Ministry of Forestry and Wildlife

Analysis of drivers and underlying causes of forest cover change in the various forest types of Kenya

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EXECUTIVE SUMMARY

The objective of the study reported here was to identify the nature and extent of major drivers and underlying causes of cover change; mainly deforestation and forest degradation in the various eco-regions Kenya. To do that, the study used different methods of data and information gathering which were both of a primary and secondary nature. The primary sources included four consultative workshops in which stakeholders from selected forestry regions or conservancies were given opportunities to give information and their insights on the historical and current drivers of deforestation and forest degradation, in addition to situations where forest cover has been stable or increasing. The workshops were complimented by both expert and contact group interviews during the visits. Secondary sources included literature reviews, and analysis of existing socio-economic data such as those on population dynamics, area under agriculture and even prices of commercial agricultural commodities. In addition, the study undertook geo-spatial analyses and change modeling on particular forest ecosystems of interest; Mau, Mt Elgon, Marsabit, Aberdares and Taita Hills.

The results of the regional workshops showed that agricultural expansion and harvesting or extraction of wood for charcoal, fire wood were the most dominant direct drivers of forest cover loss in Kenya. At present, extraction of wood for charcoal and firewood are pre-dominant, particularly in the arid and semi-arid woodlands. What was interesting is that despite regions sharing the same direct driver of deforestation and forest degradation, the underlying ones tended to differ from region to region

At the coast, human encroachment on to forest lands and wood harvesting for energy are today the main drivers. The key underlying factors are both increasing human populations in Mombasa and the fact that a majority of households still rely on firewood and charcoal for their energy needs, since they cannot afford gas and electricity. Surprisingly enough, there is also demand from industries such as those manufacturing soap and vegetable oils and salt mines, which consume significant amounts of firewood on a monthly basis. The main source of wood energy is Kwale District, which is already being targeted for a programme on sustainable charcoal production. Mining is also a major issue as it will create conditions for the establishment of settlements through employment and infra-structure in addition to the direct effects of mining sites. In the Tana Delta, commercial agriculture for white sugar and other bio-fuel crops will claim more forest land, and also threaten fragile and ecologically important riverine and delta ecosystems.

In Ewaso North Conservancy, the dry woodlands are subjected to grazing pressure and despite its relatively lower population densities than the neighbouring counties in Meru, it is the main supplier of wood energy, which is predominantly in the form of charcoal. In towns such as Isiolo and Meru and in which charcoal and fuelwood remain the preferred source of domestic energy fueling demand, the price of charcoal which has also shot up from Sh 500 to Sh. 1200-1500. Charcoal prices was singled out as a major underlying cause of deforestation, since it has lured, according to observers, an unprecedented number of charcoal producers, than was known before.

In the Mau and North Rift Conservancies agricultural expansion represented by both subsistence and commercial agriculture has been the key driver. In this regard tea and wheat growing have claimed a lot of forest land; a situation which was abetted by an unwritten policy of the government prior to 2002 to excise or de-proclaim over 50,000 ha from the Mau Forest Area alone. Demand for tea in international markets and governance were the main underlying causes. In the North Rift, agricultural expansion by both subsistence and commercial maize farmers remain the key drivers, while in Nyanza and Western increasing population densities put pressure on forest land and the associated demand for wood energy for domestic use and also for fish smoking particularly around the lake, cause both degradation and deforestation.

The geo-spatial analysis of the five case study areas show scenarios of further forest cover losses over the next 3 decades, should the government not put in place mitigation measures under REDD+ or in its National Forest Programme. Because of their visual effects, the change models have a high potential for policy advocacy, at both central and devolved levels of governments. Without stricter management measures, the Aberdares, Mau Complex, Marsabit are at great risk of further cover losses. In the Mt Elgon areas, predicted increases in forest cover can be reversed if security improves and farming communities resume their full production. Furthermore, the 'potential for transition' or vulnerability maps do show areas at greater risk for forest cover loss than others and can be used in the design of actions to mitigate cover loss.

The report concludes with a number of proposed mitigation measures and strategies which could be used to build a national REDD+ Strategy. In summary Kenya should consider the following issues for purposes of mitigation:

- In the late and post transition phases, woodfuel extraction becomes a dominant driver; an issue which requires requisite policies on both energy and forest management perspectives
- Kenya among other East African countries seems poised to be an Oil and Gas producing country; a development which a future REDD+ Programme could use
- Affordable Energy for Industry – particularly at the Coast requires a comprehensive policy on affordable energy for Kenya; a development that is likely to have a huge national impact
- Era of sustainable charcoal as Kenya's embraces REDD+ as a strategy should be key component among the suite of strategies
- Afforestation and restoration of degraded forests fits into the REDD+ agenda
- On-farm forestry where large scale afforestation is not possible is another
- Recognition and promotion of local NR institutions - Shrines in Marsabit, Loita Hills in Masailand
- Interest from Community Forestry Associations (CFAs) and NGOs in Forest Management
- The country's enthusiasm for REDD+ requires Pilot Projects to created opportunities for learning

In mitigation, a future national REDD+ will need take cognizance of region specific issues. In Nyanza-Western for example the following are important

- farm forestry prospects under REDD+ are a possibility to increase wood cover on farms

- sustainable charcoal and firewood production is required in the domestic and fish smoking
- Fuel efficiency initiatives – Programmatic CDM –is possible
- Agricultural intensification – fertilizer inputs, greenhouses, biogas, zero-grazing – is necessary to handle increasing populations but with limited areas for expansion

At the Coast the key issues are

- Sustainable woodland management – REDD+
- Sustainable charcoal and fuel efficiency – Programmatic CDM – concentrating in Kwale District
- Energy pricing policies – nationwide
- Energy efficiency in industry – gas switch - CDM
- On-farm forestry – private – REDD+ - given the high demand of wood products and land availability
- PES – Manufacturing / Tourism Industries – industrial consumers should be incentivized to consume wood energy from sustainable sources to have a market led mitigation
- Afforestation / Rehabilitation – REDD+ and CDM – is highly possible at the cost

Ewaso North –

- Woodland management – focus on the dry woodlands to improve sustainable supplies.
- Sustainable charcoal
- Recognition of Sacred Forests Shrines

With consideration for the above, a set of issues from which strategy options have been derived and presented in Table 7 are. The issues and the strategy options should form the basis for a comprehensive REDD+ Strategy for Kenya. The issues listed herein are briefly described in the main document in section 8.5.

Issue 1: Governance Framework and Structures for REDD+

Issue 2. Capacitation and collaborative agreements with County Governments

Issue 3. Programme for the rehabilitation and protection of Kenya's Water Towers through REDD+.

Issue 4. Afforestation and reforestation programme to create and enhance carbon stocks under REDD+

Issue 5. Farm forestry programme for the voluntary carbon markets

Issue 7. Management protocols for dry woodlands

Issue8. Agricultural Intensification

Issue 9 Policy support to the National REDD+ Programme

1. INTRODUCTION: BACKGROUND TO THE STUDY AND CURRENT STATUS OF FORESTS IN KENYA

1.1. BACKGROUND OF THE STUDY

Kenya decided in 2010 to join the global initiative spearheaded by the World Bank's Forest Carbon Partnership Fund (FCPF)to reduce emissions of carbon from deforestation and forest degradation and the role of conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+). This study on drivers of forest cover change aims to describe in more detail, the direct and underlying causes of deforestation and forest degradation in Kenya and to reveal, if any, differences among drivers operating in the various parts of the country.

In order to appreciate the magnitude of the proposed exercise to analyze and describe the drivers of deforestation and forest degradation in Kenya in the context of a national REDD+ Programme, one needs to note that over 80% of Kenya's land area is either arid or semi-arid (*ASALs*) with relatively low human population densities, as opposed to the wetter and more arable 20% of the remaining land area, in which over 70% of the population lives. It is also instructive that on the 20% of arable land are major water catchment areas known as '*water towers'* which have been under pressure from forces of land based production, which have affected their extent, integrity and ecological functioning. It is therefore not an entirely surprising statistic that about 12 % of the land areas which was originally covered by closed canopy forests has been reduced to a mere 1.7% of its original size, thanks to population pressure for settlements, infra-structure, demand for wood products and conversion to agriculture (GOK 2010). The bulk of the remaining closed canopy forest areas are either Forest Reserves managed by the Kenya Forest Service (KFS), or National Parks managed by Kenya Wildlife Service (KWS). There are also forests on trust lands which will fall under County Governments in Kenya's new political dispensation.

1.2. KENYA'S FOREST RESOURCES

The natural woody vegetation cover of Kenya can be broadly classified, mainly on the basis of average height and crown cover as, *indigenous closed canopy forests, mangroves, open woodlands, plantations, bush lands* and *trees on farms*. The relative sizes of these various vegetation cover types are tabulated in Table 1.

Table 1: Areas of forest in Kenya and rate of change since 1990. Source: FAO Forest Resource Assessment 2010. Country Report for Kenya.

Category of forest resource (using FAO definitions)[1]	Area ('000 Ha)				Annual change 1990 to 2010 ('000 Ha)
	1990	2000	2005	2010	
Indigenous closed Canopy Forest	1240	1,190	1,165	1,140	-5
Indigenous Mangroves	80	80	80	80	0
Open woodlands	2,150	2,100	2,075	2,050	-5
Public Plantation Forests	170	134	119	107	-3.15
Private Plantation forests	68	78	83	90	+1.1
Sub-total Forest land (total of above categories)	*3,708*	*3,582*	*2,357*	*3,467*	*-12.05*
Bush-land	24,800	24,635	24,570	24,510	-14.5
Farms with Trees	9,420	10,020	10,320	10,385	+48.25
Total Area of Kenya	58,037	58,037	58,037	58,037	0

Over the past three decades, large areas of forest reserves have been officially "de-gazetted" and in addition, unofficially converted to other uses, mainly agriculture, and the remaining protected indigenous forests managed by KFS and KWS have been degraded by decades of logging, both legal and illegal, of valuable timber trees resulting in reduced carbon stocks and degraded biodiversity values. Forests on community trust lands under the control of local authorities continue to be degraded and destroyed through over-exploitation for timber, poles, charcoal and fuel wood, and

[1] FAO definitions used in Table 1:

Indigenous Forests: A group of trees whose crowns are largely contiguous and include the ecosystem that makes it up and a tree canopy cover of over 10% and the canopy is essentially of indigenous tree species growing under natural conditions and excludes planted indigenous plantation forests. The forest is delineated through legal gazetment. The area includes Mangroves and bamboo ecosystems.

Plantation forests: All areas of systematically planted, man-managed tree resource composed of primarily exotic species. Categories include both young and mature plantations that have been established for commercial timber production. It includes clear felled areas within plantations and excludes all plantations of non-timber such as tea and coffee. It includes associated land cover/use such as roads, fire-breaks and building infrastructure if they are too small to be clearly mapped off the satellite imagery.

Open woodlands: Land classified as forest with trees higher than 5 metres and canopy cover of between 10% – 40 or trees able to reach these threshold in situ or with a combined cover of shrubs bushes and trees above 10%.

Bush lands: Communities typically composed of tall, woody self supporting single and multi-stemmed plants branching at or near ground with in most cases no clearly definable structure. Total canopy cover >10% with canopy height between 2-5M

Trees on farm: Trees found on privately owned farmlands

through unregulated grazing and clearance for agriculture; depicting what Hardin (1968)calls the "tragedy of the commons".In addition and paradoxically even the area of publicly owned plantations, which has been the backbone of Kenya's once thriving wood based industry, has progressively reduced from 150,000 ha in the early 1990s to 107,000 by 2011(GOK 2010) and so have large swathes and pockets of natural forests.Contrary to this, tree cover in farms either as isolated groves of woodlots has increased. On private plantations mainly owned by tea estates and companies such as Kakuzi there have been marginal increases in planted aggregate area.

Kenya's decision to join the REDD+ process is, among other things, an opportunity to use an international process to achieve its own objectives to mitigate losses of forest cover and increase forest cover as now enshrined in its constitution. In doing that, a REDD+ Programme will need to consider the past problems as well as current governance frameworks provided by both national and international institutional arrangements. Some of these that are relevant to forest governance include Vision 2030, The National Climate Change Response strategy, the Arid and Semi-arid Lands Policy, the Livestock Development Policy. In addition, international ones such as the United Nations Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species of Fauna and Flora (CITES), United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD) are relevant, particularly in the context of REDD+. Also, the Land policy and the Constitutionof 2010 have impacted Kenya's forest sector

1.3. THE DRIVERS OF DEFORESTATION AND FOREST DEGRADATION – DIRECT AND UNDERLYING CAUSES OF DEFORESTATION AND DEGRADATION

Kenya's rural population is concentrated in what are termed 'high' and 'medium-potential' agro-ecological zonesin which rainfall levels are adequate to support agriculture. Predictably, these are also the places in which closed canopy forests, and the water towers arelocated. In the same agro-ecological zones, population growth rates over the last 4 decades have been phenomenal and during the 70's and even early 80's, Kenya had one of the highest populationgrowth rates in the world.The high population growth rate has interacted with other underlying drivers and the manifestation of that has taken the form of agricultural expansion,which is considered a major driver of forest cover loss in Kenya.Based on earlier discussions at the national level, the principal drivers (Government of Kenya 2010)were summarized in order of importance as clearance for agriculture; linked to rural poverty and rapid population growth, unsustainable utilization (including timber harvesting, charcoal

production, grazing in forests), and past governance and institutional failures in the forest sector (Table 2). However, there was need to seek the views and opinions from various parts of the country and have a closer look at the possible underlying causes or drivers.

Table 2. Drivers of deforestation and forest degradation (Source: Kenya R-PP Document 2010)

DRIVER CATEGORY	DIRECT DRIVERS	INDIRECT DRIVERS
Governance drivers	De-gazetting forest lands (Note this was an important driver of deforestation in the past although it is now addressed through the Forest Act 2005)	Poor governance, including weak institutions, corruption, illegal logging, weak law enforcement. Weak community participation in forest management Inadequate benefit sharing from forest resources (including revenue sharing) Local authorities do not value their forests Communal land systems - lack of private ownership of the resources/land Unclear tenure and access to forest resources (e.g. Local Authority forests)
Policy drivers	Allowing grazing in forest reserves during droughts causes degradation Banning Taungya system has slowed reforestation Bad administration of the Taungya system	Agricultural policies urging farmers to produce more cash crops for export The focus on gazetted forests has led to reduced attention on dry land woodlands and other types of forests including coast and riparian forests Harvesting ban in plantation fores
Other drivers		Inadequate of integration of the forest sector into the economy and national accounting
Economic drivers	Poverty (broad issue - focus on livelihoods) Reliance on charcoal fuel / Unsustainable charcoal production/large urban market for charcoal fuel Conversion of trustland woodland to agricultural use for large-scale commercial production of bio fuel crops or other agricultural crops Population pressures causing clearing (Competing land uses), including agricultural expansion Conversion of coastal forest to other uses	High prices for agricultural products. Subsidies/Incentives- tax exemption for fertilizers, for farming tractors Fixing timber prices at too low levels
Technology Drivers	Lack of knowledge and use of appropriate technology in tree growing, and nurseries production Lack of knowledge by the population about impacts of deforestation. Lack of knowledge on tree planting and lack of access to information (ref. Uganda success in tree planting partly due to provision of good extension information) Improved saw milling technology	Lack of security of supply of timber to the sawmilling industry (low investment in timber processing technology, poor timber conversion ratios)
Cultural drivers	Fires used in land clearing, inadequate capacity to manage fires Wildlife damage (elephants and other) Droughts	The cultural urge to own land

1.4. THE CHALLENGES IN UNDERSTANDING DRIVERS OF FOREST COVER CHANGE

The identification, analysis and description of drivers, is a critical element in any national REDD+ strategy, but it has its own challenges and opportunities. A few of those are explained below:

- Some of the greatest drivers of change are from outside the forest sector and there is no tradition of monitoring them or discussing them in the past, hence new skills are needed to do that
- The identification of underlying causes is one thing, estimating their likely effects is yet another challenge for which there is no standard approach. Ideally this study should have attempted to quantify the effects of the identified drivers but, there was neither the budget nor the time to accomplish that in the allotted time
- The drivers of deforestation and forest degradation tend to vary in type and magnitude from one forest area to another within a givencountry or even within a county, so any general statement on drivers may not be advisable because of the geographical variations. The same argument justifies the view that countries while setting national reference levels, could consider setting sub-national ones, as well to take into account geographical differences within any particular country
- It is difficult but necessary to attempt to build an outlook on how the 'new political dispensation' occasioned by the new constitution will affect the forest sector
- Building of scenarios of forest cover change will require skills in modeling based on anticipated social, political and economic factors obtaining in Kenya, including external factors

1.5. STUDY OBJECTIVES

The purpose of this study, as derived from the detailed Terms of Reference, is to identify the drivers of deforestation and forest degradation in Kenya. The objectives of this study were:

a) To make a detailed and spatially explicit analysis of the drivers of deforestation in Kenya through a methodology that will identify direct and indirect causes of deforestation and lead to the identification and definition of the underlying drivers of deforestation in Kenya;

b) To estimate the strength and importance of each driver;

c) Model cover change of selected forested landscapes to show what could happen if the necessary mitigation actions are not put into place

d) To collect and document data and information on forest resource use as contained in items 3.1 to 3.3 in the Terms of Reference and also the other multiple of co-benefits from the forest sector.

These are expected to contribute towards the REDD+ readiness process in terms of:

a) Formulation of the REDD+ strategy for the country;
b) The trends generated from the study will be a vital input into the setting reference and reference emission levels for the Kenya REDD+ Programme
c) Will provide a solid foundation for describing and defining what safeguards in the context of Kenya could be and the likely challenges thereof
d) Will give guidance on where MRV efforts should be concentrated such as areas of 'high risk' for deforestation, loss of biological diversity and others.

1.6. OUTPUTS

At the end of the study the following will be the outputs:

i. A detailed and spatially explicit analysis of the drivers of deforestation identifying direct/indirect causes, and proximate/underline drivers of deforestation in Kenya. A historical spatial assessment of the drivers of deforestation over the last 20 years from land use/ forest cover maps

ii. Reports on selected forest areas in Kenya illustrating how forest cover has changed and the key drivers that have underpinned such change and expected future trends in cover change

iii. A set of proposed strategy options to mitigate the current and expected drivers of forest cover change in Kenya including their justification, including geographical variations in the application of strategy options

1.7 LIMITATIONS OF THE STUDY

This study was designed to seek expert opinions, experiences and insights of a variety of stakeholders in the forest and related sectors to identify the direct and underlying or indirect drivers of forest cover change in Kenya. In doing so, differences in the among the geographical regions of Kenya in how the drivers of change have manifested themselves and the obvious and subtle differences between the underlying drivers or causes were to also to be identified and described. However the 3-month duration of the study and its design did not include the quantification of the effects of each driver, direct or underlying in each geographical area. What was possible was a non-parametric ranking of drivers within a region, largely based on expert opinions rather than hard data which is not collected. Despite this limitation that fact that cover change modelling has provided spatial information of transition potential; essentially areas of high vulnerability to change is useful in future design of localized REDD+ Programmes and Projects

In the original technical proposal presented by the authors, one of the objectives was to derive statistical or mathematical relationships (multiple regression models) between selected socio-economic variables and the observed rates of forest cover change, with the possibility of developing simple predictive models. Since the data on the three epochs amounted to just three data points with 10 year intervals, it was not possible to conduct regression analysis without more data points, as that would compromise precision and also grossly violate the assumptions underlying regressions. This is also another limitation of the study and in a future REDD+ or sustainable forest management (SFM) programme, collection of data at short time intervals, of between three to five years will in the future enable the construction of more robust models for change prediction.

Another limitation is that the study tended to concentrate on mountain forests which are also water towers and much less in the dry woodlands. However parts of the coastal hinterland and Isiolo, both of which supply wood fuels to neighbouring urban communities provided useful insights into the issues associated with the dry woodlands. In addition, the inclusion of Marsabit as a case study area, though it is a semi-montane forest formation sitting with a dry woodland dominated surrounding, nonetheless provided information on the effects of grazing on the dry woodlands.

2. PROCESSES OF FOREST COVER CHANGE: ALITERATURE REVIEW

2.1. INTRODUCTION AND DEFINITIONS OF DEFORESTATION AND FOREST DEGRADATION

The forest sectors of virtually all developed and developing countries have been analyzed and debated upon in discourses focused on both economic and environmental management grounds. This is because of the recognized 'values' of forested or tree dominated landscapes, which in developing countries have been largely viewed from their contributions to economic development and provision of livelihood support, poverty reduction and elimination (Sunderlin et al, 2004), alongside the environmental management aspects associated with forest ecosystems. In all these, an issue that national programmes chronically face is the continuous loss of forest cover through processes that have been described as deforestation and forest degradation. These processes represent chronic challenges to countries, the majority of which subscribe or claim to subscribe to the principles of sustainable forest management (SFM).

Kenya which historically has had a viable industrial plantation-based forest sector, in addition to gazetted reservesof natural forests has over the last 3 decades experienced unprecedented losses of forest cover through a number of mechanisms which have led to both deforestation and forest degradation (GOK 2010). In this section, working definitions of deforestation and forest degradation are provided, as are forces that drive them, also referred to as drivers.For purposes of definition, deforestation refers to the destruction of forest cover and the conversion of forests into other land uses (Wunder 2002), whereas forest degradation describes processes which do not convert forest lands to non-forest uses but reduce the quality or impair the functioning of forest ecosystems by interfering with structure, spatial distribution, crown cover, diversity and related attributes. In the current literature, the drivers of deforestation and forest degradation can be direct

or proximate, while others are either indirect or underlying (Geist and Lambin 2002, Angelsen and Kaimowitz 1999, Wunder 2002).

2.2. DEFORESTATION PROCESSES IN AFRICA WITH PARTICULAR REFERENCE TO KENYA

While deforestation and forest degradation processes in Kenya can be understood within the socio-economic and political changes in Kenya prior to and after its political independence until now, it is important to appreciate and analyse Kenya's situation within an Africa wide context. This is because deforestation has become a global issue stemming from global Climate Change discussions which led to the Bali Action Plan, which recognized the potential and valuable contribution of the forest sector in climate change mitigation, as was also the realization that the enhancement and maintenance of forest carbon is an economically feasible option toward climate change mitigation (Stern 2007).In this same context, it is noteworthy that Africa contains 14% of the global population, and contributes roughly that proportion to global soil and biomass carbon stocks. By contrast, the continent emits only 3% of global fossil fuel carbon (Williams et al 2007), and 5.3% of the global greenhouse gases from all non-land use sectors (UNFCCC 2005, 2008).
Africa's legacy of historic carbon emissions from deforestation before 1990 amounts to merely 10% of the global total (Houghton, R.A, 2003).However, current land use emissions of carbon and other Greenhouse Gases (GHG) as a contribution to the global total are over-proportionally high. Land-use emissions also dominate the continents own GHG emissions. Africa lost more forest area during the period 1990-2005 than any other continent. Compared to Africa's share of people and land area, the continent's GHG fluxes from deforestation and its pyrogenic emissions of trace gases, aerosols and black carbon from forests and savannas add over-proportionally to the continent's own and to global emissions. Investments in conserving and managing Africa's forests sustainably, adequately managing fires, and tackling proximate and underlying causes in adjacent sectors, particularly agriculture, energy and infrastructure, promise to contribute preeminently to curbing Global Climate Change.

In the above Africa context, Kenya among other countries in East Africa, has experienced significant losses in forest cover, particularly over the last two decades. The main reasons included agricultural expansion and a rapidly growing population. In addition,poor governance of the forest sector which saw the excision by the government, of 67,000 ha of forest land was the single most important driver which affected gazetted forest areas, most of which were in critical water catchment areas such as, Mau, Mt Elgon and Mt Kenya. Vast areas of forests were also being cleared for new settlements and through illegal logging as highlighted by Bussmann (1996) and Ochieng (2010). In the late 1980, 12,000 ha were cleared in South-Western Mau forest and 15,000 ha in South Nandi forests for settlements. Eventually, South-west Mau was reduced from 84,000 to about 60,000 ha, while over 15,000 ha of Maasai Mau have since been converted into illegal settlements.

Bussman (1996) further noted that in 1993 and early 1994, forest and plantation areas were extensively burned following a series of presidential decrees, which permitted settlers who were evicted following the abolition of the 'shamba'system in 1987, and new squatters to move into the

forest and slash and burn and finally cultivate the cleared forests. Kinyanjui (2009, 2012) observed that between the 1990s and early 2000, sections of the Mau forest were excised to settle forest dwelling communities with the aim of conserving the remnant forests (Kinyanjui, 2009). He notes that East Mau was reduced from 65,000 to 25,000 ha (see also Ochieng 2010). The massive excisions that Kenya has experienced is a study on how governance, or its absence; and basically land grabbing motivated by commercial agricultural interests, packaged with a populist policy to resettle the rural poor can destroy a once proud and economically performing forest sector. Even worse, the period during which those injudicious excisions took place also coincided with a period of under-funding of the Forest Service and associated failures of regeneration of plantations after harvesting; resulting in serious planting backlogs that the current Forest Service is trying to address.In the Mt. Kenya forest areas, large-scale selective logging of *O. usambarensis* and cultivation of *marijuana* was a major cause of degradation of the wet camphor forests (Bussmann, 1996). Dry *Juniperus procera* forests were logged and were endangered more by formation of new settlement schemes. Exploitation of forests for charcoal was and still remains a major cause of degradation in the area since the 1970s. During this period Kenya used to export about 58000 tons of charcoal to the Middle East every year. In addition illegal logging and cases of overharvesting have degraded natural forests and in a number of cases led to deforestation and encroachment. In the Mt. Kenya forest area, some plantations of *C. lusitanica* and *P. radiata* were opened up for cultivation after clearing in early 1993 through a presidential decree (Bussmann, 1996).

Weak institutional capacity and poor enforcement of forest laws have also been identified as major drivers of forest cover change in Kenya (Ochieng 2010). Bussmann (1996) assessed the institutional capacity of the local Mt. Kenya forest office to discharge its duties. He noted that there were over 40 sawmills operating in the Mount Kenya area in 1991 and that these saw mills were equipped with high-tech logging and sawing equipment. The author observes that in contrast, none of the forest stations had an adequate number of lorries, 4 by 4 trucks and tractors to support forest operations. He noted that Chogoria Forest Station had no vehicle at all, Castle Station only one tractor, while Chehe and Ragati Forest Stations shared a single old land rover, but could not afford petrol. License fee for extracting timber remains as they were in the 1970s. At the same time, fines for illegal logging and other activities are incredibly low making the timber trade more attractive as it yields very high returns

Despite what reads like a sad story of forest destruction, Kenya also has cases where some forest blocks have been protected through traditional means which have allowed for their conservative use. The Kayas of the Coastal Region which are sacred forests are good examples even though they are relatively small. Reports from, Samburu and Marsabit Counties indicate that they have such forests, should attract scholars so that they can be mapped and described, with a view to their official recognition and promotion for eco-tourism. The case of Loita Hills in southern Kenya and its conservation by traditional Maasai methods is definitely noteworthy and well-described in a recent study by Ole Riamit (2010). Rising to an altitude of 2600 m above sea-level, it covers an area of approximately 33,000 hectares and the dominant tree species are *Juniperus procera* (cedar), *Podocarpus falcatus*, *Warbugia ugandensis* and *Olea Africana* and others, in effect a dry afro-montane vegetation

typical of many other mountains in Kenya, such as Mt Marsabit and Mt Kulal. The forest has a number of open glades that are valuable grazing grounds for the Maasai.

In their study Buyinza et al.(2010) observed that, despite various forest types occurring in East Africa, Kenya, Uganda and Tanzania share economic, geographic, political and socio-economic traits. Buyinza et al.(2010) have furthermore made the observation that the underlying driversof deforestation and forest degradation are complex and often lie outside the forest sector, and in general the key drivers are i) policies – excisions, settlement, agricultural policies ii) agricultural expansion iii) harvesting of firewood and poles (mangroves, dry woodlands), iv) over emphasis on government forest estates rather than a wider participation by non-government players v) policy conflicts and low capacity to monitor.It is also interesting that the authors conclude that local drivers have heavier effects than global ones such as Climate Change, and the increasing recognition for supply and payment of environmental services (PES). However, when the global drivers interact with local ones they bring about new challenges which tend to require innovative approaches for mitigation than most government forest management agencies are used to; a point that any national REDD+ should be mindful about.

2.3. THE CONCEPT OF FOREST TRANSITION IN COUNTRIES

In describing how forest cover changes through the developmental phases of a country the concept of forest transition is a useful way of depicting such changes. In that regard, the forest transition (FT) model describes the overall human induced changes of forest cover over time and basically presents the combined effect of various drivers of on a national scale. The concept was proposed and articulated by Mather (1992) and later expounded by Rudel (2005) and Kauppi et al 2006. The model basically shows the transition in which, a country with, say 40% forest cover, goes through phases of decreasing forest cover through human activity till a period of maximum decrease, before a country realizes that it can no longer afford to lose more forest cover and at which time, it begins to stop further net loss of forest cover and put in policies and measures to increase forest cover. Graphically, the trajectory is described at the national level by an inverse J-shaped curve over time as illustrated in Figure 1.

Furthermore the entire inverse J-shaped curve can be broken into four phases namely; pre-transition, early-transition, late-transition and post-transition phases as illustrated. These phases generally represent a time sequence of national development (Honosuma et al, 2012).In an assessment of D & D drivers in developing countries (Honosuma et al, 2012) drew some general conclusions based on descriptions and data from readiness preparation proposals (R-PPs) from 46 non-Annex I Countries, in which Kenya was included. In general, their assessment suggested that deforestation drivers are similar for Africa & Asia, but for forest degradation, drivers were more similar between Asia and Latin America and the Caribbean. In most cases, commercial agriculture was the most prevalent driver, in 40% of countries and tends to feature most strongly in the early

transition phase, followed by local subsistence agriculture which accounted for 33 % of deforestation. In Africa in particular, – subsistence Agriculture remains the dominant driver but the effect of commercial agriculture likely to increase in 'early transition' countries such Angola, DRC, Zambia, Mozambique. With respect to forest degradation, logging accounts for 52%, fuel wood and charcoal 31%, fire 9% and livestock grazing 7%. The Forest Service of Kenya can use its position on the curve for purposes of policy advocacy for the forest sector in general and for REDD+ in particular. In summary, Honosuma et al, (2012) observed that the phases of transition are associated by drivers of varying significance as listed herein.

- Agricultural expansion dominates the early and transition phases
- Fuel wood and fires – become more dominant in late post transition phases
- Subsistence agriculture – fairly stable over all phases
- Urban expansion – largest in the post-transition phase

The general nature of the study notwithstanding, the study by Hosonuma et al, 2012, places Kenya in in the late transition phase in the generalized transition curve. It is worthwhile for Kenya to construct sub-national curves depicting where counties stand and use them to draw up county level forestry development programmes in attempts to increase forest cover and restore and increase the importance of the local forest based industry to Kenya's overall economy.

What was fascinating during sub-national consultations to produce this report, is that participants found the transitional model a useful way of depicting the status of forest cover change in their respective regions. Some even declared that they would use the model to describe their own local situations; an outcome that suggests that the model could be used successfully in policy advocacy and to seek resources to improve forest management. Consequently, future REDD+ initiatives should build on the interest that has so far been generated in the model.

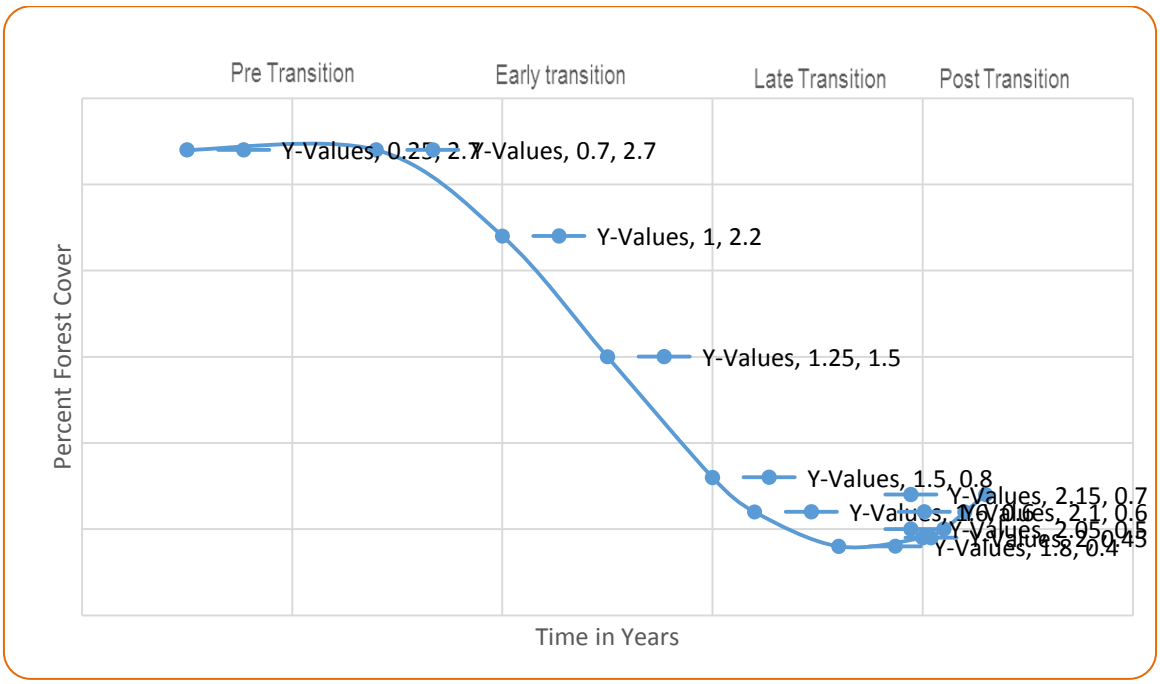


Figure 1 A generalized forest transition model showing four phases of cover change over time (Mather 1992, Hosonuma et al 2012)

3. STUDY APPROACH AND METHODOLOGY

The study was conducted using a two pronged approach: a desktop study on drivers of forest cover change and a series of regional consultative meetings to define and describe key drivers as perceived by practitioners and other stakeholders. The second was a spatial analyses of satellite data to estimate cover change over time and model cover change using a spatial model. These are described in greater detail in subsequent sections.

3.1. METHODS FOR COLLECTING SPATIAL DATA

3.1.1 NATIONAL AND SUB-NATIONAL CONSULTATIONS

A series of consultative workshops, staring with a national one and followed by five sub-national workshops were held in selected parts of Kenya. The results of the workshops are summarized in section 6 and case studies on forest cover change in selected forested areas. The workshops were facilitated and designed to elicit responses from experts, practitioners with knowledge of the particular parts of Kenya, on both the direct and underlying drivers of deforestation and forest degradation, as well as factors important for mitigation. The workshop results are in Annex (Section 11.1)

3.1.2 ANALYSIS OF SELECTED SOCIO-ECONOMIC SOCIO-ECONOMIC VARIABLES RELATED TO FOREST COVER CHANGE

This approach was meant to establish the weight of different causes of deforestation and degradation, using regression models, to relate a number of variables to cover change. However and despite the intention *to undertake a regression analysis of these socio-economic variables with observed cover changes, it was later found not possible because of lack of adequate geo-spatial data on forest cover change at short time intervals needed to meet the statistical assumptions for regression analyses.*Despite this drawback, the authors documented trends in a range of socio-economic variables as they relate to observed cover changes in the country, which are presented in section 4 of the report.

