

**Ministry of Natural Resources and Tourism
Forest and Beekeeping Division**

Conservation and Management of the Eastern Arc Mountain Forests Project.



**FIRE REDUCTION STRATEGIES IN THE EASTERN ARC MOUNTAINS
OF TANZANIA**

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EXCECUTIVE SUMMARY

The high and growing human population in the Eastern Arc Mountains (EAMs) leads to intense pressure on the remaining natural forest, with anthropogenic fire being one of the main threats to this ecosystem (Forconsult 2005). The local farmers adjacent to the forests practice traditional subsistence farming and use fire as a management tool. Furthermore, fire is used for hunting, taboo reinforcement, honey collection, charcoal burning, pyromaniacs and arson. Some of these fires cause significant ecological and socio-economic impacts and if fire enters dense high forest then it can cause considerable damage. For example in 1997/98 and 1999/2000 about 300 ha and 100 ha were burnt respectively in the Uluguru Mountain forests; there are complaints amongst local people that some streams have dried up as a result of fire, and there is an un-quantified loss of biodiversity. A similar and more frightening scenario is provided by the 1997 fire which destroyed the Kandle-Kampaa and Kwembago Catchment in Lushoto District. In the same year, and in 2004, large areas of the Kilimanjaro National Park (KINAPA) forest were also destroyed by fire. So far, the camphor forests in Lushoto have not been able to regenerate and water flow from the sources has been reduced. Unfortunately, it seems that most local communities are unaware of these cause/effect relationships. Fire data from the Moderate Resolution Imaging Spectroradiometer (MODIS) satellite further showed that the number of fire points within forest reserves, plantations and the remaining Eastern Arc portion of 14 Districts have generally increased over the past five years (Wurster and Burgess, 2005). Furthermore, Forconsult (2005) showed that fire occurred in 23 forests out of 25 EAM forests studied in the 14 districts of the EAMs. Such simple statistics indicate the challenge faced by forest conservationists in the region. In most districts there are no apparent solutions to the fire problem, despite years of regulation and attempts to control fire. There have only been small efforts by the Central or district governments to bring about on-the- ground interventions in relation to fire management in the area due to lack of funds and human capital. In spite of this, fire has been reduced significantly in Mwangi and Mufindi Districts due to intensive mass education, use of bylaws and anti-fire campaigns by both the Local government and NGOs. The current work is intended to fit fire management into the daily routine of local farmers and villagers in general, since they are the main actors and the target group for implementation.

The **overall objective** of this work was to ensure that Conservation status of EAMs is improved through the development and implementation of an integrated conservation strategy for biodiversity conservation and water supply.

Specific objectives

- Document available information on the problem of forest fires in Tanzania.
- Document available knowledge on the problem of fire in the EAMs and its effects on forest and grassland vegetation.
- Review and summarise the available mechanisms, legal and traditional, available in Tanzania for the prevention, control and management of wild fires in the EAMs.
- Gather experiences of successful fire management from EAMs (especially Mwanga and Mufindi districts), or from other similar mountain ecosystems in Tanzania or Eastern Africa.
- Assess whether the characteristics of Mwanga and Mufindi are unique, or whether fire might also be controlled using similar methods elsewhere in the EAMs.
- Prepare a draft fire management strategy for the EAMs, based on the above elements of the work.
- Seek stakeholders input into the draft fire management strategy through a facilitated workshop.
- Prepare a final fire management strategy for CMEAMF based on the outcome of the stakeholders' workshop.

The main output of this task is a draft Fire Management Strategy for the EAMs, containing sections on:

- The fire problem, reasons why it happens, and what its effects are on Eastern Arc forests and grasslands.
- Available laws and other mechanisms that regulate burning, and an assessment of their effectiveness.
- Successful and unsuccessful fire management strategies within the EAMs (also elsewhere in Tanzania if relevant).
- Strategies for addressing the fire issue across the EAMs, which are practical and can be implemented within the means available to Districts and Forest and Beekeeping Division.
- Outline of how the success of these strategies might be measured.

This study was carried out in seven Districts of the EAMs namely: Mufindi (Iringa), Kilombero and Mvomero (Morogoro), Mpwapwa (Dodoma), Kilindi, and Korogwe (Tanga) and Mwanga (Kilimanjaro).

Nearly all districts lack adequate records of fire incidences and most interviewees relied upon their memories to present data on fire frequency and the area burnt. In spite of this, results indicate that the number of fires and area burned has been fluctuating annually in all the districts due to various reasons particularly; weather condition, use of laws and education. It was also noted that the use of fire in agricultural practices in many parts of the EAMs illustrates the complexities of fire prevention policies and fire legislation and the linkages between the forestry and agriculture sector. Where fire is an indispensable tool in shifting cultivation, for example, its widespread use needs to be taken into account when laws are developed so that people are not forced to break the laws to meet basic needs.

Fire prevention through sound management (such as public education, use of bylaws) remains, by far, more cost-efficient than fire suppression during emergencies. However, lack of resources, negligence and policies focusing narrowly on conservation have left several areas without fire management strategies and have increased their vulnerability. The use of bylaws, anti-fire campaigns, proper forest management plans and sacred forests that engage residents in the quest for solutions have proved effective in both preventing and controlling wild fires in Mwanga and Mufindi Districts. The local governments in these districts have operationalized management plans and bylaws to guide most forests reserves under their jurisdiction. Similarly, fire is an important agenda item in all District/Village Environmental meetings and the District Commissioners organize and lead anti-fire campaigns before the dry season. These districts contain many sacred forests and most people respect these and also other forest reserves. On the contrary Kilombero, Mpwapwa, and Kilindi appear to have high number of fire incidences while Korogwe and Mvomero are somewhere in between these two groups. Lack of proper education, lack of functional bylaws and management plans appear to be some of the reasons for the problems. It appears that through continued education, communities in these areas understand the benefit of protecting their forests, and consequently they do everything to prevent forest fire. Experiences and successes from Mwanga and Mufindi could be copied, with modification to local conditions, by other districts. On the basis of this study and

experiences gained elsewhere, the following **Fire reduction strategies** are proposed for the entire EAMs:

i) Establishment of National, Regional and Global networks

Forest wildfires are a worldwide problem. Thus, the establishment of Wild-land Fire Networks at the global regional and national levels would provide effective national, regional and global fora for sharing knowledge and experiences on wildfire, collaboration on formulation and harmonization of wildfire policies for global application and management strategies. The Global Fire Monitoring Centre (GFMC), the Global Observation of Forest Cover Fire Implementation Team and FAO are some of the Institutions which can help at Global level while at Regional initiatives such as East African Wildfire Network (EAWFN), SADC Wildfire Network (SADCWN), African Wildfire Network (AWFN) and National Institutions such as Ministries (MNRT), and NGOs could be used or could take the lead.

ii) Development of harmonized wildfire policies and wildlife acts

Currently each natural resource management sector e.g. forestry, agriculture and livestock, beekeeping, wildlife, land and environment, has a separate sectoral management policy and separate management act and most often, these policies and acts conflict widely on wildfire issues. While almost all the sectoral policies and sectoral acts don't treat wildfire with the attention it deserves, it is only the forest act that dedicates a section on it. All the other sectoral policies and acts just mention wildfire in passing and often as a useful management tool in cleaning up the farms and reactivating forage growth in pasture and wild lands. Indeed, the success of all natural resources based sectoral activities almost entirely depends on a healthy environment. Wildfire, therefore, needs to be singled out as one of the most constraining factors in all sectoral development endeavours and should, to that effect, be fought against determinedly by all resources management sectors. The sectoral stakeholders need to sit together to review their sectoral policies and acts in relation to wildfire in order to come up with a harmonized cross-sectoral national wildfire management policy and act.

iii) Use of various aids in wildfire management

When properly enacted and judiciously enforced, the laws, bylaws and related legislations are effective wildfire management tools. For example, in Mufindi District and the highland

zones of Mwanga District where the protocols of responsibilities in dealing with fires – from their detection, suppression, reporting, to closely following up the cases at the courts are clearly streamlined - wildfire incidences have declined drastically with time. It was, however, unfortunately noted that there was a general lack of streamlined enforcement mechanisms in most of the wildfire prone districts (Mpwapwa, Kilombero and Kilindi). In order to be effective it is suggested that District natural resources and various government agencies, available NGOs and local communities, should:

- Streamline procedures for the effective enforcement of available laws and bylaws
- Facilitate villages in enacting and using bylaws – for example formation of Village Environmental Committees to monitor execution of the bylaws
- Formulate and regularly review bylaws with a view of accommodating emerging issues
- Harmonize the mechanisms and technology packages on environmental conservation to reduce conflicts
- Activate law enforcement against arsonists or shifting cultivators
- Stimulate investments in issues that address the underlying causes of fire since these could be more cost-effective than investments in fire suppression technologies and resources, which are often only used for a few months each year.

Since most of the above have cost implications, the District Development Committees should deliberately allocate some funds for such activities, giving priority to those areas which are fire prone. Funds could also be sought through application to Environmental NGOs or the Central Government.

iv) Education

The DNRA, DFO, Natural resources based extension workers, NGOs and politicians need to educate villagers and village governments on the roles and responsibilities of different committees, and ownership of the village by-laws. Similarly in order to enhance education on the hazards of wildfires to natural resource bases, environment, human properties and human life; actions need to be taken to limit their incidences and suppress those which are started, including developing protocols for reporting fire and dealing with the associated cases.

Establishment of programs e.g. radio, cinema, TV, newspapers, use of posters and displays that emphasize on fire prevention and suppression of forest fires could form an important part of the education curricula e.g. the case of Mwanga. This could include development of education packages on the impacts of fire on food security and community livelihoods

v) Management plans

It was noted, during the survey, that most of the Central Government, District Council and Community forests did not have management plans. It is suggested that there should be a deliberate effort to promote and encourage the development of management plans in these forests. This could be facilitated by the various Government and NGO agencies in close collaboration with local community stakeholders using various instruments such as the PFM, JFM, and CBFM etc. Issues to be taken on board could include:

- Establishment of Community-based fire control activities.
- Development of area specific (i.e. District) guidelines governing the application of fires as a management tool in various land use groups.
- Development and installation of fire alarm and fire danger rating systems/networks within any land use category.

vi) Encouragement and use of Local Institutions

Although forests under local management were encountered in only two districts (Mufindi and Mwanga) of the seven surveyed (i.e. 28.6%), they are known to be widespread in various parts of the EAM and Tanzania in general. Wherever they exist, these locally managed forests tend to remain intact and highly respected by the surrounding communities. Thus, across the Eastern Arc Mountains there could be a program for:

- Promoting the establishment and strengthening of traditional/clan forests for effective fire reduction.
- Involving local institutions in the management and control of forests and forest fires at the district and village levels.

vii) Private sector and NGOs involvement

Various private companies and/or NGOs in almost all districts covered take environment, including wildfires, as among the key programs of their operations. Many of them are directly participating in the community awareness raising campaigns about wildfires,

community education, facilitation of VECs formation and the formulation of district and village bylaws. These efforts need to be further promoted and strengthened by involving and integrating private sector and NGOs activities into district/village development plans.

viii) Wildfire monitoring and evaluation

In order to have effective and efficient wildfire management plans and strategies, reliable data are required. It is, therefore, important to establish mechanisms for wildfire monitoring, reporting and evaluation. Monitoring could be done through various mechanisms e.g. watchtower systems; ground and aerial patrols, close collaboration with the local communities and various stakeholders. Equipment to determine precise geographic location (GPS) and the capture of images (computer labs) are also needed. The trends of fire risks; impacts on natural resources base, human properties, human life and environment must be evaluated in order to mitigate the impacts.

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LIST OF ACRONYMS

AWFN	=	African Wildfire Network
CBFM	=	Community Based Forest Management
CBO	=	Community Based Organization
CGFRs	=	Central Government Forest Reserve(s)
CMEAMF	=	Conservation and Management of Eastern Arc Mountain Forests
DAS	=	District Administrative Secretary
DC(s)	=	District Commissioner(s)
DFO	=	District Forest Officer
DNRA	=	District Natural Resources Advisor
EAMs	=	Eastern Arc Mountains
EAWFN	=	East African Wildfire Network
EUCAMP	=	East Usambara Conservation Area Management Program
FAO	=	Food and Agriculture Organization of the United Nations
FBD	=	Forest and Beekeeping Division
GEF	=	Global Environmental Facility
GFMC	=	Global Fire Monitoring Centre
GTZ	=	Germany Development Cooperation

IUCN	=	The World Conservation Union
JFM	=	Joint Forest Management
KINAPA	=	Kilimanjaro National Park
KVTC	=	Kilombero Valley Teak Company
LGFRs	=	Local Government Forest Reserve(s)
MEMA	=	“Matumizi Endelevu ya Mali Asili”
MNRT	=	Ministry of Natural Resources and Tourism
MODIS	=	Moderate Resolution Imaging Spectroradiometer
MUET	=	Mufindi Environmental Trust
MUFIPRO	=	Mixed Farming Improvement and Irrigation Project
NFP	=	National Forest Programme
NGO	=	Non Governmental Organization
PA(s)	=	Protected Areas(s)
PFM	=	Participatory Forest Management
PMORALG	=	Prime Minister’s Regional Administration and Local Government
RAS	=	Regional Administrative Secretary
SADC	=	Southern Africa Development Conference
SADCWN	=	SADC Wildfire Network
SUA	=	Sokoine University of Agriculture
TAFORI	=	Tanzania Forestry Research Institute
TANAPA	=	Tanzania National Parks
TFAP	=	Tanzania Forestry Action Plan
TFCG	=	Tanzania Forestry Conservation Group
UNDP	=	United Nations Development Programme
URT	=	United Republic of Tanzania
VEC	=	Village Environmental Committee
VPO	=	Vice President’s Office

1.0 INTRODUCTION

1.1 Background information

1.1.1 Global fires, an overview

Wildfires are world-wide problems and uncontrolled or misused fire wreaks havoc on society and the environment, destroying property and natural capital, depleting nutrient pools, polluting water supplies, reducing biodiversity, increasing emission of greenhouse gases, disrupting communities, decimating livestock and even killing people (Sarre and Goldammer, 1996). Furthermore, fire contributes in changing the landscape structure and species composition including grasslands, savannahs, closed forests and woodlands (Christensen, 1985; Goldammer, 1990; Tylor, 1995). Globally more than 350 million ha of forest were burned in 2000 of which 95% were caused by human activities. Global records show that approximately 3.9 Gt of carbon (Gt C) are released annually into the atmosphere through biomass burning (Andreae and Goldammer, 1992), equivalent to over 70% of the annual anthropogenic fossil fuel emissions. With its inherent sensitivity to climatic conditions, and with the prospect of rapid future climate change, fire has been a focus of intensive investigation in recent years (Lelieveld, *et.al.*, 1996).

The existence of ecosystems such as the African savannas, the Brazilian cerrado, many Mediterranean-type ecosystems and Prairie grasslands cannot be adequately explained without the consideration of human burning activities, which shifted the periodicity of fire, consequently changing vegetation composition (Schule, 1990). The World Summit for Sustainable Development (WSSD) in Johannesburg, South Africa, 2002, provided the groundwork for an action programme to reduce the negative effects of wild land fire on the environment and humanity. This led to an International Wild land Fire summit in Sydney, Australia, in October 2003.

Africa leads the world in the number of fires and area burned almost every year in total or by areas (FAO, 2003). For example, in 2000 it is estimated that 175 million hectares of forest, savannah woodlands and grasslands were burned south of the equator in Africa. Many fires were intentionally set to clear land for agriculture, and many of these fires

went out of control to burn much larger areas than were originally intended. It is not possible to state conclusively that there is a long-term upward trend in fire at the global level, since historical data are available for only a small minority of countries. However, the problems experienced by individual countries and regions are such that an increasing number of national and local governments are elevating fire as a priority issue requiring increased policy attention and increased allocation of resources (FAO, 2005).

1.1.2 Status of wild fire in Tanzania

Tanzania has about 33.5 million hectares of forests and it is estimated that forest fires destroy about 65,000ha of forests and other wooded areas annually (Aloo, 2001). To date few systematic studies concerning the type and extent of forest fire risk in national terms in Tanzania have been undertaken (Hall and Gwalema 1985; Kimaryo, 1988; Madoffe *et al.*, 2000). Despite the magnitude of threat, hard data on the number and extent of fires are lacking, and most statements on the fire issue are based on anecdote and opinions. Some information is however, available at SUA, TAFORI, FBD, TFCG. Most of these fires occur in woodlands (75%), followed by forest plantations (20%) and least in high forests (5%). Forest fires protection in the Eastern Arc Mountains (which are dominantly high forest) is hampered by lack of fire management policies and legal instruments to support fire prevention and suppression. Trained human and financial resources are also limited. Burgess *et al.* (2005) and Forconsult (2005) identified fire as the biggest single threat to the Eastern Arc Mountain forests causing devastating effects to biodiversity and water conservation. The three studies by FBD, SUA and TFCG ranked five threats with fire appearing the first among all threats.

In Tanzania, ignition sources are analogous to those found elsewhere in the world (Cheney 1970; Fitzgerald 1971; Komarek 1971; Van Wyk 1971; Mnzava 1980) – basically lightning or caused by man. Ignition by lightning in Tanzania is rare (Poulsen, 1975) because thunderstorms usually occur in the rainy season when vegetation is too wet to support ignition. Most fires are caused by human activities particularly farm preparation (URT, 1998), game hunting, honey hunting, burning simultaneously to improve pasture quality and to eliminate parasites (Fitzgerald, 1971), charcoal burning,

mining, pit sawing, grazing, controlled burning, arson and fire attributed to pedestrians (Poulsen, 1997). In the EAMs which are dominantly mountainous the slope, aspect and shape all facilitate the spread of fire (McArthur, 1978; Rothelmel, 1983). The miombo woodlands are particularly prone to fire and in most parts this is an annual event. In recent years, fire has compromised efforts towards forest sustainability and biodiversity conservation causing great concerns among government authorities, and local and international researchers and conservation agents. There is therefore, an urgent need for documentation of the problem if measures are to be made to reverse or slow the process. The task of fire management is to ensure that fire is used in such a way that its negative impacts are minimized and its positive impacts maximized.

