach cleansing
Mlimangondi		leaves crushed	wounds
Mlende		seeds	spread by wind and indicate rains, used for rainmaking procedures
Mlungu	*Erythrina abyssinica* (Lam.)	barks,roots	distensions, mumbs, splin problems, gonorrhea,body swellings and burns, malaria
Mndana	*Turraea holstii* (Gürke)	roots/leaves fermented 7 days +sugar	painkiller/ nerval disorder, laxative, menses cycle
Mndana+ Ndashi		roots boiled	nerve disorder
Mdandawasi		whole plant	sotomach problems
Mdendela		roots	cough
Mnjamanjama		leaves, leaves+honey+egg	cough
Mnjanga		leaves boiled	livestock anthelmintic
Mngima	*Prunus africana* (Hook.f.) Kalkman	leaves/ roots, bark	”50 medicineicinal uses”,animals, even rituals,making milk sour/ prostatae cancer
Mnuka	*Calodendrum capense* (Thunb.)		hemostatic when sheep tail cut and during boys circumcision
Mnyamanyi	*Euphorbia tirucalli* (L.) Thunb. Forssk.	Milk from leaves warmed and put into eye	eye infection, swollen glands

Mnyanmanyi		leaves boiled and drunk	cough, cattle fever
Mnyinya		leaves,roots boiled and drunk	anthelmintic humans and animals, leaves for salad
Mnynia		leaves boiled or raw	stomach ache
Mninja		whole plant	malaria prevention
Mokazi		berries eaten	vitamins
Mombo	*Myrica (Morella) salicifolia* (Boj. ex Baker) Hochst. ex A.Rich.	bark chewed	cough, asthma, stomach upset, analgesic, respiratory diseases
Mora/ Mgaraso	*Nuxia congesta* (R. Br.)	leaves,bark	various medicinal uses
Moringa	*Moringa oleifera* (Lam.)	leaves,fruits,seeds	vitamis and iron source, treatment of hysteria,HIV, conjunctivitis, rheumatism,toothache
Mosi	*Trema orientalis* (L.) Blume		used in goat´s intestine analysis to detect outsider of community or other tribe member bewitched
Mosu		bark boiled	chest pain, astma
Mpera	*Psidium guajava* (L.)	leaves, fruit/ oil/ bark	typhoid, dysentery, antibacterial, diarrhoea/ anti-inflammatory/ ring-worms, ulcer/ diabetes fever,hypertension, toothache
Mrahani/ Mkongo	*Eucalyptus saligna* (Sm.)	seeds,bark	emetic when poison ingested
Mrimbo	*Tabernaemontana holstii* (K. Schum.)	bark,leaves	livestock, human medicine
Mriri Maganda(LL)			
Mroreka		roots/ bark	chest pain/ intestinal infections, snake bite, syphilis
Mrughundia			blood purification

Mrumbawasi	*Ocimum suave* (Willd.) / *Hoslundia opposite* (Vahl)	leaves chewed	stop hick-up, stomach problems, haemmorroids,cough
Mrundurundu		bark	
Msambarau	*Syzygium cuminii* (Linn.) Skeels	berries eaten, leaves medicinal	hypertension
Msasha	*Cordia ovalis* (R. Br.)		gonorrhea
Msasha+Mloi		roots/roots	gonorrhea
Msembele	*Lobelia giberroa* (Hemsl.)	leaves	livestock East Coast fever
Msemberi		leaves	livestock fever
Mshigha(LL)	*Lannea stuhlmannii* (Engl.) Eyles	bark boiled	barrennes, boils,skin diseases,headache,curses,cough
Mshuluti		bark boiled	asthma
Msidu	*Dodonaea viscosa* (Jacq.)	stem/leaves crushed mixed with water	toothbrush/soap
Msina mongo			
Msisina	*Aspilia mossambicensis* (Oliv.) Wild		vulnerary, sore eyes and gums, ulcer (animals)
Msoko	*Cassia abbreviata* (Oliv.)	pods, roots	hypertension, hemostatic, yellow fever, typhoid fever
Msoko+Mnyananyi		whole plant	catching fish by poisoning water
Msufi		bark boiled	antibiotic orally /externally
Msunduru		bark boiled	painkiller
Msuruwache+ Mlungu	*Albizia gummifera* (C.A. Sm.)	leaves, bark, roots	Mnyaya(similar to HIV/AIDS in symptons and signs), dental care, acaricide
Mtaranganga	*Capparis tomentosa*	roots +sugar fermented for 7 days	Muscle ailment, painkiller