3.1.3GEO-DATA: SPATIAL-TEMPORAL ANALYSIS

Sources of geo-data: Satellite Images

The satellite data that were used in the spatial and temporal analysis came from the Kenya Forest Service, the Department of Remote Sensing and Resource Surveys and the Institute of Resource Assessment that had already undertaken forest cover assessment and estimated extent of forest cover and its changes over three epochs: 1990, 2000 and 2010. Other results of their work included; forest cover mapping for specific forest blocks such as the Mau, Aberdares, and Mt. Kenya over the

three epochs, and had produced information on the extent of forest losses between 1990 and 2000 and between 2000 and 2010. Since one of the objectives was to derive statistical or mathematical relationships (multiple regression models) between selected socio-economic variables and the observed rates of forest cover change. Since the data on the three epochs amounted to just three data points with 10 year intervals, it was not possible to conduct regression analysis without more data points. This study therefore selected the forest areas (Mt Marsabit, Taita Hills, Mau, Mt Elgon and Aberdares) already stated in the previous sections, acquired satellite data at 5 year intervals which yielded an additional set of data points.

For purposes of cover change modeling, again from the selected forest areas already stated, drivers of forest cover change which were revealed during regional consultations were weighted and used in spatial modeling.

3.1.4 Procedure for Spatial-Temporal Analysis

Basic data and methodology outline for spatial analysis

The mapping methodology entailed the following broad steps;

i. land cover mapping
ii. historical land cover change detection and
iii. future land cover change prediction

Land cover mapping was done for six (6) epochs (1985, 1990, 1995, 2000, 2005, and 2010) using Earth Observation (Remote Sensing) technology. High resolution (10 -30 m) satellite imagery were acquired as follows:

i. 30m resolution Landsat satellite imagery for 1985, 1990, 1995, 2000 and 2005 epochs
ii. 10m resolution ALOS AVNIR2 satellite imagery for 2010 epoch

The classification system used for mapping the land cover was based on the *2003Good Practice Guidance for Land Use, Land-Use Change and Forestry* (*GPG-LULUCF*) that was developed by the Intergovernmental Panel on Climate Change (IPCC) in response to the invitation by the United Nations Framework Convention on Climate Change (UNFCCC) to develop *good practice guidance* for land use, land-use change and forestry (LULUCF). The IPCC classification system entails the following six land cover categories: *Forestland*, *Cropland*, *Grassland*, *Wetland*, *Settlement*, and *Otherlands*.

On-screen, vector-based interpretation of the satellite imagery was done based on the 2010 imagery to create the 2010 land cover map which then was used as the base map. The 2010 land cover map

was subsequently overlaid and edited based on the imagery for 1985, 1990, 1995, 2000 and 2005 epochs to produce land cover maps for each epoch.

Historical land cover change detection

Historical land cover change detection was achieved by way of performing a union of attribute files of land cover shapefiles for two epochs to achieve one attribute file that contained two fields – one with entries of the earlier land cover type and the second with entries of the later land cover type. A reclassification operation was then performed to create another field showing the transitions (e,g from areas that changed from Forestland to Cropland).

The above operation was done for the following:

i. Five year land cover changes (1985 – 1990, 1990 – 1995, 1995 – 2000, 2000 – 2005, and 2005 – 2010)
ii. Ten year land cover changes (1985 – 1995, 1995 – 2005, 1990 – 2000, and 2000 – 2010)
iii. Fifteen year land cover changes (1985 – 2000, 1990 – 2005 and 1995 – 2010)
iv. Long term / 25 year land cover changes (1985 – 2010)

Future land cover change prediction

Future land cover change prediction was done based on long-term (25 years) changes. The change map generated from comparing the 1985 – 2010 epochs was used to model *Transition Potentials*. Modeling of transition potentials entails the following:

a. Grouping of land cover transitions into a set of sub-models so as to explore the potential power of explanatory variables. Variables can be added to the model either as static (express aspects of basic suitability for the land cover transition under consideration, and are unchanging over time) or dynamic (are time dependent drivers such as proximity to existing development or infrastructure and are recalculated over time during the course of a prediction).

b. Modeling each transition using the Multi-Layer Perceptron (MLP) neural network computation to results into a transition potential map for each transition – an expression of time-specific potential for change.

c. Running the hard and soft prediction model for land cover change prediction. The hard prediction model is based on a competitive land allocation model (similar to a multi-objective decision process) while the soft prediction yields a map of vulnerability to change for the selected set of transitions.

As highlighted already, five forested areas listed below were selected for analyses of historical cover changes as described above and also for prediction of change and generation of potential for transition or areas of likely vulnerability to change.

- Taita Hills representsa forest formation rising above the dry woodlands in the coastal region Kenya
- Mt Marsabit also representsa relatively high elevation 'water tower' in the middle of the dry woodlands in the northern rangeland region of Kenya
- The Aberdares, Mau Range and Mt Elgon forests represent the montane 'water-towers' in the Kenya Highlands, which have been under pressure of encroachment since Kenya's political independence in the 1960s

In each of these forest areas, drivers of deforestation; both direct and underlying, which had been identified during and before the consultations, were treated as factors of cover change and depending on each region, they were given various weights which were then used to generate projected cover changes in three 20-year epochs, assuming that current trends remain. For instance in the Mau Range, agricultural expansion was given more weight than extraction of wood and grazing, whereas in Marsabit, grazing and wood extraction had more weight than agricultural expansion.

4. ANALYSIS OF SELECTED SOCIO-ECONOMIC FACTORS AND THEIR POSSIBLE ASSOCIATION WITH FOREST COVER CHANGE IN KENYA

4.1 BACKGROUND AND INTRODUCTION

In the presence of data, it is possible to establish the weight of different causes of deforestation and degradation, the team examined changes in a number of socio-economic variables and related these to observed cover changes. While several drivers may be playing their roles in deforestation and forest degradation in Kenya, it seems that clearing for agriculture, urbanization, economic growth (GDP) and Poverty, exploitation for fuel wood, and socio/economic policies and governance challenges are the dominant causal factors. *Although the team intended to undertake a regression analysis of these socio-economic variables with observed cover changes, this was not possible to lack of adequate geo-spatial data on*

forest cover change. However, the team documented trends in a range of socio-economic variables as they relate to observed cover changes in the country.

Macro-economic context

The period between 1990 and 2002, was characterized by a controlled economy, limited trade liberalization, slow economic growth (GDP growth of less than 2%), forest excisions, deepening poverty, etc. On the other hand, the period between 2002 and 2012, was characterized by higher degrees of market liberalization, appreciable economic growth (GDP of an average of 5%), urban expansion, improved investment in infrastructure, changes in poverty levels, and increased investment in irrigation, provision of credit, etc. This separation helps us to identify potential factors or agents for deforestation through agricultural land expansion and as a result of changes in population, increased urbanization, economic growth and poverty levels over the two periods. It should be noted that while both regimes emphasized agricultural production, different approaches and incentives were employed, with possibly different results, especially in terms of rate of expansion of agricultural land.

Population and urbanization

Population is often used as a proxy for pressure on natural resources including forests (see Kant and Redantz, 1997). Sometimes preference is given to population density or growth (Kaimowitz and Angelsen, 1998). Growing human populations creates increasing demand for food, energy, shelter, etc., adding pressure on the local agents of deforestation. It is important to note that the human population impact on deforestation is indirect and manifests in expansion of agriculture, grazing pressure (livestock density), and increased fuel wood collection. However, the negative impact on forest cover can be felt when either the rural and urban population increases, or both. Increased rural population means more demand for agricultural and grazing land, resulting in clearance of virgin lands including forests. Increased urban population implies increased demand for food, shelter and fuel wood among other commodities, and can be associated with increased demand for agricultural land and subsistence products. The model will factor in population and urbanization. On urbanization, the model will examine the impact of changes in urban population and growth in urban areas on deforestation and degradation.

Poverty and income

Gross domestic product (GDP) can be used as a proxy for overall national economic growth and poverty. If per capita income (GDP) is used as a proxy of poverty, it can be hypothesized that it is inversely related to deforestation, i.e., the higher the per capita income the lower will be the rate of deforestation. Also as incomes grow, the demand for fuel wood is likely to decrease as preference for substitutes increases (Panayotou and Sungsuwan, 1994). However, Kaimowitz and Angelsen (1998) note that many deforestation models associate higher national per capita incomes in developing countries with greater deforestation.

However, the inverse relationship between GDP and deforestation may be distorted by the fact that increased per capita income may be more representative of economic growth in industry and the service sectors but with a skewed income distribution in the economy, which is a common phenomenon in many developing countries. In this case a high per capita income may still coexist with massive poverty and increasing deforestation. On the other hand the growth in industry and service sectors in itself may be good in that it creates employment opportunities in sectors other than agriculture, thereby reducing dependency on agriculture and natural forests. In this study, we will use both GDP and 'Hard Core' Poverty Rate as factors for deforestation. The model will examine how changes in GDP have affected deforestation and forest degradation in Kenya. The author hypothesizes, however, that while GDP has improved over time; implying low deforestation from the inverse relationship, this has been canceled by the increase in the number of people experiencing Food and Absolute Hard Core Poverty rates.

Socio-economic policies influencing expansion for agriculture

The socio-economic policies considered to have resulted in increased clearing for agriculture are those aimed at stimulating agricultural production through better producer prices (whether nominal or real), improving availability of credit and extension services to farmers, subsidies and facilitating marketing of agricultural produce. Indeed many studies have demonstrated the effect of certain economic policies on forest resources (Holden, 1997; Hyde et al., 1996; Kant and Redantz, 1997; Persson and Munasinghe, 1995; Reardon and Vosti, 1992). Policies such as liberalization of marketing of crops and distribution of agricultural inputs as well as improving extension services have the potential to influence agricultural production.

In Zimbabwe, for instance, only 2% of the communal area farmers received credit in 1980 (Amin and Chipika, 1989). Further, extension and marketing services were scarce and farmers generally lacked

adequate support services (Amin and Chipika, 1989). However, as Chipika and Kowero (no date) shows, the Zimbabwean government reversed this situation in 1980s. The government implemented a policy which improved marketing and distribution of maize inputs as well as provision of credit and extension services, with very encouraging results. According to Amin (1988) credit to communal farmers from the Agricultural Finance Corporation (AFC) increased by about 50 times in amount and 30 times in the number of loans between 1979/80 and 1985/86. Chipika and Kowero (no date) note that these policies resulted increased expansion of agricultural land and concluded that these policies greatly impacted forest cover in Zimbabwe.

Agricultural production

Increased population comes with the demand to increase food production, which essentially implies increasing agricultural production. Agricultural production can be increased through intensification and or intensification. In tropical countries like Kenya, intensive agriculture has been hindered by the presence of large numbers of small rural (peasant) farmers who are poor, farming small pieces of marginal lands, and have limited or no access to credit facilities and limited information on new high yielding crop varieties and agricultural technologies. Extensive agriculture, usually encroaching into natural forest and pasture lands, remains the main option of survival for this large portion of the population. Area under cultivation can be used as a good proxy for impact of agricultural expansion on forest cover since it excludes improvements in agricultural output due to intensification using modern inputs which are largely beyond the means of many poor rural farmers. While the relationship between agricultural productivity and the demand for agricultural land is not clear, increased agricultural productivity may mean that less land is required to meet the basic food requirements of peasant households. However, increased agricultural productivity may also result in greater demand for land on which to cultivate the required crops. This latter impact can lead to deforestation and is the subject of this paper.

The next section of the report analyzed data on selected socio-economic variables with a view to relating them to historical changes in forest cover in some parts of Kenya. The factors include:

- Population
- Urbanization
- Infrastructure
- Economic growth (Principally Gross Domestic Product)
- Area under agriculture (selected crops)
- Expenditure on agricultural inputs

4.2 POPULATION

One of the indirect causes of deforestation and forest degradation is population growth. Kenya has, over the last decades, experienced an exponential growth in its population (Figure 2). As Figure 2 shows, Kenya's population has increased from about 2.5 million people in 1897 to about 39 million people in 2009. The population is expected to grow at an annual rate of 3.5%.

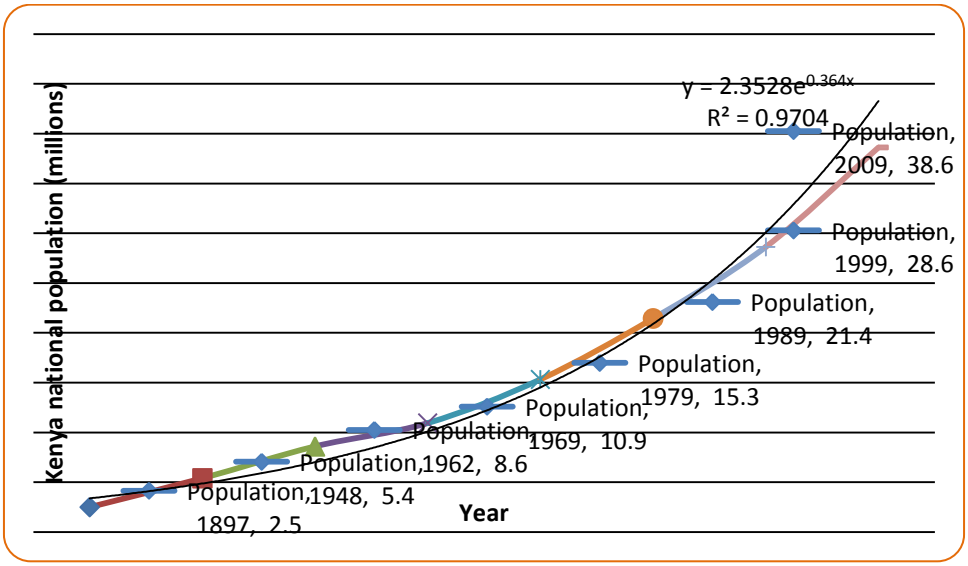


Figure 2: Kenya national population, 1969 - 2009 (source: Statistical Abstracts and National Census Reports, various years)

Figure 3 shows the relationship between population growth and forest cover change. As the Figure shows, the increased population has been accompanied by a decrease in forest cover. As population increases, the extent of forest cover decreases.

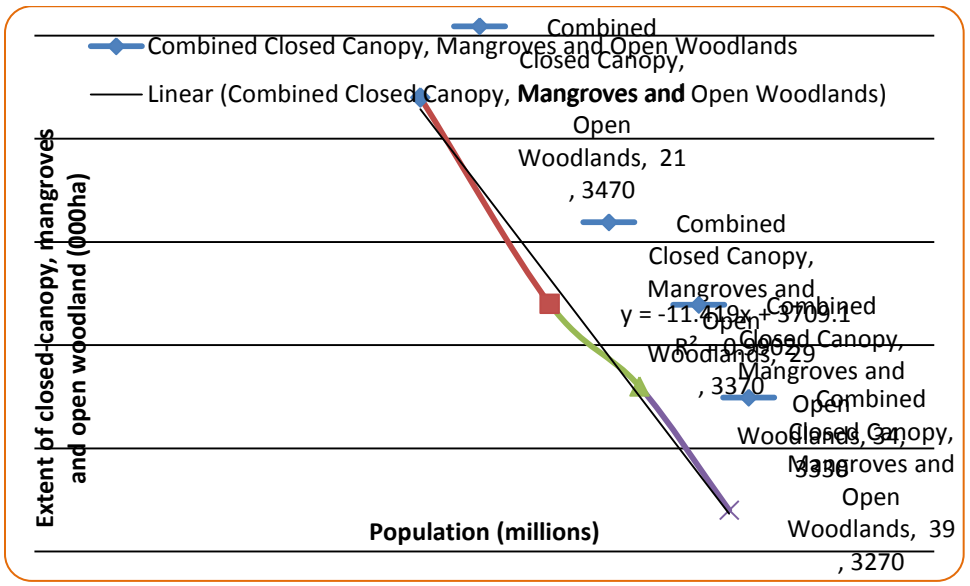


Figure 3: The negative correlation between population growth and forest cover (data on forest cover, FAO FRA Kenya Country Report, Population, Kenya Statistical Abstracts, various years)

The increasing population has led to high population density in all parts of the country. At the national level the density of the population has increased two and a half fold from 27 persons per square kilometers in 1979 to 66 persons per square kilometers by 2009. In many areas, the population density is over 100 persons per square kilometers. Figure 4 shows changes in population density for selected areas.As the Figure shows, the population is becoming denser. In Trans Nzoia, for instance, the population density tripled from 105 persons per square kilometer in 1979 to 328 persons per square kilometer in 2009. Similarly, the population density of Uasin Gishu increased from 79 persons per square kilometer in 1979 to 267 persons per square kilometer. The population density of Embu District increased from 97 persons per square kilometer in 1989 (Statistical Abstract 1989) to 409 persons per square kilometers in 2011 (Statistical Abstract 2011) thereby exerting more pressure on the adjacent Mt. Kenya forest. Similarly, while the population density of Nyeri District stood at 148 persons per square kilometers in 1989, the population density of Nyeri North (a part of the former Nyeri District) stands at 351 persons per square kilometers currently (Statistical Abstract 2011). This translates into more pressure on the adjacent Aberdare forest as the additional people seek more land for farming, and exploit the forest for such products as fire wood.

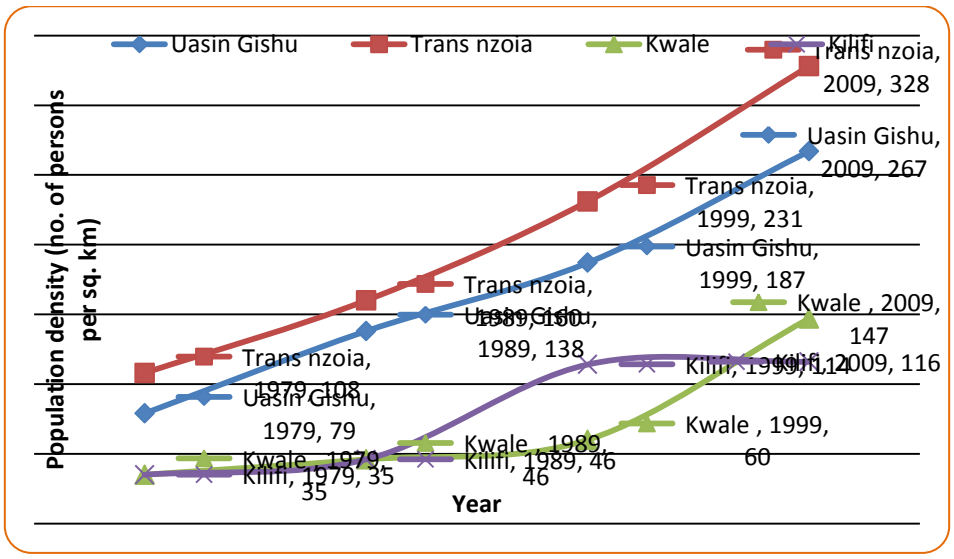


Figure 4: Changes in population density for selected areas

It should be noted that the increase in population density is not only restricted to the high potential areas alone. The Arid and Semi-arid areas (ASALs) have also witnessed an increase in population density. For instance, the population density of Marsabit District increased fourfold from one person per square kilometer in 1979 to four persons per square kilometer in 2009. Similarly, the population density of Isiolo District increased three-fold from two to six persons per square kilometers over the same period. This increase in population density means that the number of livestock has also increased, thereby resulting in more grazing pressure and hence degradation of the dry woodlands. The increased demand for fuel wood as a result of the increase in population density has further compounded pressure on the dry land forests.

Given the limited economic opportunities available in these areas many of the residents have resorted to charcoal production and exploitation of the dry land woodlands for a variety of marketed products. As a result, the dry land forests have witnessed increased degradation. The changing lifestyles in the dry lands have also seen many pastoral communities become sedentary as they settle more permanently. This has led to formation of more permanent settlements, and hence, more permanent grazing areas. Establishment of such permanent settlement has further increased demand for forest products, thereby exacerbating degradation of the dry land forests. While Mt. Marsabit was mainly a dry season grazing area, it has today become a permanent grazing zone, leading to massive degradation of the forest.

4.3 URBANIZATION

Kenya has also witnessed a growth in its urban populations. The number of urban centers (including cities, municipalities, town councils and 'other' towns have not only increased, but the urban centers have also witnessed increased populations. While there was only one city in the period before 2000 – the Nairobi city -, today there are a total of three cities in Kenya with the additional ones being Kisumu and Mombasa. Similarly, while there were only 38 Municipalities in the period before 2009

(Statistical Abstract 2009), the number of municipalities rose to 41 by the end of 2009 (see Statistical Abstract, 2011). The urban centers have also witnessed tremendous growth in their populations. For instance, the population of Nairobi increased from 827,775 inhabitants in 1979 to about 3.1 million people in 2009. On the other hand, the population of Nakuru town has more than tripled from just over a half a million people in 1997 to over 1.5 million people in 2009. As Figure 5 shows, the same trend is seen in the other towns and municipalities, with the urban population growth rate standing at 3.3% per annum.

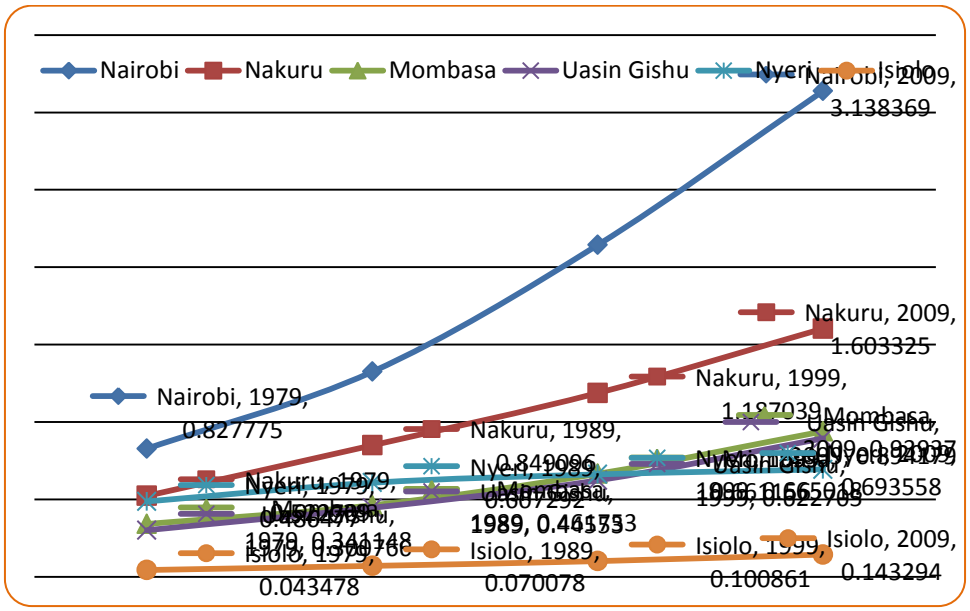


Figure 5: Trends in growth of urban population for selected urban centers

Establishment of new cities and municipalities has caused deforestation and forest degradation in two ways. Firstly, the areas designated for such cities, municipalities and towns have been cleared of vegetation. Secondly, establishment of these urban areas has created more demand for construction material and hence exploitation of the country's forest resources to meet this demand. The increasing urban population too has had profound impact on forest cover in Kenya. The increasing population creates demand for more housing which translates into more demand for construction wood and timber. The increased population has also meant more demand for food items and hence more pressure to clear (forest) land to provide for the demanded food. With over 60% of the urban population dependent on fuel wood (especially charcoal) for cooking, the increased population has translated into more demand for fuel wood especially charcoal. This has meant more pressure on exploitation of surrounding dry land forests

4.4 PLANNED INFRASTRUCTURE DEVELOPMENTS

From an infra-structure development perspective, the dry woodland areas could be adversely affected if safeguards are not put in place. They include developments the examples of which are listed herein.

- Konza technology city
- Isiolo Port
- Lamu port, LAPSET Project, comprising of a road, rail and pipeline connecting Kenya to South Sudan and Ethiopia
- The Northern Corridor Transport Project
- Construction of a standard gauge railway line from Mombasa to Kisumu
- Creation of a one-million-ha irrigation scheme in the Tana Delta Region and in Kitui County

The implementation of these developments will result in clearing huge hectares of (forest) land, and this will be followed with creation of make-shift and permanent settlements. That these developments will be followed by massive deforestation and degradation need not be overemphasized!

4.5 HIV/AIDS

The issue of HIV / AIDS and how it affects population structures and affect the management of natural resources is also relevant. The impact of HIV / AIDS on forest cover change is indirect, manifesting itself on impacts on skilled and skilled forest labor, and availability of government resource for investment in forestry. Although it is difficult to obtain forest specific data, the overall HIV prevalence rate gives an idea of the impact of HIV on forestry and other sectors. As Figure6 below shows, the HIV prevalence rate was relatively higher during the period before 2002. The 1990s especially realized a higher prevalence rate. It can be argued that the higher HIV prevalence rate and hence higher mortality from HIV/AIDS and related incidences in the 1990s reduced availability of manpower for various sectors including forestry. This affected forest operations especially with regard to re-planting of cleared forests and implementation of prescribed silvicultural operations. This can partly explain the buildup in planting backlog that accumulated the 1990s. The other explanation could come from the structural adjustment programs during the same period which led to retrenchment of many forest employees.

Besides affecting the availability of skilled and unskilled labor, high rates of HIV/AIDS infection also has drastic consequences on expenditure on forestry activities and investment in forestry at the household level. Governments facing high national HIV prevalence rates devote more of its budget to HIV prevention and management programs thus denying other sectors such as forestry budgetary allocation. At the household level, with the intensive care required for HIV patients, households' budgets are further stretched when they have to take care of HIV infected members. This limits their capacity to invest in other economic activities such as agriculture and forestry. Mush of the household man-days is also spent on caring for the infected thus further limiting availability of household labor for forestry and other related activities. However, with the reducing prevalence rate in Kenya, the impact of this pandemic on forestry, and indeed the entire economy, is reducing.

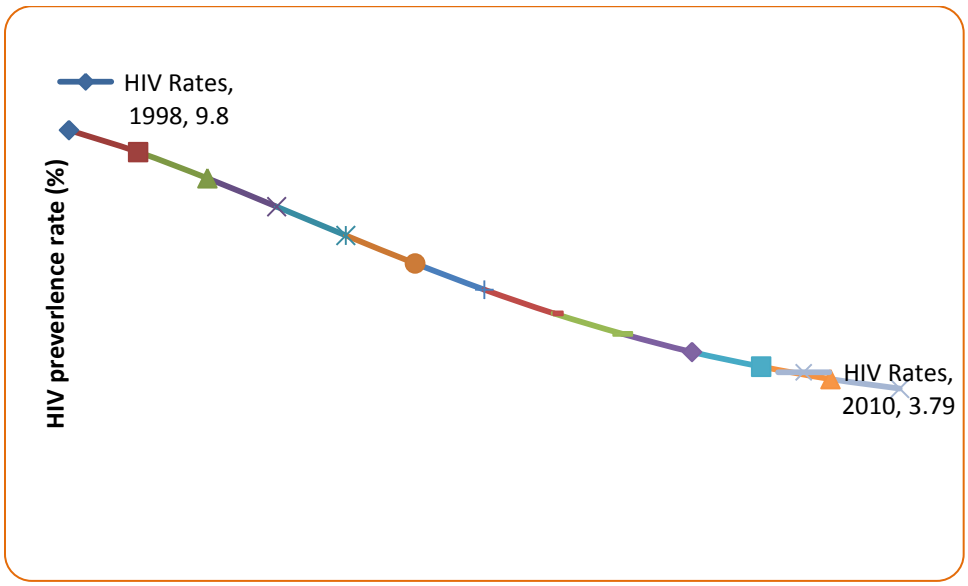


Figure 6: Kenya National HIV prevalence rate (%), 1998 - 2010 (data source: Statistical Abstract 2011)

4.6 ECONOMIC GROWTH

Economic growth – especially a country's Gross Domestic Product (GDP) – is hypothesized to strongly affect forest cover change and is thus worth examining. The 2002 – 2012 period has been characterized by an increase in GDP. This is as opposed to the earlier period when total GDP stood at below KSh. five billion (Figure 7). While poverty levels stood at 56% prior to 2002, this reduced to 46% by 2012(see Daily Nation, December 13th 2012). However, whether the increase in GDP and the 10% drop in poverty levels have translated into reduced pressure on forests is hard to tell since the population has also increased tremendously. However, one could argue that the increased incomes have resulted in increased investment in agricultural technology and in forestry. This is especially so since the area under farm forests has been increasing (Figure 8) though this could also be explained by dwindling supplies from state forests which has led to increase in prices of wood thus making plantation forestry a viable venture. Agricultural growth improved from a negative 3% during the pre- 2002 regime to a positive 6% during the succeeding regime. While this could be due to the increase in area under crops, a significant part of the increase could be attributed to improved use of farm inputs. While the Kenya Meat Commission and the National Cereals and Produce Board had failed or became dysfunctional, these were revived in the succeeding regime, thereby guaranteeing farmers some markets for their produce.

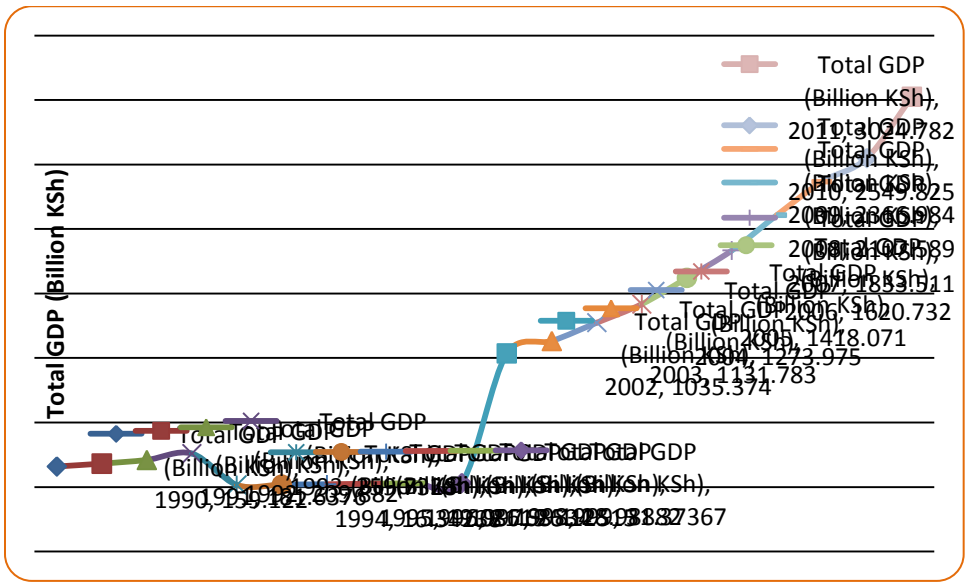


Figure 7: Kenya Gross Domestic Product (GDP), 1990 - 2011

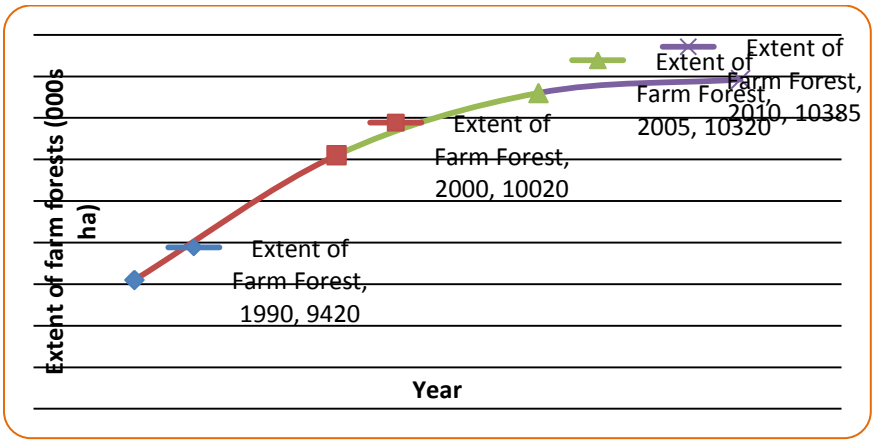


Figure 8: Extent of farm forests (000s ha) (data source: FAO FRA Country Report for Kenya)

4.7 CHANGES IN LAND AREA UNDER AGRICULTURE

However, despite the growing economy, agriculture remains the economic mainstay for the vast majority of Kenyans. Agriculture's contribution to the overall GDP continues to remain dominant despite increasing contribution from other sectors, such as manufacturing, transport, construction and others (Figure 9). Thus, while increased incomes of farmers could have resulted in increased investment in farm inputs, we fear that the remarkable performance of the sector could actually be due to more land being put under agriculture. Thus, we examine area under selected crops below.

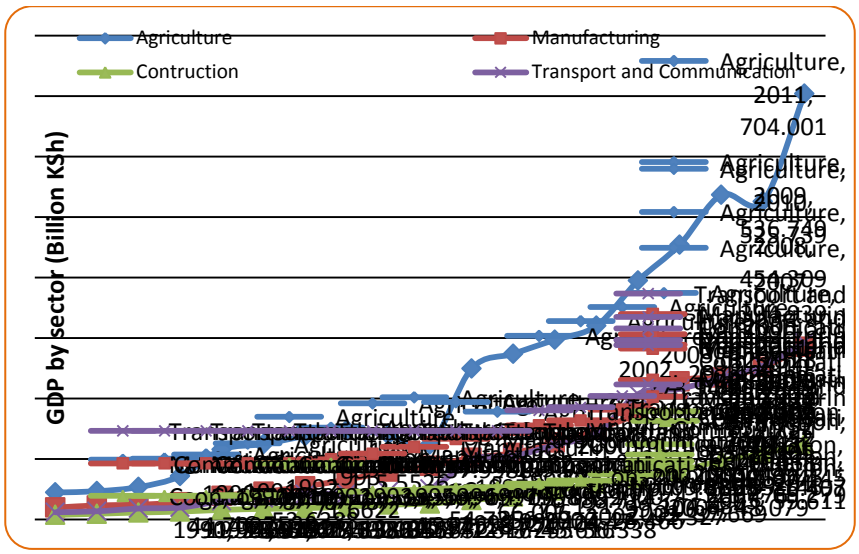


Figure 9: GDP by sector (Billion KSh); 1990 - 2011

1. Sugarcane

As already discussed the major causes of forest cover change is clearing for agriculture and this is true for Kenya (see Republic of Kenya, 1990). Figure 10shows changes in area under sugarcane for the period between 1997 and 2011. As the figure shows, the area under sugarcane has increased from 127,560 ha in 1997 to 179,269 ha in 2011. From the local press it is generally believed that although sugarcane production has been increasing over the years the average productivity per hectare of land has been decreasing due to a combination of factors including high rates of erosion (see Figures 10, 11 and Table 3 below). This is one of the reasons that has made many farmers to increase the area under sugarcane to enable them realize constant or increased farm incomes. The increase in area under sugarcane can also be explained by the increases in sugarcane prices which have made investment in sugarcane attractive to many farmers. The government plans to revive the defunct Ramisi sugar factory. While this is a welcome development, it will result in clearing of vegetation to give room for the plantation. Thus careful planning including introduction of safeguards is necessary.