There are a lot to learn from the past experiences of forest fire management in Tanzania and a few examples are cited. Many fires pass unrecorded but several fire incidences caused by one or a combination of ignition sources have been reported in the last three decades. In 1960, 16.4 ha of *Cypress* plantation in Rubya Forest were burnt, started by a villager in conflict with the officer- in charge of the project (Mnzava, 1980). In 1962, about 2 ha of pine plantation in Kiwira Project were burnt by grazers as a reprisal for taking over an area of grassland following agreement with the local authority (Tanganyika Forest Division, 1962). In 1963, 19,736 ha of heath land vegetation of Kilimanjaro were burnt as a result of fires left unattended by game hunters and honey gatherers (Tanganyika Forest Division, 1963). The 1967 Peter's Hut Fire on Kilimanjaro Mountain was so serious that it prompted the Government to re-emphasize the preventive measures against the start and spread of fires. This particular fire destroyed 21,000 ha and was attributed to climbers' carelessness or to game poachers (Tanzania Forest Division, 1967). Also in 1967, 200 trees of Camphor (then valued at 10,000 T.shs) in the Barankata evergreen forest on the slopes of Mount Kilimanjaro were destroyed when unattended fires left by pit sawyers and /or honey hunters spread. In the same year, fires escaping from agricultural land caused extensive damage: 320 ha at Chome Forest Reserve (South Pare Mountains) and 19.2ha of a young Pine plantation in Ruvuma Region. In 1983, about 5,000 ha of conifer (*Pines* and *Cypress*) plantation at Sao Hill was destroyed by fires which escaped from a nearby ranch following efforts to burn for

control of tsetse fly and ticks (Tanzania Forest Division, 1984). The National Park forests on Kilimanjaro are one of the high forests which have suffered very serious fire incidences in the recent years, 2001 and 2004. Despite the forests being wet and green almost throughout the year, drought could have facilitated ignition and spread of the fire. It was estimated that more than 300 ha of forests were lost in these incidences. These fires may have escaped from either the tourists' camps or farm preparation. Both fires were very hot and fast spreading and could not be extinguished by TANAPA without the help of the villagers and the army. Plane spraying was also requested from neighbouring Kenya for both fire incidences.

From 1980-83 records show a combined loss of 7,810 ha of natural forest from various causes (Tanzania Forest Division, 1984). This was 37% of the total area burnt in Kilimanjaro alone in 1967. About one decade ago (1997); pit-sawyers caused a serious fire in Lushoto District. The fire was very hot and spread very fast due thick and continuous accumulation of litter resulting from serious drought which occurred in that and the previous year. About 33,280 stems/ha with diameter at breast height (dbh) less than 10 cm and 525 stems/ha with diameter at breast height greater than 10 cm died due to fire respectively. Of the dead 525 trees/ha, 330 were Camphor with a volume of 188 m³/ha of which 180m³/ha was contributed by trees with diameter greater than 20 cm. A reduction of 20% in species abundance was recorded; making the Kwembago, parts of Shume Magamba, and Kandlekampa Forests show regeneration shortcomings (Maliondo *et al*; 2000). Despite the fact that quantified information on the losses of West Usambara forest biodiversity caused by bushfires is not available, their contribution is, no doubt, significant. Nsolomo and Chamshama (1990) noted that fire damage to vegetation is of a higher magnitude than damage caused by pit-sawing or fuel wood and pole cutting. The problem of fires is a recurrent one and a permanent solution is still to be found. Thus it remains a living challenge to effective biodiversity conservation. In a special pullout on climate change last April, *Time* magazine says that of the 20 hottest years on record, 19 occurred between the 1980's and 2000's. This possibly explains the devastating inferno at Lushoto – something unheard of before. It is a poignant reminder

that the Eastern Arc Mountain forests though normally wet and thus below ignition point suffer during exceptionally dry years as these expose them to fire risks.

1.1.3 Preventive measures: limitation of ignition

At various stages of natural resources development, the Tanzania Government introduced eight preventive measures aiming to reduce and eventually eliminate fires from various sources, as follows:

- Prohibition, through inclusion of clauses in the Forest Ordinance (e.g. clauses 23 and 24 of the 1926 Forest Ordinance) and forest policy (e.g. clause 17 of the 1953 Forest Policy) stating what should be done to reduce fire hazard and steps to be taken in case of fire breakout (Forestry and Beekeeping Division, 1953; Committee in Forestry, 1957). This has recently revised to cover unattended or rekindled fires (URT, 2002 a), and kindling fires (URT, 2002b).
- Promulgation of local by-laws forbidding residents from using fires to clear land surrounding their premises (whether for crop growing, snake chasing or exorcism of evil spirits according to tribal taboos and beliefs) without prior consultation with the forestry authorities (Mbegu and Mlenge, 1983).
- Pruning all plantations to a minimum height of 2.5 m (Poulsen, 1975).
- Release of a directive by Tanganyika African National Union (TANU) Annual General Meeting of 1975 (Mbegu and Mlenge, 1983) directing all regions whose income is solely livestock oriented, to reduce herds by 10% in anticipation of reducing fire incidences.
- Vigorous propaganda campaigns using radios, schools, newspapers and extension services to create awareness among the general public of the importance of forests to the national economy, of the dangers posed to these forests by irresponsible use of fire, what constituted offences against the forest rules and penalties applicable for infringements.
- Stressing the necessity of good relations between the forestry authorities and the general public (Mnzava, 1980).
- Requiring livestock owners grazing in the forest under licence, to cut creepers and climbers as condition for their licence (Tanganyika Forest Division, 1962).

- Requiring prior consultation between ranch keeper and forest officer before range burning.

1.2 Problem Statement and Justification

The Eastern Arc Mountains (EAMs) forests are rich in biodiversity and are important for water, agricultural production and myriads of forest products (Mittermeier *et al.*, 1998; Myers *et al.*, 2000). These forests have been under continuous exploitative human pressure for at least 2,000 years (Schmidt, 1989). Until recently, especially before the past 50 years (Kikula, 1989), recovery was possible in some parts. However, the growing human population in the area is leading to increased pressure on the remaining natural forest and anthropogenic fire is one of the main threats to this ecosystem (Forconsult, 2005). The local farmers adjacent to the forests practice subsistence traditional farming and they use fire as a management tool. Furthermore, fire is used for hunting, taboo reinforcement, pyromaniacs and arson. Some of these fires cause significant ecological and socio-economic impacts. For example in 1997/98 and 1999/2000 about 300 ha and 100 ha were burnt respectively in the Uluguru Mountain forests and there are complaints amongst local people that some streams have dried up as a result of fire, yet there is unquantified loss of biodiversity. A similar and more frightening scenario is provided by the 1997 fire which destroyed the Kandeke-Kampala and Kwembago Catchment in Lushoto District. So far, the camphor forests have not been able to regenerate and water flow from the sources has been reduced. Unfortunately, it seems that most local communities are unaware of these cause/effect relationships.

The fire data from the MODIS satellite show that the number of fire points within forest reserves, plantations and the remaining Eastern Arc portion of 14 Districts have increased over the past 5 years (Wurster and Burgess, 2005) (Table 1). The most fire prone year was 2003, a year of drought in the region. However, between January and September 2005 there were already 1,643 fire points across the Eastern Arc. Of note is that the number of fire points per square kilometer of land is much lower in Forest Reserves than in plantations or general District land. Such simple statistics indicate the challenge that faces forest conservationists in the region.

CMEAMF: Fire Reduction Strategies -EAMs

Table 1 Fire incidences in selected Districts in the Eastern Arc Mountain Forests

District	Period	No. of fires	Remarks
Kilindi	1988 - 2000	28	Year incidences unavailable
Kilombero	1997 - 2006	34,40,22, 19,15,150, 6, 6,7,3*	
Korogwe	2000 - 2006	7,6,11, 10,6,4,3*	* Chronological order
Mufindi	1997 - 2006	36,24,28, 32,19,23, 15,17,14,12*	
Mwanga	1998-2006	35,10,20, 15,50,10, 101,12,25,None*	
Lushoto	1997 - 2006	4,1,2,	Respectively 1997, 2001, 2002 & 2005

Furthermore, Forconsult (2005) showed that fire occurred in 23 forests out of the 25 EAM forests studied in 14 districts. In most districts there are no apparent solutions to the fire problem, despite years of regulation and attempts at control, and in most places fire incidence is believed to be increasing. However, officials in one district, Mwanga, claim that the fire problem has been contained (Forconsult, 2005). Additionally, in Mufindi District it is claimed to be much reduced. There is a need to build from these apparent local successes in fire control to develop fire reduction strategies that can be scaled up to address the fire problem across the EAMs (Appendix I).

There have been either very limited or no efforts to bring about on-the- ground interventions in relation to fire management in the Eastern Arc Mountains. The Forestry

and Beekeeping Division conducted seminars up to early 1990s, but these were only directed to decision makers (and not to the local people), who actually have by-laws addressing the issue of fire management, but a lack of motivation and means for enforcement hampers any real change. There are other problems too that are related to fires. Little is known on the place of fire in the society in terms of what triggers the setting of fire and whether there are traditional institutions governing the use of fire. Unanswered questions are: what do villagers know of the impact of fire on the environment in terms of water supply, species diversity of flora and fauna? What are the best mechanisms of fire control from their point of view? This study aimed to try and find ways to fit fire management into the daily routine of local farmers and villagers in general, since they are the main actors and the target group for implementation.

The loss of the EAMs forests through fire would have negative environmental consequences such as reduction in water supply, biodiversity, pollution of water sources and reduced agriculture production. Therefore, the sustainable management of the EAMs is critical, both for local, national and global interests as the EAM forests are one of the 34 hotspots known for endemism and biodiversity richness in addition to providing myriads of ecological services including Carbon sequestration and water supply.

1.3 Objective

1.3.1 Overall objective

Conservation status of EAMs is improved through the development and implementation of an integrated conservation strategy for biodiversity conservation and water supply.

1.3.2 Specific objectives (Accomplishments)

- Outline of how the success of these strategies might be measured.
- Document available information on the problem of forest fires in Tanzania.
- Document available knowledge on the problem of fire in the EAMs and its effects on forest and grassland vegetation.

- Review and summarise available mechanisms, legal and traditional, in Tanzania for the prevention, control and management of wild fires in the EAMs.
- Gather experiences of successful fire management from EAMs (especially Mwanga and Mufindi), or from other similar mountain ecosystems in Tanzania or Eastern Africa.
- Assess whether the characteristics of Mwanga and Mufindi are unique, or whether fire might also be controlled using similar methods elsewhere in the EAMs.
- Prepare a draft fire management strategy for the EAMs, based on the above elements of the work.
- Seek stakeholders input into the draft fire management strategy through facilitated workshop.
- Prepare a final fire management strategy for CMEAMF based on the outcome of the stakeholders' workshop.

1.4 Expected output

The main output of this task is a draft Fire Management Strategy for the EAMs, containing sections on:

- The fire problem, reasons why it happens, and what its effects are on Eastern Arc forests and grasslands
- Available laws and other mechanisms that regulate burning, and an assessment of their effectiveness.
- Successful and unsuccessful fire management strategies within the EAMs (also elsewhere in Tanzania if relevant).
- Strategies for addressing the fire issue across the EAMs, which are practical and can be implemented within the means available to Districts and Forestry and Beekeeping Division.
- Outline of how the success of these strategies might be measured.

2.0 REVIEW OF POLICIES RELEVANT TO WILDFIRES

The following review seeks to identify entry points which can be exploited for forest fire control in Tanzania, notably in the Eastern Arc Mountain Forests. On the question of past and current prevention and intervention practices used elsewhere, in the light of current field instructions in use, it is amply clear that Tanzania's position is not enviable. There is also a possibility of getting negative results from improper adherence of the aforementioned measures and practices such as those promoting excessive litter accumulations under woodlands. Biodiversity considerations, steep topography, and fragmentation also evoke special fire management considerations. It is imperative to take stock of the options available in anticipation that fire control prescriptions will be built from current practices since initiating sophisticated approaches may in the long-term, be unsustainable.

2.1 The National Forest Policy of 1998

The National Forest Policy (URT, 1998a) mentions fires as one of the threats to public lands leading to their degradation. It is clearly stated in the policy that wild fires are taking place annually affecting both natural forests and plantations. Uncontrolled wildfires are hampering natural regeneration resulting in eventual deforestation. However, the forests lack systematic management, unclear boundaries and inadequate resources for control. The policy therefore emphasizes clear ownership on land and trees, allocation of forests and their management responsibilities to villages, private individuals or to the government as a way to curb forest degradation caused by among others, forest fires (URT, 1998a: Policy Statement 5). Fire management in the Forest Policy is not separately stipulated, but mentioned in a group of threats and appropriate interventions such as developing forest management plans and co-management approaches.

Shortcomings in the Forest Policy

The Forest Policy does not provide policy statements for fire management apart from recognizing its impact on vegetation. Most forests are under public ownership, and these are open access areas where a lack of land and tree tenure means that they have continued

to be burnt. The policy advocates empowering local communities on management of forests but the whole process is heavily donor dependent and this is not sustainable. Empowerment requires government commitment and synergy with other policies such as Land, Agriculture, Wildlife, Beekeeping, Mining and Environment. The policy does not provide scenarios on how common land problems are going to be solved in the framework of other related policies.

2.2 Forest Act No. 14 (2002)

The Forest Act number 14 (2002) has sections 70 – 76 devoted for fire issues and provides restrictions on burning of vegetation. It is clearly stated that, unless otherwise exempted by an order made by the Minister and published in the Gazette, no person shall subject to provisions of Section 70(1) within any area of Tanzania Mainland; (a) burn any vegetation on any land outside the cartilage of his own house or compound and (b) wilfully or negligently kindle or cause to be kindled any fire which he has reasonable cause to believe may spread so as to destroy or damage any property of another person. The Act requires that any person permitted to kindle any fire must give notice of his intention to burn the vegetation in writing and deliver it by hand or orally. The notice must be effective from the date it was issued and shall state as near as may be the time at which the burning will take place. Where fire lawfully kindled after notice was given spread to other land, Section 71(1) of the Act provides for powers to require other persons to assist in extinguishing the fire.

The Director of Forestry and Beekeeping Division may give order to land owners by written notice to provide proper protection to adjoining land from the risk of fire, and Section 72(1) (a) requires land owners to provide firebreaks on the boundaries of such width as may be specified in the notice and (b) to establish and maintain internal firebreaks. Should the occupier neglect the order, the Director shall carry out the work and the costs involved shall be debited to the occupier of the land. Section 91(1) of the Forest Act No. 14 (2002) explains offences in connection with fires and states that any person who without lawful authority; (a) lights or assist in lighting, rekindles or adds fuel to any fire or cause any of these activities to take place, (b) leaves unattended fire which

he, with or without authority has lighted or assisted in lighting or used or rekindled or to which he has added fuel before such fire is thoroughly extinguished; or fails to comply with any lawful order issued to him under Part IX of this Act, shall be guilty of an offence and upon conviction, shall be liable to a fine of not less than fifty thousand shillings and not exceeding one million shillings or to imprisonment for a term not exceeding one year or to both such fine and imprisonment (URT, 2002).

Shortcomings of the Forest Act

The Forest Act clearly states prohibition on fires in forested land. The problem of human and financial resources however makes the implementation of the act modest furthermore, the punishment stipulated for the contravention of some sections, is very mild compared to the resulting, negative environmental impact.

2.3 Wildlife Policy (1998)

The Wildlife Policy of 1998 puts emphasis on establishment of Protected Areas (PAs) for the ultimate goal of conservation and management of biological diversity. Tanzania has designated a significant proportion of her land area for a PA network devoted to wildlife conservation. Under the conservation and management of biological diversity, the policy clearly states strategies to achieve this, and one is a strategy seeking to minimize the damage caused by wildfires. A second strategy is the use of prescribed fires (burning) for management programs as per PA management plans (URT, 1998b: 13 (Strategy No. xvii and xviii)). The wildlife policy also advocate establishment of Wildlife Management Areas (WMAs) outside PAs and this helps in reducing fires originating from public lands (www.tanzania.go.tz/policiesf.html).

Shortcomings of the Wildlife policy

The policy does not explicitly say how best fire can be minimised. The synergy with other land use polices is not given and therefore opens room for conflict in a situation where burning regimes differs.

2.4 Wildlife Conservation Act No. 12 (1974)

The Wildlife Conservation Act No. 12 of 1974 (Section 9 (1) prohibits burning of bush or grass fire in a game reserve except by and in accordance with the written permission previously sought and obtained of the Director as well as if any part of the game reserve is included in the forest reserve, the Director of Forestry or his duly authorized representative. In the same Section part (2) it emphasizes that any person who contravenes Section (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding TAS 5,000 or imprisonment for a term not exceeding two years or to both fine and imprisonment. Fire is not given sufficient strength and the punishment is very mild and the Act does not address fires originating from outside the game reserves which incidentally are the main sources of fire in most reserves.

2.5 The Beekeeping Policy (1998) and Beekeeping Act (2002)

The National Beekeeping Policy mentions fire as one of major threats to honey bee colonies which are important in production of quality honey. The use of fire for honey harvesting is discouraged. The policy emphasizes the establishment of community based beekeeping reserves for maximum protection of bees and their habitats. The Beekeeping Act No. 15 of 2002 prohibits burning within gazetted bee reserves under Section 17 Sub-sections 1(a) and (h). Section 44(2) states that any person who uses open fire to harvest apiary products commits an offence and upon conviction shall be liable to a fine of not less than 50,000 TAS and not exceeding 200,000 TAS or to imprisonment for a term not exceeding six months or to both such fine and imprisonment. The punishment is mild and the Act does not address fires originating from outside the bee-reserve which incidentally are the main causes of fire in most reserves.

2.6 Other relevant policies and Acts

2.6.1 National Environmental Policy (1997)

The National Environment Policy of 1997 identifies six major environmental problems as: loss of wildlife habitats and biodiversity, deforestation, land degradation, deterioration of aquatic systems, lack of accessible, good quality water and environmental pollution. All these have resulted into land degradation. The policy further explains that poor

agricultural practices such as shifting cultivation, lack of crop rotation practices and land husbandry techniques exacerbate the problem. The policy does not treat fire as an environmental problem of its own but it seems to be combined with other factors resulting to land degradation (URT, 1997a).

2.6.2 The National Agriculture and Livestock Policy (1997)

The Agriculture and Livestock Policy of 1997 asserts that agriculture operates in a delicate natural environment which requires proper management and protection. Furthermore it recognizes that the incorrect use of land, water, and forests in the production of crops and livestock can have far reaching effects on environmental integrity. It is mentioned that frequent bush fires aimed to cause the regeneration of pastures result in increased environmental degradation. One of the objectives of this policy is, therefore, to promote integrated sustainable use and management of natural resources such as land, soil, water and vegetation in order to conserve the environment (URT, 1997b: 21(f)).