	(Lam.)		
Muachanyama		leaves	attracts butterflies,cough,flu,splin probrems
Muakoshi		stem	prevents nightmares when placed under a mattress
Muama			sore throat
Mubachabacha			acaricide
Mudikoshi		roots crushed	antibiotic for wounds
Mudumbua ngondi munda			hemostatic when sheep tail is cut and during male circumcision
Mukengera/ male grass		leaves,stem	suffocation of a goat as sacrificed
Mukomborosho		leaves	livestock medicine, pesticide for maize storaging
Muku	*Juniperus procera* (Hochst. ex Endl.)	leaves fresh, bark boiled	stomach ache
Muuku	*Terminalia brownii* (Fresen.)	bark, roots/ sap	stomach ache/ toothache, poison for hunting, yellow fever
Mukungo		leaves	eye infection
Mukuru		roots boiled	diarrea, dewormer
Munje			gonorrhea
Murugaso		bark	yellow fever
Musu	*Syzygium guineense* (Willd.) DC.	bark boiled	fever
Mutanyacase/Mtanyakesi		whole plant	used to win a court case
Mvumu		bark	liver problems, diarrhea
Mvunde		roots	sterility
Mwakisgchi		leaves boiled and child washed with it	against nightmares
Mwakwawira		leaves, stem	flatulence, livestock fever
Mwama+ Mvunde	*Combretum molle* (R. Br. ex G.Don)	leaves	abortion, antidote for snakebites, leprocy, fever, pain, anthelmintic for hook-worm

Mwarubaini (LL) Neem tree	*Azadirachta indica* (A. Juss)	roots,leaves	anthelmintic
Mwarufu=Chao	*Eucalyptus nitens* (Maiden)	bark,leaves	removes bad spirits when burned on charcoal under a blanket
Mwasa		roots boiled	stomach ache
Mwavwa/o	*Milletia oblata* (Dunn)	bark raw/roots boiled ,leaves	acaricide, pig wounds/stomach ache
Mwemberi	*Lantana camara* (L.) */trifolia* (L.) Cham.	leaves,roots	anthelmintic, hepatitis, rheumatism, de-wormer, toothache, anticoagulant, cough, stomach ache, liver problems
Mwesi		leaves	eye medicine
Mwesu	*Teclea nobilis* (Delile)	leaves,roots	anthelmintic, pneumonia
Mwiriwiri		leaves	cleansing ritual
Mwunde			anti-poison for snake bites
Mwuwughogho		bark boiled	anti-purgative
Ndelema		leaves boiled	stomach ache,hemostasis
Ndido	*Maesa lanceolata* (Forssk.) Voigt	bark	fever of humans and animals
Ndunda	*Solanum nigrum* (L.) Tausch ex Dunal	leaves	leaves as vegetable, stomach ache, malaria prevention
Ndungua		stem	tooth brush
Ngandu		roots dipped into water	HIV, wizard tolerance
Ngidi + Luno	*Ochna holstii* (Engl.) */ovata* (F. Hoffm.)		stomach ache, emetic when poison ingested
Nginga			acaricide, emetic
Nginga+ Mdana+ Mbogonbogo			emetic when poison ingested
Ngoli	”Whistle plant”	whole plant	blood purification
Njundu			calming influence on nervous person
Obani mbundukua		berries	flu

Passion fruit	*Passiflora edulis* (Sims)	roots	epilepsy
Rukaramba	*Bidens pilosa* (L.)	leaves	vulnerary, as iodine, for first aid
Sandalwood	*Santalum* sp. (L.)	leaves chewed	cosmetics, cough
Sodom apple	*Calotropis procera* (Aiton) W.T. Aiton	roots boiled, seeds	nerve problems, stomach rumlbes,stiffness,desinfection of umbilical cord,eye infection
Suruwi		leaves	flu
Wakesho			cleansing
Wamea			medicine for washing animals from fleas
Magical medicinal mixtures:			
Fighi-medicine			protection of households, forests, cattle shelters and people
Kiweto			wind medicine used at war
Kucha-kucha mukeku wako wacha			sleep medicine
Mbingu			mixture of 66 tree species and animal components to get a longer life
Mtero			protection
Mugulee			for killing wizards
Ngataa		i.e.Mndana,Mnyama,Kilaso,Kirimba,Mlungu, Kimbungu,Kidongadi needed	for giving convincing and authoritarian speeches (like a lion)

Appendix 5. Traditional use (other than medicinal) of plants found at traditionally protected forests and sites.