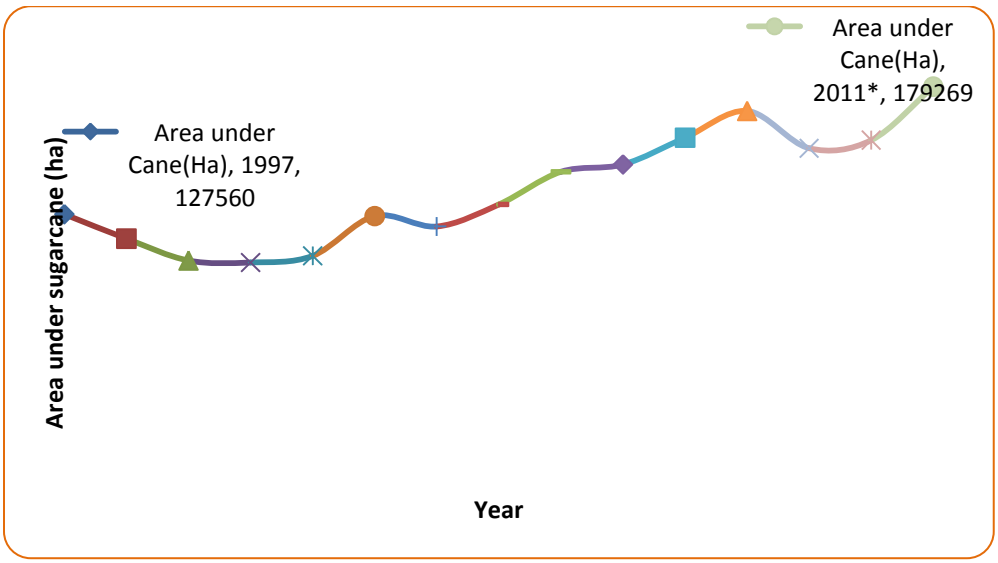


Figure 10: Area under sugarcane, 1997 - 2011 (source: Economic Surveys, various years)

Table 3: Area under sugarcane, area harvested, production and average yield, 1997 – 2011. (source: Economic Surveys, various years)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*	2007	2008	2009	2010	2011*
Area under Cane(Ha)	127560	117657	108793	107985	110666	126826	122580	131507	144765	147730	158568	169421	154298	157583	179269
Area Harvested (Ha)	43814	50111	51833	57243	47794	54010	50468	54191	56537	54621	59201	54465	65774	68738	64091
Production (Tonnes)	4278273	4661361	4415801	3941524	3550792	4501363	4204055	4660995	4800820	4932839	5204214	5112040	5610702	5709586	5338562
Average Yield (Tonnes/Ha)	90.81	85.51	78.42	60.52	63.71	70.67	69.17	73.81	71.46	70.89	70.87	72.94	65.21	63.55	58.94

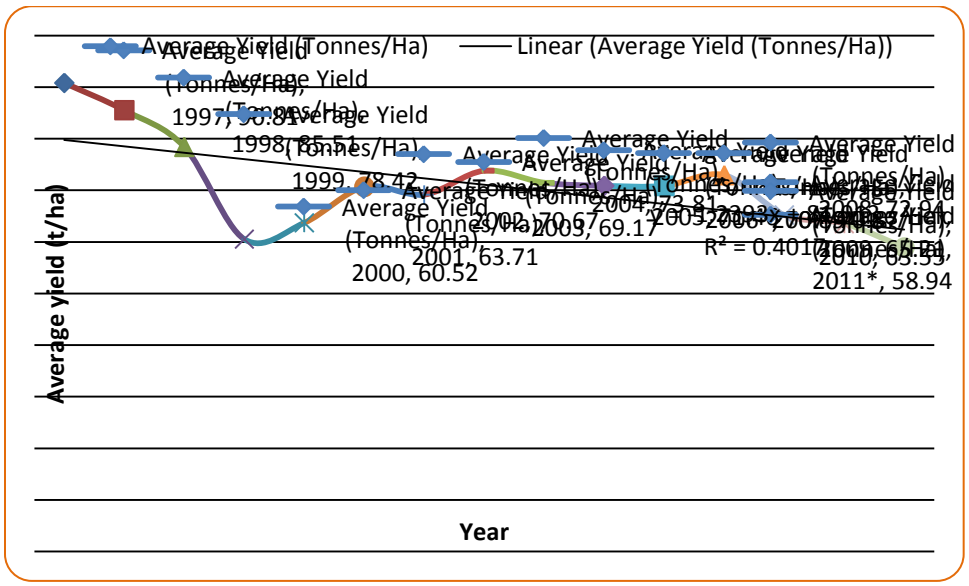


Figure 11: Average yield of sugarcane (t/Ha) for the period 1997 to 2011 (source: Economic Surveys, various years)

Tea and Coffee

Like is the case with sugarcane, the area under tea has been increasing (Figure 12). The total area under tea has increased from 117,350 ha in 1997 to 187,800 ha in 2000. This translates to an additional 50,32 ha being put under tea each year. This increase could have been occasioned by a number of factors including increasing prices and demand for Kenyan Tea in the International market. The price of tea has increased, in nominal terms, from KSh. 2,500 per 100 kg in 1987 to KSh. 26,500 per 100 kg in 2012. This is an increase of over 900% over the 24 year period. It should be noted that as shown in Figures 12 and13, the productivity of tea has remained somewhat constant over the period for Tea estates while smallholder farmers have realized a marginal increase over the period. However, given the high inflation and interest rate, the value of a unit of tea has decreased over the years. This has meant that for a farmer to realize constant incomes he/she has to increase the area under tea and this explains the increasing area under tea for both Tea Estates and Smallholder farmers.

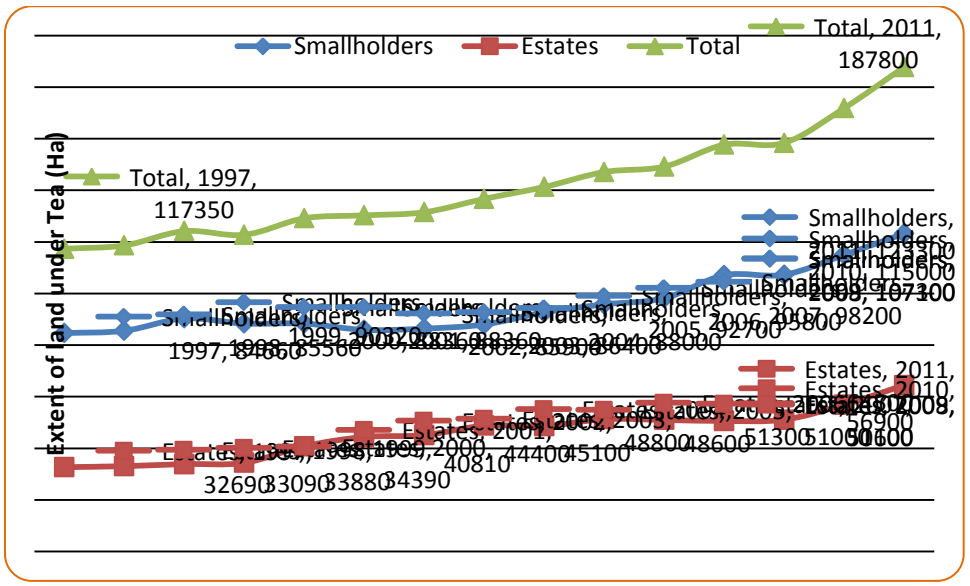


Figure 12: Extent of area under tea in Kenya, 1987 – 2011

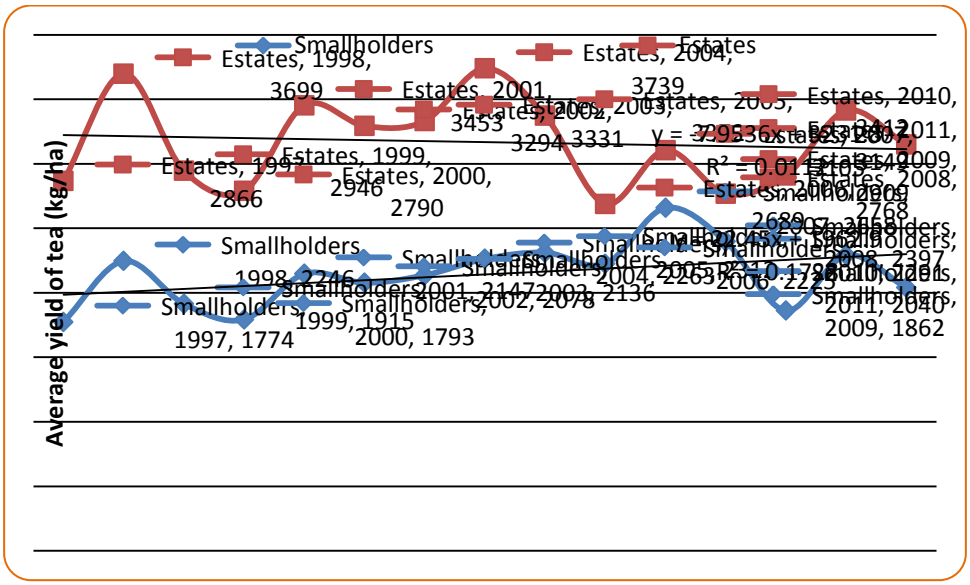


Figure 13: Average yield of tea (kg/ha) in Kenya, 1997 - 2011

Unlike with tea and sugarcane, the area under coffee has more or less remained constant while productivity has been fluctuating with occasional increases (Figures14 and 15). This can be explained by a number of factors. Firstly, coffee prices have experienced a near-exponential growth over the two decades. While coffee sold at only KSH 3,662 per 100 kg in 1987 (Statistical Abstract, 1987), coffee prices rose to KSh. 59,453 per 100 kg in 2011 (Figure 16). This reflects an increase of over 1500% over the 24 year period. Although these prices are in nominal terms, it means a farmer could obtain the same amount of money (in real terms) from the same or reduced unit of land. Secondly, the Aberdares and Mt. Kenya forests around which most of the country's coffee is grown have

realized enhanced conservation and protection as demonstrated the extended electric fences. This has reduced the level of encroachment into these forests for expansion for agriculture and exploitation of forest resources. This is thanks to the efforts of both KWS and KFS. Lastly, the government after 2001 offered coffee farmers a number of debt waivers which has subsequently lifted the economic burden off coffee farmers, and also spearheaded the revamping of the once dying coffee societies making coffee production a lot more profitable as the societies could better address the needs of coffee farmers. However, the declining productivity of coffee remains a cause for worry and if not address through intensification could result into more land being put under coffee.

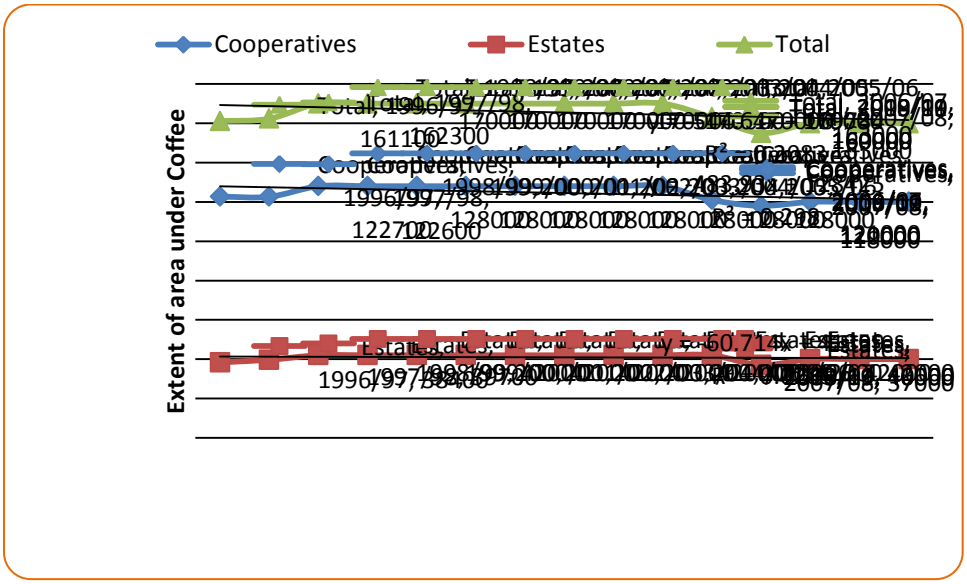


Figure 14 Area under coffee in Kenya between 1996 and 2010

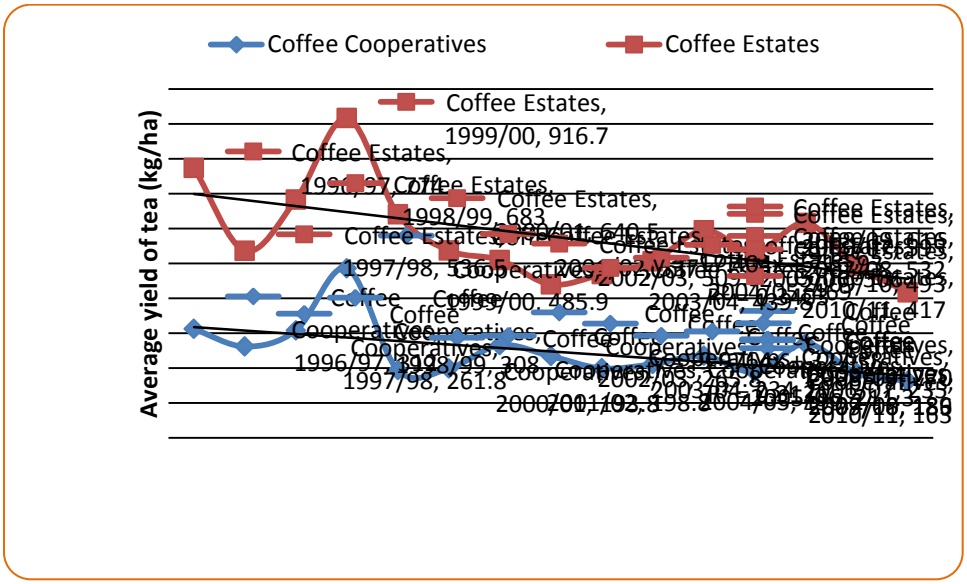


Figure 15: Average yield of Coffee (kg/ha), 1996/97 - 2010/11

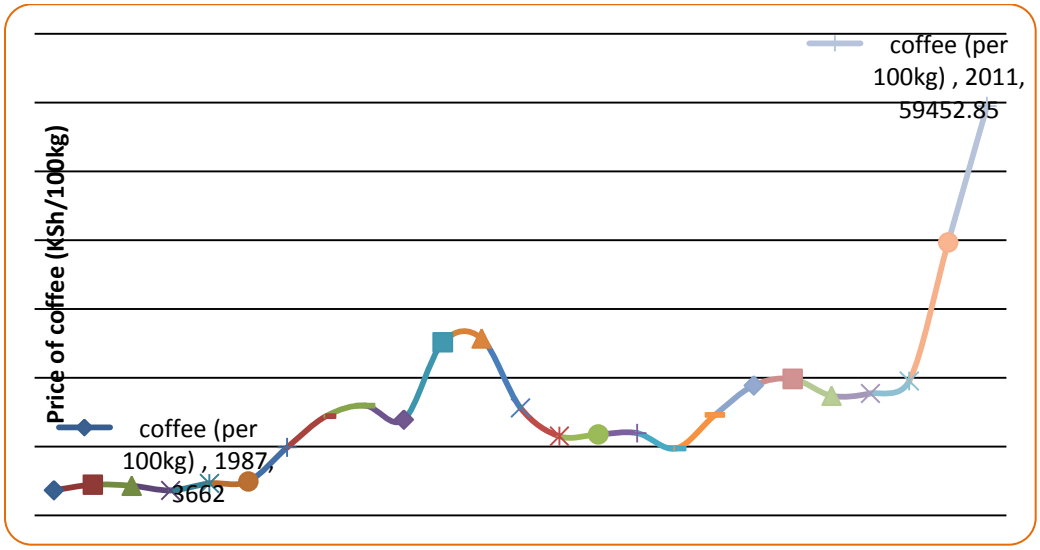


Figure 16: Prices of coffee (KSh/100kg), 1987 -2011

4.1. TRENDS IN USE OF FARM INPUTS

As noted above, the increased in agricultural productivity and its increasing contribution to the GDP could also be attributable to increased investment in farm inputs. Thus, we examine use of agricultural inputs using imports of inputs as a proxy. Figure 17 below shows trend in value of agricultural input for the period between 1981 and 2010. As the figure shows, the value / expenditure on agricultural inputs has been increasing. Expenditure on improved seeds was just under KSH. 2 billion for the period before 2002. After this period – i.e. the Kibaki regime, the expenditure increased to about 2.3 billion in 2003 and has since increased to over KSh. 4 billion in 2010. Similarly, the expenditure on fertilizer has increased over the years. While national expenditure on fertilizer stood at less than KSh. 3 billion prior to 2002, the expenditure surpassed the KSh. 3 billion mark in 2002 when the NARCgovernmenttook over. By 2010, the expenditure on fertilizer had doubled to over KSh. 6 billion in 2010. This increased expenditure on farm inputs (especially improved seed and fertilizer) could have improved farm productivity thus reducing the pressure to put more land under agricultural production and hence reduced deforestation resulting from agricultural expansion.

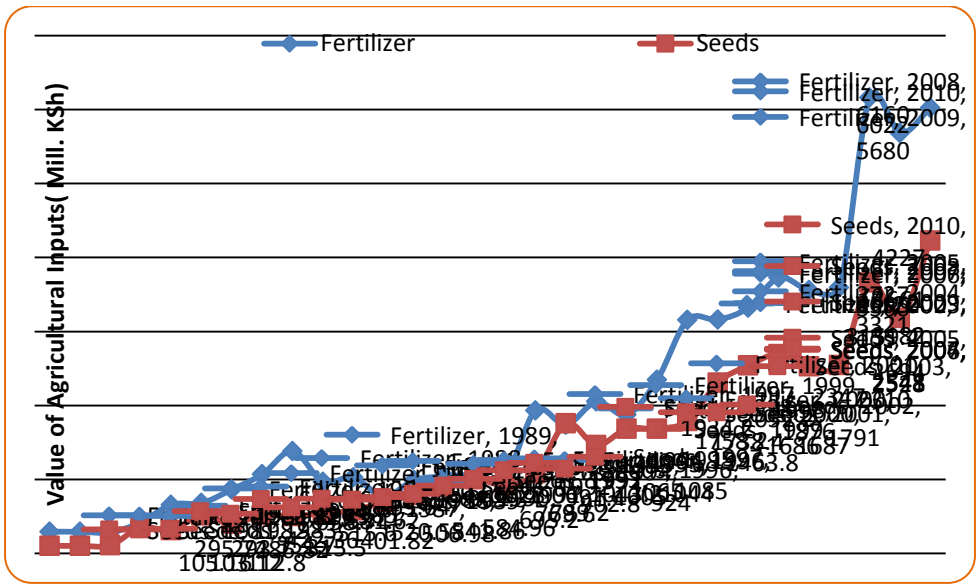


Figure 17: Trends in National Expenditure on Agricultural Inputs

5. CASE STUDIES AND PREDICTED COVER CHANGE FROM GIS BASED MODELLING

5.1 Changes in forest cover in selected areas between 1985 and 2010

To describe the trends in deforestation and forest degradation the following forest areas were selected as *case studies* for more detailed analysis of spatial data.

- Taita Hills represent an elevated forest formation rising above the dry woodlands in the coastal region Kenya
- Mt Marsabit also representsa relatively high elevation 'water tower' in the middle of the dry woodlands in the northern rangeland region of Kenya
- The Aberdares, Mau Range and Mt Elgon - represent the montane 'water-towers' in the Kenya Highlands

This section describes these case studies

5.1.1 MT. MARSABIT FOREST

The Mt. Marsabit forest area covers about 15,700 hectares. The forest has, however, experienced cover losses over the years, with the area under crops and grass increasing at the expense of natural forests (Figure18). As the Figure shows, the extent of forestland has reduced from 240.5 km^2 in 1985 to 132 km^2 in 2010. On the contrary the area under grasslands has increased from 592 km^2 in 1985 to 665 km^2 in 2010. While the Marsabit is traditionally a pastoral area with little crop cultivation, the area under crops increased by half from 66 km^2 to 93 km^2 over the same period. Expansion of the adjacent Marsabit town has also encroached into the forest.

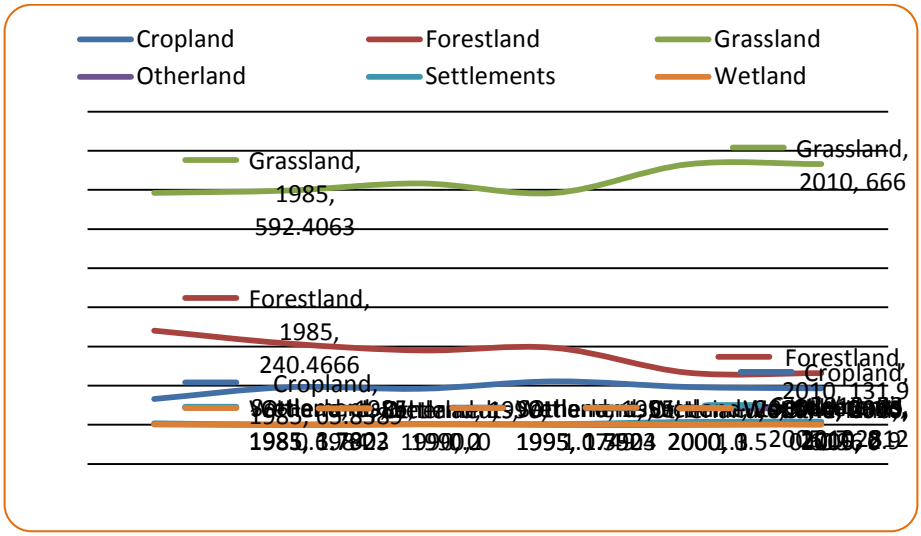


Figure 18: Changes in vegetation cover in Mt. Marsabit forest, 1985 - 2010

Besides deforestation, the forest also suffers serious degradation especially from grazing and illegal firewood collection and charcoal burning. It is estimated that some 50,000 cattle graze in the forest daily (MEMR, 2012). The direct causes of deforestation and forest degradation can therefore be summarized as encroachment, charcoal burning and fuel wood collection, and illegal grazing. Table 2 below shows area of forest land converted to other land uses between 1985 and 2005.

Table 4: Area of Mt. Marsabit forest converted to other land uses, 1985 - 2005

CHANGE 1985 – 2005						
	Cropland	Forestland	Grassland	Other land	Settlements	Wetland
Cropland	61.0745	0.1087	2.1806	0	2.4752	0
Forestland	28.4869	132.044	79.0494	0	0.6968	0.189
Grassland	8.3951	0.9123	582.4358	0	0.663	0
Otherland	0	0	1.7923	0	0	0
Settlements	0.3316	0.0024	0	0	3.4462	0
Wetland	0	0	0.2677	0	0	0.4307

The key underlying causes include population expansion (both urban and rural), the changing settlement patterns and change to sedentary livelihoods with large herds of livestock grazing in the forest. MEMR (2012) observe that although Mt. Marsabit has traditionally been a dry season growing area, immigration of pastoralist communities into the area has made it a permanent grazing area. This as noted above, was also confirmed through the regional workshops.This has hindered natural regeneration and resulted in destruction of vegetation. The burgeoning rural and urban population has resulted in increased demand for fire wood and charcoal, and grazing land thus putting extra pressure on the dwindling vegetation.

5.1.2 THE MT. ELGON FOREST BLOCK

Figure 19 below shows changes in the vegetation cover of Mt. Elgon forest. As the Figure shows, the area under crop land has been declining while area under forest has increased slightly. The reducing area under crops can be explained to the cessation of the 'shamba'system while the increase in area under forest could be explained by natural regeneration of the abandoned 'shamba' systems areas. However, it should be noted that the area under grassland is increasing and this could be as a result of the some of the logged / abandoned areas being converted into grazing land especially through frequent use of fire by the surrounding communities. Summarizing, therefore, the most dominant threat to Mt. Elgon forest is grazing.

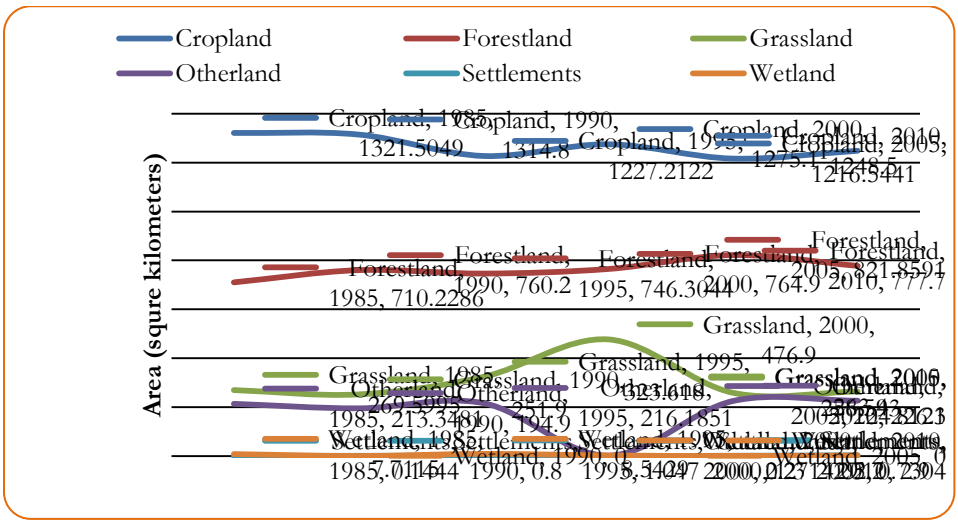


Figure 19: Area under different vegetation clasifications, 1985 - 2010

Table 3 below shows area of Mt. Elgon forest converted to other land uses for the period between 1985 and 2010.

Table 5: Area of Mt. Elgon forest converted to other land uses, 1985 - 2010

CHANGE 1985_2010						
	Cropland	Forestland	Grassland	Other land	Settlements	Wetland
Cropland	1219.119	64.6866	27.1095	0	2.6331	1.7344
Forestland	12.9213	662.0464	16.0964	15.2072	0	0.4138
Grassland	2.8881	46.2944	219.1906	0.0574	0	0
Otherland	0	1.8022	0	210.44	0	0
Settlements	0.0713	0	0	0	0.0722	0
Wetland	7.6766	0	0	0	0	0

a. The Cherangany Forest

The western slopes of Cherangany forest is characterized by intensive and subsistence agriculture and livestock farming. On the other hand, the Upper parts of West Pokot and Kerio Valley are characterized by nomadic pastoralism. The forest also experienced reducing forest cover while the area under crops increasing. While the area under forest has reduced from 46,450 ha in 1973 to 23,850 ha in 2009, the area under crops has nearly doubled from KSh. 49,950 ha to 99,800 over the same period (see MEMR, 2012). This makes agricultural expansion the dominant direct cause of deforestation in the area. Other direct causes of deforestation and forest degradation include encroachment, illegal logging, fire wood collection and charcoal burning, illegal grazing and climate change.

5.1.3 Mau Forest Complex

Some information and Statistics on Mau Forest

Between 1973 and 2009, the Mau forest complex experienced a decline in forest cover against an increase in area under agriculture. This was partly due to excision of about 35,000ha of East Mau forest for conversion into settlements in 2001. According to MEMR (2012), forested areas have since been replaced by fragmented landscapes composed of remnant forest patches, advanced and emerging secondary vegetation, grasslands and a few plantations, roads and paths, and housing units (homesteads).

5.1.4 TAITA HILLS FORESTS

The Taita Hills, composed of the Dabida (north-west of Voi), Sagalla (south of Voi) and Kasigau massifs, cover an area of approximately 1,000 square kilometers. To protect the hills from severe logging, it was declared a Nature Reserve and consumptive use of the forest banned. The population of Taita Hills has increased and as expected this has led historically to conversion of forest land for agriculture and grazing. The Dabida massif is the largest and tallest of the three and rises to 2228 meters at its highest peak. The hills are the northernmost portion of the Eastern Arc Mountains of East Africa, well known for their high levels of endemism.

Between 1985 and 2010, forest cover in the hills has increased from 270 km^2 to 414 km^2, which is remarkable but can be explained by an increase of trees outside forests; thanks to agro-forestry practices by farmers in the hills.

5.2 PREDICTED COVER CHANGES IN FIVE SELECTED FOREST AREAS

Introduction and summary of key results

This section presents results on change modeling which basically used current trends and the relative weights of each change factor to make predictions on cover change in 2030, 2050 and 2080, for each of the 5 selected areas. Details on land cover change between 1985 and 2010 are presented in both tabular and graphical formats followed by a table which combines historical cover change (1985 to 2010) and predicted changes for the three time periods already stated. In addition, the predicted changes are depicted in spatial terms, through maps indicating *the potential of transition* from one cover class (e.g. forest land) to another (e.g. grassland). The 'potential for transition' are colour-coded and each colour code represents a probability for change occurring. The areas with the highest probability shown in the maps and associated legends indicate where change is most likely to occur unless management measures are brought to bear. Finally predicted cover maps by 2030, 2050 and 2080 are also presented for each forest area

In the *Aberdares,* forest land has been fairly stable at 2064 km^2 in 1985 with a slight decrease to 2061 km2 in 2010. The predicted areas in 2030, 2050 and 2080 are 2025, 1991 and 1945km^2 respectively, all indicating a slight decrease. The data on both historical changes and associated figures are presented herein (Figures 20, 21 and Table 6)

In the *Mt Elgon Forests*, area (on Kenyan territory) forest cover increased from 710 km^2 in 1985 and to 777km^2 in 2010. The predicted forest cover in 2030, 2050 and 2080 are 928, 863 and 916km^2 respectively, all indicating an overall increase. The data on both historical changes and associated figures are presented herein (Figures 22, 23 and Table 7)

In the *Mau Forest Complex*, forest cover decreased from 4695 km^2 in 1985 to 4041 km^2 in 2010.

The predicted forest cover in 2030, 2050 and 2080 are 3538, 3124 and 2680km^2 respectively, all indicating significant decreases in forest cover unless the status of their protection is significantly increased. The data on both historical changes and associated figures are presented herein (Figures 24, 25 Table 8)

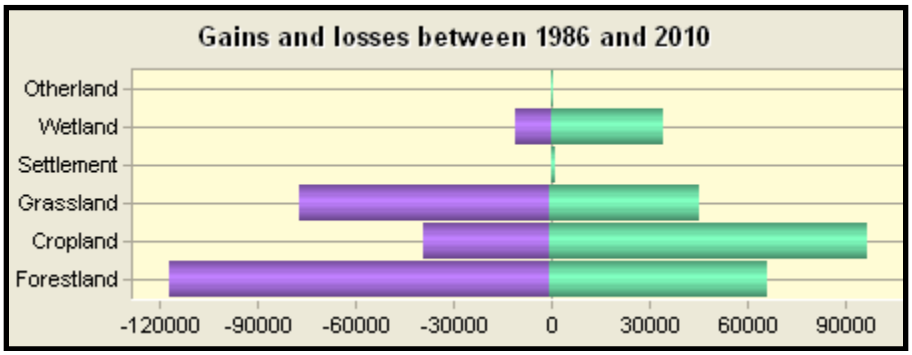
In the *Marsabit Forest Area*, the extent of forestland has reduced from 240.5 km^2 in 1985 to 132 km^2 in 2010. On the contrary the area under grasslands has increased from 592 km^2 in 1985 to 665 km^2 in 2010. While the Marsabit is traditionally a pastoral area with little crop cultivation, the area under crops increased by half from 66 km^2 to 93 km^2 over the same period. Expansion of the adjacent Marsabit town has also encroached into the forest. The predicted forest cover in 2030, 2050 and 2080 are 83, 55 and 36 km^2 respectively, all indicating significant decreases in forest cover unless drastic measures are put in place to stop and reverse the trend. The data on both historical changes and associated figures are presented herein (Figures 26, 27 and Table 9).

In the *Taita Hills*, forest cover increased between 1985 and 2010, from 270 km^2 to 414 km^2. The predicted forest cover in 2030, 2050 and 2080 are 482, 503 and 480km^2 respectively, all indicating significant increases in forest cover. The data on both historical changes and associated figures are presented herein (Figures 28, 29 and Table 10)

In addition to the above summaries, maps showing historical and predicted spatial changes in forest cover and other land cover classes have also been provided for each forest area, as are 'potential for transition' maps that have been generated from the predictive models. The maps are all in Annex III.