Shortfalls: Apart from pastureland, fire is not explicitly mentioned in the policy besides land preparation with this use of fire being implicated as one of the main cause of forest fires.

2.6.3 The National Land Policy of 1999

Section 4.2.9 of the National Land Act provides for the protection of sensitive areas. Policy statement 4.2.10 outlines the creation of mechanisms for the protection of sensitive areas including among others; water catchments areas, mountains, forests, national parks, national heritage and areas of biodiversity. These areas, or part of them, shall not be allocated to individuals. Section 7.1.0 explains the importance of coordination in land use management. It is stated that before user rights such as for mining, timber harvesting, hunting etc are considered, existing land tenure rights should be recognised. Emphasis is given on the formation of an Inter-ministerial Committee by relevant ministries to ensure consultation between the issuing authorities and the Ministry responsible for lands. Policy statement is given under Section 7.2.1 on agricultural land

use and puts emphasis on community involvement in resource management, land planning and conflict resolution. The whole issue of land tenure features clearly in the policy and discourages shifting cultivation and nomadism which have been always accused of causing forest fires.

3.0 METHODOLOGY

3.1 Study sites and location

The field element of this study was carried out in seven districts of the EAMs (Fig 1). The selected districts Mufindi (Iringa), Kilombero and Mvomero (Morogoro), Mpwapwa (Dodoma), Kilindi and Korogwe (Tanga) and Mwanga (Kilimanjaro) were visited by the Consultants during the survey (Appendix II).

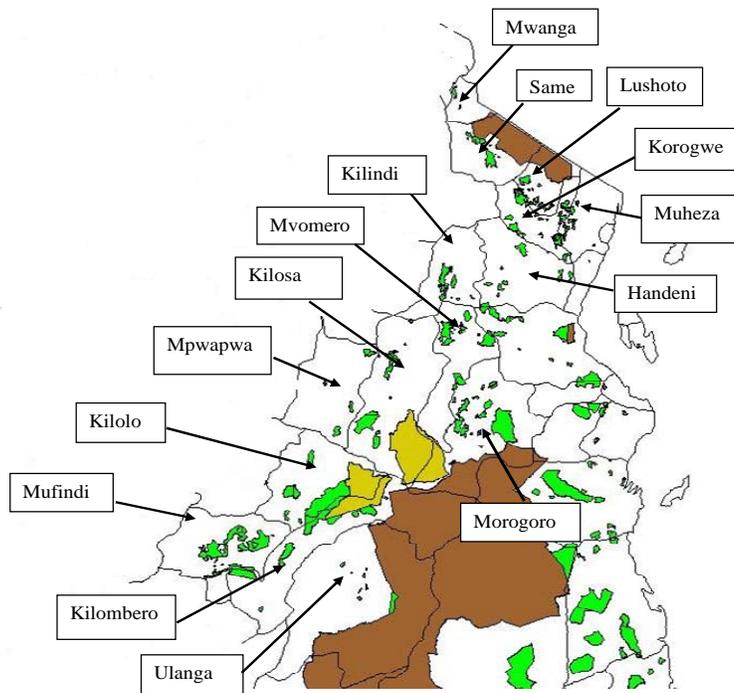


Fig. 1 Location of the study districts within the Eastern Arc Mountain forests of Tanzania

3.2 Sampling Design

Seven out of the 14 districts of the Eastern Arc Mountains were selected for the study (see Fig. 1). From the existing information it was clear that some of the districts in the Eastern Arc Mountains experienced repeated annual fires; others occasionally experienced such fires while others were largely immune from such problems. The first

task was therefore to make a classification of the districts found in the Eastern Arc Mountains into three broad categories of forest fire incidence severity. Borderline cases were considered as the fourth category depending on fire frequency. Purposive sampling design was therefore used to select representative districts, and 50% sampling intensity was adopted. Seven districts were selected based on the above set criteria. Except for the key informants (Elders, Village Executive Officers and District Officials), respondents from the local communities or VEC members were selected randomly based on who was available and willing to participate during the interviews. At least two to three villages were sampled, with one in the area with high frequencies of forest fires, those in low and dry lands, which are in most cases the sources of fire spreading to highlands and one with minimum reported cases of forest fires and those close to the mountain forests which are normally wetter.

3.3 Types of data collected

To facilitate the process of developing a Fire Reduction Strategy for the Eastern Arc Mountains, both primary and secondary data were gathered. The primary sources of information included Villagers, Village Environment Committees, District Forest/Natural Resources Officers, Non-Government Organisations and Traditional Leaders in the visited districts. The secondary information was collected from reports, policy documents and the internet. Most of the secondary information was collected from the Ministry of Natural Resources (Forestry and Beekeeping Division), Environment Section - Vice President's Office, National Environment Council (NEMC), Faculty of Forest and Nature Conservation (SUA), Tanzania Forestry Research Institute (TAFORI) and the Conservation and Management of Eastern Arc Mountains Forests Project (CMEAMF) offices.

The primary information collected covered social, economic, environmental and ecological aspects of forest fires. The social and economic information collected focused on communities' daily socio-economic activities impacting on the forest, whether there were villages surrounding the forests, community participation in combating forest fires and available mechanisms (Bylaws, regulations and fire monitoring tools).

Environmental and ecological information focused on forest fires as an environmental problem, which areas are the most affected, the effect of forest fires on flora and fauna, types of the forests surrounding the villages and sources of forest fires. The secondary information collected included policy statements, government regulations, Acts, Laws, National Vision documents and National Strategies geared towards combating forest fires for sustainable forests and environmental conservation.

3.4 Research Tools and techniques applied

This study was carried out using a range of research techniques which included structured interviews, focused group discussions and review of secondary data.

(i) Structured interviews

Both open-ended and closed questions were used to probe about forest fires (Appendix II). To make the questions clearer to the interviewees and interviewers, the language used was Kiswahili and the answers were later translated to English. About 200 respondents were interviewed in 17 villages from seven districts visited during the study (Table 2).

Table 2: Districts, villages and number of respondents visited in the EAMs, Tanzania

District	Village	Number of respondents
Mwanga	Kwakoa	15
	Chanjale	25
Korogwe	Makumba	22
	Mfundia	18
Kilindi	Kwadiboma	21
	Gombelo	22
Mvomero	Vinile	19
	Difinga	17
Mufindi	Itimbo	27
	Nandala	25
	Kitasengwa	23
Kilombero	Kidatu	18
	Ihanga	22
	Sagamaganga	26
Mpwapwa	Mwanawota	16
	Mbuga	23
	Galigali	19

(ii) Focused group discussions (Un-structured interviews)

Checklists were used to guide focused discussions with key informants, normally District Leaders, Councillors and other Policy makers. Other key informants were Forestry and Beekeeping Division, National Environment Management Council (NEMC) and the Vice President's Office (Environment). Such discussions were important for cross-checking the reliability and validity of responses from structured interviews.

(iii) Secondary data

Various documents such as Dennis *et al.* (2001), FAO (2001), and Nasi *et al.* (2002) were reviewed to get information on forest fire management. Further documents reviewed included District Natural Resource Reports, management plans, different policies, Laws and other scholarly documents. Relevant information was also retrieved from internet web sites.

3.5 Data analysis

3.5.1 Primary data

Information collected from structured interviews was coded and analysed using Microsoft Excel or SPSS to get means and percentages of responses for comparison purposes across the districts. No critical statistical analyses were done as this was not the scope of this study.

3.5.2 Secondary data

Information obtained from focused discussions and literature review of documents was analysed by content analysis and information relevant to forest fire management was filtered to address different specific objectives of this study.

The information generated from this study will form the basis for fire control/prevention strategy for the EAMs. This information will be available to managers working in the EAMs and policy makers and some of the outcomes/recommendations could be tested in fire prone areas.

4.0 RESULTS AND DISCUSSION

4.1 Overview

Prior to questionnaire response analysis, it is pertinent to take note of contending factors in forest fire control in the Eastern Arc Mountains as these will most likely influence fire control strategies.

The Eastern Arc Mountains range up to 2,635 m in altitude (Kimhandu Peak in the Ulugurus). From 2,635 m to c. 2,400 m the habitats are elfin woodlands/forests, montane grasslands and bogs. Forest habitat extends downwards from c. 2,400 m (except where the lower slopes have been cleared). The forest formations have been divided into upper montane (1,800 – 2,635 m), montane (1,250 – 1,800 m) and sub-montane forest (800 – 1,250 m) (Burgess *et al.*, 1998). Those mountain blocks that face the wet ocean winds have high rainfall reaching up to 2,000 – 3,000 mm per year in the east facing slopes. The western side of the mountains is relatively drier. The western side of North Uluguru forest reserve receives 1,200 – 3,100 mm/yr while the Eastern side receives 2,900 – 4,000 mm/yr (Mialla and Mbwana, 2006). Under such high rainfall regimes relative humidity values are reasonably above susceptibility to ignition and this sets a stage for climatically induced fire exclusion.

Slopes are an integral part of the Eastern Arc Mountains and fires spread faster upslope than on level terrain (McArthur, 1967). Both wind and slope tilt the flame over unburnt fuel and bring it to ignition temperature sooner than if they were not present. This seems to explain why fires from Kilombero District quickly spread to Mufindi and Kilolo. This is likely to influence fire control strategies notably in the relatively drier western parts of the Eastern Arc Mountain forests. Slope also gives to temperature inversion and thermal belts above and below which the temperature decreases. Within the thermal belts wildfires can remain quite active during the night and may be reactivated in the following day. Also attributed to slope is the stepping up or low intensity fires when flames reach the top of ridges with little or no flying sparks and embers (Luke and MacArthur, 1978).

Furthermore, there is a somewhat intractable subject concerning the economics of forest fire control in the Eastern Arc Mountains. In Tanzania, environmental accounting is at its infancy (Ngaga pers. comm.). Equally undeveloped, is biodiversity accounting. However, it is observed that species (flora and fauna) richness and endemism ranging from lower to high life forms imply incommensurable values. A good albeit lone horticultural example is *Saintpaulia ionantha* retail trade estimated at 30 million USD a year (Lovett, 1988). There is growing interest in the domestication of *Allanblackia stuhlmanii* for the production of short chain cooking fats. This is also likely to have far reaching economic implications. There are also other economic benefits from the Eastern Arc Mountains that lack an existing cost benefit analyses.

The results from this study are presented in two sub-chapters:

- i) Responses of interviewees (DC, DAS, DNRA, DFO, VEC chairpersons and/or VEC Executive Committees, Traditional leaders, NGO representatives) and Consultants observation in the study district.
- ii) Summary of questionnaire response analysis from different stakeholders at district level. This format was adopted so that it is easy to understand the lessons learnt in each district

Different forest fires management strategies were identified for each district and are presented below:

One of the major problems noticed during this study was that most efforts on environment and forest conservation which have a bearing on forest fires management are donor supported. The Forestry and Beekeeping Division is getting very little funding from Central Government as it is not categorised as a priority sector. This is a threat to the sustainability of the programmes. Priority departments under the District Council are health, water, infrastructure, education and agriculture

4.2 Responses of the interviewees and Consultants observation at district level

4.2.1 Mufindi District

Mufindi district is located to the South West of Iringa and is among the districts in the Eastern Arc Mountains of Tanzania where forest fires are a serious problem. The district is characterized by both montane forests (mostly natural forests) and sub-montane forests (mostly conifers planted in grasslands). The main plantation species include *Pinus*, *Cypressus*, *Eucalyptus* and *Acacia*. The main sources of fire are farms: (farm preparation), honey collectors, pastoralists and pit-sawyers. Plantation forests suffer more fire incidences than natural forests. Villages bordering Morogoro are said to suffer more fire frequencies originating from the Morogoro side, especially from Kilombero through hunting and pastoralists activities. Records show that in the past five years fire has been reduced drastically in Mufindi District. The main reason for the success is claimed to be the communication and sending of the right messages to stakeholders. For example people are told that fire is good at home and in factories where it is controlled, but out of control it burns everything. They carry out campaigns for the villages surrounding Sao Hill forest plantations and natural forests during dry seasons. The campaigns are led by the District Commissioner and involve all stakeholders (including traditional leaders) in the district. The district has nick named the fire as “*moto kichaa*”, meaning “violent fire” to reflect their undesirability by all stakeholders and that it must be dealt with accordingly when it happens. Some villages refrain from using fires for different economic activities such as honey collection, farm preparations due to the fear of the fire spreading to the existing sacred forest.

Without those extra efforts the situation would have been worse. There is a need to offer education to the communities on forest fires and emphasize on the use of traditional leaders. Put forest fires as permanent agenda in all district/village meetings. The fire problem need collaborative efforts among government leaders and must be given priority. During VEC meetings a message from the DC on fire alert is read to explain procedures to be taken in case of unanticipated fire. Special forms for recording forest fires are in place at the ward and village offices (Appendix IV).

A bylaw specifically forbidding destruction of general land forests was enacted in 1996 (Appendix V). The law stipulates (sections 6-8) that it is a public responsibility (at village level) to put-off, and make arrangements to suppress fire occurrences; including reporting fire occurrence whenever sighted. There are provisions for what should be done when farms are prepared for planting including the time when this is to be done. Wildfire cases are handled by the Mufindi District court.

Forest fire fighting strategies and programmes at district level have involved the use of Forest publicity cinema shows and people were able to identify fire as an obstacle to development. They claim that fire hinders development efforts. People have developed a habit to hate forest fires as it is said to affect the working group most and affect them economically due to lost time during fire fighting. They have identified fire hazard areas and planted trees as green fire breaks. This is done whether people like it or not. Since most fires occur during dry season, farmers are advised to clean all possible fuel around their farms which are likely to catch fires. They encourage agroforestry so that there are permanent crops on farm and this may include beekeeping. The number of stakeholders who hate forest fires has increased over the years.

Fire Reduction Strategies

- Carry out campaigns during dry season to discourage the use of fires on farm preparations. The District Commissioner leads the annual campaigns in all the villages in the proximity to the plantations and natural forests.
- The district views forest fires as a very serious problem and works very hard to solve them by involving all stakeholders to prevent them from starting and or to suppress the fires that do start.
- Villages have aggressive VECs and bylaws which give the VEC biting teeth in respect to offences associated to fire. All Village Executive Officers have been ordered to send all offences related to fire to the District Court immediately they happen.
- There are effective mechanisms of involving Forest Extension Offices and NGOs such as; Green Resources Limited, TFCG and MUET in fire management i.e. for

suppression at the district level, as opposed to being Forestry and Beekeeping Division's sole concern.

- Sao Hill Forest Plantation Management have made regulations that allow mobile sawmill owners to saw logs outside the forests in specified locations, have strengthened communication between fire towers, collaborate with district and village leaders and conduct annual meetings with communities on forest fires at the beginning of each dry season.
- Every year the DC and the District management team make programs to visit all villages for campaign on forest fires, and this is handed over from one DC to another for sustainability.
- The district introduced annual competitions among villages on environmental issues and winners get different prizes as an incentive.
- Attempts are made to encourage farmers to plant trees in buffer zones to protect public forests.
- Forest fire is one of the standing agenda items during political campaigns/village meetings.
- Individuals found farming in reserved forests (public or village) are served with eviction forms, the copies of which are kept by: the farmer, village management, District Natural Resources Officer, and the District Court. This forestalls a repeat of such offences because reference to previous records of a similar offence imply stiffer penalty.

4.2.2 Kilombero District

Kilombero district is one of the EAMs districts with very high fire incidences (Arc Journal 2006). This year (2006), however, is said to have been exceptional, as there were no serious fire incidences compared to the last 10 years when during the fire season period (August and September) most forests suffer from fires. The main causes of forest fires in the natural forests are: hunting (poaching) and honey collection. There are counter-accusations that most fires in Kilombero originate from Iringa and those in Iringa claim that most forest fires originate from Kilombero. To solve this problem, the District Commissioners of Iringa, Kilosa and Kilombero convened a joint meeting to deliberate

on the same. A joint Fire brigade was proposed, however, this agreement was not implemented. In the mean time people in both districts are advised to burn their farm residues at 6 a.m. since during this time the wind is usually very mild. However, people's preference is 2 p.m. as the fire readily burns the debris. Furthermore, fire is also used as a horoscope by some people. The more extensive the burning, the longer the fire burners life will be. In Kilombero, many farms are left unweeded for the whole year and when the weeding is due it is difficult to undertake as there are many stinging weeds. The quick solution is the use of fire which sometimes gets out of control.

Fire Reduction Strategies

- The District Natural Resources Advisor is keen to hold responsible all those who cause forest fires and has made fire a permanent agenda in all district meetings. The district officials claim that there are a lot of immigrants from Njombe and these are the main sources of fire problems. At least there are a lot of accusations and counter-accusations between Kilombero and Iringa Districts. There is a need for awareness creation and exchange of information. Most people do not have enough land resources and those who stay in high mountains of Mngeta are causing fires through encroachment in the forest. Villagers are very close to Udzungwa National Park because further down-slope are wetlands, forest reserves and KVTC lands - which are expanding. The net-effect is that many people are landless. The introduction of Participatory Forest Management (PFM) in the forests may help to reduce forest fires as this will help to create buffer zones. Negotiations with neighbouring villages to join PFM are going on. There is a need to organise honey hunters into groups so that they can fight fire incidences easily. Poachers are very problematic and have been setting fires to drive animals to their targets. The district is insisting on having clear forest boundaries. It is said that 2-3 years ago the district had fire brigades at village level and these reduced fire incidences but currently the practice is abeyance. The existing collaboration with TANAPA after declaring the Kilombero Scarp Escarpment area a National Park (Udzungwa Mountains National Park) and with Wildlife Department over the Kilombero Valley Ramsar Site has helped to control forest fires.

- The Kilombero Valley Teak Company has planted about 6,500 ha with teak and has contracts with villages on fire protection, which are reviewed annually. The project has patrol teams and they get incentives for their performance. The project has fire towers and fire stations which communicate with the project head quarters. They clear fire lines twice per year and have specific sites for beekeeping. They have also distributed fire recording and monitoring forms which are filled by the Village Executive Officers monthly showing the source of the fire. The Forest Managers in KVTC believe that standing alone in the process of fire control and achieving success is a pipe dream and therefore collaborative efforts with other stakeholders are inevitable.
- Fire however, is useful tool to control vegetation if done at the right time. A good example of fire management is Mikumi National Park where they practise rotational burning and this makes it possible to avoid inducing grassland growth instead of tree growth. Continuous fire protection is dangerous as lots of burning material accumulates and when there is a fire it can be catastrophic. Kilombero Valley Teak Company has a 3-4 years burning rotation and this has promoted regeneration from saplings and seems to improve water quality as well. They are doing fire control studies and monitor vegetation changes using satellite images and use GPS for ground verification.