Vernacular name	Use
Chusu	used for brushing away army ants, leaves left along the compound
Delema	biofuel
Desmodia	fodder
Garingari	used in beehives to attract bees
Ikowa	for killing moles, leaves in their holes
Irisojangondi	seeds for decoration
Isangasha grass	taching, construction, animal fodder
Isaye	boundary marking
Isengerughu	celebrations, rituals
Iwurugho	traditional toilet paper
Kiangachi	toothbrush,sap was sugar of the old days,basket,Lungo (basket for rise cleaning) making, construction by ties
Kideu	soil improvement, rain attraction
Kidongadi	firewood
Kijulu	jembe handels, building
Kikongori	poles
Kilangoni	sap is like milk and gum used for bird trapping
Kilulu	rain indication by new red leaves and shredding the old ones,beehives
Kimbungu	fruits
Kinyondo	-
Kirumbutu	fodder, bee-hives, door frames,firewood,timber,drums,insect repellent
Kiungu	fruits edible, firewood
Kiwi / Mngamu	shoe polish
Luafumbo	soap
Lukuko grass	used in singing and dancing sessions to guarantee that no-one messes up with your voice
Luno	fencing
Lusu	indicates barren land, fallow
Machanyale	beads for decoration of handicrafts (whiteish colour)
Madoma	water protection
Madugudhu	walking stick given for elders as a sign of leadership (has to walk around with it for 7 days to show off)
Maduma	yams
Makumbo	yams eaten in ceremonies
Mararo	used in burial ceremony
Mbogha	rope-making
Mboghombogho	firewood
Mburungu	fruits
Mchuko	cooking sticks
Mdaindai	berries

Mdana	arrows, bows
Mfenesi	fruits
Mgondoyi	bows, arrows
Mgungunyi	butterflies like flowers
Mhungu	combs, arrows, shields, drums, wooden toys
Mkalala	fodder for animals
Mkengera	goat suffocation during rituals
Mkongorosho	rain indication by smell
Mkuyu	berries, drum making
Mlende	seeds spread by wind indicating rains, used for rainmaking procedures
Mlimangondi	attracts bees, rain indicator
Mlungu	beehives,drums,not to be used for firewood, only exeption for old women who use it for burning the clay pots to be very strong
Mmeru	latex
Mngamu	shoe polish tan
Mnganga	-
Mngima	making milk sour, furniture,poles
Mnuka	smell drives away safari ants from house, sculpting
Mnyama	arrows
Mnyanga	fruits edible
Mokachi	berries
Mora	water retention, rain indication
Mraringa	pot decoration
Mrimbo	latex used for trapping birds,fruits edible
Msaigembe	poles,fruits for birds, leaves for fodder
Msambarau	carpenting,firewood,fruits
Msasha	natural sandpaper
Msembele	rituals
Mshagosha	mortel and pistol carving
Mshagulu	-
Msherembe	whistle
Msidu	soap
Msimu	fencing
Msumi	village protection, boundary marking, shade
Msurubali	fruit
Mtoritori	fiber, lubricant for machines
Muale	grainary construction
Muama	keeps up fire
Mukangu	broomes
Mukhorogho	seeds edible

Mungoli	salty vegetable
Mungorusa	erosion controll, beehive-making
Mungungunyi	berries
Mwadodi	poisonous for goats
Mwavwa	carvings, graining
Mwalafigho	arrows, cooking sticks
Mwama	construction, bee-attraction, firewood, charcoal, fodder
Mwamasungu	latrine construction
Mwarombo	firewood
Mwawusungu	carvings, tools
Mwesi	firewood
Mwingo	sticks, poles, carvings, combs
Mwiriwiri	cleansing rituals
Mvudi	soap for washing dishes
Mvumu	log smoked used for milk preservation, kiondo (basket) making, rituals
Mwyino	whistle, ink from berries
Ndido	charcoal, firewood
Nyanga	berries for birds
Nyarambiri	pesticide for maize storage
Red oat grass	thatching, fodder for cattle
Rikot	fruits
Wawuzu	-

Appendix 6. Useful species on farms according to Taita households.