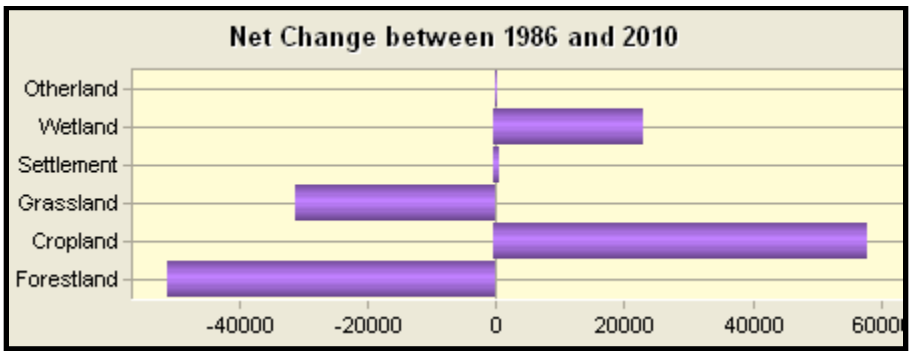
5.2.1 ABERDARES

The figures and tables below show historical and predicted changes land cover in the Aberdare Mountain Range



Land Cover Category	Losses (Km²)	Gains (Km²)
Forestland	-117458	66564
Cropland	-39037	97007
Grassland	-77127	46041
Settlement	-45	850
Wetland	-11298	34503
Otherland	0.00	0

Figure 20 : Aberdares: Gains and losses in land cover between 1986 and 2010



Land Cover Category	Net Change(Km²)
Forestland	-50894
Cropland	57970
Grassland	-31086
Settlement	805
Wetland	23205
Otherland	0

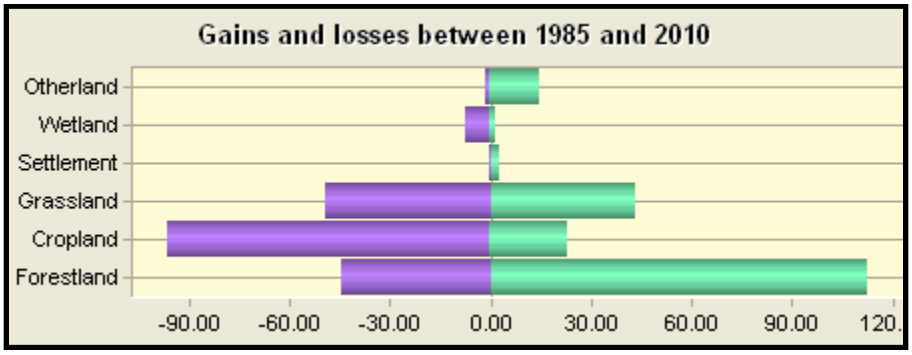
Figure 21 Net change in land cover classes in the Aberdares between 1986 and 2010

Table 6 Historical and predicted changes in the areas of land cover classes in the Aberdares

ABERDARE (AREA in Sq KM)									
LANDUSE	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2030**	**2050**	**2080**
Cropland	6350.2688	5436.2543	6126.7184	6491.4350	6448.4141	6491.4350	6531.9	6572.1	6632.2
Forestland	2064.3269	2368.8775	2050.3422	2061.9285	1968.3807	2061.9285	2025.4	1991	1945.5
Grassland	1998.8315	2701.8110	2194.8019	1801.6515	1943.8983	1801.6515	2077.9	2072.1	2060.6
Otherland	285.4177	183.8217	288.0994	284.4459	289.8660	284.4459	4.6	4.6	4.6
Settlements	50.3554	27.1341	89.0822	89.3854	105.3778	89.3854	89.5	89.5	89.5
Wetland	147.1723	178.4741	147.3284	167.5263	140.1203	167.5263	167.4	167.4	167.4
	10896.37	10896.37	10896.37	10896.37	10896.06	10896.37	10896.7	10897.8	10899.8

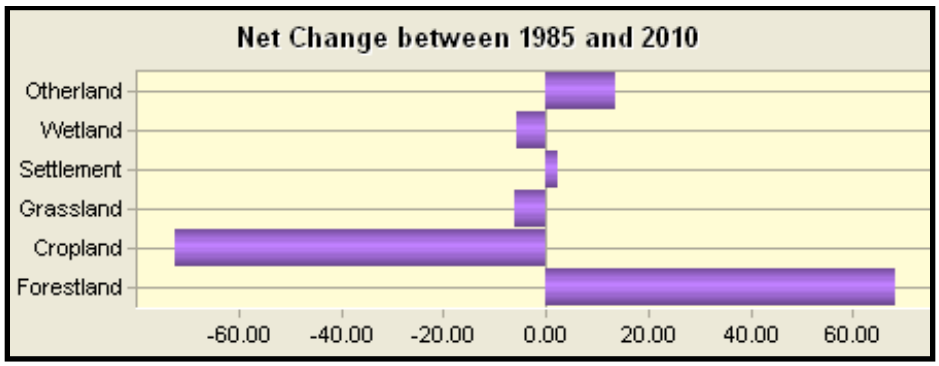
5.2.2 MT ELGON

The figures and tables herein show historical and predicted changes in the Mt Elgon Forest Area on the Kenyan side, starting with data and figures on gains and losses in land cover between 1985 and 2010



Land Cover Category	Losses (Km^2)	Gains (Km^2)
Forestland	-44.66	112.79
Cropland	-96.18	23.55
Grassland	-49.22	43.21
Settlement	-0.08	2.63
Wetland	-7.67	2.15
Otherland	-1.81	15.30

Figure 22 Mt Elgon: Gains and losses in land cover between 1986 and 2010



Land Cover Category	Net Change(Km²)
Forestland	68.12
Cropland	-72.63
Grassland	-6.01
Settlement	2.55
Wetland	-5.53
Otherland	13.49

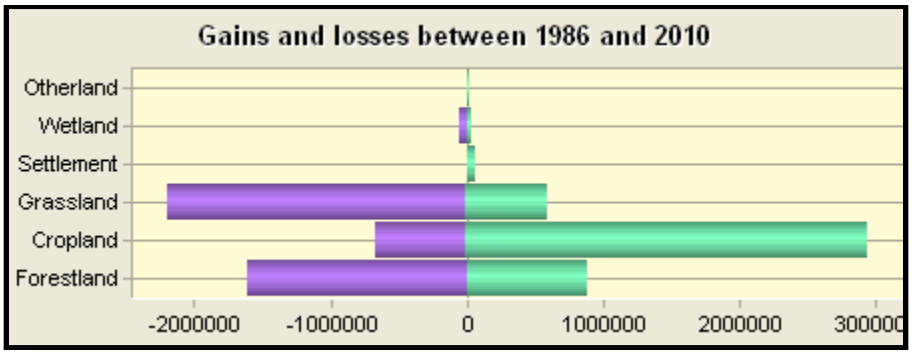
Figure 23:Net change in land cover classes in Mt Elgon between 1986 and 2010

Table 7:Historical and predicted changes in the areas of land cover classes in the Mt Elgon Region

MT.ELGON (AREA in Sq KM)									
LANDUSE	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2030**	**2050**	**2080**
Cropland	1321.505	1314.8	1227.212	1275.1	1216.544	1248.5	1033.2	1132.4	1060.1
Forestland	710.2286	760.2	746.3044	764.9	821.8591	777.7	928.8	863.4	916.8
Grassland	269.5995	251.9	323.618	246.8	258.593	263.4	306.5	260	261
Otherland	213.3481	194.9	216.1851	229.1	224.8123	226.1	239.2	251.9	269.6
Settlements	0.1444	0.8	1.047	0.271429	0.7304	2.9	2.7	2.7	2.7
Wetland	7.7115	0	8.5429	2.2	0	2.2	0	0.1	0.3
	2522.537	2522.6	2522.91	2518.371	2522.539	2520.8	2510.4	2510.5	2510.5

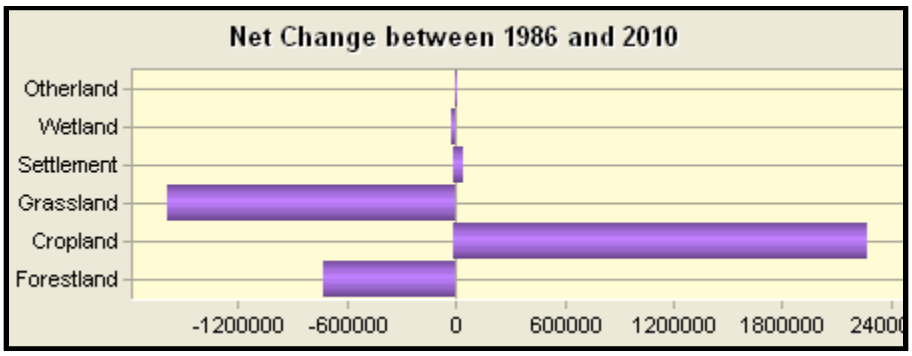
5.2.3 MAU FOREST COMPLEX

The information in the figures and tables below presents the gains and losses in land cover between 1986 and 2010 and predicted changes in the Mau Complex. More than any other forest area in Kenya, the Mau represents the continuous struggle between sustainable forest management and commercial agriculture as a driver of forest cover loss.



Land Cover Category	Losses (Km²)	Gains (Km²)
Forestland	-1610148	883284
Cropland	-672508	2947560
Grassland	-2189476	606064
Settlement	0	59082
Wetland	-59805	35947
Otherland	0.00	0

Figure 24: Mau Complex, Gains and losses in land cover between 1986 and 2010



Land Cover Category	Net Change(Km²)
Forestland	-726864
Cropland	2275052
Grassland	-1583412
Settlement	59082
Wetland	-23858
Otherland	0

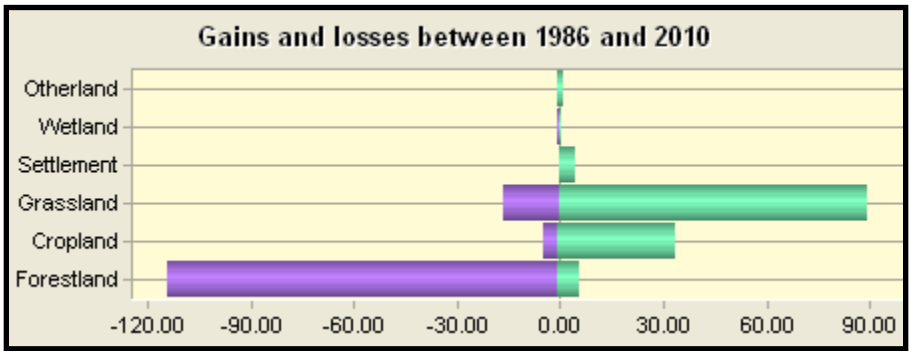
Figure 25:Net change in land cover classes in the Mau Complex between 1986 and 2010

Table 8:Historical and predicted changes in the areas of land cover classes in the Mau Complex

MAU RANGE (AREA in Sq KM)									
LANDUSE	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2030**	**2050**	**2080**
Cropland	11342.71	11995.41	11590.84	12737.74	13498.48	13390.16	14402.4	15063.2	15642.5
Forestland	4695.84	5635.62	4810.025	4825.404	3620.878	4041.589	3538.7	3124.7	2680.5
Grassland	3608.423	2043.371	3254.754	2078.411	2522.373	2183.587	1622	1325.8	1119.8
Otherland	0	0		0	0	0	0	0	0
Settlements	35.00153	35.63943	39.69927	71.15632	72.15132	88.15495	139.9	189.3	189.3
Wetland	169.8605	142.0083	156.5135	139.0872	137.9504	148.339	148.2	148.2	148.2
	19851.84	19852.05	19851.84	19851.8	19851.84	19851.84	19851.2	19851.2	19780.3

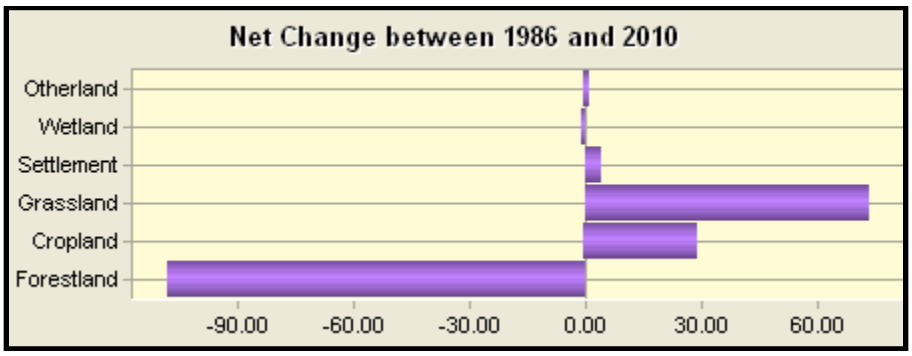
5.2.4 MARSABIT

The gains and losses in land cover with a focus on forest cover changes on Mt Marsabit are presented herein, together with predicted future cover changes.



Land Cover Category	Losses (Km^2)	Gains (Km^2)
Forestland	-113.98	6.25
Cropland	-4.84	34.28
Grassland	-16.28	89.67
Settlement	-0.27	4.38
Wetland	-0.70	0.00
Otherland	0.00	1.49

Figure 26: Mt Marsabit, Gains and losses in land cover between 1986 and 2010



Land Cover Category	Net Change(Km²)
Forestland	-107.74
Cropland	29.44
Grassland	73.39
Settlement	4.11
Wetland	-0.70
Otherland	1.49

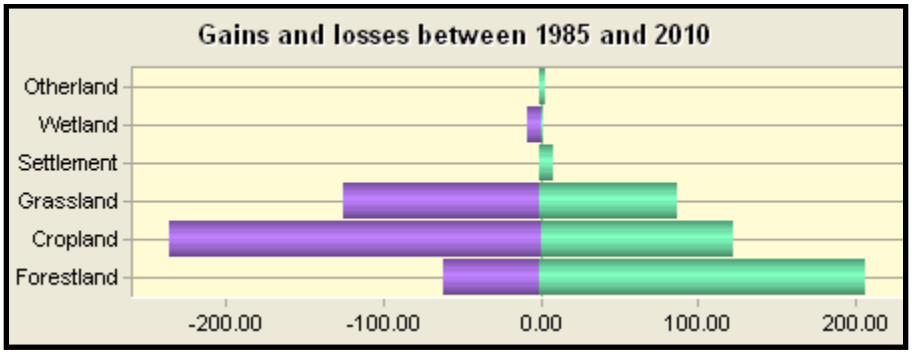
Figure 27: Net change in land cover classes on Mt Marsabit between 1986 and 2010

Table 9:Historical and predicted changes in the areas of land cover classes on Mt Marsabit

MARSABIT (AREA in Sq KM)									
LANDUSE	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2030**	**2050**	**2080**
Cropland	65.8389	95.9	92.0342	110.8	96.5052	93	113.3	127.7	142.9
Forestland	240.4666	207.7	189.9035	196.5	133.0293	131.9	83.2	55.2	35.7
Grassland	592.4063	598.4	616.4884	592.2	665.4082	666	695.3	708.8	713.1
Otherland	1.7923	0	1.7923	0	0	2.9	3.3	3.3	3.3
Settlements	3.7802	0	1.5504	1.5	7.2812	8	7.9	7.9	7.9
Wetland	0.6984	0.2	1.0749	1.3	0.6196	0	0	0	0.3
	904.9827	902.2	902.8437	902.3	902.8435	901.8	903	902.9	903.2

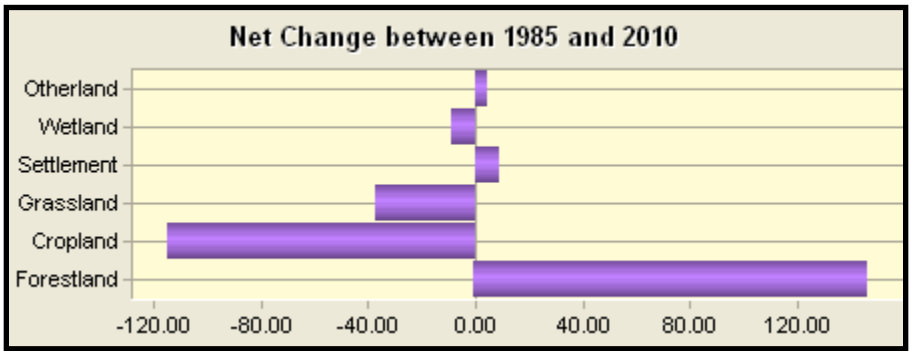
5.2.5 TAITA HILLS

A historical account of land cover changes in Taita Hills between 1985 and 2010 are presented here, including predictions of future changes. What is interesting is that forest cover given recent trends appears to be increasing.



Land Cover Category	Losses (Km²)	Gains (Km²)
Forestland	-61.70	208.04
Cropland	-236.63	122.31
Grassland	-125.23	88.30
Settlement	0	9.24
Wetland	-8.64	0
Otherland	0	4.28

Figure 28: Taita Hills:Gains and losses in land cover between 1986 and 2010



Land Cover Category	Net Change(Km^2)
Forestland	146.35
Cropland	-114.31
Grassland	-36.93
Settlement	9.24
Wetland	-8.64
Otherland	4.28

Figure 29:Net change in land cover classes on Taita Hills between 1986 and 2010

Table 10: Historical and predicted changes in the areas of land cover classes on Taita Hills

TAITA HILLS (AREA in Sq KM)									
LANDUSE	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2030**	**2050**	**2080**
Cropland	715.7693	673.6673		576.0293	698.4533	603.8034	544.6	510.4	481.4
Forestland	270.9637	427.0104		435.6946	535.2213	414.9715	482.6	503.4	480.5
Grassland	3609.0342	3494.4524		3582.6708	3359.0538	3572.0875	3563.5	3576.8	3628.7
Otherland	0.0000	9.2467		9.2467	9.2467	4.2971	4.3	4.3	4.3
Settlements	0.0000	0.0000		0.0000	0.0000	9.2467	9.2	9.2	9.2
Wetland	8.6391	0.0293		0.7648	2.4311	0.0000	0	0	0
	4604.4063	4604.4062	0	4604.406	4604.406	4604.406	4604.2	4604.1	4604.1

6. RESULTS FROM SUB-NATIONAL CONSULTATIONS ON THE DRIVERS OF FOREST COVER CHANGE IN KENYA

6.1 DRIVERS OF DEFORESTATION AND FOREST DEGRADATION IN KENYA: A SYNTHESIS FROM SUB-NATIONAL CONSULTATIONS

6.1.1. Introduction

As already stated, the study on drivers of deforestation and forest degradation entailed sub-national consultations in 5 regions of Kenya. The expectation was that this would yield more accurate information on the key drivers specific to particular regions and those operating across regions, including any differences among them, as perceived by sub-national experts, practitioners and other local stakeholders. It was also meant to build upon information that was generated in 2009 when Kenya held a national level workshop on drivers as part of the preparation of its Readiness Preparation Proposal (R-PP) in 2009.

Based on existing literature (Geist and Lambin 2001, GOK 2009, Honosuma et al, 2012), *Agricultural Expansion, Wood Extraction* and development of all manner of *Infrastructure* seem to be the main direct drivers of deforestation and forest degradation. However within those three main direct drivers, there are, if you will, actions that may have different motivations, but whose main effects are deforestation and forest degradation. Agricultural expansion in Kenya can be further subdivided into *shifting cultivation*, as was practiced traditionally in the Mau and Mt Elgon regions, *permanent subsistence agriculture*, *permanent commercial farming* and *local trans-migration*. Likewise, wood extraction can take the form of *artisanal logging*, *commercial logging* in plantations and natural forests and woodlands, *firewood harvesting* and *charcoal production* for both domestic and commercial uses. Infra-structure in Kenya is illustrated by the growth of towns, transport infrastructure (roads, railway, and sea and airports), public utilities (water, sanitation) and it would appear that the planned transport corridor to Southern Sudan (LAPSSET) is going to have its greatest effects on forest cover loss in the northern rangelands of Kenya. This section presents a synthesis on the drivers of deforestation and forest degradation, based on the regional or sub-national level consultations. As stated earlier, *the relative effects of the drivers on forest cover change were not quantified* since this was beyond the scope of the study, given the time limit that the study was conducted under. It is nonetheless recognized that *this is an important limitation* of the results reported herein and it would be important to attempt to quantify the effects of the drivers as Kenya designs region-specific forestry and REDD+ strategies.

6.1.2. An Overview of Direct and Indirect Drivers of Deforestation and Forest Degradation in Kenya

A summary of the drivers of deforestation and forest degradation, by forest areas or conservancies in selected regions of Kenya is presented in Table6. Below are descriptions of direct and indirect causes or drivers of both deforestation and forest degradation, which are followed by some key observations from the various forest areas or conservancies.

Table 11. Summary of drivers of deforestation and forest degradation in various parts of Kenya (Based on sub-national consultations)

REGION / CONSERVANCY	FOREST TYPES	DIRECT DRIVERS	INDIRECT DRIVERS
COAST	Mangroves Coastal Forests Dry woodlands Montane – Taita Hills Plantations	Wood extraction Poles *Charcoal production* *Firewood* Timber Agricultural expansion Subsistence agriculture Commercial agriculture – sugar / bio-fuels Infra-structure - Tourism establishments Grazing and browsing Wildlife damage – elephants in (Shimba Hills) Kwale Mining – still minor but growing at the coast	*Industrial demand for fuel wood* – salt, soap, vegetable oil industries High costs of electricity for industry and LPG for domestic use *Urban over-dependence on charcoal* Rural Poverty Absence of industrial plantations
EWASO NORTH	Dry (*Acacia-Commiphora*) Woodlands Dry Evergreen-Montane (Mathews Range/ Ndotos, Mt Marsabit and Mt Kulal)	Wood extraction *Charcoal production* *Firewood* Timber and poles (cedar, podo) Grazing and browsing Livestock Wildlife – Elephants Fires - wildfires	*Increase in Charcoal prices* *Growing demand for charcoal* Urban population increases Vast area – weak institutional presence Lack of cheaper alternatives
MAU	Montane Industrial Plantations	Agricultural Expansion *Permanent Subsistence* *Permanent commercial agriculture – Tea, wheat* Wood Extraction Domestic fuel wood and charcoal) Commercial timber (poles and timber)	*Governance – Deliberate excisions of gazette forest land* *Population pressure* Demand for timber and fencing posts
NOTH RIFT	Montane Dry woodlands Industrial plantations	Agricultural Expansion *Permanent subsistence agriculture* *Permanent commercial agriculture* Wood extraction Timber – illegal logging Firewood and charcoal	*Low rates of regeneration of clear cut plantations* *Population pressure* *Rural poverty*
NYANZA		Agricultural expansion *Permanent subsistence* *Permanent commercial- sugar, tobacco* Wood extraction *Firewood and charcoal* *Fish smoking* *Poles for construction*& fencing	*Low rates of regeneration of clear cut plantations* *Inadequate institutional presence of the forest service* *Population pressure*
WESTERN		Agricultural expansion *Permanent subsistence* *Permanent commercial - sugar, tobacco* Wood extraction *Firewood and charcoal* Poles for construction & fencing	*Low rates of regeneration of clear cut plantations* *Population pressure* Rural poverty

6.1.3 DIRECT (PROXIMATE) DRIVERS OF DEFORESTATION

Forest cover loss in Kenya, based on Kenya's history and economic status as a largely agricultural country, can be attributed in the most part to *agricultural expansion*. This is especially so in the agro-ecological zones that constitute the mid- to high- potential areas in terms of agricultural production. In all the regions of Kenya loss of cover caused by agricultural expansion occurs with variations as to whether such agricultural expansion is motivated by subsistence or the market economy. At the coast where rural poverty is comparatively high, cultivation for subsistence has increased over time with increasing populations. Another motivation for agricultural expansion in the Coastal region are the markets in the urban areas of Malindi, Kilifi, Mombasa, Voi and Wundanyi.

The best example of agricultural expansion fueled by subsistence and commercial farming interests is in the Mau Conservancy. Unprecedented levels of officially sanctioned excisions of gazetted forests by 2001 was motivated by interests in commercial tea and wheat cultivation, in addition to small scale farming for subsistence and surplus production for the market. In the North-Rift, expansion of both commercial and subsistence agriculture has been a driver for deforestation. The exception is in Ewaso North Conservancy of which the bulk is in the dry areas and in which agricultural expansion has been confined to riverine areas and mountain ecosystems represented by Mt Kulal and Mt Marsabit. Over the last three decades *commercial agricultural expansion* in Nyanza and Western has been dominated by expansion of sugarcane plantations (Sony Sugar in Migori and Mumias Sugar Company in Western Kenya, Tobacco in both Nyanza and Western, Nyayo Tea Zones in Mt Elgon and more recently Rice Growing in Yala Swamp by Dominion Farms. Recently also, a new Sugar Company has been established in Ndhiwa). Expansion of *Nyayo Tea Zones* , which were supposed to be 100 meters of protective 'buffer strips'around forests but in some parts of Rift Valley and Western Kenya, have been reportedly extended without authority of KFS to 150 m strips instead.

Another direct driver of deforestation and certainly forest degradation is *wood extraction* for various purposes. In all parts of Kenya where consultations were made, extraction of wood for fuel in the unprocessed form and for charcoal production is the biggest consumer of wood, even though data on quantities are not systematically collected by the Kenya Forest Service or the Ministry of Energy. Given the importance of wood energy, this is a major oversight which should be addressed under REDD+. This is particularly true of the dry woodlands in Coast, Ewaso North and North Rift Conservancies, which are the main supply sources of fuelwood and charcoal for urban areas linked to them through road networks. At the Coast, charcoal and firewood are supplied from the drier woodlands in Kwale and Taita-Taveta areas to the Metropolitan Populations of Mombasa and other coastal urban areas. From personal communication an estimated 9,500 bags of charcoal is supplied to Mombasa on a weekly basis from Kwale, making it a key source of both domestic and industrial energy source, worthy of systematic and sustainable management. The same is true in Ewaso North Conservancy which supplies firewood and charcoal to urban centres such as Isiolo and even Meru in the neighbouring County and Conservancy. The same is true of the drier parts of North Rift

Conservancy which also supplies the same to urban centres such as Eldoret, Kitale and as far as Nakuru. In Nyanza and Western conservancies, supplies of fuelwood and charcoal are mainly from within their own boundaries, making fuel wood production, one of the challenges to forest management.

In addition to wood extraction for fuel, production of *poles for house construction and fencing* is another use which drives degradation. This is certainly the case at the Coast, Ewaso North, Mau, Nyanza and Western Forest Conservancies. At the coast, the mangroves despite the remaining blocks and fragments being largely protected have been harvested for years for construction poles and even charcoal production, which used to supply export markets in the Middle-East; a situation that attracted an export ban by the Government of Kenya. Though commercial concessions for indigenous timber species is virtually banned, the Montane Forests in Mau, Mt Elgon are still subjected to illegal logging, particularly for cedar posts (*Juniperous procera*) and timber species such as Elgon Teak (*Olea welwitschii*). Illegal harvesting of cedar is also experienced on Mt Kulal and Mt Marsabit, which are also 'Water Towers' in their own rights.

Though there are no clear records kept, *public infrastructure* such as roads and dams directly cause deforestation and, in addition, create opportunities for new settlements which put pressure on forest land and its resources. Roads and railways also facilitate access of local wood products to distant markets. In this regard infra-structure is both a direct and underlying driver to forest cover change. The LAPPSET project which aims to link the future Lamu Port on Kenya's Coast to the South Sudan oil fields by railway and pipeline will certainly create opportunities for forest cover loss and mitigation measures against unwarranted loss will need to be put in place, given the trends which have been observed in Ewaso North and Coast Conservancies. Infrastructure development especially development of roads (Isiolo – Merile, Merile-Marsabit) and several others which are at different stages of development) are also likely to result in increased threats to the dry land forests. Others include Isiolo international airport, livestock holding grounds and abattoirs. Even more spectacular would be the Isiolo Resort City, a planned oil refinery and oil pipeline, linked to the planned LAPPSET project.

Other direct drivers of deforestation and forest degradation are encroachment for*human settlements, mining, wildlife damage and wild fires.* Human settlements are closely linked to agricultural expansion as the rural poor create new dwellings in proximity to newly opened up forest areas. The Mau and Mount Elgon areas have provided good examples and in Nyanza the resettlement of farmers in Gwasi Hills is another example, which became quite controversial in both political and environmental terms, since settlers came in from a different administrative district and started clear-cutting hill tops for farming with its attendant issues of soil erosion and destructive flush flooding downstream. In Kwale County, wildlife damage to natural vegetation and plantation species through bulk feeding and trampling by elephants is a well-documented phenomenon, and related to increases in their populations. Damage caused by fire to vegetation, particularly anthropogenic wildfires can be quite damaging to trees especially because of increased fire frequency, overgrazing and over-harvesting oftenreduce the natural regenerative potential of woodlands. *Mining* while not yet

widespread in Kenya is likely to be a deforestation phenomenon at the Coast where deposits of niobium and platinum have been found, as are deposits of coal in Kitui County.

6.1.4 INDIRECT (UNDERLYING) CAUSES OF DEFORESTATION AND FOREST DEGRADATION

The consultative meetings used to prepare this report entailed discussions on the differences between underlying and direct causes or drivers of deforestation and by extension, forest degradation. This was to help identify those region-specific factors that could be considered as underlying causes to the direct ones that have been highlighted above. It was therefore of much interest to note that the indirect or underlying drivers identified irrespective of the regions of Kenya were; *governance* and *policies*, *industrial demand*, *commodity prices*, *costs of alternative energy sources*, *population*, *rural poverty*, and *infrastructure*. Stakeholders engaged in these discussions also identified *weak institutional presences* of the Forest Service as another indirect driver of cover change.

Poor governance and *unwritten policies* of government was considered the single most important driver underlying the excisions of gazetted forests in the Mau Forest Complex, particularly before and up to 2001, when over 40,000 ha of forests were de-gazetted or excised for commercial tea and wheat growing, coupled with a populist policy to provide land to the poor. This was possible because of the political fiat of the regime of the day and also because the Forest Act at that time was not stringent enough to dissuade the political leadership from de-gazetting huge areas from this iconic 'water tower' in Kenya. *Political interference* mainly by local politicians has also been a key factor that frustrates government efforts to curb encroachments and illegal harvesting on forest lands. Even in the Mau and elsewhere, local politicians tend to resist eviction of illegal forest setters, thus exacerbating deforestation and degradation of some of the affected forests.

Further encroachment of various blocks in the Mau Complex were also motivated by *population pressure* from natural population growth, as has been the case in other parts of Kenya, such as Kakamega, Gwasi Hills, Aberdares, Mt, Elgon, Mt Kenya and Mt Kulal. In addition, population pressure associated with overdependence on fuel wood and charcoal is a driver of both forest degradation and deforestation; for the simple fact that conversion of forest land to agriculture is made easier where a forest has been degraded through over-harvesting. In Isiolo town for example local stakeholders interviewed observed that the population has increased from 90,000 inhabitants to an estimated 141,000 in 2012; a factor that has created more demand for firewood and charcoal. In both Nyanza and Western Provinces *population growth on restricted land areas* has led to restricted forestry development and existing land continues to be sub-divided for the settlement of growing families. This has propelled encroachment on forest lands, particularly on County Council Forests which have had weak institutional presence and legislative power to manage the forests.

Demand from Industry and *household* for fuel wood is illustrated in the coast region and is a major concern as far as deforestation and forest degradation is concerned. This is because a majority of household energy needs even in the city of Mombasa is dependent on biomass and mainly wood energy in the form of fuel wood and charcoal. In addition and somewhat of a surprise some industries at the coast that would normally use electricity also depend on fuel wood and the demand

appears to be increasing. From information provided by personnel from the Kenya Forest Service, some textile industries are testing fuel wood (Pers Comm), while industries such as Pwani Oil, Panga Soap and several Salt Companies all consume fuel wood from sources that at the moment, are not certified in terms of their sustainability. Crystalline Salt Company consumes about 20 tons of fuel wood per day (pers comm). For Pwani Oil, one supplier is reported to supply 20 tons of fuel wood three times a month. One participant noted that he is aware of five people in Lamu who suppliers firewood to Pwani Oil, and noted that there are also suppliers from Malindi and Kilifi to the same company. Other factories that use fire wood include (1) Kenya Calcium Limited, (2) Salt Industries (7 factories), soap companies and Bamburi Cement. The hotel industry at the Coast also creates demand for unknown quantities of biomass energy and construction materials, even though some support afforestation and conservation in general; a point that can be used in the design of stakeholder participation to reduce deforestation and forest degradation. It is important to note that the demand from industry is heavily influenced by the*high costs of electricity* which is considered *prohibitive* and hence drives demand for biomass fuels by both industries and households.

Increase in commodity prices as an indirect driver of cover change is best exemplified by recent rises in charcoal prices in Ewaso North Conservancy. The increase is prices is caused by increased demand for charcoal by the growing urban populations particularly around the Mt Kenya area namely Isiolo, Meru, Nanyuki, and Moyale from Marsabit. It was noted that the price of charcoal in Isiolo has increased from KSh. 300 to 1,200 within a period of 2 years due to high demand. In Marsabit, the price has increased from KSh. 500 to 1,600 due to high demand in Moyale. In Maua, it was noted that the price has increased from KSh. 500 to 1,800. The group observed that in Kinna, some business people have closed their retail shops to venture into charcoal production using power saws due to high demand and competitive prices. It is estimated that around 62 power saws are available in Kinna and Garba Tulla area alone. Even the local administration officers are reported to have turned to charcoal burning to cash in on the booming trade.

Insecurity is also an underlying factor in the northern rangelands, and in places, such as in Baragoi, people have being forced to live in the surrounding Kirisia forest to hide from bandits and other perennial attackers, hence aggravating forest degradation.*Increased sedenterization* of pastoralists and change in land use has seen many of the residents in Ewaso North shift from pure pastoralism to mixed crop and livestock production. It was noted that crop cultivation has become more pronounced in Gafarsa, Rapsu, Malkagala, Kinna, Merti, Marsabit- Badasa and Songa, with pastoralists in these areas changing into farmers.

Weak institutional presence which generally translates into weak law enforcement coupled with perennially low fines for forest related offences is also contributing to degradation and deforestation

In Nyanza and Western, underlying drivers of deforestation and forest degradation include,

- The misunderstanding between KFS and Local Governments on the ownership and legal jurisdiction over forest lands

- Inadequate capacity of Community Forestry Associations, most of whom were formed just recently
- Population growth and high rates of unemployment
- Increasing demand for forest products
- Over-reliance on wood energy
- Insecurity in the Mt Elgon Area, which has impeded free movement of people and investment into sustainable agriculture

The boxes below illustrate perspectives from Ewaso North Conservancy and Meru, on matters regarding deforestation processes, with some indications on mitigation strategies and actions.

Box 1: Perspectives of Key Respondents on Deforestation in Isiolo, Marsabit and Samburu Counties

The key respondents included Jackson Nzou (Isiolo), Roseline Lesaibile (Samburu) , Aron Duba (Marsabit), Tom Letiwa (Samburu) and Erick Chemitei (Samburu)

Given the vastness of the northern rangelands represented by Isiolo, Marsabit and Marsabit Counties, the consultants sought the opinion of the respondents on whether the new devolved governance system could improve the status of forest resource management. The reactions were mixed because in some cases tribal differences and inter-clan differences can hinder agreement on management measures. In Marsabit, NEMA had revoked some 416 illegal allotments that had been given by the Council. However, this revocation has not been implemented and that such trends could continue under the new county government because of protection by local politicians.

On the possible gazettement of Mt Kulal, the response was that conflict may arise between KFS and the County Assembly, on the grounds that KFS would deny them revenues by putting Mt. Kulal forest out of their management jurisdiction. However, on a more positive note, the respondents also noted that County Governments could have a positive impact on forestry if they are properly sensitized. This is especially so if Participatory Forest Management is implemented in each of the forest blocks in the region. However, they noted that this will be possible only if issues of governance are sorted out and proper management and governance structures put in place. This also calls for a more planned and coordinated transition of forest management to the county governments.

In the conservancy, an important factor for protection of forests are traditional safeguards against overexploitation of trees. In Samburu, for example, Mathews Ranges is conserved and managed better than other forests because of its terrain and local traditions that guard against indiscriminate tree cutting. Among the Samburu a man will not cut down more than five big *Acacia tortilis* trees in his entire lifetime. Other forests that have been successfully management through traditional management systems include Kobida Baiyo, Forole Mountains, and Solole.

In Marsabit County there are a number of shrines that are protected through traditional beliefs. Good examples of these are, Kubi Abayu, Forolle Oaliti, Mt Kulal, Hurri Hills, Ngurunit, Aabo & Borrolle Mountains, Sololo District

Box 2: An Overview of Deforestation and Forest Degradation in Meru, Mt Kenya Region: Mr Evans Maneno, Zonal Manager, Meru as Respondent. 10th May 2013

Mr. Manemo underscored that the main causes of deforestation and forest degradation within the lower parts of Meru Zone neighboring Isiolo County were unsustainable exploitation of wood for charcoal, and fire wood, forest fires, and illegal logging. Meru town is a major market for charcoal most of which comes from the dry woodlands of Ewaso North Conservancy

He observed that in Kiagi Hills where exploitation for charcoal is rampant, the activity is largely drive by increased prices of charcoal, which have risen from KSh 300 to between KSh 1200 -1500 over the last two or so years. Underlying this is the rapid rise of Meru Town's population over the last decade.