4.2.3 Mpwapwa District

The district has NGOs such as Church organisations including JITUME which work on environmental conservation by introducing different technologies that reduce pressure on natural forests. The causes of wildfires in Mpwapwa are not different from the causes mentioned in other districts i.e. farm preparation, honey collection, small game hunting, horoscope inclinations, arson etc. A number of notable wildfire losses mentioned include loss of sandalwood which was extensively used for curing eye ailments. Also mentioned was the Kiboriani (2004) fire which entrapped and killed 24 baboons. Loose tenure rights and lack of permanent crops were observed as one of the contributory factors to frequent wild fires. Fires also tend to be widespread when communities are facing food shortages- charcoal production increases as means for getting money for buying food.

Fire Reduction Strategies

- Traditional forests like the “*Nyumbanitu*” (thick dark forest) helps in awareness creation on fire prevention. Land ownership activities have been initiated by JITUME and have subsequently been endorsed by the Local Government Administration. Village Executive Officers have been instructed by District Executive Directors to make close follow-ups and make sure that Land Ownership Certificates are made available for the applicants. This is expected to reduce land conflicts in the area which have been implicated as one of the main source of fire (arsonists). Furthermore, it has been possible for women to own land and some have planted permanent tree crops. It has also been possible for villages to own forests, and subsequently fight fires in an effort to protect trees.
- The Local Government Administration many also hold Village Administration accountable whenever fire occurs in their vicinity. This has reduced fire occurrences including containment of accidental ones.
- Religious leaders have also been instrumental in telling the faithful about the destructive consequences of wildfires, and urging the fighting of such fires.
- Use of wood energy saving stoves is strongly advocated and house to house verification of such use is regularly undertaken. Furthermore, people are encouraged to plant alternative tree crops such as *Jatropha curcas* and *Moringa oleifera* for the supply of bio-energy, food and environmental conservation and improvement of household income consequently reducing dependence to the forest.
- Some efforts to improve the economy of the people in a bid to reduce their dependence to the forest (for example charcoal burning which has a propensity of causing forest fires) as a sole source of income particularly when food is in short supply are in place for example, seed multiplication of short variety Sorghum – *Okoa*, and *Tegemea* is undertaken. Seed is to be distributed to farmer groups (currently 587) to enhance food security. *Vihingo* a cassava variety has also been introduced for the same purpose. Palatability is increased by use of chipping machines followed by solar drying; and flour mixing – cassava and sorghum. Furthermore, beekeeping has been introduced as an income generation activity. In cooperation with Friends of Tanzania, an arrangement similar to Heifer International has been introduced. Milk cows and goats have been

distributed to groups for distribution among group members as required by the agreements.

4.2.4 Mvomero District

Mvomero district is covered by a large part of semi-arid lowland and is seriously affected by fire due to large areas of general lands being under intensive charcoal production and grazing activities. Most of the fires in the mountain areas comprising mainly of Uluguru South, and Nguru Mountains are set during dry season mostly during farm preparations and by pastoralists. A large part of Mvomero District is occupied by pastoralists and peasant farmers. In the highlands, people use fire to reduce plant residues. It was noted that fires are frequent in general land inhabited by people and occasionally get out of control and spread to the forest reserves. The local people on the mountains believe on using fire for land preparation, and this has caused fires to escape into the forests nearby. It was revealed that most people in the highlands of Mvomero District do not own land, they hire land from Land lords and they are not allowed to plant any permanent crops, thus they do not care about using fires during land preparation as it will not have any impact on their crops.

In the past the *Wandewa* (Traditional Leaders) used to supervise the use of fires in the farms, however, of late these systems have collapsed. In the lowlands most fires are caused by charcoal making, hunting and burning of grass to activate growth of new shoots and eradicating insect pests including tsetse flies. Despite high numbers of fire incidences during the past two decades, this year (2006) has generally had far fewer fire incidences due to the wet weather and short dry season.

Local Institutions responsible for fire problems

In addition to government efforts in environmental conservation in Mvomero district, other key players who play a vital role in forest fire reduction include various NGOs, such as Wildlife Conservation Society of Tanzania (WCST) working mainly in Uluguru North, Participatory Environment Management (PEMA) working in Turiani in the Nguru Mountains and various religious institutions including the Tanzania Assemblies of God Church in Wami Sokoine.

According to the District Forest Officer most villages (about 13 villages in the Uluguru Mountains) have bylaws which are at different stages of getting approval by the District Council and others have already been approved. With the help of WCST and other NGOs villages have formed Village Environmental Committees (VECs). The district has a Fire Protection Team composed of the technical staff from the District Council, WCST and the Catchment Forest Project (CFP). Wildlife Conservation Society of Tanzania, on the other hand, does not have a budget line for fire management component in their work plans. They, however, carry out sensitisation, awareness creation and education on environmental conservation and education, with emphasis on fire problems. Already incendiary fines are instituted on offenders at the tune of TAS 50,000 per act.

Problems hindering fire management

- Inadequate funding to the Forestry and Beekeeping Division from Central Government for activities at District level.
- Inadequate allocation of resources by the district councils for forest fire fighting. Slowly however, through the NGOs, the communities are being sensitised on forest fires and their impact on the environment.
- Lack of staff and capacity in VECs at the district level.
- Land use conflicts between pastoralists, hunters and farmers which has been a source of some forest fires.
- Conflicts of interest between the VECs and Village Governments, as Village Governments find VECs threats to their positions, so they do not support environmental activities. They regard them as coming from outside and that the VECs belong to certain donor projects.

Fire Reduction Strategies

- The Morogoro Catchment Forest Project has formulated a fire reporting form whereby the VECs are given to record fires and report them.

- To combat fire, the District team and Forest Catchment Office collaborate with NGOs to educate and carry out awareness campaigns to communities just before and during the dry season.
- Foresters in visited areas think that to fight the forest fires Forestry and Beekeeping Division must:
 - Ensure forest boundaries are cleared every year around natural forests and introduce green fire breaks.
 - Introduce fire towers in strategic points along the Eastern Arc to signal fire hazards, with radio communications between towers and the central office.
 - Allocate enough resources and mobilize fire crews for fire fighting.
 - Develop management plans for each forest in the Eastern Arc where fire management should come out clearly.

4.2.5 Kilindi District

Fire and illegal harvesting are the major forest threats in Kilindi District. There are two fire seasons, between September and December (main fire season) and January to February (minor fire season). Farmers, pastoralists and hunters cause most fires and the former burn vegetation during field preparations (Plate 1), hunters set fire to entrap animals, while pastoralists burn to activate grass growth. The Sukuma and the Barbaig pastoralists set most of the fires. Other causes of fire include: control of tsetse flies, honey collectors and illegal logging activities. Some immigrants from Kilimanjaro, Arusha and other districts of Tanga Region were allocated large pieces of land for agricultural development. Most of these people exploited the merchantable trees and abandoned the land, a situation that opened up these areas to wildfire during logging and charcoal making activities. Large land allocation to immigrants by the Government has been stopped and currently the District Government is working for better land allocation arrangements.



Plate 1. Preparation of Agricultural fields with fire in Kilindi district

The high number of fire incidences in year 2003 were due to very dry conditions, in comparison with year 2006, which had fairly good rains (Table 3). Furthermore, the Government ban of all logging activities in the natural forest during 2005/06 could also have contributed to the reduction of fire incidences. Records also show that there are more fire incidences in the Village and Local Government Forest Reserves compared to the Central Government Forest Reserves. Most of the former group of forests are at high altitude far from community farms and are much less accessible.

Table 3. Number of fire incidences (2002-2006) recorded in Kilindi District

Year	Number of fires
2002	18
2003	30
2004	25
2005	16
2006	5

Local Institutions responsible for addressing fire problems

i) Village Environmental Committees

Kilindi District has 64 registered villages and each village has a Village Environmental Committee (VEC), which is responsible with all environmental issues. Each VEC is supposed to submit a monthly report to the District Council for the latter to make a follow-up of important issues. Unfortunately some villages do not send their reports in time and in such cases the district has no resources to make a follow-up.

ii) Bylaws

The Handeni Integrated Agroforestry Programs (HIAP) facilitated the formation of by-laws for 54 villages. These bylaws were active during the active phases (1998-2001) of the project. However, after project termination most of these bylaws went into abeyance and they need to be activated and to accommodate new thoughts. The dormancy of these bylaws has given some people an excuse for various environmental offences, especially fire. Arsonists are supposed to be reported either to the VEC or to the district, however due to lack of resources and non-functional bylaws most of them are acquitted. These shortcomings have increased fire incidences after 2001

iii) Participatory Forest Management and Joint Forest Management

Participatory Forest Management was introduced in three villages: Kwamelingwa, Kwamwande and Gombero in year 2006. The programme has just started and it may be too early to talk about its success or failure. On the other hand, Joint Forest Management (JFM) was introduced in four villages in 2002: Kilindi, Tamota, Misufini and Kimembe. The former has finalized its by-laws and it is being practiced while the other three villages are at various stages of by-laws completion. In Kimembe village, illegal logging, mining and fire problems have been reduced significantly while these problems still persist in the other three villages.

iv) Traditional forests

Kilindi has several traditional/sacred forests, which are protected by local cultures and taboos. Most of these forests are free from fire due to cultural attachment of the local communities to these forests. Many people fear and respect these forests and tampering with them is associated with bad omen.

Site visits

Two villages were visited, namely Kwediboma and Gombelo. Kwediboma village is surrounded by four Central Government Forest Reserve (Kwediboma, North Nguu, Kileguru and Mkongo). All these forests suffer from annual fires at varying frequency and intensity. The main causes of fire include: farm preparation, hunting, livestock keeping and honey collection. Table 4 shows fire incidences and the area burnt in Kwediboma and Gombelo Villages.

Table 4: Number of fire incidences and area burnt (ha) between 2002 and 2006 in Kwediboma and Gombelo Villages, Kilindi District

Year	Kwediboma		Gombelo	
	No of fire incidences	Area (ha)	No of fire incidences	Area (ha)
2002	5	5	4	2
2003	6	10	3	15
2004	5	6	2	4
2005	2	4	1	6
2006	Nil	-	Nil	-

Consistent high fire incidences in Kwediboma are perhaps due to lack of functioning by-laws and VEC and therefore all the forest issues are handled by the Ward/Village Forester who is usually overloaded with duties. Furthermore, people who don't participate in fire fighting are not punished and most of the people who set fire are not caught due to lack of will amongst the local people, lack of enough human and capital resources and the technique of some who use long "wicks" to allow gradual movement of

fire towards dry target vegetation and therefore facilitate their disappearance from the scene before the fire starts.

In Gombero Village fire incidences are few and rare perhaps due to the following: Existence of by-laws since 1997 and a functioning PFM since 1997, forest patrol by at least one person per hamlet, availability of Natural Resources Committees which monitor all environmental issues where all hamlets have a representative in this committee. Other factors include a TAS 500 motivation (if funds are available) to individuals participating in the patrol and whenever there is fire a siren (“*Mbiu*”) is rung to alert the people. Gombero Village is surrounded by three sacred forests (Gombera, Changalikwe and Malajala), which have remained free of fire for many years. Handeni Integrated Agroforestry Programme and PFM have used these forests as a successful conservation study sites for the local communities.

Problems hindering fire management

- Lack of funds, equipment and human resources have denied forest workers access to most of the areas.
- Division of responsibilities between employees of Local Government and Central Government is not very clear and sometimes brings misunderstandings amongst workers.
- Lack of the Local Government’s priority to forests as one of the strategically important departments. The Local Government therefore gives forests and natural resources at large small allocations.

Strategies for fire reduction

- Education – Intensify community education and responsible officers with emphasis on the importance of forests and the impact of fires to these forests. The District Government should allocate some funds to initiate such programmes or create a good environment to attract conservation NGOs.

- Encourage study tours for the VEC to learn successful examples in other districts/locations. Funds could be sought through fund raising activities or use part of the income from village activities to facilitate such trips.
- Enact bylaws to all villages and facilitate the VEC to implement the laws and regulations. The District Government should allocate some funds or request some donors to facilitate this activity.
- Funds – give enough funding to the forest sector to buy patrol implement, train workers and facilitate patrol.
- Have an efficient and effective reporting and a follow-up system from the grass-root to the District level. Special accounting and reporting forms should be designed to cater for this activity.

4.2.6 Korogwe District

Wildfires were singled out as the major forest threat in Korogwe district. Most fires are caused by farmers during farm preparations, hunters, charcoal burners and illegal loggers (specifically in Mashewa Ward by illegal loggers from Kenya). It was reported by the DNRA and DFO that for the last two decades fire problems have been on the decrease, although there is a general lack of evidence especially in the last five years (Table 5). Public education by Government officers and people's perception on the dangers of fire is stated to have helped to reduce fire incidences. For example in 2004 all Natural Resources Officers were denied their annual leave and mobilized to anti-fire campaign. This campaign was very successful as evidenced by only one fire incidence for the whole year and the following year. In 2006 there was no fire incidences reported to the DFO probably due to rain falling for most of the year. Fire campaigns have been intensified for the last four years and the fire problem is accorded special attention during International Environmental Day and National Tree Planting Day. These events are presided over by the District Commissioner and rotate across all the Wards of Korogwe in order to drive the message to the greater part of the inhabitants. All Ward Development Committees also give particular attention to environmental issues.

Table 5: Number of fire incidences (2002 and 2006) in Makumba, and Kijango Villages, Korogwe District

Year	Makumba	Kijango
2003	5	3
2004	2	2
2005	2	1
2006	1	0

Local Institutions responsible for fire problems

i) Village Environmental Committees

All villages in Korogwe District have a VEC which are responsible for all environmental issues. In spite of this, most VECs lack human and physical resources. These committees collaborate with the catchments officers on patrols and some of them have their local informers who facilitate in identifying community members who are carrying out illegal activities.

ii) Bylaws

Korogwe District has a total of 135 villages but only 11 villages have operational by-laws. In these villages there are very few or no fire incidences in the surrounding forests. Most of the remaining villages are working on their by-laws; however the speed is low due to lack of funds. The Districts Commissioner's lawful ("*Amri halali*") orders/directs the people to acquire permits from their Village Chairpersons before burning agricultural trash. Similarly the DC has posted several fire posters to all village and ward offices as part of awareness creation.

iii) Participatory Forest Management and Tanzania Forest Conservation Group

Participatory Forest Management was introduced in 13 pilot villages in 2004 and records show that the program is working very well in 11 of the villages. In these villages most people are aware of the dangers of fire to the environment and other related

environmental problems. For example, forest patrol is very intensive in sensitive areas such as Chanyanda, Mafi, Mashewa and Mswaa. These patrols have significantly reduced fire incidences, illegal timber harvesting and encroachment. The Tanzania Forest Conservation Group (NGO) has a good network in Korogwe covering 36 villages. Through seminars and different forest activities such as tree planting, people in these villages are more aware on fire problems and the importance of conserving their natural resources at large.

Site visits

Makumba and Kijango Villages are surrounded by two forest reserves: Nilo (CGFR) and Mfundia (VF). Both forests suffer from annual fires although the later has more incidences. Most of the fires here are caused by hunting and farm preparations. Animals such as colobus monkeys and “pimbi”, which had disappeared from the frequent forest fire sites, have come back perhaps due to the reduced fire incidences. The reduced fire cases in Kijango village could be due to public education initiated by the project EUCAMP in year 2002 while in Makumba it could be due to availability of functioning by-laws. In Makumba Village burning of trash during farm preparation was strictly prohibited and members who wanted to burn have to get a written permit from either Village Executive Secretary or the Chairperson of the VEC. Hamlet Chairpersons were accountable for all fire incidences and this regulation made them very tough on fire issues. In both sites there are regular forest patrols to contain illegal timber harvesting and livestock keepers, who also look into fire cases. Around the Nilo Forest Reserve (Plate 2) neighbouring Makumba Village has experienced very few fire incidences partly due to its inaccessibility and the evergreen or semi-green vegetation cover. Before year 2002 most people were relaxed on fire issues and did not participate much in fire fighting activities. However, after 2002 it became apparent that whoever causes fire in a Village or Government Forest Reserve is liable to a fine of not less than TAS 10,000.



Plate 2 Nilo Forest Reserve as seen from Makumba Village, Korogwe District

Although it has been somewhat difficult to apprehend arsonists the general attitude of the people is very positive in dealing with fire problems as expressed by VEC of Kijango villagers who decided to intensify forest patrols during fire seasons. Getting a token sum of money from fines or exemption from other village development activities motivated patrol crew members. Similarly, the VEC took census of all dog keepers, who were mostly hunters, educated them on the impacts of forest fires and alerted them that they would be accountable for any fire incidence. The hunters abandoned dog hunting, a situation which reduced fire incidences. However, later, the hunters resumed hunting without dogs and fire incidences have recurred. Suspected hunters from neighbouring villages of Muheza District were reported back to their respective village governments for necessary measures. Furthermore, most of the farmers bordering forest reserves were advised not to use fire during farm preparation or else take maximum precaution during burning. The use of screams (“*Yowe*”) as a tool to alert people during fire incidences has yielded positive results in Kijango Village. Many people respond positively to the call, and those who don’t respond are usually punished under customary regulations, for example they have to part with a cock, or a goat as a fine.

Problems hindering fire management

- Lack of funds, equipment and manpower has denied most forest workers and politicians access to most of the areas.

- Lack of strong traditional institutions and NGOs which advocate forest conservation from the grassroots.
- Lack of education amongst the local population to understand and appreciate the importance of forest conservation.
- Lack of the Government's recognition of Forestry as one of the strategically important department. The Government therefore gives forests and natural resources at large low priority and very little money.

Strategies for fire reduction

- Education – Intensify community education and that for responsible district officers – The district should allocate some funds for the activity or pledge for help from donors or the Central Government.
- Proper boundary demarcation of reserves to reduce chances of people giving unnecessary excuses whenever they enter the reserves. Similarly, intensify gap planting in all forest reserves to inculcate care and concern to the communities on forest matters. This should be undertaken urgently through self help programmes with a back-stopping from the District Government.
- Law enforcement and enactment of bylaws in all villages in order to facilitate the VEC to implement the laws and regulations. This activity can be taken piece-meal using funds from village incomes or allocation from the District basket.
- Intensify patrol and involve as many people as possible especially during fire seasons. Funds from the village/ward income could be used to facilitate this activity.