Vernacular name	Scientific name	Ecological value	Economical use	Ethno medicine	Ethno veterinary	Frequency
Avocado	*Persea americana* (Mill.)		fruits	seed for toothache		30
Baki	*Memecylon teitense* (Wickens)			fever	medicinal	2
Bamboo			used as water pipes			5
Boniface			firewood		fever (cows)	2
Bougainville	*Bougainvillea* (Comm. ex Juss.)	beautyfier				1
Calliandra	*Calliandra calothyrsus* (Meisn.)	nitrogen fixing	fodder		medicine for cattle	3
Camphor			timber	fever		5
Cedar	*Juniperus procera* (Hochst. ex Endl.)		timber, firewood			1
Dowe/Towe/ Mbambara	*Commiphora* sp. (Jacq.)	soil friendly	lotion making leather tanning	toothache, anti-parasite		4
Garingari			beehive productivity			1
Genjeka				sore throat,ulcer		3
Grevillea	*Grevillea robusta* (A.Cunn. ex R.Br.)	soil friendly	timber,firewood,fencing			42
Imbo			fruits			1
Isengerughu	*Ensete ventricosum* (Welw.) (Cheesman)	water retention	fruit			1
Iti	*Acacia mellifera* (Benth.)		charcoal	anemia	anemia	3
Iwurugho				leaves for flu		2
Jarambiri		pesticide		fever	fever	1
Kei- apple	*Aberia caffra*		fencing			1

	(Hook.f. & Harv.) Warb.					
Kiangachi	*Phoenix reclinata* (Jacq.)	beautyfier	basket making			2
Kidenya	*Acacia seyal* (Delile)		firewood	used for witchcraft rituals		1
Kidongadi	*Cussonia spicata* (Thunb.)			fever	fever (cows, cats)	3
Kighoi			fruits			1
Kijulu	*Osyris lanceolata* (Hochst. & Steud.)	soil erosion controll on steep areas and rocks		roots for stomach ache		1
Kilulu	*Ficus lutea* (Vahl)	water retention, erosion controll		flu	fever(cow)	2
Kimbungu	*Rhus vulgaris* (Meikle)		firewood ,fruits		stomach ache	2
Kipapa	*Aloe secundiflora* (Engl.)			fever,antibiotic,wounds,stomach ache	fever, antibiotic (poultry)	16
Kirumba	*Carissa edulis* (Vahl)		fruits			2
Kirumbutu	*Melia volkensii* (Gürke)		timber			2
Kishagha					punishment of wizards	1
Kishatu		boundary marking		fever, analgesia	fever	1
Kishoe	*Ficus ingens* (Miq.)	rain attraction and prediction		analgesia, fever	foot and mouth disease (cow)	12
Kisuchi				stomach ache		1
Kitukumu						1
Kongodi- grass		soil erosion prevention on riverbanks		fever		1
Lemon	*Citrus limon* (L.) Osbeck			fever		

Liquat/Chokoti	*Eriobotrya japonica* (Thunb.) Lindl.		fruits			3
Lukundukundu					medicine for cattle	1
Lumbi	*Euphorbia heterochroma* (Pax)				fever (poultry, cow)	5
Lumbi+vegetable pep					medicine for poultry	2
Luno				muscle cramps		1
Macadamia	*Macadamia tetraphylla* (L.A.S. Johnson)		nuts			10
Madu gha kwaru	"Rabbit ear tree"	shade				1
Mafundo				cough		1
Mango	*Mangifera indica* (L.) Blume	soil fertilizer	timber, fruits			17
Manyodo				roots for stomach ache		1
Mbaramchoka	*Heteromorpha trifoliata* (Eckl. & Zeyh.)			malaria		1
Mbaro				medicinal		1
Mbinu	*Senna didymobotrya* (Fresen.) H.S.Irwin & Barneby			laxative		2
Mbirimbiri	*Gnidia latifolia* (Hort. ex Meisn.)	Calcium booster for soil, pesticide			cattle fever	3
Mboghobogho /Ndunu	*Vangueria* sp. (Comm. ex Juss.)			leaves for stomach ache, power drink		2
Mboi		pesticide			fever,digestion	4

					problems (cows,goats)	
Mbuchi	*Acacia* sp. (Mill.)		fencing	energy drink		1
Mbuku	*Euclea racemosa* (Murr.)			diarrhea, toothbrush		2
Mbunduki	*Pinus patula* (Schiede & Deppe ex Schltdl.)		timber, resin for sale, boundary marking			2
Mchicha			vegetable	HIV-AIDS		1
Mchovu					dewormer for dogs	1
Mdana	*Ehretia bakeri* (Baker)		timber	Hypertension, analgesia, stomach ache		2
Mdi ghwa vua "rain making tree"	Mdi ghwa vua "rain making tree"					1
Mdongu	Mdongu			cough		1
Mgono				cough		1
Mgorusa	*Ekebergia capensis* (Sparrm.)		firewood			1
Mkange			timber		fever (cows)	1
Mkeresu			firewood			1
Mkongo/ Mukongo	*Ocotea usambarensis* (Engl.)	suites riverbeds,water retention,rains from leaves	firewood for sale			10
Mkungu/i	*Syzygium sclerophyllum* (Brenan) Thwaites			fever		1
Mkungu/e Mkongo	*Eucalyptus saligna* (Sm.)		timber, firewood			28
Mkuyu	*Ficus sycomorus* (L.)	water retention, leaves fertilize soil	timber, construction, seedlings sold			42
Mkwachu (LL)	*Tamarindus indica* (L.)		fruits			1