He further alluded to the fact that the Southern Part of Meru is a largely tea growing area and that .that individual land holdings in the area are becoming smaller.. He noted that given the vibrant tea industry in the area, there is very high demand for fuel wood for curing tea. As a result, there is heavy poaching for firewood in the adjacent Ruthumbi forest. Key factors underlying the heavy poaching for fuel wood is caused by another two underlying factors namely (i) increased land fragmentation resulting from the burgeoning population – no land to grow trees, and (ii) increasing levels of poverty and lack of alternative economic activities for the youth

Another cause of degradation is the increased poaching of cedar posts. This is caused by the high demand and increased prices of cedar posts. One cedar post is reported to selling at KSh. 300 in Meru, and KSh. 500 in Isiolo. The current ban on logging has also created incentives for illegal logging for timber as the prices of timber has gone up due to the resulting low supply. Although there is a ban on timber harvesting, KFS issues timber movement permits for timber produced on farm. However, this is often abused as the unscrupulous traders use these permits to transport timber obtained through illegal logging in the forests.

Mr Maneno also observed that although illegal grazing has become less rampant due to smaller herds and enhanced zero grazing in the area, it not uncommon to find such incidences. This is especially so during periods of extreme droughts when pastoralists from Isiolo, Samburu and other ASAL areas drive their herds deep into the Meru Forest to search for pasture and water. He noted that this was particularly a serious issue in 2009 when the ASALs experience prolonged and severe drought.

Extended droughts tend to also lead to dry fuel loads,which increases fire hazards resulting in heavy burning of standing trees. The Zonal Manager noted that is especially pronounced in the Western Slopes of Mt Kenya in Marania and Ontulili forests. Besides drought, frost also kills a lot of vegetation which cause a fire hazard. Traditional burning before the rains is also still practiced but with no safeguards.

Despite the above challenges and direct and underlying causes of deforestation and forest degradation a number of opportunities for mitigation exist. A good example cited by the Zonal Manager is the Plantation Establishment and Livelihood Improvement Scheme (PELIS) which has resulted in reduced illegal activities in the forest. The System, he noted, has seen many previous illegal loggers and grazers become champions of sustainable forest management and that many of the local communities have formed village scouts to help patrol and protect the forest.

A new and encouraging development is that most of the tea factories are buying land to establish their own fuel woodlots and will thus reduce the current pressure on state forests and, in addition, the Ministry of Agriculture is doing more to sensitize people on and promote zero grazing and that this will reduce illegal grazing in the forest.

6.1.5 OBSERVATIONS AND CONCLUSIONS FROM THE IDENTIFIED DIRECT AND UNDERLYING DRIVERS OF DEFORESTATION AND DEGRADATION IN KENYA

From the described drivers of deforestation and forest degradation the following observations and conclusions are made:

i. The various regions of Kenya generally experience the same direct drivers of deforestation and forest degradation, but on closer examination the underlying drivers differ in nature and even intensity. In Isiolo, deforestation is driven by wood extraction for charcoal production and firewood but unlike Nyanza and Western, the overriding underlying factor is recent increases in charcoal prices. At the coast, demand from industries that prefer cheaper biomass fuels to electricity is the main underlying driver, in addition to population growth in Mombasa and other coastal towns. Data to support these observations is highly needed.

ii. In the Mau Forest Complex, poor governance was the main reason behind the significant losses of forest cover through excisions facilitated by the political leadership. Aligned to this was demand by the elite for commercial tea and wheat plantations.

iii. The fact that the Forest Service has accumulated huge planting backlogs, that it is currently addressing represents historical governance problems that should never be allowed to recur, since in some cases, lack of re-planting has inadvertently facilitated encroachment onto forest lands by creating open spaces in formerly planted areas

iv. Population pressure in both rural and urban settings seems to cut across all the regions, with the exception of Ewaso North, where it is mainly confined to urban areas

v. The influence of infrastructure development on forest cover losses is not well documented but the current national REDD+ process has drawn attention to it. The LAPPSET Project should therefore be under close scrutiny, starting from Lamu Port, through the northern rangelands, Turkana to South Sudan, from a forest cover loss perspective

vi. Kenya as a country relies heavily on biomass fuels and this will continue to be the case in the foreseeable future unless drastic measures are taken to meet domestic energy demand. This is consistent with the observation that in the early and late transition phases of a country when agricultural expansion is stable, wood extraction for energy becomes a major driver

vii. In places such as Nyanza and parts of Western where there are no big industrial plantations, gazetted forest lands have been encroached as a result of weak institutional presences particularly to promote on-farm forestry as well as in gazette land

viii. In the northern rangelands represented by Ewaso North, supply of firewood and charcoal is their huge contribution from a forest product perspective, but the concept of sustainable charcoal production and the deliberate management of dry woodlands in that regard is virtually non-existent. With the coming of LAPPSET losses of forest cover can be expected to escalate

ix. At the coast the dry woodlands of Kwale and Taita -Taveta are being degraded and converted as a result of charcoal production and firewood harvesting. Again sustainable charcoal production is not being practiced, even though there are incipient efforts to do that. It is also an interesting area because deforestation and forest degradation is being driven by industrial demand for firewood and household consumption of charcoal and firewood. The good thing is that the industries are known and they can be brought together to promote market driven processes in aid of sustainable production to meet their demand. For starters mandatory collection of data on production and consumption is urgently needed.

x. Mining is going to have an impact at the coast if no environmental safeguards, particularly forest cover is not addressed

xi. Even though the drivers were identified, there is virtually no readily available data to estimate their relative share in causing, either deforestation or forest degradation. For commercial crops such as tea, sugar, wheat and tobacco it is possible to get area statistics as a proxy indicator of how much land has been converted from forests and woodlands to grow them. To help appreciate the environment under which deforestation and forest degradation have taken place over the years, a whole section showing socio-economic data and in some cases area under crops has been prepared.

xii. From the literature and personal communications during the sub-national consultations, some areas with locally significant forest cover such as Mathews Range in Ewaso North and Loita Hills in Narok Country have not been subjected to massive forms of deforestation and degradation than comparable areas have experienced. For Loita Hills, it is largely explained by traditional values and methods of forest management and in Mathews Range it is a mixture of a difficult terrain and local Samburu Culture which discourages the cutting of trees. Interestingly, Samburu and Marsabit Counties have sacred forests which are protected through traditional myths and beliefs; akin to what underlies the protection of the Kaya's at the Coast.

The results from the regional consultations on drivers of forest cover change in Kenya suggest that poor governance has been the single most important driver underlying other drivers, since it is what led to officially sanctioned but ill-advised excisions of gazetted forest lands. Since degradation and deforestations seems to be going on in the dry woodlands, which are important sources of wood energy, the governance structures and the policies of government to manage woody vegetation to produce energy is urgently needed. The findings show that historically agricultural expansion has been the major direct driver of deforestation. In the Rift Valley (Mau Area), Mount Kenya (Western Slopes), Mt Elgon commercial farming interests were key drivers. The main crops are tea (Rift Valley, Mount Elgon), wheat (Mau and Mt Kenya), maize (Trans-Nzoia in the Mt Elgon). In some parts of Nyanza and Western, sugar and tobacco have been the main commercial crops driving cover loss but population pressure resulting in the expansion in permanent subsistence farming has also become predominant. However today, wood extraction for construction, firewood and charcoal are the main drivers in places such as the Coast, Ewaso North, North Rift, Nyanza and Western. According to Nosonuma et al, 2012, such forms of wood extraction become dominant in the late transition and post-transition phases in a country. These findings would suggest that Kenya is in the late transition phase as described by the Forest Transition Model (Mather 1992, Rudder 2005, Nosonuma et al, 2012).

The supply of energy to industry and urban households in rapidly growing urban areas should be a cause for concern but also an opportunity for constructive engagement with both suppliers and consumers. It is critical that the supply of energy is officially recognized as an important contribution of the forest sector to Kenya's economy. Furthermore the fact that some industries at the coast consume what would appear to be significant amounts of firewood and charcoal from currently non-certified sources is an opportunity for the forest and energy sectors to dialogue since it seems the costs of electric power is seen as prohibitive. With the discovery of oil and gas deposits

along the East African Coast and Kenya's hinterland, time is ripe to look at how to promote and provide incentives for urban households to switch to electricity and gas for their domestic energy needs, as a way to reduce over-dependence on firewood and charcoal. Sustainable charcoal production, coupled with affordable alternatives seems like a potentially viable way to ease harvesting pressure, especially in the dry woodlands, the sustainable management of which has been historically weak or non-existent. It would seem that a renewed official recognition of their role in energy supply is necessary and should be backed by resources to manage them.

Given the fact that the same driver of deforestation and degradation may have different underlying causes depending on where one is in Kenya, it is prudent that any future REDD+ Strategy recognize those differences and recommend mitigation strategies that take those differences into account. The case of industrial demand for firewood at the coast and urban household demand for energy in the Isiolo, Mt Kenya and Nyanza regions in Kenya illustrates the issue.

The issue of weak institutional presences of the Forest Service in vast and relatively under-populated areas, particularly in the dry woodlands is an issue that the Service has recognized, but it seems that the Service needs a compelling reason to unlock public resources to manage these areas. It would seem that a concerted effort between the Forest Service and energy ministry is long overdue and pilot projects such as the one being tried in Kwale to organize charcoal producers is the right way to go but it has to be used to reform national policies on energy in a systematic way. A future REDD+ should therefore embrace sustainable charcoal production and demand side management as one of its core programmes, since the fuel wood subsector is both a source of deforestation, degradation and direct CO2 emissions, which is the core business of a REDD+ programme. One possible way is for the Central Government to provide incentives for newly devolved government structures to embrace and implement policies that are supportive of forest management, particularly increasing forest cover within a sustainable use or sustainable forest management (SFM) framework, recognizing the need to twin forest management with rural economic development.

The fact that certain blocks of natural forests have been protected and sustainably used, suggests that where local traditional institutions have proved to be effective, they should receive official government support since such communities are providing environmental services for which the principles of Payment for Environmental Services (PES) should apply. In the consultations, Samburu and Marsabit Counties have such forests which should be documented and officially recognized and promoted for sustainable tourism; a form of PES. The same should apply to the Kaya's of Kwale County and Loita Hills in Masailand. The case of Loita Hills and its conservation by traditional methods is definitely noteworthy and well-described in a recent study by Ole Riamit (2010).

7. POLICY ENVIRONMENT FOR PAST AND CURRENT STATUS OF FOREST COVER CHANGE IN KENYA

An appreciation of the policy environment that has influenced and nurtured forest cover changes in Kenya, particularly deforestation and forest degradation, calls for, among other things, an understanding of how forest policies have evolved over time. One starting point is to recall that the Forest Service as we know it today, owes its existence and policy focus to the political leadership and development paradigms have steered the country, starting from the colonial era to today.

7.1. EVOLUTION OF FOREST POLICIES AND GOVERNANCE STRUCTURES IN KENYA AND OTHER COUNTRIES

The forest agency in Kenya as well as in all other East African countries were initially created largely to serve colonial interests, which were paramount in the first half of the twentieth century. It could be claimed that such interests also ensured the useful role of forests to protect water catchments, which was for the good of the settler and colonized alike. In connection with this came the realization that existing natural forests, in countries like Kenya were getting depleted and that plantations of relatively fast growing species were needed to supply wood for industrial development and, in the process, also provide employment opportunities and earn foreign exchange. Forest departments in countries such as Malawi, Tanzania, Zambia and Zimbabwe are typical of forest departments of the British colonial era of the early to mid-1900s. They tend to have a central high command with regional districts or conservancies, which are in charge of forest reserves and plantations.

The forest policy of Kenya, such as Sessional Paper I of 1968, emphasized the provision of employment opportunities, the supply of wood for economic development, and at the same time protection for water catchments, nature conservation and other associated amenities. The administrative structures put in place were responsible for granting and managing timber concessions in natural forests to private industry, and developing industrial plantations supported by appropriate research. This can be attributed to a factor that has also been recognized internationally that in cases where the contribution made by the forest sector is clear, it is easier to allocate resources to the sector (Morrell & Anziani 1994). The fast-growing exotic plantation species were meant as a major import substitution commodity and have contributed immensely to industrial development in Kenya and elsewhere, despite its decline over the last two decades.

To date, most forestry institutions remain in the hands of the central government, dominated by centrally planned economic models of development (Katerere 1996). In general, and like the policies of a number of past colonies of Britain, the forest policies of Kenya, have gone through three major phases in recent history: the *colonial era* opted to provide timber to the colonizing country; this changed more to forestry for economic development in the *import substitution era* in newly independent African States and, recently, forestry under *economic liberalization* and the structural adjustment era.

The *practice of forestry in this latest era has seen drastic reduction in public funding for the sector at a time when the sector is still supposed to contribute to socioeconomic development and maintenance of biological diversity*, with the participation of local communities and the wider public. More emphasis has been placed on farm forestry, agroforestry and the community-level management of natural forests. An important question is whether these policy changes have been reflected in how forestry institutions are structured and whether foresters have continued to enjoy broad political support for their activities,namely the production of fibre and non-wood forest products in addition to the conservation of soil and water and the protection and conservation of biological biodiversity.

During the *colonial* and certainly the *import substitution era* of *post-independent development* for most countries, the forest estate was well defined and policed. Strong forest departments were in charge of timber concessions from natural stands and plantations. The policies of most of these departments had a strong statement on the management of planted or natural stands on a sustained yield basis, in addition to the improvement of production through silviculture and tree improvement (Kojwang 1996). It is clear from countries such as Kenya and Zimbabwe that research on tree improvement and disease control was encouraged by these policies. Hence, Zimbabwe is a leader in improved tree seed and Kenya contributed immensely to the control of *Dothistroma*needle blight in plantation pines in the 1960s and early 1970s.

Today, forestry is under pressure from competing land uses such as agriculture, which is the greatest single cause of forest conversion, as well as charcoal production and poorly managed timber concessions. In the national development context, the forest industries of most countries do not have the same national standing as they had during the *import substitution era, with the exception* of South Africa, Swaziland and Zimbabwe, which share a similar colonial heritage with Kenya. It also appears that as Kenya went through a period of economic stagnation during the 1990's to 2000, it was forced by economic circumstances to rationalize the structure of the entire civil service, which

weakened the forest sector as well as others. Despite that, the forest sector was faced with, and supposed to respond to development challenges and new global policies. Such challenges are represented by the advent of calls for poverty alleviation, food security, balancing environment and development, the conservation of biological diversity, privatization and the devolution of powers and rights to communities to manage natural resources in rural areas. It is noteworthy in most of the East African and SADC countries that despite apparent policy shifts and a greater sensitivity to community participation in the management of natural resources, the forest institutions are still largely centralist. The situation in Tanzania was basically the same until it adopted the policy of decentralization, even though it has turned out that it has reduced the effectiveness of the forest service (Kowero 1996).

It is against the backdrop of changing economic circumstances and the evolution of forest policies and structures of forest agencies that one ought to examine and put into perspective, the deforestation and forest degradation processes and trends that we have so far observed. At this point it is important to note that in 2005 Kenya adopted a new forest legislation, the Forest Act of 2005 which has vastly improved and promotedthe wider participation of the public and the private sector in forest management and has made it more difficult to exercise the kind of improvident behavior that saw massive politically supported excisions of forest lands and a general breakdown in governance of the forest sector in general. It is also critical to take note of Kenya's new devolved system of governance that was brought about by Kenya's new Constitution of 2011 and its likely influence on forestry development in the years to come. In line with these it is important to look at the past and present policy environments and their conduciveness to Kenya's future REDD+ Programme. The issues that are key in looking at the policy environment are as follows:

i. Overall development policies with an emphasis of current ones and their likely trends in the next decade, which is basically an economic outlook and how that may support REDD+
ii. The appropriateness of current policies, legislation and strategies developed for the forest sector – in terms of participation, production, protection and processing
iii. Policies in the land use sectors that promote or run counter to the policies of the forest sector

iv. Policies with no direct relationships to the forest sector, but which underlie the problems and challenges that have negatively affected the forest sector – e.g. trade, infrastructure, population, commodity prices, interest rates, investment

v. The influence of global environment policies on Kenya's Forest Sector

vi. Global trade policies – free trade, globalization, emerging markets

7.2. KENYA'S POLICIES AND EFFORTS TO CURB DEFORESTATION AND FOREST DEGRADATION

Prior to 2005, Kenya's Forest Policy of 1968, though comprehensive and supportive of sustained yield and even the protection of Kenya's remaining natural forests was supported by weak legislation which made it easy for excisions of forest land to be made through decrees. This was also made possible by a government which did not facilitate sufficient consultations with professionals, practitioners and civil society on the short and long term effects of loss of forest cover and even of a policy which banned the Shamba or Taungya systems which had been effectively used to regenerate clear cut forests or establish new plantations altogether. With a combination of an agricultural development policy which stressed more cultivation without the necessary environmental considerations or safeguards, population pressure, poverty and others, conversion of forest land to agriculture and human settlements progressed to the detriment of the forest sector and by extension, the goods and services, for which forests are known and should be managed. It is also a fact that while the environmental role of forests and forestry were known, the critical contributions in the mitigation of climate change, now recognized as a global imperative, had not gathered the kind of global recognition that there is today.

With the development of a new Forest Act in 2005, following almost a decade of consultations and development, the key elements of the new policy and legislation are:

- A greatly enhanced role for communities through Community Forest Associations and other mechanisms
- A focus on livelihoods and sharing benefits from forests more equitably
- Forest management planning that is guided by professionalism, is science based, and uses an eco-system approach
- Appropriate incentives to promote sustainable use and management of forest resources
- Establishment of semi-autonomous Kenya Forest Service as a new institution to replace the Forest Department with an expanded mandate in the management of all types of forests
- Promotion of commercial tree growing
- Parliamentary approval of excision of gazetted forests, backed by Environmental Impact Assessments
- Management plans are required for all major forest ecosystems

- Establishment of a Forest Management and Conservation Fund
- Recognition for the concept of Payments for Ecosystem Services (PES)
- Commitments to Sustainable Forest Management and the environmental role of forests

The Forest Act of 2005 is supported by other land use related policies and legislation such as

i. The New Constitution of 2010, Article 69 (1)(b) requiring that Kenya increases its total forest cover to 10%, a development which is eminently complementary or supportive of Kenya's future REDD+
ii. Vision 2030 which recognizes the need for Kenya to follow alow carbon development pathway and embraces environmental management alongside economic prosperity.
iii. The Agriculture Act of 2009, and with it, the Farm Forestry Rules which requires that 10% of farm land be set aside for the growing of trees, is probably the single most important piece of conservation friendly legislation from Agriculture since the soil conservation regulations in the pre- and immediate post-colonial era.
iv. The new National Forestry Bill of 2013, which among other things provides for a chain-of-custody system to verify and report the origins of forest products in compliance with the initiative; Forest Law Enforcement, Governance and Trade in forest products (FLEGT), which is promoted by the EU. This can be used effectively to deal with the issue of 'leakage' which remains a challenge to REDD+ Programmes
v. The new Environmental Management and Conservation Act of (EMCA) of 1999 which makes it mandatory for any developments on land including de-gazettement and even large scale afforestation programmes to be subjected to Environmental Impact Assessments.
vi. New Land Policy which aims to streamline land management and administration, review existing land laws and address past problems including inequalities in access to land, land tenure issues, underutilization or abandonment of land, and over-exploitation and unsustainable use of land.
vii. The Land Act of 2012 also enables the management of land for environmental easements, particularly those easements established under EMCA.
viii. The Energy Act of 2006 – Together with the Energy Policy, Sessional Paper No 4 of 2004, the Act calls for policies to develop renewable forms of energy, among others. In this regard, it is important to recognize fuel wood as a renewable energy form and should be sustainably managed. Again this is in line with REDD+ and Clean Development Mechanisms where energy efficiency during the conversion of wood to charcoal and its use should be promoted in Kenya and the rest of Africa.
ix. The Charcoal Rules of 2009 promulgated by the Kenya Forest Service – enables the growing of trees for energy, legal recognition and registration of Charcoal Producer Associations (CPAs) and Charcoal Transporters (CTAs) Associations, which are supposed to adhere to sustainable management practices in charcoal production.

x. The Master plan for the Conservation of Water Towers (MEMR 2012) has provided an analysis of historically land cover changes in Kenya's key water catchments and sub-catchments which invariably are forested. In the strategy the protection and restoration of catchment forests is considered an imperative and in this regard, the rehabilitation of degraded catchment forests to increase or improve cover, thereby enhancing carbon stocks is quite highly compatible with REDD+

In general, current indications suggest a more supportive policy environment for sustainable forest management and REDD+, unlike in the past that excisions of forest land and politically motivated encroachment was condoned. In the discussion of drivers what came out in the form of current policies and strategies that are supportive of the need to reduce deforestation and degradation are the new Forest Act of 2005 which has facilitated the formation on Community Forestry Associations to create management partnerships for improved participation in forest management and has also made it legally difficult to excise or de-proclaim forest lands in the manner that Kenya witnessed up to 2001. In addition the revised Agricultural Policy with its Farm Forestry rules requiring that 10% of farm land be put under trees is another one which is quite crucial in the mid to high potential agro-ecological zones where there is more intensive cultivation. It is also supportive of tree growing in arid and semi-arid areas. Other policy documents are the National Climate Change Action Plan 2013-2017 under Vision 2030 of Kenya, Kenya's Climate Change Adaptation and Mitigation Strategy of 2009, and the Master plan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya of 2012

7.3 POLICY INCENTIVES TO REDD+

Key examples of what could be considered as incentives to the forest sector and REDD+ are hereby listed and briefly described.

i. Under EMCA the Minister of Finance has authority to create levies and taxes to promote sustainable management of forests; a provision which can be used as one of the innovative financing mechanisms under a REDD+ Programme.
ii. The Forest Conservation and Management Fund for Commercial Forestry
iii. The Water Towers Conservation Fund under NEMA is also another funding mechanism.
iv. The National Climate Change Response Strategy (NCCRS) recommends tax incentives and favorable import tariffs on emission reducing technologies
v. Foreign investment protection Act – allows repatriation of profits, hence is an incentive for Foreign Direct Investments
vi. Long term concessions in the forest sector – will enable the private sector to provide long-term investments in the sector for production and sustainable use of forest resources and in the processing of forest products with the KFS playing a regulatory role.

7.4 OTHER POLICIES IMPORTANT FOR THE FOREST SECTOR

i. The new Land Policy – calls for the development of comprehensive resource tenure – and provides for the development of land use plans at national, regional and local levels

ii. The County Government Act No 17, of 2012 calls for County Development Planning to facilitate development of settlement plans for socio-economic and environmental development. This can be used to set agenda for forestry development plans for counties.

7.5 OTHER POLICY ISSUES FOR CONSIDERATION

i. Despite the Farm Forestry Rules of 2009 under the Agriculture Act, there is no evidence that current policies on Food Security through agricultural and developments programmes are explicit that further development must not lead to the loss of the remaining forest cover. In fact all the land and natural resource sectors should be compelled by the central government by ensure that no further loss forest cover
ii. Despite the fact the bulk of Kenya's woody biomass is outside gazetted forests and are also in the dry woodlands, their management is still minimal at best and resources toward their management is still quite meager.
iii. The role of forestry in energy supply is not recognized or accounted for in national statement of accounts. This is further reflected in the fact that budgets for the management of woodlands for energy, even under the Ministry in charge of energy is negligible. There is definitely a need for a strong wood energy policy co-sponsored by the Ministries in charge of energy, forestry and environment.
iv. The role that the forest sector has historically played in the protection of water catchments is also greatly undervalued, even in the city of Nairobi which has benefitted and continues to benefit from water coming from Aberdares forest reserves. Again, this is an area where policy development and cross-sector planning is crucial. It seems that the concept of PES should be more articulated and publicized in Kenya in order to develop stronger policies and political will in favor of forest protection

8 POSSIBLE STRATEGIES AND PROGRAMMES TO MITIGATE FOREST COVER LOSS IN KENYA

This section of the report is derived from the challenges and opportunities within a REDD+ context which aim to reduce emissions emanating from deforestation, forest degradation and so in a manner that is compatible with sustainable management of forests, including the enhancement of carbon stocks.

8.4 SUMMARY OF PAST AND CURRENT EFFORTS TO REDUCE FOREST COVER LOSSES IN KENYA AND THE CURRENT POLICY FRAMEWORK FOR FURTHER ACTION

In suggesting possible mitigation strategies, one must be cognizant with the efforts that Kenya has put in the recent past to reduce deforestation and forest degradation. A summary of those efforts are hereby given as follows:

i. In 2005, Kenya promulgated new forestry legislation, the Forest Act of 2005, which among other things broke from tradition and enabled the formation of community forestry associations as legitimate partners in forest management and their protection thereof

ii. The Forest Act also made the rules of de-gazzetement or excisions of forest lands more stringent. Today, Parliamentary Approval is required for any excisions, making such decisions more transparent, consultative and less likely to be manipulated by populist or even elitist tendencies of the powers that be.

iii. Today, the forest sector of Kenya, again enabled by the Forest Act of 2005 and also its own Strategic Plan of 2012 is enabled to partner with private companies, through formal competitive concessions to regenerate, manage and sustainably utilize forest resources. This thinking can also be used in the participation of the private sector under REDD+, particularly in carbon enhancement projects under reforestation and afforestation.

iv. The Charcoal Rules of 2009 is yet another piece of legislation that aims to regulate the charcoal industry from the perspective of the forest sector and enables the formation charcoal producers and transporters association; which is an effort to encourage lawful trade in charcoal and the adoption of sustainable production practices.

v. In 2011 Kenya promulgated a new Constitution which requires the country to increase its forest cover to 10% which also gives strength to the *Farm Forestry Rules* under the Agriculture Act of 2009, requiring that 10% of farm land be set aside for the growing of trees

vi. Currently the Kenya Forest Service itself has increased its efforts in the regeneration or re-planting of areas which have been clear-cut.

The new Forest Bill 2013 when enacted, will provide fiscal and tax incentives to increase investments in the forest sector, will enable the establishment of a National Community Forestry Programme, a National Afforestation Programme and a Permanent Forest Sink Initiative.

The efforts that Kenya has made with regard to reducing deforestation *have concentrated in creating framework conditions*or *systemic capacity* to improve the management of trees and forests. Clearly a lot remains to be done and what the country needs are mechanisms to unlock resources to meet the policy objectives and use the same policies and their objectives to set targets that the key players in the forest sector and particularly under REDD+ should achieve and accomplish. It is therefore in order to look at the challenges that a future REDD+ will have to contend with.

8.5 SUMMARY OF KEY ISSUES, CHALLENGES AND OPPORTUNITIES IMPORTANT IN THE DESIGN OF MITIGATION ACTIONS

Based on readings of Kenya's R-PP of 2010 and the sub-national consultations on drivers of deforestation and forest degradation, a few issues and challenges are noteworthy.

i. Having acknowledged that Kenya has the right systemic capacity in the form of policies and laws which can be positively used to promote REDD+ and sustainable forest management, the real issue is the allocation of requisite resources and the creation of structures and partnerships to manage the forest sector to achieve set objectives and targets.
ii. Since Kenya has just launched a new devolved governance system, which in theory could bring services closer to the people, particularly local communities, but it is still a huge challenge since the County Governments are still at the planning stages and a number may not prioritize forest management matters. In fact the fear is that to raise revenue, over-exploitation of existing forest resources in their jurisdiction may occur, as well as the fact that counties may also resent central control of forest resources and legislation. Creating strategic and operational partnerships with County Governments is therefore an imperative in any future REDD+ and SFM Programmes at both local and national levels.
iii. The forest sector in pursuing both REDD+ and SFM objectives will require the support of other sectors whose policies and actions either affect forestry directly or indirectly. Hence one of the biggest tasks will be to seek the cooperation of the finance, agriculture, energy and infrastructure sectors, just to mention the key ones. The challenge is to ensure that forests and forestry are safeguarded in the policies and practices of these sectors.
iv. Going by the findings from sub-national consultations on deforestation and degradation drivers, a national REDD+ will need to design mitigation programmes which are responding to the right underlying causes or drivers. This is also true of reference levels, which may require that internally, the setting of reference levels for a conservancy such as Mau and Coast are 'tailor-made' to suit local circumstances. Kenya could have a national debate on which regions of Kenya will require such treatment.
v. Given that Kenya is most probably in the late transition phase according to the Forest Transition Model, the extraction of wood for energy and poles for construction becomes the major driver of forest cover change. However the production of charcoal and its marketing

is hardly regulated. Most of the charcoal from the dry woodlands occur in trust and or community lands which are subjected to the vagaries of open access resources. The challenge is to formalize the production, marketing and monitoring a product which is heavily traded in the informal market.

vi. Given that REDD+ is still a relatively unknown in Kenya and the fact that there is only one major REDD+ Pilot is worrisome. Preferably, there should be at least one large pilot REDD+ for each of the key forest types and mix of land uses to aid learning by both government and its partners.

vii. Since the participation of local communities is going to be crucial the capacitation and empowerment of Community Forestry Associations and farmer groups to engage in REDD+ and take advantage of existing policy incentives is import because at the moment, the majority of CFAs are still in their early stages of development

viii. The issue of carbon rights and benefit sharing should be clarified since the addition of County Governments, another layer of governance, could bring confusion especially where benefit sharing between the government and local communities is concerned.

8.6 SUGGESTED STRATEGIC AND OPERATIONAL MITIGATION OPTIONS FROM A REDD+ PERSPECTIVE

The mitigation interventions are presented herein in a table format (Table …). They merely highlight what the authors, based on their consultations, think are crucial enough to be included in a future REDD+ Strategy, but are by no means exhaustive. As such they should be treated as concepts that will need to be elaborated by identifying and describing the *challenges*of each, statements of *objectives*, *indicative actions, achievable* and *measurable targets*, *relevant indicators* and *responsible institutions* or *partnerships*. It is also important to include under each strategy, the *areas of concentration* and the *emission reduction or carbon abatement potential*, which is a useful concept for measurement, reporting and verification (MRV) and carbon accounting.In conjunction with the material in Table 7, a list of nine strategic issues are listed herein, briefly explained and should be further discussed in a future national REDD+ strategy. They are:

1. Governance Framework and Structures for REDD+
2. Capacitation and collaborative agreements with County Governments
3. Programme for the rehabilitation and protection of Kenya's Water Towers through REDD+
4. Afforestation and reforestation programme to create and enhance carbon stocks under REDD+
5. Farm forestry programme for the voluntary carbon markets
6. Energy Efficiency
7. Management protocols for dry woodlands
8. Agricultural Intensification
9. *Option 9* Policy support to the National REDD+ Programme

Issue 1: **Governance Framework and Structures for REDD+**

As a minimum this would entail the formation and activation of REDD+ Policy and Technical Committees with clear work programme and time bound targets. One of their products will be a clear REDD+ Implementation Framework, a National REDD+ Strategy, a clarification of Carbon Rights in all types of forests and Benefit-Sharing Mechanisms.

*Issue2.***Capacitation and collaborative agreements with County Governments**

This option calls for the Kenya Forest Service to develop Institutional Capacity and Forestry Programmes for the County Governments and negotiate achievable management targets for each. This could be a stepwise process and can start with a selected set of counties or conservancies which cover a group of counties.

*Issue 3.***Programme for the rehabilitation and protection of Kenya's Water Towers through REDD+.**

This will take advantage of the already existing master plan, which recognizes that the water towers have been subjected to various degrees of degradation and deforestation. They provide opportunities for the enhancement of carbon stocks and the yield of water and biological diversity as co-benefits, not to mention employment of local communities and sharing of benefits of carbon sequestration

*Issue4.***Afforestation and reforestation programme to create and enhance carbon stocks under REDD+**

This is particularly relevant in areas such as Coast Province with no significant afforestation programmes, yet are conducive for growing of trees exist. The Lake Victoria Region where plantations on hill tops have been degraded is another example. Again, these should be designed with clear emission reduction potentials that are well articulated, including expected employment potential.

At the coast supply of wood fuels to industry should be strictly controlled and should be certified as coming from sustainable sources.

Issue5. **Farm forestry programme for the voluntary carbon markets**

This recognizes the fact that there is more woody biomass on farms, than in industrial forest plantations and reserves. In places such as Eastern, Nyanza and Western regions without huge forestry plantations compared to those in Rift Valley and parts of Central Conservancy, farm forestry is the only way to increase forest cover to the extent recommended under the farm forestry rules.

There is also room for *energy woodlots* or forests to supply poles, firewood and charcoal on a sustained yield basis, which is something that Coast Conservancy should employ to deal with wood fuel demand in Mombasa and other coastal towns.

*Issue 6.***Energy Efficiency**

This is a crucial programme since the bulk of Kenya is still dependent on biomass fuels. This will mainly target Kenya's Urban Populations to reduce consumption of biomass fuels through the use of more efficient carbonization techniques, fuel efficient stoves. It will have several components.

i. Sourcing wood from sustainable sources – a charcoal and firewood certification scheme
ii. Efficient carbonization (charcoal making) technologies
iii. Promotion of fuel efficient stoves – can follow the current format of Programmatic clean development mechanism (CDM) Projects
iv. Certification of producers and marketing agents

Issue 7.**Management protocols for dry woodlands**

Given their crucial role for supplying wood energy, the dry woodlands need to be managed on a scientific basis to allow regeneration and to guide harvesters on allowable cut and cutting cycles. This will be crucial for realizing sustainable charcoal production. This is especially crucial at the Coast and Ewaso North Conservancies and in the North Rift Regions of Kenya.

An important and innovative aspect of this is to use *market based approaches* (organize and collaborate with industrial consumers) that require that industrial consumers source their wood supplies from sustainable sources.

Issue 8. **Agricultural Intensification**

This is a programme that will not be directly run by a REDD+ but by the Ministry of Agriculture. However since it is a policy issue the REDD+ Programme can advocate it to both Central and County Governments since it resonates well with Kenya's objectives to improve productivity on existing land and improve food and income security.