4.2.7 Mwanga district

Mwanga district is geographically divided into low and highland areas and these have different land husbandry models. In the highlands, people are settled and have proper land management plans. Each piece of land outside forest reserves belongs to a family, clan or individual, public and religious institutions. These areas are normally wet and receive higher rainfall than lowlands. Several soil conservation measures have been introduced and are being practiced by farmers and they include agroforestry, soil and water conservation (*Makinga maji*) and traditional irrigation schemes. The farmers in the

highland areas do not use fire for land preparation and records show that forest fires are very rare and most of the recorded fires spread from the lowland. For example in 1997 Kindoroko, and Minja Forest Reserves were burnt as a result of fire spread from the lowland. Conversely, the lowlands are either arid or semi arid with rainfall in some places reaching far below 300 mm per year. The main occupation of the local communities is farming and livestock keeping. People use fire during farm preparations (Plate 3), hunting and some livestock keeper set fire intentionally to activate grass growth. Some of these fires stray to the forests.

In the highland areas of the North Pare Mountains large areas of forest land were burnt in 1997 (Table 6). Severe drought which occurred during that year facilitated the spread of fire from the lowland. From year 2000 – 2006, no fire incidence has been recorded. This could be due to awareness creation to the communities done jointly by some environmental NGOs and the District Council, implementation of bylaws and management plans in different parts of the district. Furthermore the district has Bushfire Task Forces up to village levels managed by the Village Environmental Committees.



Plate 3. Crop residues being burnt during farm preparation in Mwanga District

Table 6. Fire incidences (1993-2006) in Mwanga District (high elevation North Pare portion)

Year	Forest reserve	Area burnt (ha)	Total area (ha)
1993	Kindoroko	10.5	12
	Kiverenge	1.5	
1994	Kindoroko	4.0	4.0
1995	Kindoroko	1.0	35
	Mramba	34	
1997	Kindoroko	260	486
	Minja	200	
	Kamwala I	17	
	Kamwala II	9	
2000	Kamwala I	8	20
	Minja	12	
2001- 2006	NO FIRE INCIDENCE		

Local Institutions responsible with fire problems

Mwanga district has a number of Non-Governmental Organisations working in areas of agriculture, livestock and forestry, vital in environmental conservation and fire management - these are presented below.

i) MIFIPRO – TRUST FUND – Mixed Farming Improvement and Irrigation Project

MIFIPRO TRUST FUND is located at Kigonigoni Village in the lowland savannah area, around Lake Jipe. The main activities of the project include soil and water conservation. Areas around and within Kigonogoni have very high forest fire incidences, most of them originating from farm preparation or livestock keepers when they burn to eradicate tsetse flies, hunters and fish smokers. Cattle keepers also look at fire as beneficial in stimulating new grass for their livestock, and this brings conflicts of interests among land users. There are claims that hunters who set fires come from the highlands. People from the

mountains usually cultivate in the lowlands and perhaps they conduct some hunting as a side event consequently causing forest fires. On the other hand, lowland fire is said to stray into forests in highlands. This was one of the sources of conflicts in land use. To solve such problems village governments for the lowland and highland villages formed task forces to fight fires and other environmental problems. These communities jointly demarcated areas for various uses, and this measure has reduced fire incidences drastically. Before MIFIPRO there was poor implementation of bylaws due to the fact that Village Leaders could hardly act upon the people who voted them into offices. MIFIPRO therefore started forming committees to look on environmental issues including reactivating the bylaws. The project has also seconded a forester who helps in offering training on forest and environment issues. There are warnings scribbled along the forest boundaries on boards, rocks and big Baobab trees warnings “*Usichome moto*” (Do not set fire) and painted in white so that they are easily visible from a distance (Plate 4a&b).



Plate 4a. Anti-fire posters (“*Usichome moto*”) in different location in Mwangi District



Plate 4b. Anti-fire posters (“*Usichome moto*”) in different location in Mwanga District

ii) Hifadhi Ardhi Ngujini (HANGU)

This NGO organises fire and illegal felling patrols and tree planting activities. It is a very important institution and in 2003 it worked with the office of DNRA to extinguish fire which occurred in Kindoroko area. They rehabilitate degraded forest by gap filling using *Grevillea robusta* tree species.

iv) Mwanga Organic Beekeeping Association (MOBA)

Mwanga Organic Beekeeping Association deals mainly with improved beekeeping by introducing modern hives and harvesting techniques. This association discourages use of fire in beekeeping, an initiative which has significantly reduced fire incidences in the lowland.

v) “*Mbughi*” (Traditional forests)

“*Mbughi*” are sacred forests used for traditional purposes such as prayers and taboos. This is one of the strongest traditional institutions in the Pare Mountains, but due to the introduction of religions and modernization it is no-longer as strong in some areas. Several clans can form one *Mbughi* and they have one spokesman. These forests are respected i.e. conserved by the owners and other members of the community. These

forests are used as models for conservation by the communities and this has positive impact on fire reduction.

Fire Reduction Strategies

- The District Government ordered Ward Development Committee to have fire warning system as permanent agenda in their meetings.
- The Village Environmental Committees were strengthened with the help of GTZ which worked to implement the TFAP in North Pare. In the event of any forest fire, the Village Governments use VECs to institute provisions in village bylaws to catch suspects. The villages have bylaws for conservation and management of forest reserves and environment approved by the district authorities. The villages also have management plans for their village forests, within which they have bylaws.
- Formulation of the District Environmental Committee, chaired by Councillors and the Secretary is a technical staff from lands, water or forestry.
- There are voluntary groups working on water sources (“*Ndiva*”) like SUNGO who apprehend and take arsonists to the court.
- When people spot fire they make a call known as “*Lukunga*”, signalling that there is a problem and all capable and healthy people would assemble in that area to fight the fire. Those who fail to attend to the *Lukunga* are normally fined (cow, goat, sheep, or money equivalent) for negligence.
- There have been a lot of awareness campaigns on environmental conservation since the inception of the TFAP-GTZ Project and other NGOs, thus, making people understand for instance the reasons for the disappearance of Lake Jipe. Most of the people in these areas claim that human activities are the most impacting factors on environmental changes so people now understand activities that affect environment; they understand that soil erosion is the cause of disappearance of Lake Jipe.
- The districts have put in place combined efforts between government and private sector, NGOs and CBOs in fighting environmental degradation. This is evident from the claim that most forest fires were witnessed before the formation of MIFIPRO (i.e. early 1990s) as it was difficult for the government alone to reach people and educate them. After MIFIPRO started activities in these areas, there was transport to reach and

sensitise people on environmental issues, and this had positive impact on reducing fire incidences. It is also necessary to work closely with the private sector and NGOs to complement the government efforts in fire management and environmental conservation at large.

- Training, field visits and study visits (excursions) are important tools for awareness creation and are an incentive for community participation in forest fire and other management activities. This in turn makes it easier to enforce bylaws. These activities are facilitated by the District Government.
- In Ngujini Ward, Chanjale village that borders Kindoroko Forest Reserve has a Village Environmental Committee, and according to their report the last forest fire was witnessed in 1997, and from there fires were contained through formulation of forest patrol teams and enforcement of village bylaws. They have special days for firewood and fodder collection. Grazing and cigarette smoking are prohibited in the forest reserve and use of fire on land preparation is not allowed. If one must set a fire on farm, he/she must alert other people so that they assist in extinguishing it in case if it escapes from the farm. The VEC collects fees from visitors at TAS 10,000/= and also institutes fines on the people who break the laws by setting fires illegally. Fire fines are TAS 5,000/= and other offences are charged up to TAS 10,000/=. These funds help the VEC to execute activities and pay the patrol team allowances and other administration costs.
- Introduction of Participatory Forest Management (PFM) strategies such as Community Based Forest Management (CBFM) and Joint Forest management (JFM) have had positive impact on reducing forest fire incidences. In these programmes environmental education is usually emphasized.

4.3 Summary of questionnaire response analysis from different stakeholders at district level

4.3.1 Commonest environmental problems

Wildfire, grazing and charcoal burning were singled out as the commonest environmental problems in the study districts (Table 7). Wildfire seems to be the most serious problem followed by overgrazing and charcoal burning. Wildfires emerged to be more serious in Kilombero, Mpwapwa, Kilindi, followed by Mvomero and Korogwe and the last two were

Mufindi and Mwanga Districts. Charcoal burning could have direct relationship with wildfire but not overgrazing because the latter removes most of the combustible biomass consequently reducing the chance of fire occurrences. However, grass burning to induce regrowth for next season also causes wildfire. This could have been overlooked by respondents.

Table 7. Common environmental problems recorded in the Eastern Arc Mountain Districts

Problems	Percent of response by districts							Total
	Mufindi	Kilombero	Mpwapwa	Mvomero	Kilindi	Korogwe	Mwanga	
Wild fire	4.0	33.8	17.8	13.5	15.9	12.8	3.2	100
Charcoal burning	2.2	31.6	9.5	12.5	5.4	25.7	12.2	100
Overgrazing	8.7	39.1	8.7	7.2	1.4	14.3	17.2	100

4.3.2 Cropping systems and crop types

Two main cropping systems were identified namely; continuous cropping and shifting cultivation (Fig 2). Some peasants however practice either a combination of the two, or other methods. Shifting cultivation is widely practiced in Mpwapwa and Kilindi, Kilombero, Mvomero and Korogwe Districts - which perhaps contribute to high fire incidences in these districts. This practice does not feature in Mufindi and highland areas of Mwanga, where fire incidences are low. Shifting cultivation is strongly linked with slash and burn during farm preparations a practice which causes most fires in the EAMs (Fig 3).

Shifting cultivation is either not practised or is least practiced in Mufindi, and Mwanga Districts probably due to local people's traditions and land scarcity.

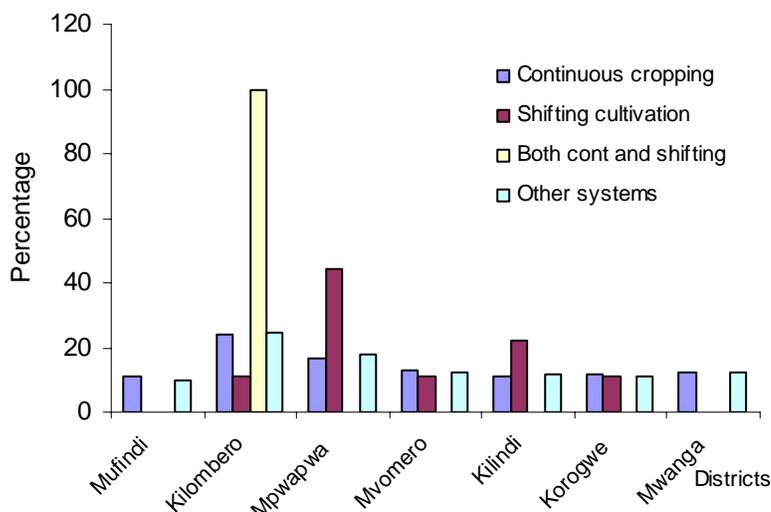


Fig 2. Cropping systems practiced in different districts

The types of crops cultivated could also influence fire incidences (Table 8). Perennial crops such as mangoes, oranges, coconuts and bananas are widely planted in the lowlands of Korogwe and Mwanga Districts and these could contribute to fire reduction. Farmers usually do not burn agricultural fields with perennial crops. On the other hand, fire is a common phenomenon in areas adjacent to agricultural fields with annual crops such as Mpwapwa and Kilombero due to ramped use of fire for clearing the fields.

Table 8: Broad categories of crops in the study districts of the Eastern Arc Mountains

Types	Mufindi	Kilombero	Mvomero	Mpwapwa	Korogwe	Mwanga	Kilindi	Total
Annual crops	10.2%	25.3%	12.7%	17.5%	11.4%	10.8%	12.0%	100.0%
Perennial crops	.0%	17.1%	2.4%	.0%	46.3%	19.5%	14.6%	100.0%

4.3.3 Different causes of forest fires

Use of fire in farm clearing and honey collection appears to be the major causes of most fires in the EAMs (Fig. 3). In Kilombero, Kilindi and Mwanga Districts, pastoralists in the lowlands set fire to stimulate growth of new pasture and control of tsetse flies and some of these fires escape and destroy adjacent forests. These districts have very high number of

Sukuma, Maasai and Barbaig pastoralists. This problem is non-existent in Mufindi District, perhaps due to land scarcity and because most of the land is under cultivation. On the other hand, in Mpwapwa, Mvomero and Korogwe, most of the forests are located far away from the pasture land and therefore fire from this source could not be captured as an important source. Beekeeping is not well developed in Mvomero and Mufindi districts and therefore use of fire in honey collection is not a serious threat. Most charcoal burning in Mwanga, Mpwapwa, and Mvomero is not a serious source of fire because it is done in the woodland/savannah which is distant from the forests. In Kilindi charcoal burning is poorly developed due to lack of markets as a result of accessibility and distance from the markets while in Mufindi charcoal burning is strictly supervised by the district or ward foresters to ensure forest safety. Finally, the use of fire as hunting tool and by drunkards also causes some fire in most districts except Mufindi, perhaps due to low level of hunting as a result of low number of wild animals for the former cause or cultural issues for the later.

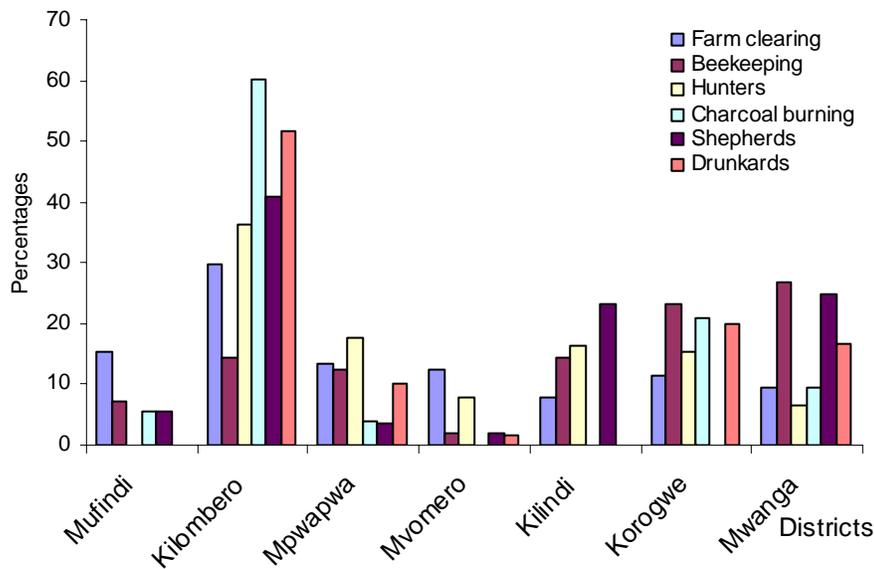


Fig. 3 Different sources of fire in the EAMS

4.3.4 Factors contributing to forest fires in the EAMs

In order to reduce fire incidences, concerted efforts are needed at the individual, local, district and national levels. Table 9 shows contribution of different factors contributing to forest fires in the EAMs. All the factors mentioned are important, but policies, environmental education and district support are given detailed discussion. The low number of fires recorded in Mufindi and Mwanga could be due to proper implementation of policies, environmental education to the communities and support from the district authorities as opposed to Kilombero, Mpwapwa, and Korogwe Districts which have high number of fire incidences. Although difficult to capture due to unequal representation of different ethnic groups amongst the interviewees, peoples culture could also contribute to fire problems.

Table 9: Factors contributing to forest fires in the EAMs as reflected from questionnaire responses

Factors	Percentage of Response by Districts							Total
	Mufindi	Kilombero	Mpwapwa	Mvomero	Kilindi	Korogwe	Mwanga	
• Prevailing unhelpful traditions	7.7	7.7	11.5	19.2	3.8	38.5	11.5	100
• Poor implementation of policies	3.8	11.5	20.1	7.7	11.5	42.3	3.0	100
• Lack of environmental education	3.4	17.2	19.0	8.6	20.7	24.1	6.9	100
• Weak support from district authorities	5.4	29.7	5.4	8.1	13.5	29.7	8.1	100
• Poorly equipped environmental officers	7.1	21.4	7.1	10.0	32.9	21.4	.0	100

4.3.5 Methods of land preparation

Land preparation was either done by slash and burn or just slashing before tilling the land. Slash and burn was practiced in all districts except Korogwe (Table 10). The practice was common in Kilombero, Mpwapwa, and Kilindi Districts while it was not so much used in Mufindi, Mvomero and Mwanga Districts. Slash and burn can only cause forest fires if burning of the agricultural residues is not properly controlled. Farmers should observe the time of burning (when there is mild wind and high humidity in the air), heap and construct fire lines around the trash and extinguish the fire before leaving the sites. In Mwanga most lowland villages have bylaws and regulations which prohibit land preparation with the use of fire, while this practice is strictly prohibited in Mufindi by the District Commissioner’s decree. In spite of these regulations in the said districts, a few people still practice this method as substantiated in Mwanga during the survey (Plate 1).

Table 10: Mode of land preparation in the sampled Eastern Arc Mountain districts

Mode of clearing	Percent of response by districts							Total
	Mufindi	Kilombero	Mpwapwa	Mvomero	Kilindi	Korogwe	Mwanga	
Clear the land by burning	5.5	23.3	21.9	18.1	20.5	0	8.8	100.
Do not clear the land by burning	14.7	14.0	21.7	10.1	11.6	14.7	15.2	100.

4.3.6 Fire control in the EAMs

Fire problems are appreciated by Forestry and Beekeeping Division and fire issues are well stipulated in the Forest Policy (URT, 1998), Forest Act (Act No. 14, 2002, Section 70) and Beekeeping Act (Act No. 15, 2002, Section 43), however there is only limited follow up due to financial and human resource constraints. The same problem is prevailing at the district level. There are no proper and updated fire records due to lack of funds and personnel. Similarly there is a lack of fire monitoring, documentation and evaluation programs.