Mlemachovu	"Elephants hate it" *Ormocarpum kirkii* (S.Moore)		medicine for sale		stomach cleansing for cows	1
Mlezenyi		shade		like Mwarubaini		1
Mlungu	*Erythrina abyssinica* (Lam.)	water retention, sacred tree		mumbs, anemia	milk fever prevention for calves	16
Mndimu/Limau	*Citrus* spp. (L.)			fever		5
Mngala / Kibaridi	*Rapanea melanophloeos* (Mez)		timber	bark for joint pains, ringworms		2
Mngamu	*Acacia mearnsii* (De Wild)	soil friendly	firewood, charcoal, construction, leather tanning	bark for fever		25
Mngima	*Prunus africana* (Hook.f.) Kalkman	leaves fertilize	timber when well managed, window frames, firewood			27
Mngungunyi		soil fertilizer				1
Mnuka+mbiribiri						1
Mnuka masi	*Ekebergia capensis* (Sparrm.)	pesticide for aphids		medicinal		2
Mnyadi	*Croton megalocarpus* (Hutch.)	pesticide, shed, soil friendly	fencing	fever, malaria		5
Mnyama			firewood, charcoal	cough		2
Modi / Mododi		strong pesticide				1
Mombo	*Myrica salicifolia* (Boj. ex Baker)	soil friendly	firewood	cough		7
Mora/Mgaraso	*Nuxia congesta* (R. Br.)	water retention, suites riverbeds	firewood, timber, seeds	cough, fever	fever	29
Mosi	*Traema orientalis* (L.) Blume		construction	cough		2
Mpapai	*Carica papaya* (L.)		fruits	seeds for deworming, fruit for diarrhea	deworming	5

Mpera	*Psidium guajava* (L.)	soil friendly, shade	fruits	fruits,leaves, roots for hypertension, typhoid, toothache		15
Mrahani	*Eucalyptus* spp. (L´Hér.)		timber, construction		leaves for chicken	9
Mrima						1
Mrimbo	*Tabernaemontana stapfiana* (Britten)	soil friendly, shade			fever (cows)	2
Mrindawasi / Rugharamba	*Bidens pilosa* (L.)	herbiside		first aid iodine for wounds, stomach ache,flu		4
Mrimva		soil friendly	timber			2
Mrumbawasi	*Hoslundia opposita* (Vahl)		timber, firewood	analgesia, flu, toothache, heart burn	analgesia, flu, cats	3
Msabibu	*Morus alba* (L.) Bureau	shade	berries			3
Msambarau	*Syzygium cuminii* (Linn.) Skeels	shade	fruits			1
Msarambinzi						1
Msembelele					leaves for cow fever	2
Msemrere					diarrhea (cows)	1
Mshari				fever, stomach ache		1
Mshigha	*Lannea stuhlmannii* (Engl.) Eyles			iron booster for anemia, porridge with grain amaranth for HIV patients	analgesia, fever (cow)	2
Mshomoro/ Mvudi	*Lantana sp.* (L.)	beautyfier				1
Mshungumulu						2
Msidu	*Dodonaea viscosa* (L.) Jacq.	shade, soil friendly		rooths for stomach ache		4
Msigha				diarrhea, cough, toothbrush	diarrhea, cough	
Msimamongo			firewood			1
Msimbiri				ritual tree		1
Msimu	*Commiphora*	shade, soil	boundary marking	fever	stomach cleansing	2

	eminii (Engl.)	erosion prevention			for cows	
Msisina	*Aspilia mossambicensis* (Oliv.) Wild			external wounds		1
Msoko	*Cassia abbreviata* (Oliv.) / *siamea* (Lam.)		timber, firewood	fever, diarrhea		1
Msumbali				with Mpera for hypertension,typhoid		1
Msumbesu	*Cupressus lusitanica* (Mill.) Lindl. ex Parl		timber, firewood, fencing			27
Msunduru				fever, cough, asthma		1
Msurubali				typhoid		1
Msuruwache	*Albizia gummifera* (J. F. Gmel.) C.A. Sm.	soil fertilizer	firewood	various diseases		20
Mtunguru	*Thylachium africanum (DC.*)			cough		2
Muababa					medicine for poultry	1
Mudikoshi				seeds for chicken pox		1
Muerezi						1
Mughalala				roots for analgesia		1
Mugharaso				roots for stomach ache		1
Mughule/ Mwalola	*Datura stramonium* (L.) Thunb.)	ornamental		ritual, truth telling plant		1
Mukhorogho	*Lannea rivae (Chiov*.) Sacleux	soil friendly				2
Mukulumba	*Acacia polycanta* (Willd.)		firewood, charcoal			1
Mungala	*Rapanea* spp. (Aubl.)	suites riverbeds	timber	roots for analgesia		1