*Issue9***Policy support to the National REDD+ Programme**

This will include:

i. Pricing of electricity and gas to enable fuel switching by industry and urban households to cleaner energy forms, not linked to deforestation and degradation
ii. Policy incentives for fuel efficient technologies
iii. Offsets by activities that directly or indirectly lead to the destruction of forests – for instance, a mining venture at the coast would be required to set aside funds for afforestation or restocking of forest stands as an off-set against loss of forest cover that is attributed to its activities. The same would apply to an irrigation project that leads to loss of forest cover
iv. Benefit sharing policies under REDD+ Programmes
v. An inter-sectoral Policy Forum to propose ways to resolve policy conflicts to central governments

Table 12. Proposed mitigation options against drivers of deforestation and forest degradation in Kenya

DRIVER	UNDERLYING CAUSES	EFFECTS	PROPOSED MITIGATION OPTIONS	EXPECTED BENEFITS
1. Agricultural Expansion i. Permanent subsistence agriculture ii. Permanent Commercial agriculture iii. Local trans-migration	Population pressure, rural poverty, lack of alternative sources of income Rising commodity prices, growth of markets Population growth, insecurity, inadequate land use plans	Deforestation of critical water towers, loss of habitats, erosion, reduced water yields for hydro-power generation, dam siltation	• Improved agricultural policies to respond to legitimate environmental concerns • Intensification to improve yields, land use planning • Assessing the environmental impacts of commercial agriculture • Renewed policies on soil and water conservation on farmed landscapes • Implementation of Farm Forestry Rules • Constant policy dialogue on agriculture and the environment • Promotion of 'Climate Smart' Agriculture	Reduced emissions through reduced conversion of forest lands Improved water yields for hydro-power generation Reduced prices for hydro-energy Increased supply of and self-sufficiency in wood and tree products in farmed landscapes Creates opportunities for rural forest carbon for voluntary markets
2. Wood Extraction • Firewood • Charcoal • Timber • Poles	Lack of alternatives, preference based on tradition, urban demand, industrial demand	Causes degradation and pre-disposes land to deforestation Shortage of timber tends to increase timber prices, which also creates markets for	• Implementation of Farm Forestry Rules to supply firewood and others for domestic use and market • Develop protocols for sustainable woodland management	Sustainable supply of poles and wood energy reduces net emissions Energy efficiency reduces emissions and can have significant impacts on emissions if implemented in urban areas – already operational under CDM

	Urban growth and demand, prices Population growth linked to increased demand for construction materials Demand for fencing and construction materials	illegal trade	• Implement Charcoal Rules and demand sustainable charcoal production policies and procedures for suppliers • Promote energy efficiency in firewood and charcoal • Industrial demand – treated below • Promote creation of woodlots and local treatment plants for durable fencing posts • Improve productivity of industrial plantations • Create new plantations in marginal areas and in places such as the Counties in the Coast	
3. Fires	Traditional use in vegetation / pasture management, land preparation	Annual fires tends to affect regeneration of natural forests and woodlands, creates opportunities for agricultural expansion	• Develop fire management policies and protocols particularly in the Water Towers and Dry Woodlands • Promotion of improved fire management with agriculture and livestock sectors	Reduced emissions from unnecessary fires
4. Mining	National Development, International demand for valuable industrial minerals (titanium, niobium, rare earths etc) Oil and Gas	Mining has direct effects but also pre-disposes forest lands to degradation and deforestation through infra-structure	• Implement Mitigation Actions in line with Environmental Impact Assessments • Develop a national system for mines to offset deforestation by funding afforestation / reforestation – mining offsets	Income from mining will be seen as environmentally responsible Creates and demands greater Corporate Social and Environmental Responsibility
5. Infrastructure	Legitimate development needs to provide housing, transport services Creation of Regional Transport Corridors – Ethiopia, South Sudan, Uganda, Rwanda & Eastern DRC	Facilitates access to supply sources and markets Stimulates new settlements-as expected under the LAPSSET Transport Corridor	• Identify likely environmental impacts and design mitigation strategies – restricted extractions, sustainable management policies, planning of settlement areas	Reduces pressure on forests – hence emissions

6. Wildlife Damage	Increase in populations of large herbivores – mostly elephants	Causes direct damage to woody vegetation – decay emissions Changes vegetation structure and may suppress Changes habitat for other plants and animals Also increases methane based emissions Increases incidences of human-wildlife conflict	• Creation of wildlife corridors to enable dispersal (e.g. Shimba Hills and Tsavo) • Trans-location of animals from overstocked areas (already done in Shimba Hills) • Use other approved population control methods	Reduces risk of bio-diversity loss Reduces emissions from decaying vegetation Reduces human-wildlife conflict
7. **Urban Demand for biomass fuels (**both domestic and industrial)	Prohibitive prices of electric power for industry (e.g. at the coast) Prohibitive prices of electric power and gas for domestic use Inadequate policy dialogue between forestry and energy sectors	Drives deforestation and forest degradation – dry woodlands	• Policy dialogue with energy sector to understand and appreciate how pricing policies for energy damage the environment • Demonstrate the benefits of forest management to energy production – application of the payment for ecosystem services (PES) concept • Develop and propose price incentives to increase use of electricity and gas in urban centers and industry • Develop rules for use of biomass fuels by industry • Under REDD+ create a permanent forestry-energy policy forum	Increases consumption of cleaner energy Promotes protection of water towers for multiple use Creates more awareness in the energy sector and implementation of PES
8. Governance Issues	Ease in the de-proclamation of forest lands Inadequate structured policy fora among land use	Massive excisions of forest lands e.g. Mau Unplanned settlements	• Develop a clear strategy paper to implement the Constitutional Provision for increase in forest cover • Implement new Forestry Act 2005	Reduced emissions from communal woodland Increased mitigation from afforestation and reforestation

	sectors Unclear tree and land tenure in un-adjudicated lands	Encroachment & degradation of water catchments	• Create awareness and empower County Governments to Implement the Constitution and Forest Act • Develop expected performance targets for key Counties • Propose incentives for afforestation / reforestation • Develop clear benefit sharing guidelines for joint management of forests & woodlands	Elimination and/or significant reduction in excisions of forest lands Improved management of water towers or catchments Increased participation in REDD+ Projects
9. Capacity Constraints	Highly centralized governance structure in the past Inadequate skills to manage forestry for sustainable development Lack of Pilot Projects for Learning Concentration in areas with industrial plantations and not natural woodlands Inadequate participation by local communities Low skills in forest management in local communities	Weak presence in large woodland areas Poorly managed communal woodlands and even private woodlots	• Devolution of responsibility to County Governments, development of competent Community Forestry Associations (CFAs) • Participatory development of forest management targets for selected key countries • Greater focus on management of trees, forests and woodlands outside forest reserves • Targeted training of County Governments and CFAs	Increased forest cover to meet constitutional target Increased incomes to local communities Increased carbon sequestration and protection of water catchments Increased skills levels in CFAs More competent County Governments

In elaborating the above strategy options, an evaluation on their feasibility can be prepared to highlight the following:

i. The policy environment in which the strategy will be implemented
ii. All manner of opportunities that the strategy option could take advantage of
iii. The risks that ought to be recognized and management in the course of implementing the strategy
iv. The kind of institutional and individual capacities critical to the achievement of the objectives of each strategy option
v. The potential mitigation potential of each strategy (this can be in the form of carbon sequestered, or emission reductions)

All the above can be presented in a matrix format as in Table 7 for ease of reference.

9.0 CONCLUDING REMARKS

i. An analysis of drivers of deforestation and forest degradation need to take into account sub-national differences since this study revealed that even where the same direct drivers operate in different areas of Kenya, the underlying drivers or causes may differ. This requires that mitigation actions identify and target the underlying causes in any mitigation programme. The fact the change modelling indicted areas of vulnerability or high potential for transition, can be used to design site-specific REDD+ Programmes and also as tools of policy advocacy

ii. A future REDD+ programme will need a comprehensive programme to promote 'climate smart' agriculture, since agricultural expansion is quite widespread as a direct driver of deforestation, while extraction of wood for fuel and poles directly drives both deforestation and degradation and is the most critical driver in the dry woodlands.

iii. Belief in the value of forests, whether motivated by traditional belief or modern scientific thinking is seemingly a powerful tool for protection of forests; as shown by a few examples of forests that have been managed under traditional practices and belief systems, and have survived several years of use and stand out amongst deforested and degraded landscapes

iv. The already recognized Water Towers Initiative should also be supported under a REDD+ since the benefits of forests on water towers are mutual between water and carbon sequestration and if REDD+ can be used as a co-financing, mechanism for them, REDD+ would have gained significant political support.

v. The participation of County Governments in implementing REDD+ is crucial and it is important that the Kenya Forest Service works closely with them to recognize the importance of sustainable forest management and increase in forest cover. In the County Governments should develop realistic forest management targets in order to implement Farm Forestry Rules under the Agriculture Act of 2009 and the Constitutional Requirement on forest cover increase, among others.

vi. There is sufficient room for the promotion of tree growing on farms since the market for tree products exists and because in the foreseeable future the majority of Kenya's households will continue to depend on wood fuels

vii. In the context of REDD+, a nationally recognized system for deforestation off-sets by sectors which cause forest cover loss, such as mining and transport infra-structure, could be tried to engender a greater sense of Corporate Social Responsibility for emissions caused by such economic activities

viii. The importance of data collection to monitor performance of the forest sector and to enable the generation of predictive models within a REDD+ context is an important issue that the Forest Service should take seriously.

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11. ANNEXES

11.1 ANNEX I REGIONAL CONSULTATIVE WORKSHOP REPORTS, OUTPUTS FROM GIS ANALYSES, PAPER ON DRIVERS OF DEFORESTATION AND FOREST DEGRADATION IN KENYA

1. COAST CONSERVANCY

This section on Coast Forest Conservancy was based mainly on a one-day consultative meeting held on, 23rd April 2013 in Mombasa, a one day visit to the Kwale District, expert interview and literature review. The workshop participants came from various parts of Coast Conservancies; Kwale, Lamu, Malindi, Mombasa, Voi and Taita Hills and they were a mixture of Forest Officers, Conservancy Committee Members and NGOs.

1.1. Status of Coastal Forests

Historically the important forest blocks in the coast include the Taita Hills Complex, Arabuko Sokoke, Shimba Hills, Buda, Witu, Boni Lungi, the Kayas (pockets of sacred forests) and mangrove ecosystems.

Coastal forest resources are important for economic, environmental and social welfare of the coastal people and country at large. Though fragmented and small, they are of critical importance to the country, are situated at the centre of the country's tourism industry, one of the leading foreign exchange earners; and are important water catchment areas for the rivers and streams on which the local people in the coastal areas depend on; and are "centers of endemism" for a wide variety of globally threatened fauna and flora. Biologically, they are important centres of endemism and recognized all along the East African Cost. These forests are represented by the Arabuko and Sokoke ecosystems, dry woodlands occurring in the hinterland of the entire coastal strip of Kenya At higher elevations, montaine forests of Taita Hills, which rise above the surrounding dry woodlands to form fascinating forest ecosystems unique different from the surrounding dry semi-arid woodlands. According to the forestry headquarters in the coastal region by 2013 the total forest area set aside for forest conservation and management in the Conservancy is 508,012 ha of which gazetted forest reserves comprises 134,758 ha., while the ungazetted forest area is 373,254 Ha and is most concentrated in Tana River and Lamu. The area under plantations is 2,728.1 ha with Kwale having the largest area of 779.7 ha under pines species; mostly *Pinus carribea* while the rest are in Malindi and Taita Taveta. Malindi has over 469.3 ha of plantation forest mostly of *Casuarina equisetifolia* and *Eucalyptus spp*.

The mangroves have variable status , with some sections in the North largely intact, patches which are under rehabilitation and heavily degraded and fragmented patches, with no chance of rehabilitation such as Tudor and Mwache in Mombasa. Relatively intact mangrove formations such as those where the new Lamu Port will be constructed will be converted into Port Infrastructure.

Shimba Hills forests which rise to an elevation of 500 meters above sea-level falls under a forest reserve and National Park, but is nonetheless degraded by a relatively large elephant population and surrounding human populations which are farmers and depend on the forests for wood energy, timber and construction poles.

The *Kayas* which are isolated pockets of sacred forests which are remnants of coastal forests are also degraded even though they are not encroached

The *dry wood lands* composed of *Acacia, Combretum* and *Commiphora* are in various stages of degradation and occur largely in communally owned and managed areas, National Parks and Private Ranches.

Rising above the surrounding dry and flat woodlands in Taita –Taveta are the *Taita Hills* which is a high elevation, montaine system, with rich soils which are farmed, high population density, but with relatively intact forest reserves, even though they are in danger of encroachment as human and livestock populations continue to increase

The main uses that the forests and woodlands of the coastal region are valued for include; charcoal production, firewood collection, butterfly farming (particularly those endemic to Arabuko-Sokoke Systems, mushroom harvesting, honey, ecotourism, construction poles and timber. In Taita Hills maintenance of water catchment forests is well recognized.They also play an important role in soil stabilization, water conservation, climate regulation, and carbon sequestration. Along the Kenyan coast fishing within mangrove areas and creeks; wood carving; agriculture; tourism; mariculture; harvesting of medicinal plants and harvesting of mangroves are important.

9.0.1 Some observations and questions asked by workshop participants on forestry in the coastal region

In consultations at the coast some interesting and pertinent issues were raised which are worth describing since they seem to have a bearing on future forest management decisions in the region under SFM and also REDD+. A few key issues are described.

Participants were keen to know the historical reasons why is plantation forestry not well developed in the coastal region. The official response was that commercial timber growing was confined mainly in the highlands of Kenya; mainly central and Rift Valley Regions in Kenya, and much less investment in forestry development was put into the coast, including the fact that plantations on the steep slopes of Taita Hills inhibits exploitation. An observation by a forest researcher at the coast was that demand for seedlings has grown over the last 5-10 years, for private commercial purposes and is showing a trend of increasing cover on private lands. However one of the problems was both

specie and provenance site matching to produce optimal yields, suggesting that more research is required in that area.

In the northern coastal region, the sound management of the invasive species of *Prosopis* (*P. Juliflora*) which has invaded the Tana Delta

In heavily degraded areas the promotion of enclosure to allow degraded areas to regenerate and for pasture management should be aggressively pursued.

Since mining interests are growing at the coast on precious industrial minerals such as the 'rare earths' such as 'niobium' and titanium, it is worthwhile to assess the potential impact of mining on deforestation and forest degradation, as a first step toward design of mitigation measures. Reportedly e site-specific reports on impact of mining on the environment have been done, particularly with respect to the risks of landslides. A NEMA task force on mining report also provides information on mining activities.

While it was recognized that exotic species are relatively fast-growing and are likely to sequester more carbon in the short term, than indigenous species, local stakeholders felt that the focus should be on forests that will deliver multiple benefits, and on this account more focus should be on indigenous forests. Even under REDD+ and while REDD+ does not discriminate on species, there is a special focus on conservation of (indigenous) forests where they exist. If one is thinking of carbon markets then one must think of the product. Carbon standards give a higher premium on credits from indigenous forests since these provide multiple benefits and not just carbon.

9.0.2 Issues from group presentations

Commenting on the situation before and after enactment of 2005 Forest Act, some participants felt that in the past there was a clear management plan for mangroves including harvesting rights, harvesting of mangroves in paddocks, adoption of selective logging. Today, however, this is not the case; which boils down to poor implementation of the Forest Act 2005. However others participants members differed, noting that the Forest Act 2005 has now brought on board communities through the CFAs, and user groups dealing in a variety of products; which in their opinion was a positive and welcome development as far are forest management is concerned.

On the issue of participatory forest management some participants noted that in the 1970 and 80's pole cutters in Arabuko Sokoke were very instrumental in conserving forests, but this is not the same today. To reverse this, some felt Benefit sharing should be emphasized and in that regard, Community Forestry Associations will work effectively where benefit sharing mechanisms are clear and substantive

One aspect that deserved attention in improving forest governance was how KFS treats informants who are willing to testify against those involved in illegal forestry activities. Some have been victimized by officers of the KFS; which is a disincentive. So communities are afraid of reporting cases of forest destruction to the authorities for fear of victimization. Also cases where when a

culprit is brought to court s/he is charged very low fines which can easily be paid and s/he continues with the illegal activities

The participants noted that given that charcoal production is a major consumer of wood and a driver of both deforestation and forest degradation, examples of improved practices should be drawn from sustainable technologies such as charcoal briquetting technologies in Taita Hills, biogas production and solar

Current Management Challenges of the various forests and woodland types at the coast

The entry point for improved forest management and also REDD+ at the Coast can be premised on the following views which were expressed by the Head of the Coast Conservancy:

- There is great potential in tree growing in Coast Conservancy and the candidate plantation species that can do well already known in this area
- There is a ready market for tree products at the coast
- Increasing supplies of timber and poles now come from Tanzania through the Lunga Lunga and Taveta border posts, though quantities have not been systematically recorded.
- It is possible to significantly improve forestry practice at the coast, provided that it is linked to income generating activities (IGAS) such as tree farming, bee keeping, butterfly breeding and rearing, and tree and fruit seedlings
- The project known as "Wildlife Works" has demonstrated that it is possible to deliver carbon to the market and again utilize the incomes to support conservation and improvement of livelihoods of local people, who in turn support nature conservation and sustainable forest management (SFM)
- On a pilot basis under an initiative called Mikoko Pamoja under the Swahili seas project we are piloting with the Gazi- Gongoni CFA in Msabweni on blue carbon

9.0.3 Drivers of deforestation and forest degradation

In the *dry woodlands* the main drivers of cover change, mainly

- Poaching for timber
- Charcoal production and firewood harvesting
- Forest fires
- Overgrazing by livestock and wildlife
- Agricultural Expansion - Commercial Agriculture
- Wildlife damage – mainly elephants

For instance demand for land for energy plantations will typically imply the conversion of dry woodlands into energy plantations. In the Tana Delta an estimated 10,000 ha of woodlands is to be cleared for plantations of *Jatropha* on a trial basis with a further 60,000 ha to be cleared for *Jatropha* depending on its viability (see Javier, Ochieng and Gritten, forthcoming publication)

In Taita Hills the main drivers of deforestation and forest degradation are grazing and fires set in forests to improve pastures and also for land preparation prior to the planting season.

Along the coast *mangroves and coastal forests* represented by the Arabuko- Sokoke systems are subjected to a number of drivers which are listed herein as:

- Demand for wood for carving to supply an ever increasing tourist populations
- Harvesting of poles for construction
- Harvesting of timber species such as *Afzelia, Trachylobium* etc
- Poaching of animals
- Use of tree barks for ropes
- Wildlife damage
- Encroachment – demand for agricultural and settlements
- Mariculture
- Mining (salt in mangrove areas), others in the coastal forest, Open cast mining in Mirima, South Coast
- Oil & Gas

The mangroves are also under threat because of reasons such as high demand for building poles and timber, exploitation for charcoal and conversion for the development of tourism facilities

Shimba Hills is both a forest reserve and national park, which hosts large herbivores such as elephant, buffalo and the only population of sable antelopes in Kenya. It is both threatened by encroachment, wildlife destruction and mining. The case of damage to tree vegetation by increasing populations of elephants in Shimba Hills is a particularly interesting and controversial example since it invokes the highly emotive issue of culling to control elephant populations. Ecologists in some parts of Africa particularly argue with some justification that huge populations of elephants are actually detrimental to the maintenance of biological diversity since trees are damaged leading to habitat degradation leading to habitat loss to smaller and more sensitive species that have difficulty competing against bulk feeders such as elephants. Despite such arguments, animal rights proponents have always taken issue with culling methods and support other methods such as the provision of dispersal corridors connecting protected areas, more judicious provision of water during the dry season and translocation of herds. In Kenya, a recent example was the translocation of elephant herds to Tsavo from Shimba Hills.

Kayas

- Ungazetted Forests e.g Kaya Rabai
- Pole cutting/ Logging
- Encroachment - Farming
- Fires

Fuel wood utilization in the coast region is a major concern as far as deforestation and forest degradation is concerned. This is because a majority of household energy needs even in the city of Mombasa is dependent on biomass and mainly wood energy in the form of fuelwood and charcoal. In addition and somewhat of a surprise some industries at the coast that would normally use electricity also depend on fuelwood and the demand appears to be increasing. From information provided by personnel from the Kenya Forest Service, some textile industries are testing fuelwood e (Pers Comm), while industries such as Pwani Oil manufacturing cooking oil, Panga Soap and a Salt Company all consume fuelwood from sources that at the moment, are not certified in terms of their sustainability. Chrystalline Salt Company consumes a reported 20 tonnes of fuelwood per day (pers comm). . For Pwani Oil, one supplier supplies 20 tonnes of fuel wood three times a month. One participant noted that he is aware of five people in Lamu who suppliers firewood to Pwani Oil, and noted that there are also suppliers from Malindi and Kilifi to the same company. Other factories that use fire wood include (1) Kenya Calcium Limited, (2) Salt Industries (7 salt firms / factors), soap companies and Bamburi Cement. In Lamu wood is supplied to the salt, calcium and vegetable oil industries among many others

The contribution of the hotel industry cannot escape scrutiny by virtue of the number of hotels and their demand for quantities of biomass energy and construction materials. While hotels are contributing to deforestation and degradation by providing markets for fuel wood and building materials, they also directly support conservation (how?)

9.0.4 Underlying causes of deforestation-a general overview along the coast

- High unemployment at the coast
    - Prohibitive electricity prices – for both domestic users in the large cities and also low tech industries such as manufacturers of soap, cooking oil, calcium
    - Inefficient / unimproved charcoal kilns leading to poor conversion rates
    - The dry woodlands are communally owned and not gazetted with strict management plans and standards
    - Conflicting policies
    - No management plans particularly for communally owned and managed dry woodlands
    - Rapid urbanization – resort cities, expanded ports (Mombasa, Malindi and Lamu)
    - High demand for firewood by several industries (e.g. Salt Works, Pwani Oil Refineries, Coast Calcium)
    - Government policies on Climate Change, REDD+, PES; Poor or Lack of Policies and Policy conflicts as one of the drivers of deforestation
    - Weak and almost non-existent extension

- Technology Drivers
    - Power saws verses pit sawing, chain verses circular saws
    - Earthen verses improved skills

Marine Forest

- Oil & Gas spillage
- Development / Urbanization

Hoteliers

- Opening up of Beaches
- Oil spillage from engine boats
- Fishing / Mariculture
- Siltation / Sedimentation
- Salt Mining
- Lack of Management Plan
- Un clear benefits sharing mechanism to the community
- Conflicting Policies
- In adequate funds to manage conservation activities
- Un clear boundaries / reserve, parks
- Education and awareness on policies / ACT (Community Empowerment)

Community/Individual

- Capacity building
- Use of indigenous knowledge / skills for the management of natural resources

Organization

- Community empowerment
- Clear benefit sharing mechanism
- Involvement of community from initial stage

Policy

- Simplified version of the policies / translate so that users of forest products
- Policy review to merge the current status
- Training of effect climate change which is caused by deforestation / degradation
- Education & awareness on REDD+ STRATEGY
- Financial constraints due to limited government budgets and withdrawal of donors which have been supporting conservation efforts
- Political interference particularly on encroachment into protected areas along the coast. Politicians tend to resist efforts by the government to remove local populations that have illegally occupied forest reserves

- Land tenure system; the coastal forests, particularly the dry woodlands are on communally owned land over which locals have unrestricted access and subjected to over-exploitation on which the Kenya Forest Service is ill equipped to control.
- Charcoal production ought to be recognized as a major energy industry at the coast and is growing in size as demand from urban households and industry at the coast increase. As such a sustainable charcoal policy and technical procedures for adhering to the policy are long overdue.
- Lack of tangible livelihood options / alternatives

9.0.5 Land and natural resource use dynamics

In the coastal region natural resource and land use dynamics can be described through the following:

- Pressure for land for tourism infra-structure along the coast
- Land for ranches, particularly in Kwale and Taita-Taveta Districts
- Land for commercial agriculture – sugar cane in Kwale, Sisal in Taita Taveta and Kilifi
- Extraction of wood for fuel (raw wood and charcoal) to supply urban domestic consumption and also growing industry
- Harvesting mangroves for charcoal, pole production and also conversion of mangrove forests into tourist facilities and mariculture

9.0.6 Capacities required for Stakeholders

Capacity for Community Forestry Associations in the areas of

- Leadership and governance
- Specialized training areas
- Operational infrastructure
- Advocacy and fund raising
- Linkages and network

For government institutions empowerment to improve forest management at the coast will entail the following:

- Operational infrastructure
- Training in specialized areas
- Human resource development
- Harmonization of conflicting policies, formulation of new ones on emerging issues e.g. REDD+, PES, etc.

9.0.7 Policies, incentives measures to address deforestation and degradation

Dry woodlands

- Alternative sources of income to ease pressure caused by dependence on fuelwood harvesting and charcoal production as an income source
- Awareness creation and promotion on the safe use of fire and the dangers of wild fires
- Adoption of modern charcoaling technologies to reduce wood volumes harvesting and help reduce over-harvesting
- Promotion of Aloe Farming

Taita Hills

- Awareness creation on and improved fire management technologies
- Adoption of improved farming methods
- Institutional capacity building

Arabuko Sokoke

- Institutional capacity building for CFAs
- Alternative livelihood opportunities
- Policy guidelines
- Supporting legislations

Mangroves

- Inventory research should be done
- Development of management plans
- Enhance community structures in supporting restoration programs in degraded areas
- Alternative livelihoods
- Development of alternative products

Shimba Hills

- Sustainable management of wildlife
- Establish community management structures

Kayas

- Establishment of management structures

9.0.8 Enabling and Limiting Elements

Gazetted forests: Arabuko Sokoke, Shimba Hills, Taita Hills, Dry woodlands, and Kayas

Enabling elements:

- Institutional policy, institutional presence, physical protection, political will and improved working environment

Limiting elements:

- Institutional conflicts e.g. KFS and KWS, community and government, conflicting legislations, overlapping mandates and responsibilities

Community forests: Kayas, Dry woodlands, Kasigau

Enabling elements:

- Culture, indigenous knowledge and technology, gazettement of kayas, land diversity and huge expansiveness

Limiting elements:

- Land tenure, tragedy of the commons,
- Land use

- Dry woodlots: grazing, harvesting of fire wood, natural resources (timber, honey harvesting, medicinal harvesting)
- Taita Hills: farming, ecotourism, natural resources (timber from communal lands)
- Arabuko Sokoke: land use: farming, ecotourism, natural resource: collection of butterflies, honey, animal poaching
- Mangroves: Land use: ecotourism, fishing, logging, beekeeping
- Shimba Hills: Land use: farming, natural resource: gum harvesting, community sanctuary
- Kayas: Land use: ecotourism, medicinal harvesting, shrines and burial grounds

Stakeholders

KFS, KWS, NEMA, NMK, Marine Reserves, KEMFRI, KEFRI, County Governments, CFAs, KPA, C&A, Hoteliers, CPA, Wood Carvers, Herbalists, Kaya Elders, FCC, Miners

Scientists and Researchers, Wildlife Works, WWF, NGOs, and civil society

Support for livelihood strategies linked to conservation of forests

- Charcoal Burners
- Butterfly farming
- Firewood Collection
- Mushroom Harvesting
- Honey
- Tourism / Ecotourism
- Construction

Dry woodlands:

Overexploited for fuelwood, unregulated charcoal production, wood carvings and overgrazed

Needs charcoal regulation

Limits to management du**e to c**ommon property resource and weak enforcement by LA

Enterprises –Aloe farming, bee-keeping

Improved stoves, efficient charcoal production, Zero grazing, promote wind/solar power

Measures: Form committees at diff levels with clear responsibilities, reporting and monitoring systems: including-Community, organizational and policy level

-Design governance and engagement structures for the diff. committees

-TOR-Dev. Clear terms of ref. for the

Taita

Also over-exploited and farmed. Also encroached by farms, timber harvesting, herbal medicine

Forest reserves need -Boundary marking, regulate

Landuse: includes farming, Water abstraction, building poles

Management has been hampered by: Slow signing of co-management agreements, harmonization of mgt strategies needed, also Improved stoves, on-farm tree planting, improved stoves, Zero grazing

Improved stoves, on-farm tree planting, improved stoves, Zero grazing

Coastal Forests

Increased pressure/fragmented

High poverty levels

-weak governance

-high demand for forest products

Embrace PFM, empower communities with IGAs/ create alternatives

Management slowed by: Slow signing of co-management agreements, harmonization of mgt strategies

Building poles, medicine, butterfly farming, ecotourism, beekeeping

Improved stoves, on-farm tree planting, improved stoves, Zero grazing, promote wind/solar power

Mangroves

The mangrove ecosystems at the coast though subjected to controlled use are nonetheless still threatened by a burgeoning tourism industry which leads to their conversion to create tourism

facilities such as hotels, beaches and mariculture. In addition they are still exploited for poles, fuel wood and charcoal. Another threat to mangroves is pollution through oil spillage, siltation and all manner of coastal erosion

Their protection are hindered by inadequate management plans and absence of collaborative models between state agencies and local populations; suggesting that the new legal provision for PFM should be used in the case of mangrove management as is the same with communally owned dry woodlands. In addition inter-agency conflicts arising out of double-gazettement(e.g. between Forest and Marine & Fisheries agencies brings more confusion and should be streamlined.

In addition to PFM arrangements government institutions need to be strengthened and result-oriented management plans should be put in place for specific areas of interest, particular areas that re threatened or in areas requiring special protection

Shimba Hills and Kwale District

Being in a protected area; both a forest reserve and a national park, the area is fairly well protected in terms of encroachment, despite regular incidences of illegal fuelwood and timber harvesting and poaching of wildlife. Due to its relatively high populations of elephants incidences of human-wildlife conflicts caused by crop-raiding and cause of bodily harm to local residents remain controversial and has led in the recent past to the translocation of some elephants to nearby Tsavo National Park.

Despite being a forest reserve and National Park, the Shimba Hills forests could also be subjected to a PFM Scheme to improve relations with local communities, share benefits and to reduce illegal activities. The management that is now shared between forest and wildlife departments also requiresharmonization which should set clear and technically feasible joint objectives, which caters to both wildlife and forest management objectives.Outside the area local farmers need alternative livelihoods some of which could be conservation based or related. Ecotourism facilities and even on-farm tree planting should be encouraged.

Kayas

While the Kayas are regarded as sacred and is what has protected their boundaries, some are still threatened by encroachment, as a result of cultural erosion. Their integrity could be further protected by offering locals support for on-farm tree planting, use fuel efficient stoves and promotion of ecotourism.

Main Players in Forestry and Conservation at the Coast

Nature Kenya, NMK, KFS, KEFRI, Arocha Kenya, KWS, KEMFRI, NEMA, CFAs, WWF, ILEG,CFCU

Kwale

- Wildlife conflicts : Elephants and Baboons
- Livestock – Somalis bringing livestock into the area
- Exotics have been introduced because they are fast growing
- Indigenous species for planting include *A tortilis, A. seyal, A. polyacantha*

Livestock

- No serious livestock due to the tse tse fly menace. Trees are a habitat for the tse tse fly so communities cut trees to give way for grasslands and livestock production
- Most charcoal is from Kwale because in Kwale the Forest Service gives or used to give Permits for Charcoal. As

Ramisi Sugar – possible future users of fuel wood in the sugar industry and is also likely to clear areas now under woodlands for planting

Develop Charcoal master plan for Kwale

Quarry Mining in Mirache – 2 hactares of the 400 ha of Mwache Forest is under mining. A block of 3ha has been exploited for over 25 years. Of the 12 ha allocated for mining, only 2-3 ha is under exploitation.

10. EWASO NORTH CONSERVANCY (NORTHERN RANGELANDS)

This section on Ewaso North Forest Conservancy was based mainly on a one day consultative meeting held on, May 9th 2013 in Isiolo (Northern Galaxy Hotel), expert interviews with participants from Samburu and Marsabit Counties

10.0 Status of ewaso north forests and woodlands

The forest conservancy known as Ewaso North is comprised of three counties in northern Kenya namely; Isiolo, Marsabit and Samburu. Put together the counties cover a land surface area of 123,000 km2 which is about 21.6% of Kenya's total land area. Of that total are, gazetted forest areas cover 344,087 ha which is made up of forests on mountainous terrain represented by Mathews Range, Ndotos Range, Leroghi Forest and Mt Nyiru in Samburu, Mt Marsabit in Marsabit. Mt Kulal (45,729 ha) and Hurri Hills (30,000 ha) are both ungazetted. In addition to these forests which are associated with mountains there are expansive trust lands or communal lands dominated by dry *Acacia-Commiphora* Woodlands and grasses.

The forest areas are tabulated herein (Table 1), in addition to a number of wildlife conservancies that have been established within the Ewaso North Conservancy (Table 2).

Table 13: Forest blocks within Ewaso North Conservancy

Forest	Area (ha)	Status of Management
Mathew rangers	93,000	Gazetted, under KFS management
Ndotos	97,000	Gazetted, under KFS management
Nyiro Hills	45,000	Gazetted, under KFS management
Kirisia	91,000	Gazetted, under KFS management
Mt. Marsabit	15,000	Gazetted, under KFS management

Mt. Kulal	45,000	Not gazetted
Hurri Hills	30,000	Not gazetted
Trust Lands	75,000	Gazetted, under KFS management
Namitichan	30,000	none
Ngarendare	5,400	ok
Mukogodo	27,000	0k
National Parks & Game Reserves (Shaba, Buffalo Springs, Samburu)	55,231	ok
Community Conservancies	500,000	ok

Table 14: Wildlife conservancies in the Ewaso North Conservancy

Conservancy	Area (ha)	Ownership
Samburu Region		
Namunyak	324,000	
Mebae		
West gate		
Mebae		
Kalama		
Sera		
Melako		
Isiolo Region		
Nakuprat		
Leparwa		
Mpus kutuk		
Nasulu		
Biliqo		
Bulesa		

Table 15: Shrines / Sacred Forests in Ewaso North

Shrines (Sacred Forests) in Marsabit County	Proximity to Marsabit Town
Kubi Abayu	6 Km
Forolle Oaliti	200km
Mt Kulal	300km
Hurri Hills	180km
Ngurunit	120km
Aabo & Borrolle Mountains, Sololo District	480km

While these forests are valued for their role in water catchments, environmental regulation and biodiversity, their management is challenged by a number of factors. These include among others, the following:

- The inadequacy of human resources by the government service makes the enforcement of forestry legislations difficult and has resulted in minimal awareness creation

- The vastness of the area which constitutes about 25% of Kenya's total land area and the fact that the various forests in the conservancy are located very far away from one another makes patrol by forest officers difficult. The individual blocks are also in themselves large which further makes management difficult especially considering the low number of staff

- Some parts of the conservancy, have very rough and hilly terrain characterized by rugged terrain which makes movement and transport difficult. Mathew's Range is one such example and it has been noted that its terrain and inaccessibility has contributed to its relatively intact forests.

- Insecurity: Under here the group observed that the area is one of the most insecure regions in the country and suffers frequent inter and intra clan conflicts, cattle rustling and general banditry. These, they noted, has made operations of the local forest offices difficult.

- Low fines charged on forest offenders: there is need to enact more punitive measures against forest offenders. These measures should be more severe than the current provisions in the Forest Act 2005
- Lack of clear legislation/clear information on the ownership of forest resources (i.e. County verses National governments). It should be clear which forests fall within which jurisdictions.
- Double gazettment of forest areas / blocks: Some forests are both forest reserves and national parks resulting in conflicts between KFS and KWS. For instance, Mt. Marsabit is both a forest reserve and a national park. Because both KFS and KWS have jurisdiction over the area, there sometimes arise conflicts between the two agencies.
- Lack of alternative livelihoods for communities living adjacent to forests

In spite of the challenges above, the group also observed that there are several opportunities for the enhanced management of forests in the area. These include;

- Community involvement/participation: Under here the group noted that recent years have witnessed increased involvement and participation of community in management of the forests, with many local communities taking charge of management and conservation of their forest resources.