Nine methods with varied levels of emphasis were proposed as mitigation measures against rampant fires in the EAMs (Table 11). Incidentally, most of these methods have been proposed in other research work (Madoffe *et al.*, 1998) and possibly what is missing is how, who and when to implement some of these proposals in addition to setting priorities for each district or the entire Arc. For example public education, law enforcement, and responsibilities of leaders have been practiced with success in some districts of the EAMs (Vincent pers. comm). Although traditional practices such as sacred forests and conserved trees have been used successfully in fire management and forest conservation in Mwanga and Mufindi Districts (Mramboah pers. comm) the practices have not been executed in other Districts. They are not known or they are not in existence in Mpwapwa and Korogwe while very few people know about these practices in Kilombero and Mvomero.

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Table 11: Known methods of fire control in the sample districts of the Eastern Arc Mountain Forests

Methods of fire control	Percent of response by districts							Total
	Mufindi	Kilombero	Mpwapwa	Mvomero	Kilindi	Korogwe	Mwanga	
• Public education	14.9	33.3	11.5	5.7	11.5	13.8	9.2	100.
• Education of leaders	.0	.0	50.0	.0	.0	0	50.0	100.
• Use of fines in kind	5.7	44.3	4.3	7.1	15.7	15.7	7.1	100.
• Traditional alarm	.0	.0	66.7	.0	33.3	0	.0	100.
• Security	.0	.0	25.0	.0	62.5	0	12.5	100.
• Responsibility of leaders	.0	59.0	1.6	14.8	3.3	18	3.3	100.
• Stronger new laws with fines	13.2	34.1	13.2	6.6	6.6	14.3	12.1	100.
• Strengthening old laws	3.4	48.3	3.4	5.2	13.8	20.7	5.2	100.
• Traditional practices	36.9	7.5	0	2.8	9.8	0	40.3	100.

5.0 FIRE REDUCTION STRATEGIES FOR THE EAMs

5.1 Overview

The districts of EAMs have varied culture and traditions and economic activities which directly or indirectly influence wildfires. Also noted are the varied paths to fire control, some which are district specific. Collective responsibility seems to be a keystone for fire control programmes in Mufindi District. Kilombero seems to rely on the same approach however; fire protection contracts forged between KVTC and Village Governments provide additional impetus. Accountability on fire issues by the Village leaders is key to fire reduction in Mpwapa. Legislation and existence of sacred forests scales down fire incidences in parts of Kilindi, Mwanga and Mufindi Districts. Functioning by-laws seem to reduce fire incidences in Korogwe, and Mvomero; while Bushfire Task Forces (down to Village level), strong co-operation between Local Government, NGOs, and CBOs; and the work of the completed TFAP North Pare Project (funded by GTZ); underline the successes recorded in Mwanga District. These district specific approaches provide fertile ground for the exchange of information between districts, building on what they already have.

5.2 Fire reduction strategies

Findings from this study give empirical evidence showing that fire is a serious threat in the EAMs and that fire regimes (intensity, frequency, season, extent and type) vary from one district and/or villages to another (sections 3.2.1-3.2.6 above with supporting illustrations of Table 3-11 and Figures 2-3). Each visited district or village has either a fire reduction strategy in place or a proposed one. Furthermore, in March 2006 the Vice Presidents Office (VPO) issued a National strategy for environmental conservation (where fire features very clearly) and water sources to all districts. Based on success stories in some parts of EAMs and learned experiences from other areas with closely related problems we are proposing the following fire reduction strategies for the entire EAMs.

5.2.1 Establishment of National, Regional and Global networks

Forest wildfires are a worldwide problem. Once they are started, they devastate vegetation, human property and even human life and often spread across national boundaries. Their occurrences, frequencies, causes, intensities, scales of coverage and resulting impacts may vary between different geographic regions, countries and localities. These, in turn provide varying richness in knowledge, experiences and skills on wildfire hazards and their management strategies. Thus, the establishment of Global Wild Fire Networks (GWFN), and similar ones at regional (RWFN) and national (NWFN) levels, would provide effective global, national and regional forum for sharing knowledge and experiences on wildfire, collaboration on wildfire policies and management strategies.

i) Wildfire Network at the International Level

International efforts would facilitate the sharing of information/knowledge and experiences on global wildfires, formulation and harmonization of wildfire policies for global application and management strategies. Here, issues like global climate and weather patterns forecasts and their likely influences on wildfire occurrences through global satellite technologies would be discussed and modelled. Similarly, global wildfire management strategies e.g. collaboration in capacity building, technology and fire fighting materials development, wildfire detection and support in wildfire suppression, would be formulated and activated. When the 2003 wildfire devastated the State of California, USA, for example, experienced French, Spanish, Italian and Australian experts in ground and aerial fire fighting came in to assist in suppressing it. Another important aspect for the GWFNs would be the establishment of the global data base systems on wildfire. Thus, the Forestry and Beekeeping Division and Tanzania in general could widely benefit from such a network especially since these EAM forests have global values.

It is worth noting that the Global Fire Monitoring Centre (GFMC) and Global Observation of Forest Cover Fire Implementation Team efforts led to the establishment of the space-borne fire monitoring system (Ahern *et al.*, 2001). This makes it possible to have complete coverage of forest fire impact around the world. Equally helpful are other

initiatives by FAO (1991, 2004, and 2005). All this serves as a basis for exchange of experiences and monitoring of fires at a Global level. The Ministry of Natural Resources and Tourism or the Vice Presidents Office should take the lead in the cooperation with these existing Networks.

ii) Wildfire Networks at the Regional Level

This would be the extension of the global initiative to a lower level as means for improved, regional specific, management. Like the case with the GWFNs, the RWFNs would facilitate the exchange of knowledge, sharing of experiences, harmonizing regional wildfire policies, climate and weather forecasting and wildfire occurrence projection. RWFNs would also involve the development of common or joint wildfire management strategies and resource sharing especially in aerial fire detection and across-the-border fire fighting strategies. Thus, the RWFNs like the East African Wildfire Network (EAWFN), SADC Wildfire Network (SADCWN) and African Wildfire Network (AWFN) are some of the regional networks which FBD and Tanzania in general could facilitate their formation and become a part.

iii) Wildfire Network at the national level

Networking the regions, specifically the districts in which the EAMFs are located and all districts housing other forest formations across the whole of Tanzania would facilitate the sharing of knowledge and experiences on wildfire status across the country. It would also allow the sharing of information on the existing management policies and strategies, permit harmonization in relation to wildfires - wildfire laws, legislations and enforcement. The NWFNs would provide very good opportunities for common platforms of planning and management strategies for wildfire across the whole country and motivate the involved stakeholders e.g. local communities, government and private institutions into renewed commitment and efforts.

This arrangement would benefit extensively from recommendations made by the FAO follow-up expert meeting to consider the international implications of national actions.

The experts recommended actions on:

- The development of human resources and mechanisms to support cooperation on forest fire management at bilateral, regional and international levels.
- The establishment of mechanisms for inter-country agreements among groups of two or more countries, aimed at coordinating efforts to establish means to share resources, personnel and equipment in situations of emergency.
- The establishment of a data base on “Legal Frameworks for Forest Fire Management; International Agreements and National Legislation (FAO 2005).

These initiatives and their resulting benefits have built-in economies of scale. Thus their impact at the global level is likely to be more effective than similar efforts mounted at national levels.

5.2.2 Development of harmonized wildfire policies and wildlife acts

As we have already seen, currently each resource management sector e.g. forestry, agriculture and livestock, beekeeping, wildlife, land and environment, has a separate sectoral management policy and separate management act, most often, these policies and acts conflict widely on wildfire issues. While almost all the sectoral policies and sectoral acts do not treat wildfires with the importance it deserves, it is only the forest act that dedicates a section to it. All the other sectoral policies and acts just mention wildfire in passing and often as a useful management tool in cleaning up the farms and reactivating forage growth in pasture and wild lands. But burning farm refuse as a land preparation method for agricultural activities, burning up old and coarse vegetation to stimulate new forage growth in the pastures, burning charcoal and use of fire in honey collection and other related forest activities have been singled out as some of the most potent sources of wildfires that destroy forests, degrade the environment, spell heavy losses to human properties and even human life. Indeed, the success of all natural resources based sectoral activities almost entirely depends on a healthy environment. Wildfire, therefore, needs to be singled out as one of the most constraining factors in all sectoral development

endeavours and should, to that effect, be fought against hardest and determinedly by all resources management sectors.

An important general finding is that the sectoral stakeholders need to sit together to review their sectoral policies and acts in relation to wildfire in order to come up with a harmonized cross-sectoral national wildfire management policy and act. Through the proposed networks above, a harmonized wildfire management policy and act would in turn be integrated into the national, regional and global wildfire management systems.

The harmonized wildfire policies and acts together with the established wildfire networks at all levels, would then provide convenient and effective platforms for common land use stakeholders dialogue. Government Ministries having a direct stake in fire control need to develop this joint fire control strategy. The ministry responsible for Local Government and other Ministries notably Agriculture, Livestock and Natural Resources need to work-out a jointly agreed implementation programme.

5.2.3 Use of various aids in wildfire management

i) Wildfire laws, bylaws and various legislations

The surveys clearly indicated that the national forest fire laws (national wildfire laws) and various related legislations are widely spread across the 7 districts and all the District Forest Officers (DFO) and District Natural Resources Advisor (DNRA) possess and are very familiar with them. Some district councils, for example, have re-enforced them with their district specific bylaws. It was also noted that such laws are widely known even by the local communities at the village level. Many villages in most of the districts have registered their village specific bylaws with the assistance of various government and NGO agents and many village bylaw legislations are at various stages of processing for approval by their respective district councils. In Mufindi District and the highland zones of Mwanza District where the protocols of responsibilities in dealing with fires from their detection, suppression, reporting, to closely following up the cases at the courts are clearly streamlined, wildfire incidences have declined drastically with time. It was,

however, unfortunately noted that there was a general lack of streamlined enforcement mechanisms in most of the wildfire prone districts.

When properly enacted and judiciously enforced, the laws, bylaws and related legislations are an effective wildfire management tool. It is, therefore, strongly suggested that central government and local government, together with the district natural resources management staff and various government agencies, available NGOs and local communities, should:

- Streamline procedures for the effective enforcement of available laws and bylaws that relate to fire control.
- Facilitate villages in enacting and using bylaws – for example formation of Village Environmental Committees to monitor execution of the bylaws.
- Formulate and regularly review of bylaws with a view of accommodating emerging issues.
- Harmonize the mechanisms and technology packages on environmental conservation to reduce conflicts.
- Activate law enforcement against arsonists or shifting cultivators.
- Stimulate investments in issues that indirectly address the underlying causes of fire since these could be more cost-effective than investments in fire suppression technologies and resources, which are often only used during a few months each year. In Kilindi District for example, villages with active beekeeping activities are actively involved in the prevention activities because wildfires causes apiary destruction.

5.2.4 Education

Villagers and village governments should be educated on the roles and responsibilities of different committees, and ownership of the village by-laws. Similarly they need to be educated on the hazards of wildfires to natural resource bases, environment, human properties and human life. Actions also need to be taken to limit their incidences and suppressing those fires that do occur - including protocols of reporting them and dealing with the associated cases.

Establishment of programs e.g. radio, cinema, TV, newspapers, use of posters and displays that emphasize on fire prevention and suppression could form an important part of the education curricula. This could include development of education packages on the impacts of fire on food security and community livelihoods.

5.2.5 Management plans

It was noted, during the survey, that most of the central government, district council and community forests did not have management plans. This made it difficult to determine the trends of their biological, ecological and socio economic status over time; or the factors that influence these. It is suggested that there should be a deliberate effort to promote and encourage the development of management plans in all central government, district council and community forests. This could be facilitated by the various government and NGO agencies, in close collaboration with local community stakeholders using various instruments such as the PFM, JFM, and CBFM etc. The NWFNs could provide a convenient forum for dialogue. Issues to be taken on board could include:

- Establishment of community-based fire control activities.
- Development of area specific (i.e. district) guidelines governing the application of fires as a management tool in various land use groups.
- Development and installation of fire alarm and fire danger rating systems/networks within any land use category.

5.2.6 Encouragement and use of Local Institutions

Although forests under local institutional management were encountered in only two districts (Mufindi and Mwanga) out of the seven surveyed (i.e. 28.6%), they are known to be widespread in various parts of the EAM and Tanzania in general. Wherever they exist, they remain intact and are highly respected by the surrounding communities. Thus, the EAMFs could have a program for:

- Promoting the establishment and strengthening of traditional/clan forests for effective fire reduction.
- Involving local institutions in the management and control of forests and forest fires at the district and village levels.

5.2.7 Private sector and NGOs involvement

During the present survey, private companies and/or NGOs were found in almost all districts covered, and most of them include environment (including wildfires) among their key programs. Many of them are directly participating in the community awareness raising campaigns about wildfires, community education, facilitation of the formation of VECs and the formulation of district and village bylaws. These efforts need to be further promoted and strengthened by involving and integrating private sector and NGO activities into district/village development plans. This could be coordinated by MNRT and supervised by the District Government.

5.2.8 Wildfire monitoring and evaluation

In order to have effective and efficient wildfire management plans and strategies, there is a need for reliable data. It is, therefore, important to establish mechanisms for wildfire monitoring, reporting and evaluation.

It is crucial that most, if not all, information on fire incidences, frequencies, intensities, causes, seasons, coverage, types of affected vegetation, losses in human properties and human lives and influencing factors are recorded. Thus, mechanisms e.g. watchtower systems, equipment for geographic location, close collaboration with the local communities and various stakeholders must be put in place. The Ministry responsible with Local and Regional Governments (PMO-RALG) in collaboration with MNRT and Vice Presidents Office (VPO) should coordinate and facilitate the functioning of such a system while the District governments should take the implementing role. All fires and fire related issues must be reported from the grass-root (village) to the Ministry for action. There must be a mechanism of evaluating the trends of fire risks; impacts on the natural resources base, human properties, human life and environment; influencing factors and their trends e.g. climate and weather patterns, fuel conditions, land use patterns, trends in socio-economic development activities and capacity building. These should be done annually in order to take the right action in time.

6.0 CONCLUSIONS

This study has shown that fire is a very serious threat to the forests and other vegetation cover in the Eastern Arc Mountains and the most affected districts are Kilombero, Kilindi and Mpwapwa. In comparison, Korogwe and Mvomero are mildly affected whereas Mwanga, and Mufundi Districts have very few incidences of fire. The main causes of forest fires were: preparation of agricultural fields, hunting, pastoralism, charcoal burning and timber harvesting. Other minor causes include honey collection, culture and arsonists. All districts and villages that were visited had no consistent and quantitative fire records, although all interviewed persons claim that fire is a serious problem in their localities. In most of the areas, fire is persistent due to a lack of funds to facilitate patrols, lack of village by-laws and awareness amongst the local communities. Other problems include lack of political will to make natural resources among the priority departments of the local governments, and lack of strong traditional institutions responsible for conservation matters.

National laws preventing forest fires also exist, but tend not to be respected in the rural areas where local bylaws are more important. Most of visited villages have no functional and up to date fire strategies and bylaws dedicated to environmental issues and those with Village forest reserves have no management plans. Conversely, fire strategies have been developed in all villages in Mwanga District, based on locally agreed and implemented bylaws. Most of the VFRs have approved management plans. The existence of sacred forests and more commitment of District leaders in Mwanga and Iringa Districts have also been recognized in reducing fire incidences. People in these districts respect and conserve these forests for their traditional activities and this attitude has a positive impacts to other forests. The successful stories in Mwanga, and Mufundi Districts could be a model for other districts in the EAMs.

REFERENCES

- Ahern, F., Goldammer, J.G., and Justice C. (eds). 2001. Global and regional vegetation fire monitoring from space: planning a coordinated international effort. SPB Academic Publishing by the Hague.
- Aloo, I. 2001. Forest fires in Tanzania. Lecture notes for MNRSA short course participants. SUA, Morogoro, Tanzania (Unpublished)
- Andreae, M. and Goldammer, J. 1992. Tropical wildland fires and other biomass burning: Environmental impacts and implications for land use and fire management. In: Cleaver, K. *et. al.* (eds.) Conservation of West and Central African Rainforests. 79-109. World Bank Environmental Paper 1. World Bank. Washington, DC.
- Asbjomsen, H., Ness, L.E. and Torres, E. 1999 Fire in moist tropical forests: A progenitor or threat to biodiversity? *ETFRN News* 21/99: Oxford UK.
- Burrows, N.D. 1995. A framework for assessing acute impacts of fire in jarrah forests for ecological studies, pp59-66. In W.L. MacCaw, N.D Burrows, G.R. Friend and A.M. Gill (eds.). Landscape fires. Proc. Of an Australian Bushfire Conference, Perth, Western Australia, 27-29 September 1993.
- Burgess N.D; Fjeldsa, J., and Botterweg, R. 1998. Faunal Importance of the Eastern Arc Mountains of Kenya and Tanzania. *JEANH* 87: 37 – 58.
- Burgess N., S.S. Madoffe and P.K.T. Munishi. 2005. What are the main threats facing the Eastern Arc Forests and how serious are they? *The Arc Journal*. TFCG Biannual Newsletter No. 19.
- Burrows, N.D. 1995. A framework for assessing acute impacts of fire in Jarrah forests for ecological studies, pp59-66. In W.L. MacCaw, N.D Burrows, G.R. Friend and A.M. Gill (eds.). Landscape fires. Proc. Of an Australian Bushfire Conference, Perth, Western Australia, 27-29 September 1993.
- Cheney, N.P. 1970. Fire protection of industrial plantation. Zambia. B.Sc. report, University of Melbourne
- Christensen, N.L. 1985. Shrubland fire regimes and their evolutionary consequences. The ecology of natural disturbance and path dynamics. (eds). S.T.A. Pickett and P.S. White pp 85-100. Academic Press, Orlando, F.L.
- Goldammers, J.G. 1993. Fire management. In: L. Pancel (Ed.). The tropical forestry Handbook, 1221-1268. Springer-Verlag, Berlin-Heidelberg.