Munya						1
Musangano	*Strombosia scheffleri* (Engl.)		timber			1
Musekiavai	*Podocarpus usambarensis* (Pilg.)		timber			1
Musizi	*Maesopsis eminii* (Engl.)	suites riverbeds	firewood, timber,fruits			4
Musu	*Syzygium guineense* (DC.) Guill. & Perr.	rain attraction	timber	bark medicinal		3
Muuku	*Terminalia brownii* (Fresen.)	soil friendly				
Mwachanyama				cough		1
Mwakuwawa		herbiside				1
Mwakuzema				diarrhea		1
Mwakiwawira				diarrhea		2
Mwama	*Combretum molle* (R. Br. ex G.Don)		firewood, charcoal, manure	cough		4
Mwarubaini Neem tree	*Azadirachta indica* (A. Juss.)		medicine (leaves, bark) for sale	variety (40) of diseases		28
Mwarufu	*Eucalyptus* sp. (L´Hér.)		timber, firewood			5
Mwasole				sacred tree, heart beat of a shrine		1
Mwavwa	*Millettia oblata* (Dunn)	rain attraction	timber, firewood	several diseases	medicine for cows	4
Mwavwa+ Mwarubaini				Medicinal soap for skin diseases on local market		1
Mwemberi	*Lantana* sp. (L.)	soil friendly		stomach ache		2
Mwimbo					medicinal	1
Mwindi nguku					diarrhea (cows, sheep)	2

Mwojhowujho			firewood,construction			1
Mvudi	*Lantana camara* (L.)		berries	cough		2
Mvumu	*Ficus thonningii* (Blume)	water retention, intercropping, shade	bark for fiber and basket-making, seedlings sold			31
Mziri			timber			1
Mzunga			fruits	leaves for fever		1
Ndido	*Maesa lanceolata* (Forssk.)	soil friendly	firewood			4
Ndowo	*Dombeya rotundifolia* (Planch.)					1
Nginga		soil erosion control	fensing	chicken pox, fever	fever	4
Nzarambinsi					cattle fever	1
Orange			fruits			7
Passion fruit	*Passiflora edulis* (Sims)		fruits	leaves for boils		8
Podo/Mmaiza	*Podocarpus latifolius* (R.Br.) Hort. ex Carrière		timber, firewood			1
Vegetable pepper		Calcium booster for soil, leaves fertilize, pesticide	fever	fever	fever	2

Appendix 7. Land use values data sheet.

Date_____

Land use category (Scientific)_____

How useful is this site for the respective use categories?

Andu aha koko na umuhimu ki kimatumizi katika chia iri...

VALUE CATEGORY *Chia ra umuhimu*	USE VALUE			
	Very useful *Muhimu sana*	Useful *muhimu*	Less useful *Muhimu kidogo*	Useless *Ndokune faida*
Staple food for home consumption *Vindo va kawaida mzinyi*				
Food for domestic animals *Vindo kwa mifugho*				
Timber production *Kubara mbao*				
Construction material *Vifaa veagha*				
Tool material *vifaa*				
Firewood *mbande*				
Basketry *Kulukia vikapu*				
Marketable food products *Vindo viko na soko*				
Hunting place *Andu kodiwa*				

Recreation *Andu kostarehe*				
Future economical security assets *Hazina kwa maisha gha baadae*				
Ecotourism *wutalii*				
Bee-keeping *Kufugha choki*				
Medicine *Maghanga*				
Butterfly farming *Kufugha vifurute*				
Resin tapping *Kudegha gamu*				
Other special use: *Matuzighamu zaidi*				
1.				
2.				
3.				