- Gazettement of the forests which has seen many of the forested hills and areas in the conservancy brought under formal protection management

- The group observed that since the promulgation of the Forest Act (2005), a number of milestones have been realized. These include:
    - Formation of two community forest associations; one in Samburu and another Marsabit
    - Improvement of tree covers, with about 34.4ha being established in isiolo

- Increased sensitization and involvement of the local communities in forest conservation and management

2.1.1. Drivers of deforestation and forest degradation

The main direct causes of deforestation and forest degradation in the conservancy include

- Charcoal production burning to supply the surrounding urban centers, f
- Forest fires especially in Kirisia forest,
- Infrastructure development especially development of roads (Isiolo – Merile, Merile-Marsabit and several others which are at different stages of development), Isiolo international airport, Livestock holding ground and abattoirs,
- Isiolo Resort City, planned oil refinery and oil pipeline, and the planned LAPPSET project.
- Illegal logging - cedar posts. Illegal logging of cedar posts is especially rampant in Mt. Kulal and parts of Samburu forests.

The group noted that the above direct causes are driven by several underlying factors, including:

1. Poverty: The group noted that majority of the residents of the conservancy are poor. They emphasized that without any other alternative sources of livelihood; many of the people depend on the forests for a range of subsistence and commercial goods and services. The low level of literacy has also limited opportunities for the local residents making exploitation of local forest resources as the only available opportunity.
2. Insecurity: In Baragoi, for instance, it was noted that people have being forced to live in the surrounding Kirisia forest to hide from from bandits and other perennial attackers.
3. Demand for fuel and charcoal around Isiolo, Meru ,Moyale from Marsabit: It was noted that a major underlying cause of exploitation for charcoal is the increased demand for and prices of charcoal in surrounding urban centers. It was noted that the price of charcoal in Isiolo has increased from KSh. 300 to 1,200 within a period of 2 years due to high demand. In Marsabit, the price has increased from KSh. 500 to 1,600 due to high demand in Moyale. In Maua, it was noted that the price has increased from KSh. 500 to 1,800. The group observed that in Kinna, business people have closed shops to venture into charcoal production using power saws due to high demand. It is estimated that Around 62 power saws are available in Kinna and Garba Tulla area. Administration officers have turned to be charcoal burners.
4. Population: Another factor inter-related with increased demand is increased population in the urban and rural regions. In Isiolo, for example, the group observed that the population has increased from 90,000 inhabitants to 141,000.
5. Weak law enforcement and low fines: The group observed that the weak low enforcement coupled with the low fines meted on forest offenders has made engagement in illegal activities attractive.
6. Increased sedentarization and change in land use: Under here the group noted that many of the residents of the conservancy have become sedentary and have shifted from pure pastoralism to crop and livestock production. It was noted that crop nagriculture has

become more pronounced in Gafarsa, Rapsu, Malkagala, Kinna, Merti, Marsabit- Badasa and Songa, with pastoralists in these areas changing into farmers.

7. Political interference : Under here the group observed that local politicians are resisting eviction of illegal forest setters, thus exacerbating deforestation and degradation of some of the affected forests.

2.1.2. Lland and natural resources dynamics

The group also noted that land use in the area has undergone tremendous changes, as follows

1. From pastoralism to crop cultivation: The group noted that many people in the region are leaving pastoralism to engage in crop cultivation and charcoal burning as already noted above. It was noted that Hurri Hills has witnessed increased crop and pasture cultivation. The group observed that it is more reliable to cultivate and harvest grass in Hurri Hills and the surrounding livestock farmers have made pasture farming an attractive activity as each base is sold at KSh. 300, and the market is readily available.
2. Excisions: Though no longer a threat, the 1980s witnessed massive excisions of forest resources. In Marsabit some forest area were excised and cleared to give way for *miraa* cultivation. This was also aggravated by lack of clear forest boundaries.
3. Establishment of resorts (tourist accommodation) in new wildlife conservancies: The group noted that a number of private and communal conservancies have been established in the region but especially in Isiolo and Samburu. The group further noted that the establishment of such conservancies is usually followed by construction of resorts and lodges attracting settlement by local residents who are employed as laborers in the conservancies.
4. Change in traditional livelihood practices. For instance, the Rendiles have started engaging in charcoal burning, something which they were not traditionally accustomed to doing.
5. Permanent use of formerly dry season grazing area as permanent grazing area e.g. Kirisia and Mt Nyiro. Under here the group noted that some of the areas that were reserved for grazing only during extreme dry seasons have now become permanent grazing areas.

2.1.3. Local capacities

These include:

1. Formation of CFAs and conservancies
2. Availability of Forest Conservation Committees
3. Decentralization of government activities through the County Governments
4. Increased interest from and participation of local communities in forest management

a. Capacities Required by different Stakeholders to Improve Conservation and Management of Forest Resources in the Conservancy

1. Development of human and financial capital resources
2. Capacity building of local communities through advocacy and enhanced awareness creation
3. Development and implementation of existing and new management plans
4. Identification and gazettement of forests in trust land for conservation purposes

Relevant stakeholders within Ewaso North Conservancy. These were highlighted as follows:

1. Ewaso Nyiro North Development Authority (ENNDA)
2. EarthWatch Institute
3. World Vision
4. African Wildlife Foundation
5. County Governments
6. National Environmental Management Authority (NEMA)
7. Kenya Wildlife Service (KWS)
8. Private and Communal Ranches / Conservancies
9. Communities – through CFAs / FCCs
10. Kenya Agricultural Research Institute (KARI)
11. International Union for the Conservation of Nature (IUCN)
12. Ministry of Agriculture
13. ActionAid

2.1.4. Policies, incentives measures to address deforestation and degradation

The group highlighted the following as some of the policies and incentives that could help reverse deforestation and forest degradation in Ewaso North Conservancy.

1. Effective cost / benefit sharing of forest resources e.g. through introduction of PELIS to reforest indigenous forest areas. This could adopted within the REDD+ framework
2. Full implementation of charcoal rules and forest Act 2005.
3. Formulation of a policy on dry land forests that is in conformity with local traditional values on and uses of forests
4. Adequate funding of forest protection i.e. KFS enforcement and CFAs in terms of remuneration, housing facilities etc.

Policies that have Supported Improved Forest Management

1. Forest Act – Makes it difficult to carry out forest excisions
2. EMCA 1999 (NEMA rules)
3. Agriculture Act- including Farm Forestry Rules 2012
4. Water Act 2002

5. Wildlife (Conservation and Management) Act Cap386

Policies and Incentives that could help Reverse Trends in Forest Cover Loss

Policies

The following were highlighted as some of the policies that could help reverse trends in forest cover change in Ewaso North Conservancy:

1. Agricultural policy: The current policy requires everyone to put at least 10% of his / her land under forests
2. Forest policy / Act section 30
3. Wildlife policy: The new Wildlife policy provides for gazettement of forest / wildlife corridors
4. EMCA Act
5. Water Act
6. Land Act
7. Vision 2030

Incentives

The following were highlighted as some of the current and planned incentives that could help reserve forest cover loss in Ewaso North Conservancy

1. Conservation funds
2. Extension services
3. Forest product market chain enhancement
4. Charcoal regulations
5. Waiver of forest product and service rates.
6. Co-management of resources
7. Benefit sharing

2.1.5. Capacities Required by different Stakeholders to Improve Conservation and Management of Forest Resources in the Conservancy

5. Development of human and financial capital resources
6. Capacity building of local communities through advocacy and enhanced awareness creation
7. Development and implementation of existing and new management plans
8. Identification and gazettement of forests in trust land for conservation purposes

2.1.6. Gaps and Barriers

1. Conflicts in policies related to conservation and management of forests (Water Act, Forests Act, Wildlife Act, Forest Act, etc.). For example, use of riparian areas for farming is prohibited by EMCA Act while the Water Act permits the same.

2. Identification and gazettement of forests in trust land (forests) for conservation purposes.

2.1.7. Questions and Issues Emerging

Q2. Noting that the group has given above-average scores for status of forest management wondered whether this was the actual reality on the ground.

The group noted that the scores presented in Table above are just approximations and are not necessarily accurate. The observed that Mathew Ranges, for instance, does not have an approved management plan and that the same is true for Kirisia forest. They also observed that most of the forests in the region except for Ngarendare forest.

Q3. A participant noted that although Mt. Kulal does not have a management plan, the local community is already managing the forest in a fairly efficient way. A representative of KFS noted that Mt. Kulal there has been a forest station in the area, meaning that the forest is under some form of formal management. It was noted that the forest is particularly better managed because of the strong partnership between KFS, the local community and the provincial administration.

Q4. A member observed that although Group II has included Mukogodo and Ngarendare forests as part of forests in the Conservancy this is not actually true as the two forests fall under Laikipia region which is not part of the Ewaso North Conservancy.

Q5. A member recalled that the group has noted that in Samburu people have changed from pastoralists to crop agriculture. He wondered whether these were immigrants or the local Samburu. The Group explained that it is the local Samburu residents who have turned to mixed farming; livestock and crops.

Q6. A member sought further clarification on waiver on forest products and services. The group explained that CFAs are already doing a lot to conserve and enhance sound management of forests within their jurisdiction. It was noted that despite this effort, the CFAs are still required to pay for such services as grazing. The Group noted that the CFAs should be exempted from paying for such services as recognition of their role in enhancing conservation and sustainable forest management.

Q7. Still on incentives, a member sought clarification on what Conservation Funds are. The group explained that the Forest Act (2005) provides for Conservation Funds, but whose implementation has not yet started.

Table 16: List of participants

Name	Organization	Station	Contact

J.M. Maina	KFS	Marsabit	zmmarsabit@kenyaforestservice.org
S. Mureithi	KWS	Isiolo	silasheka@yahoo.com
Jackson K. Nzou	KFS	Isiolo	jacksonnzou@yahoo.com
Harun Roba	DDC	Garba Tulla	
Erick K. Chemitei	KFS	Samburu	erickiplagat@gmail.com
William Lelesher	CFA	Samburu	
Roseline Lesaibile	FCC	Samburu	nesaibilie@yahoo.com
Boniface Kaliembi	KFS	Isiolo-Garba Tulla	
Agnes Nkirote	KFS	Isiolo	
Joshua Muene	KFS	Isiolo	
Letiwa Tom I	CFA	Samburu	
Moses Waithaka	KFS	Isiolo	
Waqo Duba	FCC	Marsabit	
Charles Otieno	KFS	Isiolo	
Jackson M. Muturo	NEMA	Isiolo	
Boniface K. Imanyara	ASDSD / MOA	Isiolo	
Fatuma Jimate	ADESO	Isiolo	
Benjamin Lepetet	Nakuprat Conservancy	Isiolo	
John Kinoti	Lewa Conservancy	Isiolo	
Geofrey Chege	Lewa Conservancy	Isiolo	

BOX 1: KEY RESPONDENT INTERVIEWS ON ISIOLO, MARSABIT AND SAMBURU COUNTIES

The key respondents included Jackson Nzou (Isiolo), Roseline Lesaibile (Samburu) , Aron Duba (Marsabit), Tom Letiwa (Samburu) and Erick Chemitei (Samburu)

Given the vastness of the northern rangelands represented by Isiolo, Marsabit and Marsabit Counties, the consultants sought the opinion of the respondents on whether the new devolved governance system could improve the status of forest resource management. The reactions were mixed because in some cases tribal differences and inter-clan differences can hinder agreement on management measures. In Marsabit, NEMA had revoked some 416 illegal allotments that had been given by the Council. However, this revocation has not been implemented and that such trends could continue under the new county government because of protection by local politicians.

On the possible gazettement of Mt Kulal, the response was that conflict may arise between KFS and the County Assembly, on the grounds that KFS would deny them revenues by putting Mt. Kulal forest out of their management jurisdiction. However, on a more positive note, the respondents also noted that County Governments could have a positive impact on forestry if they are properly sensitized. This is especially so if Participatory Forest Management is implemented in each of the forest blocks in the region. However, they noted that this will be possible only if issues of governance are sorted out and proper management and governance structures put in place. This also calls for a more planned and coordinated transition of forest management to the county governments.

In the conservancy an important factor for protection of forests are traditional safeguards against overexploitation of trees. In Samburu for example Mathews Ranges is conserved and managed better than other areas because of its terrain and local traditions that guard against indiscriminate tree cutting. Among the Samburu a man will not cut down more than five big *Acacia tortilis* trees in his entire lifetime. Other forests that have been successfully management through traditional management systems include Kobida Baiyo, Forole Mountains, and Solole.

In Marsabit County there are a number of shrines that are protected through traditional beliefs. Good examples of these are, Kubi Abayu, Forolle Oaliti, Mt Kulal, Hurri Hills, Ngurunit, Aabo & Borrolle Mountains, Sololo District

BOX 2: AN OVERVIEW OF DEFORESTATION AND FOREST DEGRADATION IN MERU, MT KENYA REGION: MR EVANS MANENO, ZONAL MANAGER, MERU AS RESPONDENT. 10TH MAY 2013

Mr. Manemo underscored that the main causes of deforestation and forest degradation within the lower parts of Meru Zone neighbouring Isiolo County were unsustainable exploitation of wood for charcoal, and fire wood, forest fires, and illegal logging. Meru town is a major market for charcoal most of which comes from the dry woodlands of Ewaso North Conservancy

He observed that in Kiagi Hills where exploitation for charcoal is rampant, the activity is largely drive by increased prices of charcoal, which have risen from KSh to between KSh 1200 -1500 in 2 or so years. Underlying this is the rapid rise of Meru Town's population over the last decade.

He further alluded to the fact that the Southern Part of Meru is a largely tea growing area and that .that individual land holdings in the area are becoming smaller.. He noted that given the vibrant tea industry in the area, there is very high demand for fuel wood for curing tea. As a result, there is heavy poaching for firewood in the adjacent Ruthumbi forest. Key factors underlying the heavy poaching for fuel wood is caused by two underlying factors namely (i) increased land fragmentation resulting from the burgeoning population – no land to grow trees, and (ii) increasing levels of poverty and lack of alternative economic activities for the youth

Another cause of degradation is the increased poaching of cedar posts. This is caused by the high demand and increased prices of cedar posts. One cedar post is reported to selling at KSh. 300 in Meru, and KSh. 500 in Isiolo. The current ban on logging has also created incentives for illegal logging for timber as the prices of timber has gone up due to the resulting low supply. Although there is a ban on timber harvesting, KFS issues timber movement permits for timber produced on farm. However, this is often abused as the unscrupulous traders use these permits to transport timber obtained through illegal logging in the forests.

Mr Maneno also observed that although illegal grazing has become less rampant due to smaller herds and enhanced zero grazing in the area, it not uncommon to find such incidences. This is especially so during periods of extreme droughts when pastoralists from Isiolo, Samburu and other ASAL areas drive their herds deep into the Meru Forest to search for pasture and water. He observed this was particularly a serious issue in 2009 when the ASALs experience prolonged and severe drought.

Extended droughts tend to also lead to dry fuel loads,which increases fire hazards resulting in heavy burning of standing trees. He noted that is especially pronounced in Western Slopes of Mt Kenya in Marania and Ontulili forests. Besides drought, frost also kills a lot of vegetation which cause a fire hazard. Traditional burning before the rains is also still practiced but with no safeguards.

Despite the above challenges and direct and underlying causes of deforestation and forest degradation a number of opportunities for mitigation exist. A good example cited by the Zonal Manager the Plantation Establishment and Livelihood Improvement Scheme (PELIS) which has resulted in reduced illegal activities in the forest. The System, he noted, has seen many previous illegal loggers and grazers become champions of sustainable forest management and that many of the local communities have formed village scouts to help patrol and protect the forest.

A new and encouraging development is that most of the tea factories are buying land to establish their own fuel woodlots and will thus reduce the current pressure on state forests and in addition, the Ministry of Agriculture is doing more to sensitize people on and promote zero grazing and that this will reduce illegal logging in the forest.

3. MAU AND NOTH-RIFT CONSERVANCIES

3.1. Status of Mau and North rift forests

The Mau Complex which is Kenya's largest Montane Forest covers some 400,000 ha, which are as large as Mt. Kenya and the Aberdares combined. It is also the most critical watershed with hardly

any comparison in Kenya and arguably in the whole of East Africa. It hosts the upper catchments of an incredible number of rivers which are linked to a number of lakes as listed

i. Nzoia River (Lake Victoria)
ii. Yala River (Lake Victoria)
iii. Nyando River (Lake Victoria)
iv. Sondu River (Lake Victoria)
v. Mara River (Lake Victoria)
vi. Kerio River (Lake Turkana)
vii. Molo River (Lake Baringo)
viii. Ewaso Nyiro River (Lake Natron)
ix. Njoro River (Lake Nakuru)
x. Nderit River (Lake Nakuru)
xi. Makalia River (Lake Nakuru)
xii. Naishi River (Lake Nakuru)

One of the most ecologically disastrous governance decision was the fact that by and in 2001, the Government de-proclaimed over 67,000 hectares of forest reserve land, mainly in the Mau Complex, of which the largest were in Eastern Mau Forest Reserve and South West Mau Forest Reserve where 35,301 ha and 22,797 ha respectively were hived off for resettlement and commercial tea plantations The excision in Eastern Mau impacts is believed to have been quite detrimental to Lake Nakuru since between 1973 and 2003, 36,780 hectares of dense vegetation cover were lost in the catchment of the which represented a loss of 49 % of its total dense vegetation cover and seems to have caused the drying of bore holes in the Njoro Area and the seasonal flow of formerly perennial Njoro River.

The forests that administratively constitutes the Mau Conservancy are tabulated herein:

Table 17: Mau Conservancy Forest Areas (Source: KFS-MAU Conservancy)

S/NO	COUNTY / ZONE	FOREST STATION	PLANTATION Ha..	INDIGENOUS HA.	TOTAL AREA HA.	AREA HA.
1.	BOMET	Chepalungu	136.00	4,871.1	5,008.0	5,008.0
2.	TRANS MARA				61,820	61,820
3.	BURET	Itare			16,700	
		Ndoinet			20,032	
		Maramara			16,000	52,732
		TOTAL				
4.	NAKURU	Kiptunga	8,277.50	2,085.70	10,363.20	
		Logoman	3,574.10	722.90	4,995.00	
		Sururu	18,321.10	0.00	18,241.00	
		Eburu	8,715.30	0.00	8,715.00	
		Molo	940.30	436.70	1,377.00	
		Saino	245.00	0.00	245.00	
		Baraget	4,683.80	433.10	5,116.90	
		Mariashoni	1,014.00	28.70	1,028.70	
		Nessuit	3,013.40	14.70	3,028.10	
		Teret	1,500.00	0.00	1,500.00	

		Likia	1,000.00	0.00	1,000.00	
		Dundori	1,865.60	1,204.20	3,069.80	
		Bahati	5,812.50	1,144.00	6,956.50	
		Menengai	5,990.00	61.90	6,608.90	
		TOTAL	65,620.25	6,688.90	72,309.15	72,309.15
5.	NAROK	Ol Posimoru	-	16,332	16,332	
		Nairotia	-	11,016.83	11,016.83	
		Olenguruone	58	11,053.07	11,111.07	
		Nyangores	-	13,142.4	13,142.4	
		South Mau Block	-	136.0	136.0	51,738.00
6.	KERICHO	Makutano	1,912.25	3,561.84	5,474.09	
		Tendeno	5,846.60	877.20	6,723.08	
		Kericho	24,101.90	999.69	25,101.90	
		Londiani	5,310.68	3,704.82	9,015.50	
		Malagat	1,748.60	1,389.30	3,137.9	
		Kerisoi	5,020.70	2,346.10	7,366.80	
		Sorget	3,301.30	3,555.30	6,856.60	
		Masaita	3,112.00	1,040.00	4,152	
		TOTAL	50,554.03	17,742.50	67,827.87	67,827.87
7.	KOIBATEK	Chemususu	891.0	10,413.8	11,304.8	
		Chemorgok	164.56	5,687.0	5,687.0	
		Narasha	4,208.4	1,951.0	6,159.4	
		Maji Mazuri	3,994.0	2,071.0	6,065.0	
		Kiptuget	319.0	531.0	850.0	
		Koibatek	4,400.9	4,470.6	8,871.5	
		Sabatia	3,826.8	281.2	4,108.0	
		Esageri	1,611.7	6,185.8	7,797.5	
		TOTAL	19,416.36	29,712.4	51,007.7	51,007.7
8.	BARINGO	Ol Arabel	50.0	2,923.0	2,973.0	
		Marigat	-	1,392.8	1,392.8	
		Kabarnet	300.3	4,016.97	4,317.27	
		Tenges	104.6	9,165.4	9,270.0	17,953.07
TOTAL MAU FOREST AREA						380,395.75

Table 18: The forest blocks that constitute the North Rift Conservancy

Forest name	Forest block	Type	Area (ha)	Percentage under management	Use of Management plans	Responsible institutions
North Rift	Timboroa	Conservation and plantation			No	KFS, CFA, KWS, NEMA, WRMA, Nature Kenya, County Governments, WWF,MOA,
	Lorenge, Nabkoi, Cengalo, Kipkurere	Conservation and plantation			No	
	Kapseret	Plantation			No	

	Kaptagat	Plantation and Conservation	12,930.56		Partly	
	Kipkabus	plantation			No	
	Metkei	Conservation	2000		No	
	Tingwa	Conservation	500		No	
	Kessup	Plantation and Conservation	2347.22		Draft	
	Kapchemutwa Keiyo	Plantation and Conservation	6410		Draft	
	Kapchemutwa		2125			
	Sogotio	Conservation	3561.2		No	
	Kerrer	Conservation			No	
	Kipkunur	Conservation	15175.7		No	
	Embobut	Plantation and Conservation			No	
	Kiptaber	Conservation			Yes	
	koisungur	Conservation			No	
	cheboyit	Conservation	2488.8		No	
	Chemurgoi	Conservation			Yes	
	Kabolet	Conservation			No	
	Saboti	Conservation			Yes	
	Suam	Conservation			Yes	

The key challenges that practioners face in trying to manage these forest resources are many and varied. In the Mau Forest Area, Mt Elgon and Cherangany forest management has to contend with communities that have traditionally lived in these forests and who have claims to not only residing in forest areas, but also having access to forest resources including conversion of pockets of forest land for subsistence agriculture. Examples are the Ogiek in Mau and the Sengwer in Cherangany.

In a number of forest areas boundaries are not often clear and is often an excuse for slow encroachment into forest areas for settlements and cultivation. In addition neighbouring households still rely on fuel wood for energy.

Besides the pressures on forests for firewood and charcoal there is often illegal logging for timber and poles. Cedar posts (*Juniperus procera*) which are highly valued for fencing, thanks to its natural durability, is often the target for illegal logging, particularly in the Mau Forest Complex.

Despite the Forest Act of 2005 which enabled the formation of Community Forestry Associations (CFAs), in some areas Government Staff are in conflict with local CFAs over benefit sharing arrangement which still remain unclear.

- Gaps in current Legislation(Forest Act) does not include benefit sharing.
- Conflicting Legislation in Government ministries.
- Human wildlife conflict
- Political interference
- Poor infrastructure in forest stations derail planting.
- High poverty around forest reserves.

Key Achievements

Despite the challenges already described, the Mau and North Rift Conservancies have registered some achievements, some of which are listed herein as:

- Legal recognition of CFA`s and Communities around the forests; which has improved relationships between local communities and the Forest Service
- The launching of the Forest Act of 2005, the Farm Forestry Rules 2009, requiring 10% Tree Cover on Farms and the Charcoal Rules,
- Launching and signing of management agreements; a step toward more responsible and sustainable management and conservation of forest resources
- The programme PELIS is improving tree cover in gazetted forest areas since it helps to improve survival and establishment of forest stands
- Farmers have recognized the importance of planting their own trees, hence tree cover on farms is increasing
- The newly devolved system of governance should be used as an opportunity to hand over responsibility and forest management targets for all counties in Kenya.
- There remains a strong interest by stakeholders such as farmer groups, government institutions and NGOs in forest management

Opportunities for Improvement

These include:

- Empowerment of CFA`s
- Equitable sharing of resources (Costs&benefits)
- Payment of ecosystem services eg carbon trade, water abstraction
- Fast tracking of mgt plan
- Promotion of farm forestry and nature based enterprises
- Capacity building of key institutions
- Policy formulation to address forest issues

Key Stakeholders

- CFA`s are key to mgt plan process
- -KFS
- -KWS
- -NEMA
- -KEFRI
- -WRMA
- -Line Ministries
- -County government
- -NGOs-Nature Kenya,WWF,World Vision

- -WRUA`S
- -Tea companies
- -Individual farmers
- -Parastatals
- Companies;
- RIPLY,Timsales
- -Financial institutions

NORTH RIFT

3.2. Drivers of deforestation and forest degradation

Direct causes of deforestation and forest degradation

- Illegal logging
- Expansion of agriculture
- Charcoal production
- Fires
- Shifting cultivation
- Firewood\fuel wood
- Encroachment and illegal settlements
- Tree Harvesting without replacement
- Excisions
- Development of infrastructure e.g. road construction, pipelines, dams, mining and quarrying, urbanization
- Invasive species colonize forests, esp Cherangani forest station-shrub, while in Nandi there is a climber, yellow in colour. (a degradation factor)

Underlying factors or drivers of deforestation and forest degradation in the region

- Poverty
- Climate change
- Overstocking\ Overgrazing – more a degradation rather than a deforestation factor
- High price and demand for timber /tree products
- Land use change e.g. subdivision of ranches
- Poor farming methods
- Lack of \inadequate awareness among communities
- Poor enforcement of existing laws\regulations
- Conflicting policies e.g. Forestry and Ministry of water - Chemususu Dam, Proposed Nandi and Chebara Dams
- Population increase - high demand for forest products
- Natural calamities e.g. Landslides and floods

- Poor planning

3.3. Land and natural resource use dynamics

Historically land use changes in both the Mau and North-Rift Conservancies have seen forest land converted to agricultural production during the colonial and post-colonial eras. This was also closely copied in forestry practice when indigenous forest areas were converted into plantations with exotic species; mainly species of pine and cypress. In addition, land which used to be communally owned has largely been privatized with western style property rights and as families have grown, inheritance of land by succeeding generations has generally led to subdivisions of land into fragmented smaller pieces. As human populations have increased, even some wetlands have been reclaimed for cultivation, particularly horticultural products.

In the Mau conservation through agricultural expansion has been the most dramatic in Kenya's recent history, as has already described.

In the North rift main changes have come about in several forms listed here

- Change of East Africa Tanning and extraction company forest to settlements, agricultural land and urban centers
- Forest excisions to settlements in Forests such as Kaptagat –as a result of population increase, and poor enforcement of existing policies
- Rapid urbanization and industrialization of towns such as Eldoret – fueled by wood based industries and growing University Student Populations
- Forest use and management and how production and consumption patterns have changed over time
- Change of pulpwood material to sawn timber
- Conversion of natural forest to plantation
- Collapse of industries and saw mills for lack of materials

3.4. capacities required by stakeholders

- **Technical –** Exchange visits, Monitoring and evaluation skills(M&E), PFM, Improving quality of livestock breeds.
- **Financial-** Resource mobilization skills, Financial management, Record-keeping, Procurement skills
- **Social-** Community mobilization skills, Exchange visits, Governance skills, Advocacy skills, KFS consult with minority communities living inside forest, especially inside Cherangani ecosystem
- **Capital resources-** vehicles, housing, arms, communication facilities, Tools & equipment for boundary realignments

3.5. Policies and incentives to reverse trends in forest cover loss:

a) Policies & incentives that could help reverse trends in forest cover loss include

- Participatory Forest Management Policy
- PELIS- incentive
- Benefit sharing- incentives for local communities and CFAs
- Carbon trade- incentives to promote tree farming or growing
- Eco-friendly NBEs- incentives
- Awards to good conservation farmers
- Corporate Social Responsibility (CSR) projects – from conservation supporting firms
- Devolution – with responsibility and targets for forest management
- Tree planting and World EnvironmentDay celebrations

b) Policies that could support forest management and conservation

- Mandatory 10% tree cover requirement under farm forestry rules 2009
- PFM- policy
- Buffer-zone through Nyayo tea zone
- Presidential decrees on endangered species (e.g. ban on sandal wood harvesting, *kata moja, panda mbili* (cut one, plant two)initiatives
- Environmental clubs in schools
- Forest Act 2005 – Provision for formation CFA , Management plans
- Environment Management and Coordination Act - EMCA 1999
- Joint Enforcement and compliance e.g. Mau
- Policy on harvesting could be less stringent
- Facility enabling use of living trees as collateral to secure loans
- Develop competitive market prices for forest products
- Increasing access to facilities for value addition
- Zero rate taxes on forest machines and equipment to improve recovery rates – possible ban on power saw use for conversion

3.6. Gaps and barriers to mitigation of deforestation and forest degradation

Group 1

Drivers	Gaps (stumbling blocks)
Poverty level and un employment	Inadequate resources to address poverty, inflation
Gaps in policies	Lack of Forest Policy and Land use Policy, Lack of clear policy on Cost and Benefit sharing , Legislations are not yet streamlined with the Constitution; Conflicting sectoral policies (e.g. Agriculture Act advocating on reclamation of wetlands for crop

	production, while under EMCA 1999, advocating for conservation). Lack of political good-will on conservation
Over-population and demand for settlement	Politicization of conservation work, Corruption, Conflict of interests among stakeholders, especially the politicians, Inadequate tools and equipment for boundary realignments
Infrastructural development inside the forest e.g. dams, electricity, roads, water way leaves, buildings	Conflicting sectoral policies
Lack of knowledge on carrying capacity of forest areas, leading to overgrazing	Inadequacy of resources for building capacities
Lack of PFMPs- Hence unable to address benefit-sharing issues	Inadequacy of resources for developing PFMPs

GROUP 2

Opportunities for improvement	Key achievements	Key Challenges
Ecotourism potential	Increased tree cover,	Encroachment
Support by Development partners	Use of Management Plans	Illegal settlements
Income generating activities< beekeeping, sericulture, farm forestry	Supportive policy e.g. Forest Act 2005, Farm forestry rules 2009=10% tree cover, Charcoal Rules	Illegal logging
Political goodwill and governance	Securing of forest boundaries and fencing e.g. Eburu	Corruption
Alternative fuels and improved jikos		Inadequate funding - infrastructure
		Loss of biodiversity e.g. endangered-endemic species, Benefits sharing and resource ownership under devolved Governance
		Forest fires, landslides, floods, droughts
		Inadequate staff

4. NYANZA AND WESTERN CONSERVANCIES

4.1. State of forest resources

Nyanza Conservancy falls within the Lake Victoria Basin, which in bio-geographical terms has been described as the Lake Victoria Vegetation Mosaics; which was basically a mixture of vegetation types such as wooded savannahs along the lake, montane forests in the Kisii Highlands, moist lowland forests in Siaya County and dry woodlands on top of hills with lateritic soils. Today these vegetation types are virtually unrecognizable since most of the landscapes have long been converted into cultivation fields and pastures and only isolated pockets of hilltop forests and woodlands remain. Of

these Gwasi Hills, Gembe represent the largest blocks of indigenous forests in Nyanza, despite being degraded. In addition Ruma National Park is the best example of a wooded savannah with tall elephant grass, Acacia Trees and a semi-closed riparian vegetation of species of *Acacia, Rhus, Olea, Carissa*. Situated right by the Lake, Gwasi Hills is floristically interesting because on its top it has species which are typical of Kenya's Montane Vegetation such as *Olea , Polycius* and *Cartha edulis* (miraa). On the plains in Siaya and Busia Counties including along the rivers one still finds iconic timber species such as Mvule *(Chlorophora* (*milicia) excelsa* . In addition to the remaining pockets of indigenous vegetation, there are small plantations spread over the entire conservancy.

Western Conservancy is a mixture of natural forests and plantations. Of these Kakamega Forest, the easternmost remnant of a lowland rainforest (moist Guinea-Congolian) is the most well known in addition to the Montane Forests on Mt. Elgon In addition there are reserves such as Yala, Isecheno, Buyangu and Kisere nature reserves

The programme PELIS which promotes forest regeneration programme has facilitated the planting of 110 ha of trees in Sinende /Shimoli, while another block IGOLO is being managed for carbon.

Having said that the natural forests and woodlands of Nyanza and Western Conservancies have been largely converted to agricultural fields, Nyanza and Western unlike other conservancies, and particularly Nyanza, have virtually no opportunities to expand their gazetted forest lands. The role of KFS and the community forestry associations formed under the new Forest Act of 2005 seems to be to promote the increase of tree cover on farm land and to restore degraded pockets of natural and planted forests. Going by the relatively high tree cover in Counties such as Nyamira, there seems to be ample opportunities for tree cover to be systematically increased on the farmed landscapes of the entire conservancies, given favourable annual rainfall and growing conditions.

In view of the above, it is important to recognize the key achievements from Nyanza:

- Registration of community forestry associations (CFAs)
- Gazzetment fo the 12 forest blocks .
- Fast tracking and writing of the management plan for Gwazi and Wire forests
- A combined total of 2140 ha of commercial tree species were been planted by farmers in 2012
- Wire Forest near Oyugis Town is now under rehabilitation
- There is an increase of stakeholders are participation on forestry related matters
- Increase level of awareness in tree planting i.e Migori, Ugenya, Homa Bay counties, have all met their planting targets in 2012 and 2013.

Despite the achievements a number of challenges remain

- Climate in the lower lake region has a long dry season which requires careful choice of species or provision of water to enhance establishment after planting
- Culture of planting trees is not widespread among local farmers

- Uncontrolled grazing on communal or trust lands prohibits survival of planted seedlings
- Absentee Land lords tend not to take care of their land, but this is a situation that can be reversed with the correct incentives
- HIV/aid it an impediments to developments
- It seems that the absence of industrial plantations in Nyanza is linked to the fact that forestry development is chronically under-funded and is also reflected in the relatively low numbers of technical forestry skills allocated to the Conservancy
- Insecurity due to militia groups.mt Elgon.

The opportunities that exist that can be used to reverse trends in forest cover are as follows:

- The current legislative frame work which allows for the formation and facilitation of community participation through the creation of CFAs is definitely a positive
- The demand for forest products remains high particularly in construction which is expected to increase, particularly in the new political dispensation which as devolved power to the counties
- In some areas there is still substantial parcels of land for planting trees alongside agricultural crops
- KFS is beginning to provide more skilled manpower
- Indigenous knowledge on the conservative use of trees can still be strengthened.