- Dennis, R., E. Meijaard, G. Applegate, R. Nasi & P. Moore. 2001. Impact of human-caused fires on biodiversity and ecosystem functioning, and their causes in tropical, temperate and boreal forest biomes. CBD Technical Series No. 5 Montreal, Canada, Convention of Biological Diversity.
- FAO. 1999. FAO Meeting on Public Policies Affecting Forest Fires. FAO Forestry Paper No. 138 FAO, Rome.
- FAO, 2001. The Global Forest Resources Assessment 200 – Main report. FAO Forestry Paper No. 140. Rome, FAO.
- FAO. 2003. State of the World's Forests. FAO, Rome
- FAO. 2004. Global forest fire alerts. www.fao.org/forestry/site/fire-alerts/en
- FAO. 2005. Needs and opportunities for International Cooperation in Forest Fire Preparedness, Committee on Forestry COFO/2005/3; 17th Session, Rome 15-19 March, 2005.
- Fitzgerald, D.V. 1971. Fire and animal impact on vegetation in Tanzania National parks Proceedings of the Annual Tall Timbers Fire Ecology Conference, 11:317
- FORCONSULT, 2005. Forest Condition assessment in the Eastern Arc Mountain forests of Tanzania. A consultancy report submitted to the Forestry and Beekeeping Division and UNDP/GEF (Tanzania) by FORCONSULT (SUA)
- Goldammer, J.G. and S. Manan. 1996. Fire in the Tropical forests. An overview of fire management issues and options in tropical forests. *Tropical forest update, ITTO*, Volume 6, (1): 3-7.
- Goldammer, J.G. (ed.). 1990. Fire in the Tropical Biota. Springer-Verlag, Berlin.
- Hesseln, H. 2001. Refinancing and restructuring Federal fire management. *Journal of Forestry* 99: 4-8.
- Hall, J.B. and Gwalema, W.N.K. 1985. Drought indices and fire danger indices at Morogoro, Tanzania For. Ecol. Manager; 10: 125 – 134.
- Komarek, E.V. 1971. Lightning and fire ecology in Africa. Proceedings of the Annual Tall Timbers Fire Ecology Conference, No. 11
- Kikula, I. S. 1989. Spatial changes in forest cover on the East Usambara Mountains. In A. Hamilton, A. & R. Bensted-Smith (eds). Forest Conservation in the East Usambara Mountains Tanzania. IUCN, Grand. P. 79-86.
- Kimaryo, s.m. 1988. Fire risk in forest Plantations in Tanzania. M.S.c. Thesis, School of Agriculture and Forestry Sciences, University College of North Wales, Bangor
- Lelieveld, J., P.J. Crutzen, D. Jacob and A. Thompson, 1996.** Modelling of biomass

- burning influences on tropospheric ozone. In: B.V. Wilgen; M. O. Andreae; J.G. Goldammer and J.A. Lindsay (eds.). *Fire in Southern Africa savannah: Ecological and Atmospheric Perspective* University of Witwatersrand Press (in press). (Cited in Goldammer and Manan, 1996)
- Lovett, J. 1988. Practical aspects of moist forest conservation in Tanzania. In: Goldblat, P. & Lowry P.P. (Eds) *Modern systematic studies in African botany. Monogr. System Bot. Miss. Bot. Gard; 25* 491 – 496.
- Luke, R.G. and McArthur, A.G. 1978. *Bush fires n Australia.* CSIRO Division of Forestry Research, Canberra
- McArthur, A.G. 1967. *Fire behaviour in Eucalypts forests.* Forestry and Timber Bureau Leaflet No. 107.
- Madoffe, S.S., Mgumia, F.H. and Kajembe, G.C. 1998. Relationship between bush fires, and people's occupation in miombo woodland. Paper presented in Second forestry research workshop, Arusha, Tanzania 3-5 August 1998.
- Madoffe, S.S., A. Bakke and J.A. Tarimo. 2000. The effect of fire on the diversity and abundance of wood-living beetles in miombo woodland, Tanzania. *SA For Jr.* 187: 51 – 57.
- Maliondo, S.M.S; Malimbwi, R.E; Temu, R.P.C; Constantine, E. and Zahabu 2000. Fire impact on population structure and diversity of tree species in west Usambara Camphor zone forests *Journal of Tropical Forest Science* 12 (3) : 472 -481
- Mialla, Y.S. and Mbwana, S.B. 2006. Catchment Value of the Uluguru North Forest Reserve. *Miombo* 29, 20-22.
- Mbegu, A.C. and Mlenge, W.C. 1983. Ten yeas of HADO 1973 – 1983. Forestry Division, Dar es Salaam, Tanzania
- Mittermeier, R. A., N. Myers, J.B. Thomson, G.A.B. da Fenseca and S. Olivier. 1998. Biodiversity hotspots and major tropical wilderness: Approaches to setting conservation priorities. *Conservation Biology*, 3:511-520.
- MNRT. 2005. CMEAMF Information, Education and Communication Strategy: Data report. TFCG, Dar-es-Salaam.
- Myers, N. R.A. Mittermeier, G.C. Mittermeier, G.A.B. da Fenseca A.B. Gustavo and J. Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853-

- Nasi, R. R. Dennis, E. Meijaard, G. Applegate and P. Moore. 2002. Forest fire and biological diversity. *Unasylva* 209, Vol. 53 – 2002/2. 858
- Mnzava, E.M. 1980. Village Afforestation lessons of experience in Tanzania. **FAO**, Rome
- Nsolomo, V. and Chamshama, S.A.O. 1990. Human impacts on some catchment forest reserves in Morogoro Region. In: A.S.M. Mgeni, W.S. Abeli, S.A.O. Chamshama and G.S. Kowero (Eds), Proceedings of a joint Seminar/Workshop on management of natural forest of Tanzania. *Faculty of Forestry Records No. 43*. Pp 39-45.
- Poulsen, G. 1975. Forest fire protection. Lecture Notes, University of Dar es Salaam, Morogoro
- Rothermel, R.C. 1983. How to predict the spread and intensity of forest and range fires. USD Forest Service General Technical Report, INT-143
- Sarre, A. and J.G. Goldammer. 1996. Burning down the house. Tropical forest update, *ITTO*, Volume 6 (1): 1
- Schmidt, P.R. 1989. Early exploitation and settlement in the Usambara Mountains. In: Hamilton AC, Bendsted-Smith B, (Eds). *Forest conservation in the East Usambara Mountains, Tanzania*. IUCN-Forest Division, Ministry of Lands,
- Schule, W., 1990.** Landscapes and climate in Prehistory. Interactions of Wildfire, Man and Fire. In: Goldammer (ed.). *Fire in the Tropical Biota. Ecosystem Processes and global challenges*. Ecological Studies 84. Springer-Verlag, Berlin, New York.
- Tanganyika Forest Division. 1962. Annual Report, Ministry of Lands, Forest and Wildlife, Dar es Salaam
- Tanganyika Forest Division. 1963. The forest policy. Sessional paper No. 1 Dar es Salaam
- Tanzania Forest Division. 1967. Annual Report. Ministry of Agriculture, Forests and Co-operatives, Dar es Salaam
- Tanzania Forest Division. 1984. Minutes on Shinyanga Workshop on desertification (Kumbu-Kumbu ya Warsha ya Shinyanga). Ministry of Lands, Natural Resources and Tourism, Dar es Salaam
- Tyler, C.M. 1995. Factor contributing to post-fire seedling establishment in chaparral; direct and indirect effects of fire. *Journal of Ecology* 83: 1009-1020
- URT. 1998a. National Forestry Policy. Government Printer, Dar es Salaam, Tanzania.

- URT. 1998b. National Beekeeping Policy. Government Printer, Dar es Salaam, Tanzania.
- URT 1999. National Land Policy. Government Printer Dar es Salaam, Tanzania.
- URT. 2002a. The Forest Act, 2002. Government Printer, Dar es Salaam, Tanzania (Part IX and Section 91(a)-c).
- URT. 2002b. The Beekeeping Act, 2002. Government Printer, Dar es Salaam, Tanzania (Section 44 (2)).
- Van Wyk, P. 1971. Veld burning in the Kruger National Park. Proceedings of the Annual Tall Timbers Fire Ecology Conference, No. 11
- Whelan, R.J. 1995. The Ecology of fire. Cambridge University press 347pp.
- Wurster, K. and Burgess, N. 2005. FIRE. Is the fire problem getting better or worse in the Eastern Arc Mountains? The Arc Journal. TFCG Biannual Newsletter No. 19.

APPENDICES

Appendix I: ToR for the Fire Reduction Strategy for the EAMs of Tanzania

Conservation & Management of the Eastern Arc Mountain Forests: Eastern Arc
Mountains Strategy
(GEF/UNDP:00015426)

TERMS OF REFERENCE FOR

EASTERN ARC MOUNTAINS FOREST MANAGEMENT AND FOREST
CONDITION ASSESSMENT

Introduction

The Eastern Arc Strategy is a component of the Project ‘Conservation and Management of the Eastern Arc Forests’ (GEF/UNDP: 00015426). The project is implemented by the Forest and Beekeeping Division of the Ministry of Natural Resources and Tourism and it is funded by the Global Environment Facility through the United Nations Development Programme.

Objectives

The objective of the Eastern Arc strategy component is:

Conservation status of Eastern Arc mountains improved through the development and implementation of an integrated conservation strategy for biodiversity conservation and water supply

As a part of measuring impact, the project is establishing a number of baseline surveys that can be repeated (either as a whole or in part) to measure changes over the lifespan on the project. A linked set of issues forms one of the fundamental parts of this baseline,

that of assessing the condition of the forests, the threats facing the forests, and the effectiveness of management of the forests. This document describes this work, and proposes the way in which it can be delivered across the seven Districts across the Eastern Arc. The aim of the work is to determine:

Conservation status of EAMs improved through the development and implementation of an integrated conservation strategy for biodiversity conservation and water supply.

Specific objectives (Accomplishments)

- Outline of how the success of these strategies might be measured
- Documentation of available information on the problem of forest fires in Tanzania
- Documentation of available knowledge on the problem of fire in the EAMs and its effects on forest and grassland vegetation
- Review and summarise the available mechanisms, legal and traditional, available in Tanzania for the prevention, control and management of wild fires in the EAMs
- Gather experiences of successful fire management from EAMs (especially Mwanga and Mufindi), or from other similar mountain ecosystems in Tanzania or Eastern Africa
- Assess whether the characteristics of Mwanga and Mufindi are unique, or whether fire might also be controlled using similar methods elsewhere in the EAMs
- Prepare a draft fire management strategy for the EAMs, based on the above elements of the work
- Seek stakeholders input into the draft fire management strategy through facilitated workshop
- Prepare a final fire management strategy for CMEAMF based on the outcome of the stakeholders' workshop.

Expected output

The main output of this task is a draft Fire Management Strategy for the EAMs, containing sections on:

CMEAMF: Fire Reduction Strategies -EAMs

- The fire problem, reasons why it happens, and what its effects are on Eastern Arc forests and grasslands
- Available laws and other mechanisms that regulate burning, and an assessment of their effectiveness.
- Successful and unsuccessful fire management strategies within the EAMs (also elsewhere in Tanzania if relevant)
- Strategies for addressing the fire issue across the EAMs, which are practical and can be implemented within the means available to Districts and Forest and Beekeeping Division.
- Outline of how the success of these strategies might be measured.

Copies of these products will be made available to the:

- Eastern Arc Conservation Centre in Morogoro;
- Forest and Beekeeping Division in Dar es Salaam;
- The Eastern Arc Mountains Conservation Endowment Fund.
- Materials may also be placed on the proposed Eastern Arc mountains internet site (location to be determined)

Appendix II: Itinerary for Fire Reduction Strategy for the EAM Forests

Date	Place	Activity
October 11, 2006	Morogoro - Mwanga	Travel
October 11-14, 2006	Mwanga	Field work
October 15, 2006	Mwanga - Korogwe	Travel
October 15-17, 2006	Korogwe	Field work
October 17, 2006	Korogwe - Kilindi	Travel
October 17-19, 2006	Kilindi	Field work
October 20, 2006	Kilindi - Morogoro	Travel
November 1, 2006	Morogoro - Dar	Travel
November 2, 2006	Dar	Field work
October 11, 2006	Morogoro- Mufindi	Travel
October 11-13, 2006	Mufindi	Field work
October 13, 2006	Mufindi - Kilombero	Travel
October 13-16, 2006	Kilombero	Field work
October 17, 2006	Kilombero - Mpwapwa	Travel
October 17- 19, 2006	Mpwapwa	Field work
October 20, 2006	Mpwapwa - Morogoro	Travel
November 22-23, 2006	Mvomero	Field work

Appendix III: Structured questionnaire for villagers, Village Environment Committees, DFO/DNROs, NGOs, and Traditional Leaders

**MKAKATI WA KUPUNGUZA MATUKIO YA MOTO KWENYE
TAO LA MILIMA YA MASHARIKI**

KIDADISI

WANAVIJIJI

(A) Maelezo ya Jumla

1. Wilaya:..... 2. Kijiji/Mtaa/Tarafa:.....
3. Matukio ya Moto: Mengi/Kati/Kidogo/Hakuna*

(B) Maelezo ya Msailiwa

1. Mume/Mke 2. Umri:.....
3. Kiwango chako cha elimu ni:
4. Shughuli ziletazo kipato:
-
5. Kama ni mkulima, je kilimo chako ni cha kuhamahama/cha moja kwa moja?*
6. Kama ni cha kuhamahama je mna maeneo ya kutosha? Ndiyo/Hapana*
7. Una farms la ukubwa kiasi gain? Hekari /Ekari*
8. Unalima mazao gani?.....
9. Ni njia zipi unatumia kusafisha farms lako?.....
-
10. Je wewe ni mfugaji? Ndiyo/Hapana* 11. Unafuga Wanyama gani?
.....
12. Je, unalishia wapi mifugo yako?
- Je, wafugaji wa eneo hili mnao utaratibu wa kusimamia utunzaji wa mifugo yenu? Ndiyo/Hapana*
13. Ikiwa utaratibu wa kutunza mifugo upo tafadhali fafaua ukizingatia:
 - Malisho
 - Tiba
 -

- Uongozi:
14. Je, ipo tofauti kati ya taratibu zenu za jadi na taratibu za sasa za kutunza mifugo? Ndiyo/Hapana*
15. Tofauti ni zipi kuhusu
- Malisho
 - Tiba
 - Uongozi

(C) Mazingira

1. Je, hapa Kijijini/Mtaani/Tarafani kuna matatizo ya mazingira? Ndiyo/Hapana*
 2. Tafadhali taja matatizo hayo:
 3. Je, unalionaje suala la mioto nyikani?
 4. Unakisia matukio hayo yanatokea wakati gani?
na mara ngapi kwa mwaka?.....
 5. Unakisia maeneo yanayoathirika yana ukubwa kiasi gani?
 6. Je, visababishi vya mioto hiyo ni vipi?.....
.....
Ni madhara kiasi gani unayofikiri yanatokana na mioto hiyo unapofikiria
Mimea
 - Wanyama
7. Je, kuna faida zipatikanazo kutokana na mioto hiyo? Tafadhali fafania
.....
8. Kwa mtazamo wa jadi yenu; je, zipo njia zitumikazo au zilizokuwa zikitumika kudhibiti mioto hiyo?

9. Kama ungekuwa na mamlaka, ungetumia mbinu gani:
- eKuhakikisha matukio ya mioto yanapunguzwa.....
.....
Yanakomeshwa kabisa.....
.....
.....
10. Tukizingatia taratibu za utunzaji mazingira (udhibiti moto ukiwemo) zilizopo, na maoni yako;
- Nguvu za taratibu hizo ni zipi?
.....
.....
 - Mapungufu yake ni yapi.....
.....
.....
11. Kuna suala la Ushirikishwaji wa wananchi katika utunzaji wa mazingira. Tafadhali eleza jinsi mnavyoshirikishwa
12. Je, ushirikishwaji tajwa umeleta kiwango gani cha mafanikio? Tafadhali eleza.....
.....
.....
.....
13. Tumezungumza mengi huenda ulitarajia nigusie masuala kadhaa na sikufanya hivyo! Ni kipi ambacho nilitarajiwa kukuuliza na sikufanya hivyo. Tafadhali yataje ili yajadiliwe.
.....
.....
.....
.....

MKAKATI WA KUPUNGUZA MATUKIO YA MOTO KWENYE

TAO LA MILIMA YA MASHARIKI

KIDADISI

AFISA MISITU NA AFISA MALIASILI

A. Maelezo ya Jumla

1. Wilaya: 2. Mume/ Mke:
3. Muda uliokaa hapa

B. Mazingira

1. Je, hapa Wilayani kuna matatizo ya mazingira? Ndiyo/Hapana*
 2. Kama ndiyo tafadhali taja matatizo hayo:
 3. Je, unalionaje suala la mioto nyikani?.....
 4. Unafikiri ni maeneo gani yanayoathirika zaidi?.....
 5. Je kuna vijiji karibu na maeneo hayo?
 6. Unakisia maeneo yanayoathirika yana ukubwa kiasi gani?.....
.....
 7. Je, visababishi vya mioto hiyo ni vipi?.....
.....
Je katika visababishi vya mioto ni vipi vinavyotajwa mara kwa mara?
.....
 8. Ni madhara kiasi gani na yapi unayofikiri yanatokana na mioto hiyo?
.....
 9. Je kuna faida zipatikanazo kutokana na mioto hiyo? Tafadhali fafaua
.....
 10. Mnachukua hatua gani kupambana na matukio ya mioto?
.....
- Je mnazo nyenzo za kupambana na matukio ya mioto? Ndiyo/Hapana
11. Tukizingatia taratibu za utunzaji mazingira (udhibiti moto ukiwemo) zilizopo, na maoni yako;
 - Nguvu za taratibu hizo ni zipi?
 - eMapungufu yake ni yapi

.....
.....
12. Kuna suala la ushirikishaji Tafadhali
eleza jinsi mnavyoshirikisha wananchi

(i) Kudhibiti Matukio

(ii) Kupambana na mioto iliyotokea

14. Je, ushirikishwaji tajwa umeleta kiwango gani cha mafanikio? Tafadhali
eleza.....

.....
.....