INDIRECT USE VALUE ***faida ra kihisia kusedima kuriwada kama pesa***				
	Very useful *Muhimu sana*	Useful *muhimu*	Less useful *Muhimu kidogo*	Useless *Ndokune faida*
Habitat of rare animals and plants *Makao gha nyamandu risepatikaa kirahisi*				
Soil erosion prevention *Kuzuia momonyoko*				
Rain attraction *Kuwanga vua*				
Atmosphere controller *Kuhimidi hali ya hewa*				
Place for traditional religious practices *Andu kobonyera ibada ra kitamaduni*				
Place for ceremonial rites *Andu kwa sherehe ra kitamaduni*				
Water catchment *Andu kowada machi*				
Beautifying element in the landscape *Andu koghokesha isanga*				
Other special indirect uses: *Faida* imu *zaidi:*				
1.				
2.				
3.				

Description of the site:
Wufafanuzi ghwa aho andu:

1) Local name / common name for the land use:
irina ja kawaida / irina ja matumizi ghape
2) Age of the vegetation:
umri ghwa isaka
3) What are the problems of this kind of land use?
Ni shida riao riko katika matumizi gha aha andu?
4) Can one find many sites like this in your Location?
Mundu wadima kupata andu kumu zaidi sa aha?
What kind of traditional land management practices are applied on this area?
Ni chia riao ra kienyeji rekuza mbuwa rawetumika andu aha?
Are there any traditional rules, believes or taboos applying on an area like this?
What kind of ?
Reko sheria, imani angu wutamaduni ghungi ghwa kienyeji ghwawetumika katika andu sa aha?
Are there any species of plants or animals which are important in protecting and maintaining the functions and benefits of this site?
Reko aina ingi ya midi angu nyamandu riko muhimu katika wulindiri na wukuzaji ghwa matumizi na faida ra andu aha?

Appendix 8. Self-completion questionnaire on benefits and constraints of participation in forest management.

1. Have you noticed any changes in forest management in your area? Please, explain.
2. What kind of initiatives have been created concerning forest management?
3. Which kind of community forest management are you involved in? (Structured)
4. How did you get involved in forest management? (Structured)
5. How many group members are you?
6. How long have you participated in forest management? (Structured)
7. What activities do you undertake when you participate in forest management? (Structured)
8. What motivates you to participate in community forest management? (Structured)
9. What kind of tangible benefits do you obtain from participating in community forest management? (Structured)
10. Indicate the type of employment that has arisen during your participation in forest management. (Structured)
11. Please, rank in order of preference (1–10) the benefits you obtain from the forest for domestic use. (Structured)
12. How many hours per week do you approximately use for participatory forest management?
13. Please, estimate your personal average monthly income, generated from participatory activities, in respect to the following seasons?
14. What are your expectations regarding forest management?
15. What is your position in participatory forest management system? (Structured)

16. What traditional practices of forest management are applied in this forest?

17. What is good about the way the forest management is organized?

18. What negative factors can you find about the way the management is organized?

19. How would you like to see the management system reorganized?

20. What knowledge and skills have you gained along with the new responsibilities on forest management?

21. How have your sources of livelihood changed since you started participating in community management?

(Structured)

22. Please, specify the possible factors that have improved your livelihood.

23. What are your other views regarding your participation in forest management that has not been covered in this interview?

Appendix 9. Questionnaire for household interviews on traditional ecological knowledge.

Date _____
Village / Sub-location / Location:_____ / _____ / _____
Homestead Coordinates / Altitude:_____

Male Female
Age_____
How long have you lived in this location? Origin?_____
Farm size_____

Private forest No Yes tot. area_____
Sub-location /distance from homestead _____

1. Historical transect- form (separate)

2. What kind of factors do you consider important when managing trees on your field?
3. Who have taught you the management skills and when?
Grand father
Grand mother
Father
Mother
Friends
Neighbours
Chief
Forest officer
NGO
CBO
Elementary school
Farming school
Others,who?

4. How are the work tasks divided in your household when it comes to tree management? (men/women/children/others)

Technical planning _____ Acquiring the seedlings_____

Choosing the species_____ Planting _____

Managing while growing_____ Decision on felling_____

Other tasks _____

5. From whom have you learned to know about indigenous species during your life?

If private forest owner, please answer the following:

6. What species are growing in your forest? (Order of volume) Use

7. Do you participate in community forest management? No Yes How?
8. What kind of factors do you consider most important in forest management?
9. Do you know what biodiversity conservation means? No Yes
10. What would you change on your land in order to enhance biodiversity conservation, if you could?

11. What happened to the rule "*never cut a living tree*" (an old Taita visdom)?

12. Are there any traditional restrictions, sanctions, beliefs or norms used, concerning utilization of plants, animals and other forest products? Please explain

13. Are there any places close by traditionally protected from disturbance (sacred places/ forest)?
If yes, please name them. No Yes

14. Do you know where the borders of trust land forests exactly are? No Only approximately Yes
Where does this knowledge derive from?

15. Do you think **you** have inherited traditional knowledge and skills, (learned from ancestors, not recent knowledge) ,which you can pass for the next generation? No /Yes

16. Is there traditional knowledge among the community which you think could be used more in forest and agroforestry management?
No /Yes

17. Can you list advices, rules and practices, that you consider as indigenous/traditional knowledge concerning following topics:

I) Water management
II) Soil management
III) Pest management / wildlife combat
IV) Ethno-veterinary
V) Ethno-medicine

18. Is it possible to grow the useful, indigenous plant and tree species, gathered from forest, on the *shamba*?
Which ones?

19. How much do you rely on traditional medicine compared with pharmacy products?

_All medicine from nature
_Over 50% from nature
_Half and half
_Under 50% from nature
_All medicine from pharmacy
_Other_____

20. I use traditional medicines for
_only myself
_all my family members
_gaining income
_religious purposes _other_____

21. How do you find the importance of sacred forests and sites in the area? Please rank on the scale from not important to very important.

Not Important I----------I **Very Important**

They are important because of religious reasons.

They are important places for ceremonial rites.

They host animal / plant species high in biodiversity.

They are important water sources.

They have aesthetic value in the landscape.

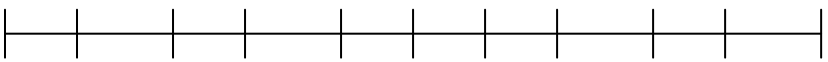
They are not significant in any ways.

Other important meaning_____

22. Are there some traditional institutions of management still working?

23. Can you mention indigenous species that used to / can have big market value?

24. How would you estimate the level of your traditional ecological knowledge inherited, on a scale from 0 to 10 ?



25. If I want to know something more about the traditional systems, who should I turn to?

Appendix 10. Matrices for forest condition characteristics and classes used in mapping the traditionally protected forests and sites (Adapted from KFS & KFWG 2007).

A.

Forest condition characteristics 1- soil cover

Soil cover	Soil cover class
More than 50% of the soils are covered	High
25% to 50%	Moderate
Less than 25% of the soils are covered	Low

Forest condition characteristics 2- crown cover

Crown cover (for forest and shrubland only)	Dominant crown cover class
More than 70%	Dense
40% to 70%	Moderate
20% to 40%	Sparse
Less than 20%	Very sparse

Forest characteristics 3- regeneration density

Density of regeneration	Regeneration class
More than 5000 trees or shrubs per ha	Dense
1500 to 5000 trees or shrubs per ha	Moderate
500 to 1499 trees or shrubs per ha	Sparse
Less than 500 trees or shrubs per ha	Very sparse

Write the names of the three most dominant species in the regeneration.

1._____ 2._____ 3._____

Forest condition characteristics 4- density of seed trees (used for shrubland only)

Density of seed trees	Seed tree class
More than 50 seed trees per ha	High
10 to 50 seed trees per ha	Moderate
Less than 10 seed trees per ha	Low

B.

Forest condition class[16]

Soil cover class	Dominant crown cover class	Regeneration class	Seed tree class[17]	Condition class
low or moderate	very sparse or sparse	very sparse or sparse	low	
			moderate or	very degraded
		moderate or dense	low	
				degraded
			moderate or high	
		very sparse or sparse	low	
	moderate or dense		moderate or high	medium
		moderate or dense	low	
			moderate or high	
high	very sparse or sparse	very sparse or sparse	low	very degraded
			moderate or high	degraded
		moderate or dense	low	
			moderate or high	medium
	moderate or dense	very sparse or sparse	low	degraded
			moderate or high	good
		moderate or dense	low	medium
			moderate or high	good

[16] Adapted form "A Field Manual on Participatory Techniques for Community Forestry" by Jackson W. J. and Ingles A. W. 1998.

[17] Not used for classifying forest. Used only for shrubland classification.

This thesis provides an outlook on the traditionally protected forests and sites in Taita Hills, Kenya. It examines their ecological characteristics and how they relate to social dynamics, explores their ideological aspects, and analyzes them as sites for conservation of cultural and biological diversity. These areas are important components of a larger complex socio-ecological system, which has symbolical status and sacred and mystical elements within it. In turn, this contributes to the connectivity of indigenous remnant forests in the agroforestry dominated landscape. Sacredness, however, enhances but, it does not equal conservation. Various social, political and economic arrangements further affect the integrity of the forests, control of witchcraft being one of them. The Taita people have a rich traditional ecological knowledge base which they apply to natural resource management, health care and social welfare.

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