15. Je kuna maeneo hapa Wilayani katika kipindi cha miaka 10 iliyopita ambapo
matukio ya moto

(i) Yamepungua

(ii) Hayajawahi kutokea

(iii) Yameongezeka

17. Ni nini maoni yako ya jumla kuhusu matukio ya mioto katika Misitu katika
ngazi ya

(i) Vijiji

(ii) Wilaya

(iii) Mkoa

(iv) Taifa

MKAKATI WA KUPUNGUZA MATUKIO YA MOTO KWENYE

TAO LA MILIMA YA MASHARIKI

KIDADISI

WENYEVITI WA KAMATI ZA MAZINGIRA VIJIJINI

A. Maelezo ya Jumla

1. Kijiji :..... 2. Wilaya :.....
3. Mme/ mke
4. Muda uliokaa hapa

B. Mazingira

1. Wewe ni Mwenyekiti wa Kamati ya Mazingira. Tafadhali eleza kwa ufupi majukumu ya kamati yako.
.....
2. Utekelezaji wa majukumu hayo umefanikiwa kwa kiasi gani?
.....
3. Katika mafanikio haya ni yapi ambayo yanaifanya kamati yako itembee kifua Mbele
4. Unaonaje moto kama tatizo la Mazingira?
5. Ni maeneo gani ya kijiji chako yanaathirika zaidi na moto?
6. Je kijiji chako kinazungukwa na misitu ya hifadhi Ndiyo/ Hapana Kama ndiyo itaje
7. Unafikiri ni maeneo gani yanayoathirika zaidi?.....
8. Je kuna vijiji karibu na maeneo hayo?
9. Unakisia maeneo yanayoathirika yana ukubwa kiasi gani?.....
10. Je, visababishi vya mioto hiyo ni vipi?.....
11. Je katika visababishi vya mioto ni vipi vinavyotajwa mara kwa mara?
.....
12. Ni madhara kiasi gani na yapi unayofikiri yanatokana na mioto hiyo?
.....
Kamati yenu ingepewa majukumu ziadi katika hifadhi ya mazingira ungependekeza majukumu yapi ya ziada?.....
13. Je Kijiji kilichopo karibu na hapa kipo umbali gani?

14. Mnashirikianaje katika utunzaji wa mazingira na vijiji hivyo vya karibu?

.....

15. Katika mazungumzo haya inawezekana kuna mbao ambayo ulitarajia yatuzungumzwe, hayakuzungumzwa tafadhali yagusie.

MKAKATI WA KUPUNGUZA MATUKIO YA MOTO KWENYE

TAO LA MILIMA YA MASHARIKI

KIDADISI

AZISE

A. Maelezo ya Jumla

1. Jina la AZISE
2. Wilaya :
3. Ipo kuanzia lini

B. Mazingira

1. Nini madhumuni ya AZISE hii?
2. Utekelezaji wa majukumu hayo umefanikiwa kwa kiasi gani?.....
3. Je Mtandao wa AZISE hii ukoje?
 Wilaya
- Mkoa
- Taifa
4. Mafanikio yenu kwa kuzingatia matndao wenu yako je?
 - (i) Ki wilaya
 - (ii) Ki Mkoa
 - (iii) Ki Taifa
5. Madhumun yenu yanahusiana vipi na utunzaji wa misitu?
6. Unaionaje nafasi ya moto katika utunzaji wa Misitu katika Milima ya Tao la Mashariki?
7. Ni maeneo gani katika eneo lenu la kazi yana matukio mengi ya moto?.....
8. Je kuna vijiji karibu na maeneo hayo?
9. Mnachukua hatua gani kupambana na matukio ya mioto?
.....
Mnashirikiana vipi na Wananchi kudhibiti matukio ya moto?
.....
.....
.....

10. Tukizingatia taratibu za utunzaji mazingira (udhibiti moto ukiwemo) zilizopo, na maoni yako;

- Nguvu za taratibu hizo ni zipi?.....
.....
.....
- Mapungufu yake ni yapi.....
.....
.....

11. Ni nini maoni yako ya jumla kuhusu matujio ya mioto katika misitu katika ngazi ya

- Vijiji
- Wilaya
- Mkoa
- Taifa

**MKAKATI WA KUPUNGUZA MATUKIO YA MOTO KWENYE
TAO LA MILIMA YA MASHARIKI
KIDADISI
VIONGOZI WA KIMILA**

A. Maelezo ya jumla

1. Kijiji:
2. Wilaya:
3. Mme/ Mke:
4. Muda ulioishi katika kujiji hiki:

B. Mazingira

1. Wewe ni Kiongozi wa Jadi Je unashughulikia masuala yapi katika kijiji chako?
2. Jadi yenu ina taratibu gani zinazochangia utunzaji mzuri wa mazingira?
.....
.....
.....
3. Mnachukua hatua gani kupambana na matukio ya mioto?
.....
.....
4. Je kuna matatizo ya moto sasa hivi hapa kwenu?
5. Ni kiasi gani hizo taratibu za kijadi zinaweza kutumika kudhibiti matukio ya moto?

Appendix IV: Fire Registration form for Mufindi District Villages

FOMU YA KUWEKA KUMBUKUMBU YAMOTO KICHAA

TARIFA:

KATA:

MWAKA:

Kijiji	Tarehe na muda	Chanzo cha moto	Eneo lililoungua (Hekta/Ekari)	Hasara iliyotokea	Jina la Mtuhumiwa

NB: FOMU HII IJAZWE NA MAAFISA MISITU/AFISA MTENDAJI WA KIJIKI/KATA INAYOHUSIKA.

Appendix V: Bylaw Forbidding destruction of general land forests in Mufindi District

TANGAZO LA SERIKALI NA. LA TAREHE
HALMASHAURI YA WILAYA YA MUFINDI
SHERIA NDOGO

ZIMETUNGWA CHINI YA FUNGU NAMBA 148 LA SHERIA NAMBA YA
1982

SHERIA NDOGO ZA UZUIAJI WA UHARIBIFU WA MISITU ISIYO
HIFADHIWA ZA HALMASHAURI YA WILAYA YA MUFINDI ZA MWAKA
1986.

- JINA: 1. Sheria ndogo hizi zitaitwa sheria ndogo za uzuiaji wa uharibifu wa Misitu isiyo hifadhiwa za mwaka 1996 za Halmashauri ya Wilaya ya Mufindi.
- SHERIA: 2. Kati ya sheri hizi, maneno yafuatayo yatakuwa na tafsiri zifuatazo
- HALMASHAURI: Maana yake ni Halmashauri ya Wilaya ya Mufindi.
- MISITU ISIYO
HIFADHIWA: Ni pamoja na Misitu, Mbuga, Nyika, na vichaka ambavyo haviko chini ya Hifadhi ya Taifa.
- AFISA
MALIASILI: Ni afisa Maliasili wa Wilaya au msaidizi wake aliyeteuliwa kwa makusudi haya.
- AFISA MISITU: Ni afisa yeyote wa misitu kwa kuanzia Bwana Misitu Msaidizi daraja la III na kuendelea ngazi za juu.
- KUKATA: Ni pamoja na kufyeka au kng'oa miti, visiki, vichaka na majani.
- MOTO ULIO-
RUHUSIWA: Ni pamoja na moto utakaotumiwa kwa madhumuni ya kupikia, kuota, kuchoma takataka, kuchoma magugu na nyasi shambani, mashamba ya miwati, na moto wowote utakaotumika kwa madhumuni ya kazi ya kitaalamu.
- KINGA-MOTO: Ni pamoja na kulima au kutengeneza kinga ya moto au kuazima kwa madhumuni ya kuzuia moto wowote usioruhusiwa usienee.
- MILIMA: Ni pamoja na miinuko na vilima vidogo vidogo.
- MIINUKO: Ni pamoja na sehemu zote zilizo na miteremko mikali-Makorongo majabali, maporomoko na au Migema.

VYANZO VYA MAJI:	Maana yake ni sehemu yoyote ambayo mito, vijito, chemichemi huanzia, au zenye uwezekano wa kutoa chemichemi za maji wakati wowote.
VILELE:	Maana yake ni sehemu za juu kabisa za milima au vilima
MWAMBAAO:	Ni mwambao wa Ardhi kutoka chanzo cha maji kwa umbali wa mita zisizopungua 200 kila upande.
MISITU:	Ni eneo lolote lenye miti na vichaka au majani au vyote pamoja au sehemu ambayo itatangazwa kuwa ni “MISITU”.
KIJIJI:	Ni pamoja na kijiji kilichoandikishwa katika sheria ya kuandikisha vijiji, kutambuliwa kwa vijiji vya Ujamaa na Uongozi wa vijiji ya 1975, au sehemu yoyote ambapo wamekusanyika watu wakajenga nyumba pamoja na kuruhusiwa kuishi hapo.
AFISA MTENDAJI:	Ni Afisa Mtendaji wa Kata, au Kijiji (yaani WEO au VEO).
MIFUGO:	Ni wanyama wafugwao.
MKAZI:	Maana yake ni mtu yeyote ambaye kwa kawaida anaishi katika kijiji kilichopo chini ya Mamlaka ya Halmashauri.
AFISA MUIDHINIWA:	Maana yake ni Afisa Maliasili au Afisa aliyeteuliwa na Halmashauri kwa ajili ya sheria ndogo hizi.
MAHALI:	3.(i) Pamoja na kuzingatia masharti ya kifungu 2 sheria ndogo hizi zitatumika kote katika eneo lililoko chini ya mamlaka ya Halmashauri ya Wilaya ya Mufindi.
MATUMIZI/ MAREKE BISHO:	(ii) Iwapo kwa maoni ya Halmashauri hali ya mambo inahitajika basi Halmashauri yaweza, kwa kupitisha azima kugeuza matumizi ya sheria ndogo hizi kuhusu au kuhusiana na Jamii yoyote ya watu kwa maana kama ile ambayo Halmashauri itakavyofikiria.
MSAMAHA:	(iii) Halmashauri yaweza kumsamehe mtu yeyote au aina yoyote ya watu wasihusike na sharti lolote katika masharti ya sheria ndogo hizi.
MARUFUKU KUKATA AU KUFYEKA MITI:	4. (i) Ni marufuku kwa mtu yeyote kukata miti au vichaka au majani au kuchoma moto katika misitu iliyoko kwenye Milima, Vyanzo vya maji na miteremko mikali
KUCHOMA MOTO KATIKA	(ii) Ni marufuku kwa mtu yeyote kulima au kuchungia mifugo katika sehemu zilizotajwa chini ya kifungu (4) (1) cha Sheria ndogo hizi.

- MISITU ISI- (iii) Ni marufuku kwa mtu yeyote kuchoma moto sehemu yoyote ile
YOHIFADHIWA:
- (i) Ni marufuku kwa mtu yeyote kuchoma moto shamba lake bila kwanza kutoa taarifa kwa Afisa Mtendaji, au Afisa Misitu wa eneo hilo na kuruhusiwa. Ruhusa hiyo haitatolewa mpaka kwanza Afisa Mtendaji au Afisa Misitu wa sehemu hiyo ameridhika kuwa hatua za kutosha zinachukuliwa ili kuzuia moto usienee nje ya sehemu iliyoruhusiwa, kuchomwa.
 - (ii) Kama eneo la kijiji litaonekana limeunguzwa bila mhusika kupatikana, na kama itathibitika kwamba mhusika huyo hakupatikana kwa kutotilia maanani jambo hilo au kwa kumfikisha au kwa kumtorosha, basi serikali ya kijiji hicho iwajibike kwa kuchukuliwa hatua.
 - (iii) Ni marufuku kwa mtu yeyote kukata miti kwa ajili ya matumizi ya Mkaa, Majengo, au mbaao bila leseni halali iliyotolewa na Afisa Misitu.
 - (iv) Ni marufuku kwa mtu yeyote, kwa makusudi au kwa kupuuza kukaa au kufyeka misitu isiyohifadhiwa ambayo mtu huyo anazo sababu za kutosha kuamini kwamba kufanya hivyo kutasababisha uharibifu wa Misitu hiyo na Ardhi ya eneo hilo.

- WAJIBU WA 5. (i) Kila mkazi au mtu yeyote haruhusiwi kukata miti eneo lolote la
KUHIFADHI misitu isiyohifadhiwa bila kibali cha Maandishi kutoka kwa Afisa
MISITU ISIYO Maliasili au Afisa muidhiniwa wa sehemu ya kijiji husika.
HIFADHIWA:
- (ii) Ufyekaji wa maeneo ya Misitu isiyohifadhiwa kwa ajili ya kilimo, mifugo na matumizi mengine utaruhusiwa tu kwa kushauriwa na kijiji ambacho kinamiliki eneo linalohusika.
 - (i) Afisa misitu, kwa idhini ya Halmashauri, aweze kubadili utaratibu wa kufyeka msitu kwa kupata miti ya kuni, majengo, mkaa na sehemu za kulima.

- WAJIBU WA 6. (i) Kila mkazi anayeishi kijijini atapaswa kwenda kusaidia kuzima
KUZIMA AU moto uliochomwa ovyo au uliotoroka katika eneo la kijiji chake au
KUZUIA MOTO kijiji cha jirani.
- b. Nikosa kwa mtu yoyote, isipokuwa mgonjwa au kipofu au kilema au mtu yeyote aliyethibitishwa kuwa hajiwezi kukataa kusaidia kuzuia au kuzima moto unaounguzwa au kuhatarisha misitu au sehemu yoyote ya eneo hilo.

- c. Kwa madhumuni ya sheria ndogo hizi, kila kijiji kitawajibika kulima au kutengeneza kingamoto katika kila sehemu itakayohitajika ili kuhakikisha kwamba hatari ya moto uliochomwa ovyo au uliatoroka hauleti uharibifu wowote.
- d. Kila itakapohitajika Halmashauri itaweza kuamua na kuagiza Vijiji/kijiji chochote kilichomo katika mamlaka yake kutengeneza kingamoto iwapo eneo lake linaonekana kuleta hatari ya wazi ya moto.
- e. Afisa Mtendaji wa Serikali ya Kijiji au Afisa Muidhiniwa, kwa wakati wowote ule atakapona moto umechomwa ovyo, ataamuru wakazi wote wa kijiji kwenda kuuzima au kuuzuia.
- f. Serikali ya kijiji chochote itawajibika kusimamia kikamilifu sheria ndogo hizi za uzuiaji wa uharibifu wa Misitu.

**WAJIBU 7.
WA KUTOA
TAARIFA YA
MOTO**

Mtu yeyote kijijini/Mjini atakayeona moto umechomwa haraka atapaswa kutoa taarifa ya moto huo kwa Afisa Muidhiniwa au wa Serikali ya Kijiji/Mji. (Kengele/ngolo Mlio maalum collection people)

**WAJIBU WA 8.
KUZUIA MOTO
USIENEE OVYO:**

(i) Kila mtu anayechoma moto ulioruhusiwa ataangalia kuwa moto huo hauenei na kusababisha kutekeleza eneo lisiloruhusiwa kuchomwa au kuteketeza mali za watu wengine.

(ii) Siku ya kwenda kuchoma moto kwa mtu aliyepewa kibali itabidi serikali ya kijiji impatie watu wasiopungua watano kwa ajili ya tahadhari endapo moto utawatoroka na kuingie sehemu isiyoruhusiwa.

- Eneo kinga moto-10 m wide
- Siku upepo mkali

**MUDA WA
KUCHOMA
MOTO:**

(iii) Muda wa kuchoma moto ulioruhusiwa baada ya kutekeleza masharti yote yaliyowekwa ni kama ifuatavyo:-
Kwa asubuhi ni kuanzia saa 1.00 hadi saa 4.00 na kwa jioni ni kuanzia saa 11.00. Unaendelea kukesha (wengine hawataki muda huu)

- UWEZO WA KUTOA AMRI AU KUZUIA:
9. Halmashauri inaweza kuamuru mtu yeyote aondoke katika sehemu yoyote ile, kama vile katika sehemu za Milima, miinuko, vyanzo vya maji n.k. ambayo Halmashauri inaridhika kwa ushauri wa Afisa Maliasili kuwa inastahili kuhifadhiwa na kutunza.
10. Halmashauri inaweza kuweka alama za mipaka au kuagiza alama hizo ziwekwe ili kutengeneza sehemu zinazostahili kutunzwa na kuendelezwa na itakuwa wajibu wa vijiji, na watu binafsi walio karibu na mipaka hiyo kushiriki kuzitunza. Na ni makosa kwa mtu yeyote kuondoa au kusogeza au kuharibu alama zinazoonyesha mipaka hiyo.
- UKAGUZI 11.(a) Afisa Muidhiniwa kwa wakati wowote unaofaa, kwa madhumuni ya masharti ya sheria ndogo hizi ataweza kuamuru mtu yeyote wa kijiji kulima au kutengeneza kingamoto, kwa madhumuni ya kuzuia uchomaji moto ovyo katika eneo la kijiji hicho.
- (a) Afisa Maliasili au Afisa Muidhiniwa, anaweza katika wakati wowote kuingia katika misitu isiyohifadhiwa na kumkamata mtu ambaye anakata miti au kufyeka, au kuchoma mkaa aonyeshe kibali cha maandishi kinachothibitisha kuwa ameruhusiwa kufanya hivyo.
- WAJIBU WA (c) KUHIFADHI NAKUBORESHA MAZINGIRA NA MANDHARI YA MAENEO YA MAKAZI YALI YOPIMWA.
- Kila mtu ambaye atakuwa amepewa kiwanja kilichopimwa katika eneo lolote lile chini ya Mamlaka ya Halmashauri ya Wilaya Mufindi atalazimika kupanda miti ya matunda, kivuli au mapambo Afisa Maliasili.
- KUTANGAZA KWA MAAZI MIO YA HALMASHAURI:
12. Jambo lolote ambalo laweza kuzingatiwa na Halmashauri chini ya Sheria ndogo hizi litatangazwa kwa namna ambayo kwa maoni ya Halmashauri itahakikisha kwamba yale yaliyomo kwenye agizo hilo, yanafaa wale wananchi ambao wamehusika au wanaelekea kuhusika nalo.
- ADHABU: 13 (i) Mtu yeyote atakayevunja au kushindwa kutimiza/kufuata maagizo yoyote kati ya masharti ya sheria ndogo hizi, atakuwa ametenda kosa au hatia yake ikithibitika atapaswa kutozwa faini isiyopungua shilingi elfu tano au isiyozidi shilingi elfu kumi au kufungwa gerezani kwa muda usiozidi miaka miwili au adhabu zote mbili faini na kifungo.

- b. Licha ya faini aliyotozwa, Mhalifu anaweza kuamuliwa na Mahakama kufidia mazao ya misitu yaliyoharibiwa na kitendo alichofanya mhalifu.

Mhuri wa Halmashauri ya Wilaya ya Mufindi ulibandikwa chini ya Sheria ndogo hizi kwa azimio lililopitishwa kwenye mkutano wa Halmashauri hii uliofanyika tarehe 28/6/1996 na mhuri ulibandikwa hivyo mbele ya:

(T.M. MGODA

.....
MWENYEKITI WA H.WILAYA MUFINDI

(W.H. KIPIGAPASI)

.....
MKURUGENZI MTENDAJI WA WILAYA
MUFINDI

NIMEKUBALI

(MUSSA S.K. NKANGAA)

DODOMA
TAREHE:

.....
WAZIRI WA NCHI, TAWALA ZA MIKOA NA SERIKALI ZA MITAA
6.2.1997