The institutions that can support forestry development and conservation in both Nyanza and Western include:

i. WARMA,
ii. NEMA,ENERGY,KENGEN,
iii. MILLENNIUM VILLAGES,
iv. GFSI,
v. WORLD NEIGHBOURS,
vi. ICRAF VI,
vii. KARI,
viii. KTDA
ix. TOBACCO,
x. EU CEFRA.
xi. NATURE KENYA,
xii. SUGAR FACTORIES,
xiii. ECO 2 EQUILIBRIUM UNIVERSITY,
xiv. MINNING COMPANY.KAIMOSI

4.2. Drivers of forest cover change

In lower Nyanza which refers to the lands that border the lake the main direct drivers include:

- Charcoal production to supply urban populations in the main centres such as Kisii, Kisumu, Homa Bay, Migori, Siay and others
- Fuel wood harvesting for fish smoking
- Overgrazing
- Encroachment of un-demarcated woodlands
- Rampant fires such as those in Lambwe Valley and the entire Kaksingri Hills

In the areas away from the lake the drivers are

- Encroachment through settlement, Got Ggwer,Kodera and Wire forests
- Expansion of Tobacco Growing in Migori and Kuria Districts – wood energy for tobacco curing
- Harvesting of wood for brick making in the Highlands (Kisii, Rongo)
- Tree harvesting for Tea Drying
- Cultivation of illicit herbs such as Cannabis sativa in Gwasi Hills

Underlying the above drivers are:

- The misunderstanding between KFS and Local Governments on the ownership and legal jurisdiction over forest lands
- Inadequate capacity of CFAs who have been formed just recently
- Population growth and high rates of unemployment
- Increasing demand for forest products
- Over-reliance on wood energy

Gazetted Government Forests : Nyanza Conservancy			
Zone	Forest	Area (Ha)	Remarks
Suba	Lambwe	732.	
	Gwasi	7,572	
	Gembe	4,500	
	Ruri		
Rachuonyo	Wire	376	
	Kodera	686	
	Homa Hills	1,012	
Nyando	Koguta	412	
Migori	Rabuor	50	
	KujuBur	4	
	Ranen	63	
	Nyamarere	26	
	Nyasoko	24	
	Magina	28	
	Otacho	107	
	Sagegi	8	
	Ombo	6	
	Aroso	10	
	Got Kwer	1.2	
Siaya	Got Ramogi	393	

	Got Naya	22	
	Got Abiero	76	
	Got Usenge	83	
	Got Odiado	70	
	Mbaga	7	
	Got Regea	-	
Kuria	Maeta	36	
	Nyantara	11	
	Kegonga	9	
	Targgwiti	39	
	Getambwega	49	
	Nyanduri	18	
Kisumu	Karateng A	12	
	Karateng B	30	
Total		16,448	

In Western Conservancy the key drivers of forest cover change include:

- De-gazettement of forest lands for housing - Gesaina primary school near Isichino 9 hac, Kaptic sec in Kipiri, Malava girls, Kakamega show ground and Shikuthsa prisons
- Expansion of commercial agriculture particularly *sugar belt* extension to cultural forest such as Mungaha and Cheptuluones –
- Expansion of *Nyayo Tea Zones* - these were supposed to be 100 meters of buffer strips but in some parts they have been extended without authority of KFS to 150 m strips instead.
- Extraction of poles and fuelwood
- Charcoal production

The underlying factors include:

- Population growth
- Demand for wood energy – firewood and charcoal
- Official policy – Nyayo Tea Zones as buffers against deforestation
- Insecurity in the Mt Elgon area- impedes free movement of people and investment in sgriculture

4.3. Land and natural resource use dynamics

In both Nyanza and Western Provinces population growth on restricted land areas has led to restricted forestry development and existing land continues to be sub-divided for the settlement of growing families. This has propelled encroachment on forest lands, particularly what used to be known as County Council Forests which has had weak institutional presence and legislative power to stem deforestation trends. Over the last three decades commercial agricultural expansion in Nyanza and Western was dominated by Sugar Expansion (Sony Sugar in Migori and Mumias, Tobacco in both Nyanza and Western, Nyayo Tea Zones in Mt Elgon and more recently Rice Growing in Yala Swamp by Dominion Farms. The high population densities in Western and Nyanza has restricted

development of industrial plantations. Today efforts need to be put to develop farm forests, woodlots and boundary plantings.

Another key observation particularly in Nyanza is the destruction of water catchments forests and woodlands and cultivation of river banks; which have led to flush flooding, siltation and fragmentation and seasonal flow of rivers which used to flow throughout the year. It is obvious that the rehabilitation of rivers through the judicious management of river-bank vegetation and protection of catchments demands more effort.

The proclamation of reserves and national parks such as Ruma in Homa Bay County and Kakamega Forest are important as they represent the remaining relatively natural areas within farmed landscapes

4.4. Capacity for conservation and management of existing forest cover

- Capacity building on the silvicultural practices
- Capacity building on the technical issues
- Networking and linkages
- Exchange visits
- Information sharing

Gaps, Challenges:

Gaps.

- Lack of information on the state of forest resources and the fact that some forest areas which have not been surveyed
- Change of ownership from county councils to KFS,
- Conflict of policies between government agencies such as KFS and KWS which seem to have different fire management regimes even where an area is both a national park and a forest reserve
- KFS does not have sufficient resources to enforcement policies.
- Decision making on the community forest natural management (CNRM) is still not well organized.
- A number of forest lands do not have management plans.
- Inter agencies conflicts in natural resources managements.
- Corruption
- Destruction of forests through Arson.

4.5. Policies, incentives and measures to address deforestation and degradation

- The Adoption of the forest policy of 2010.
- Finalization of the REDD+ policy.

- Registration of the private land which forested (Loan scheme) as means guarantee for loans.
- Ready markets, of Transmission poles KPLC.
- The riparian policies of the water act.
- The 10% tree covers on farm . On farm tree farming from the agriculture act.

11.2 Annex II: Maps from cover change modelling in five forest areas of Kenya.

ABERDARE LAND COVER CHANGE ANALYSIS

(Units: Square Kilometers)

1. Potential for Transition From Class to Class

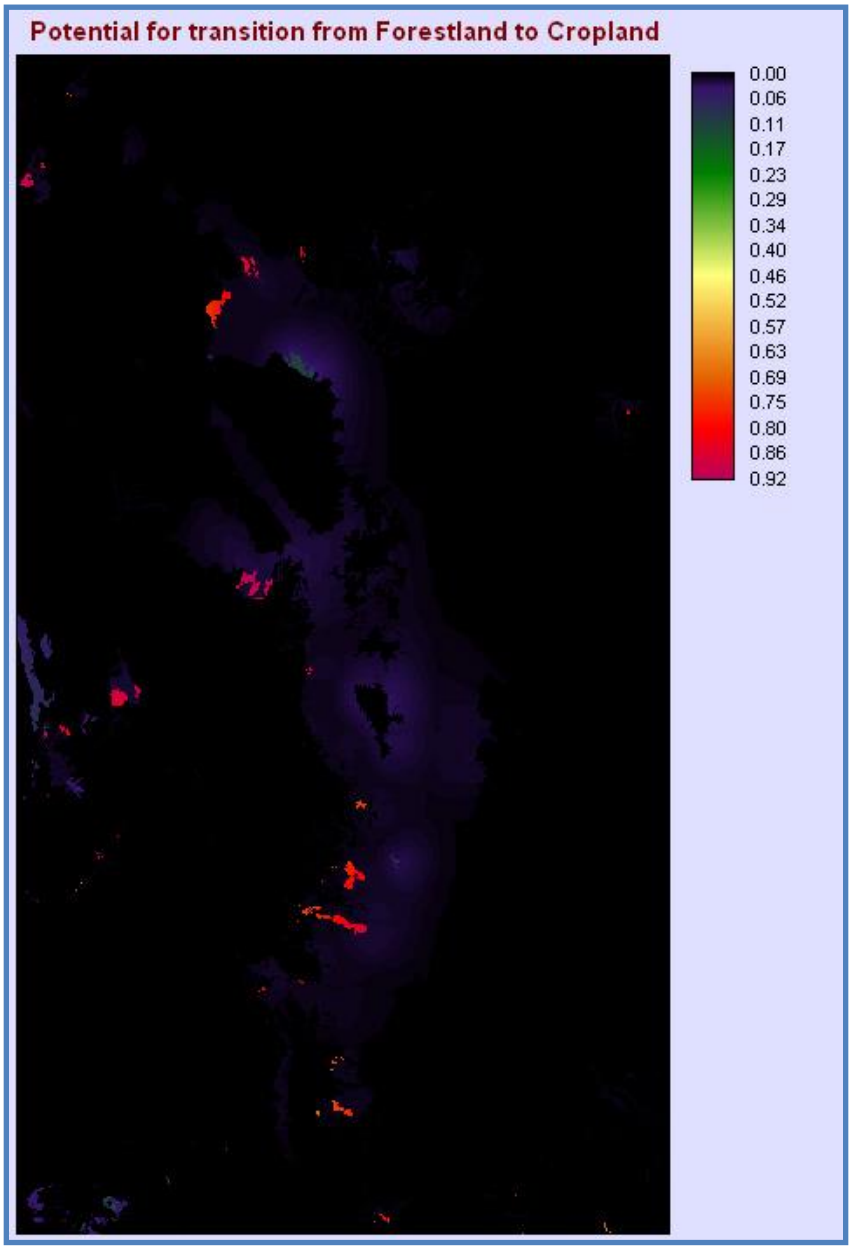

Figure 30 Aberdare 1

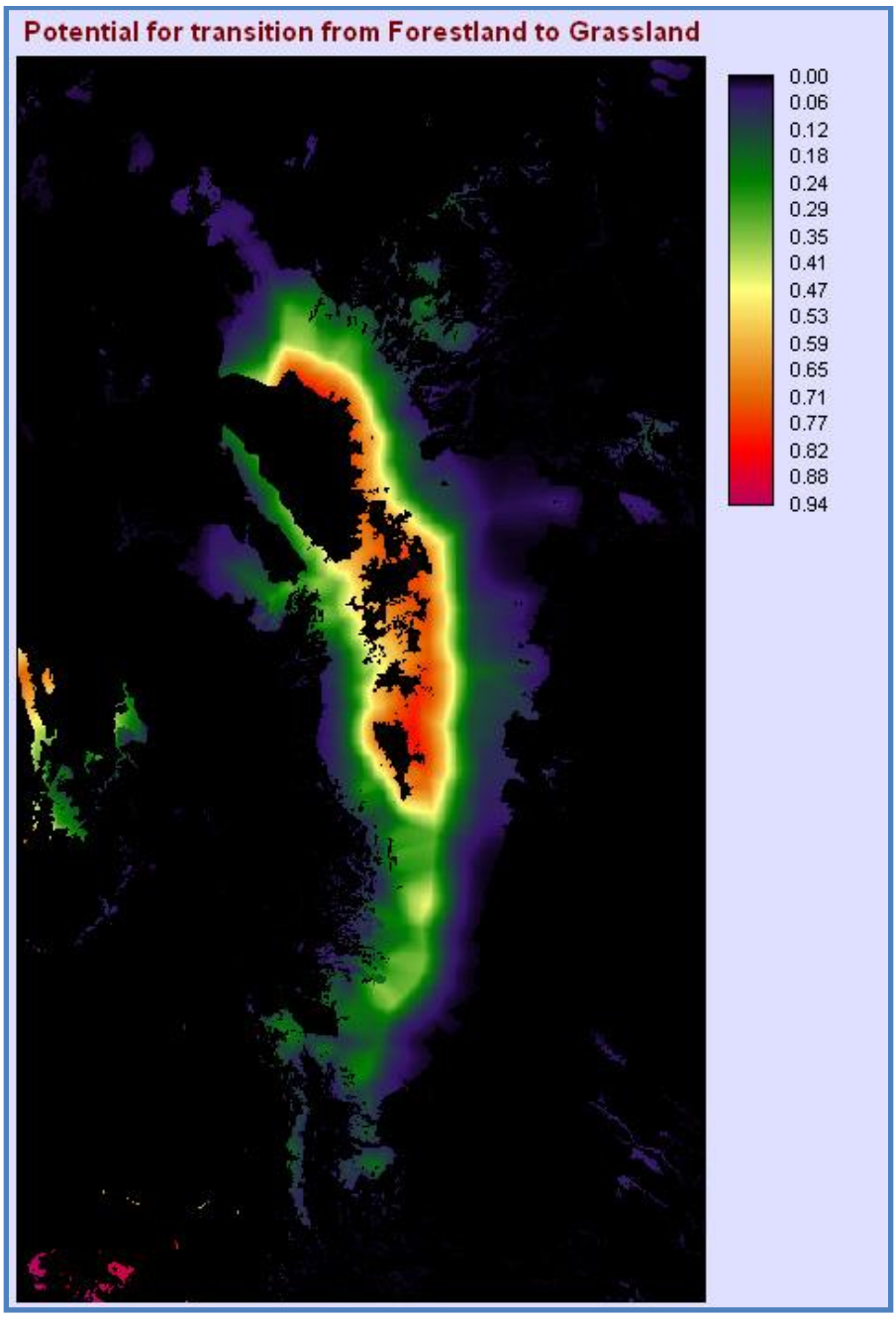

Figure 31 Aberdare 2

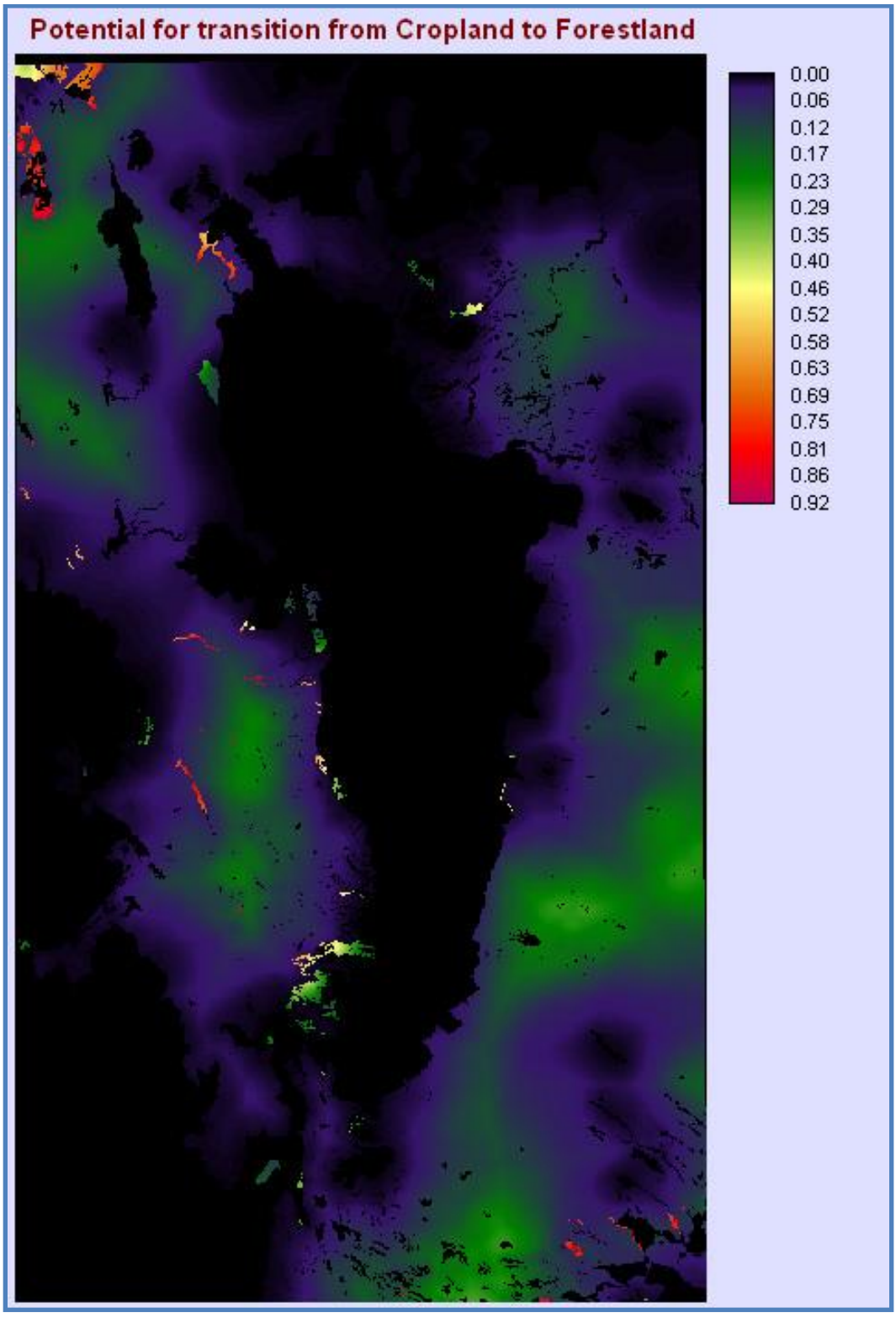

Figure 32 Aberdare 3

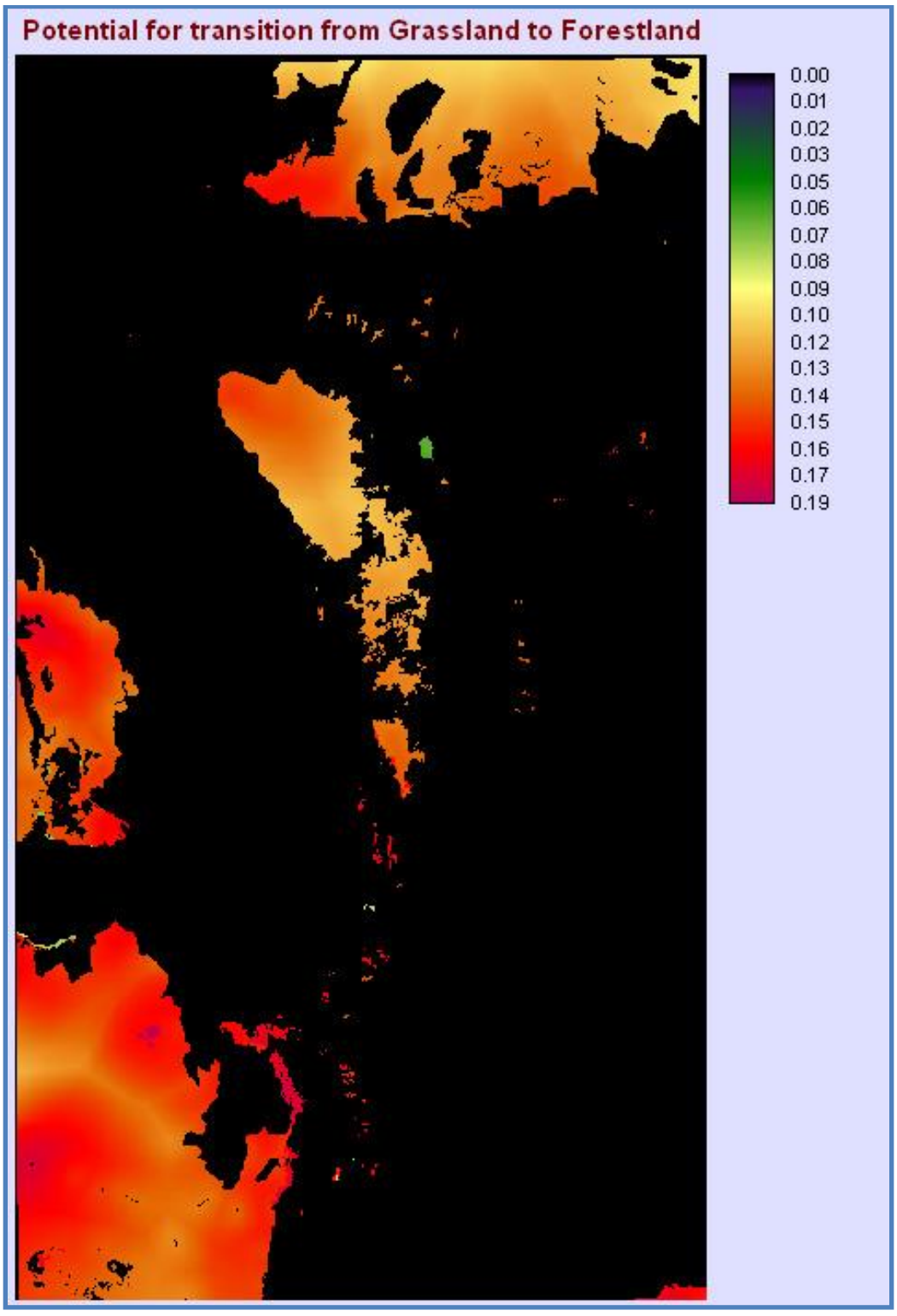

Figure 33 Aberdare 4

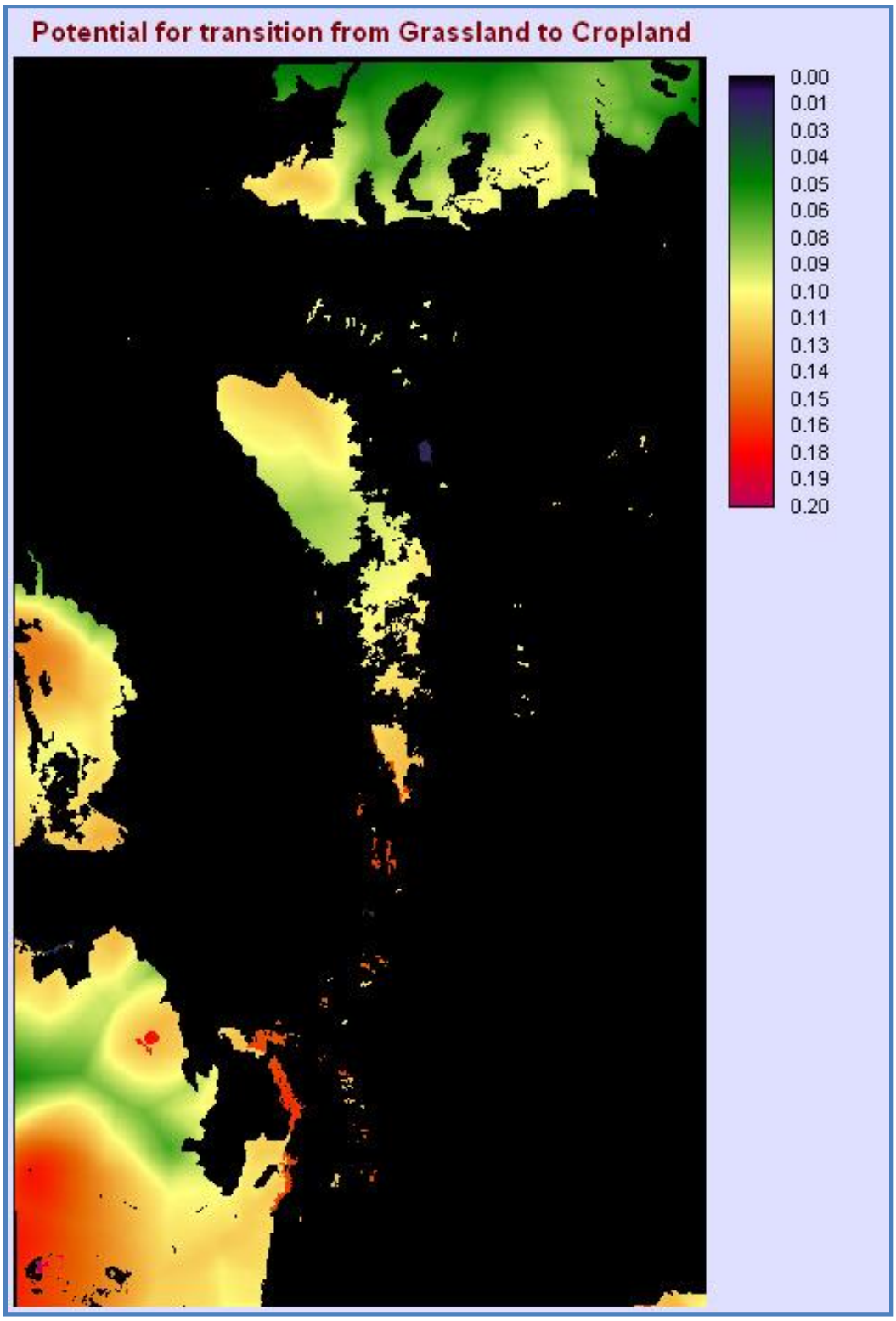

Figure 34 Aberdare 5

Current Land Cover (2010)

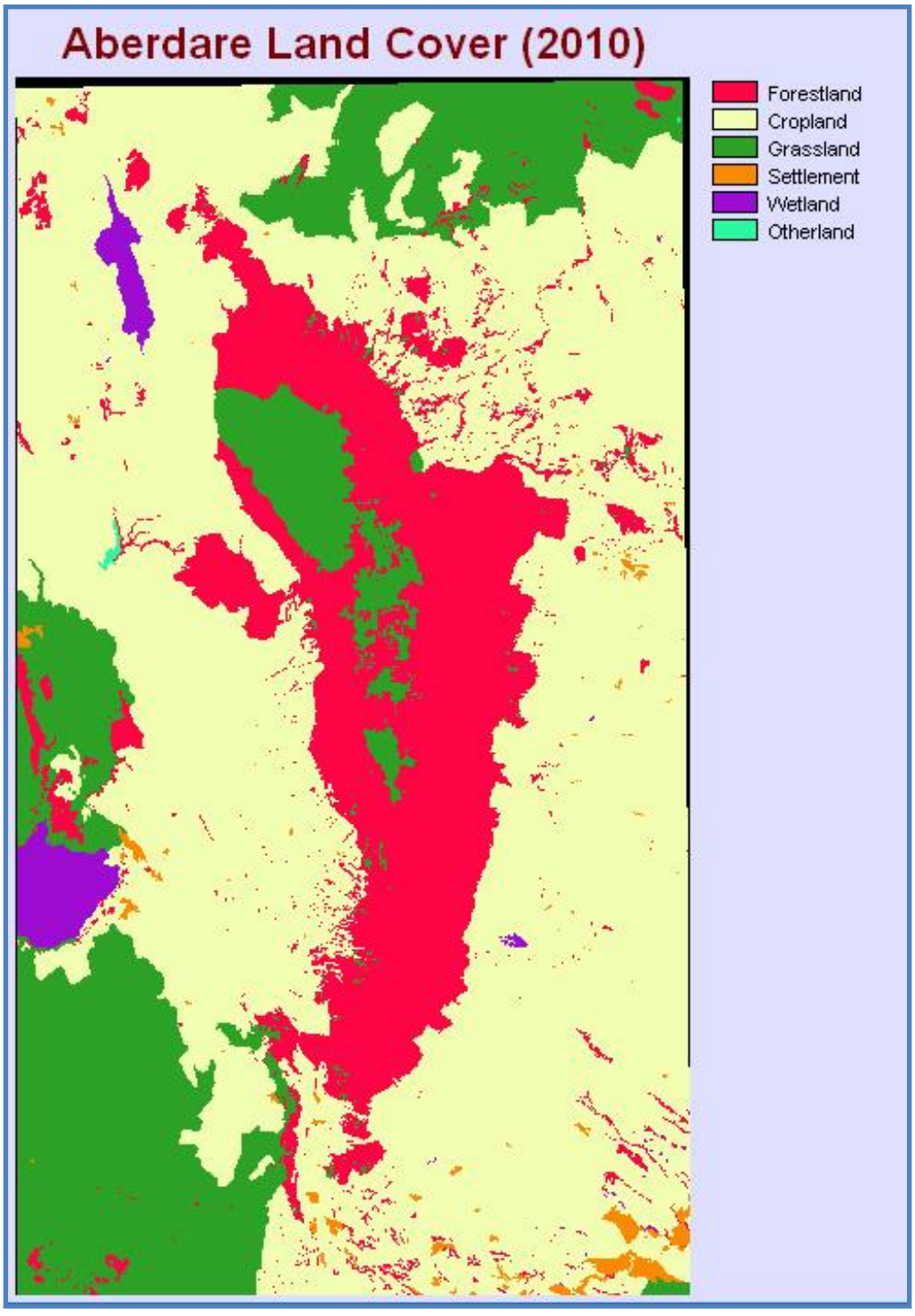

Figure 35 Aberdare 6

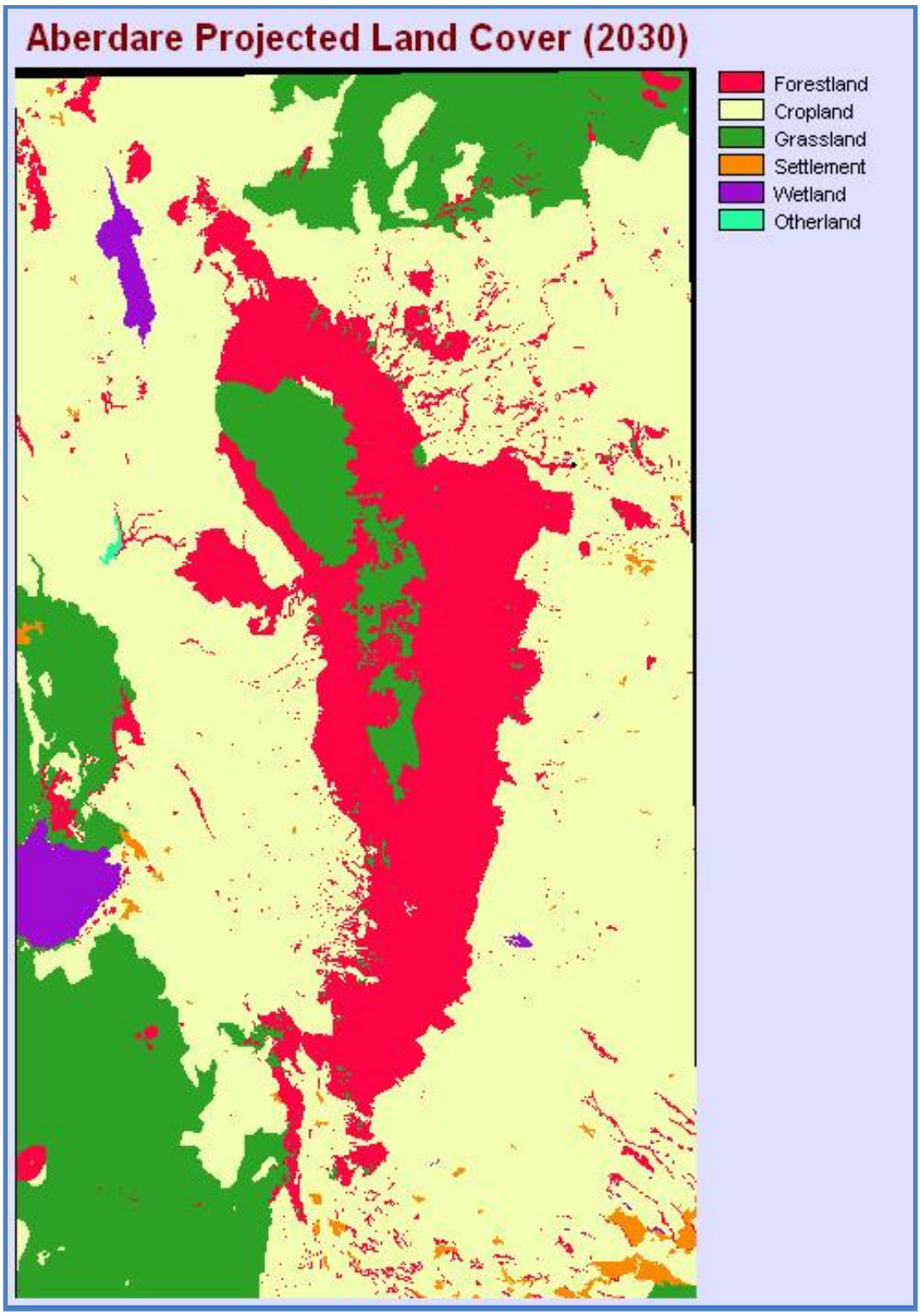

Figure 36 Aberdare 7

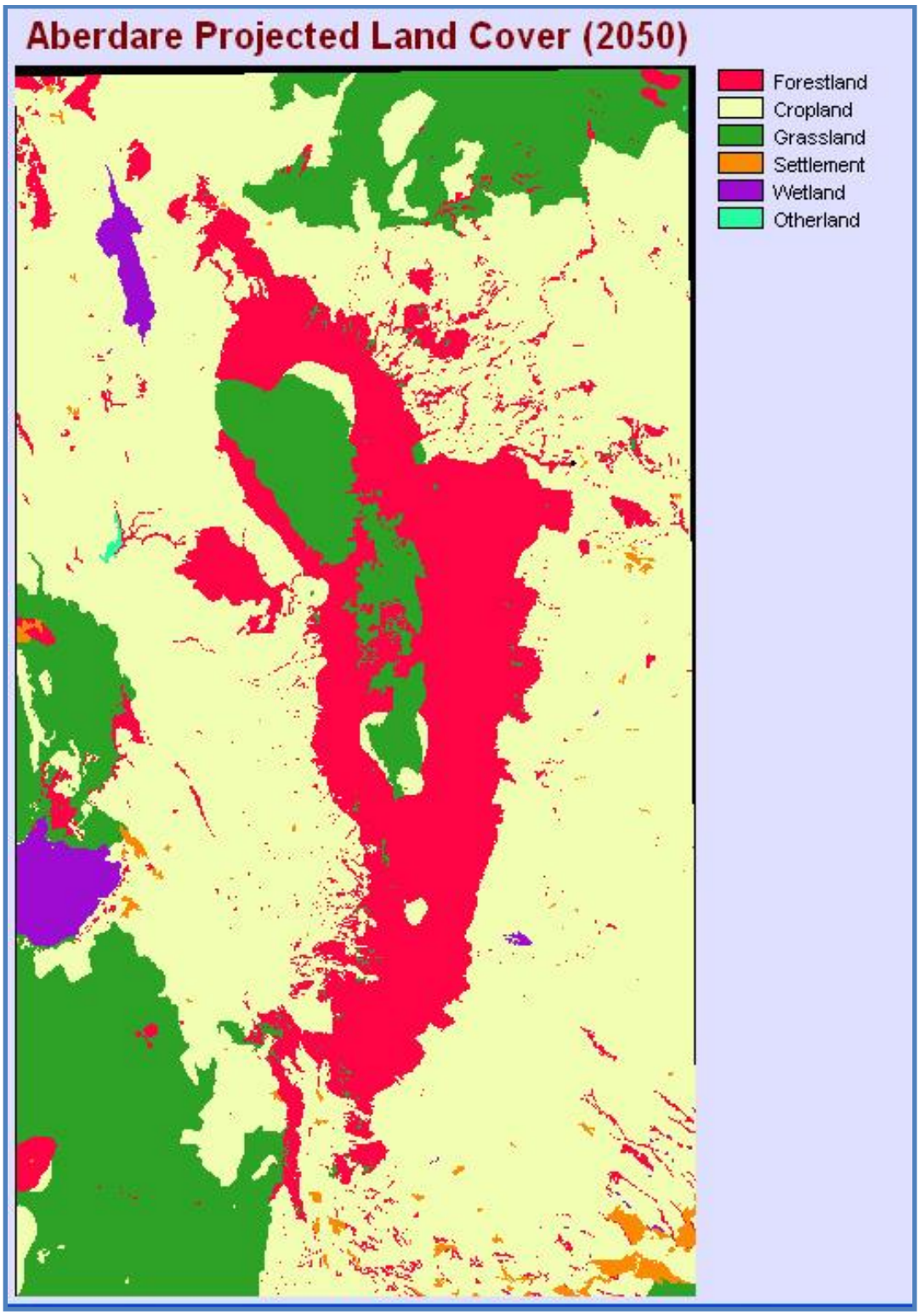

Figure 37 Aberdare 8

Future Land Cover (2080)

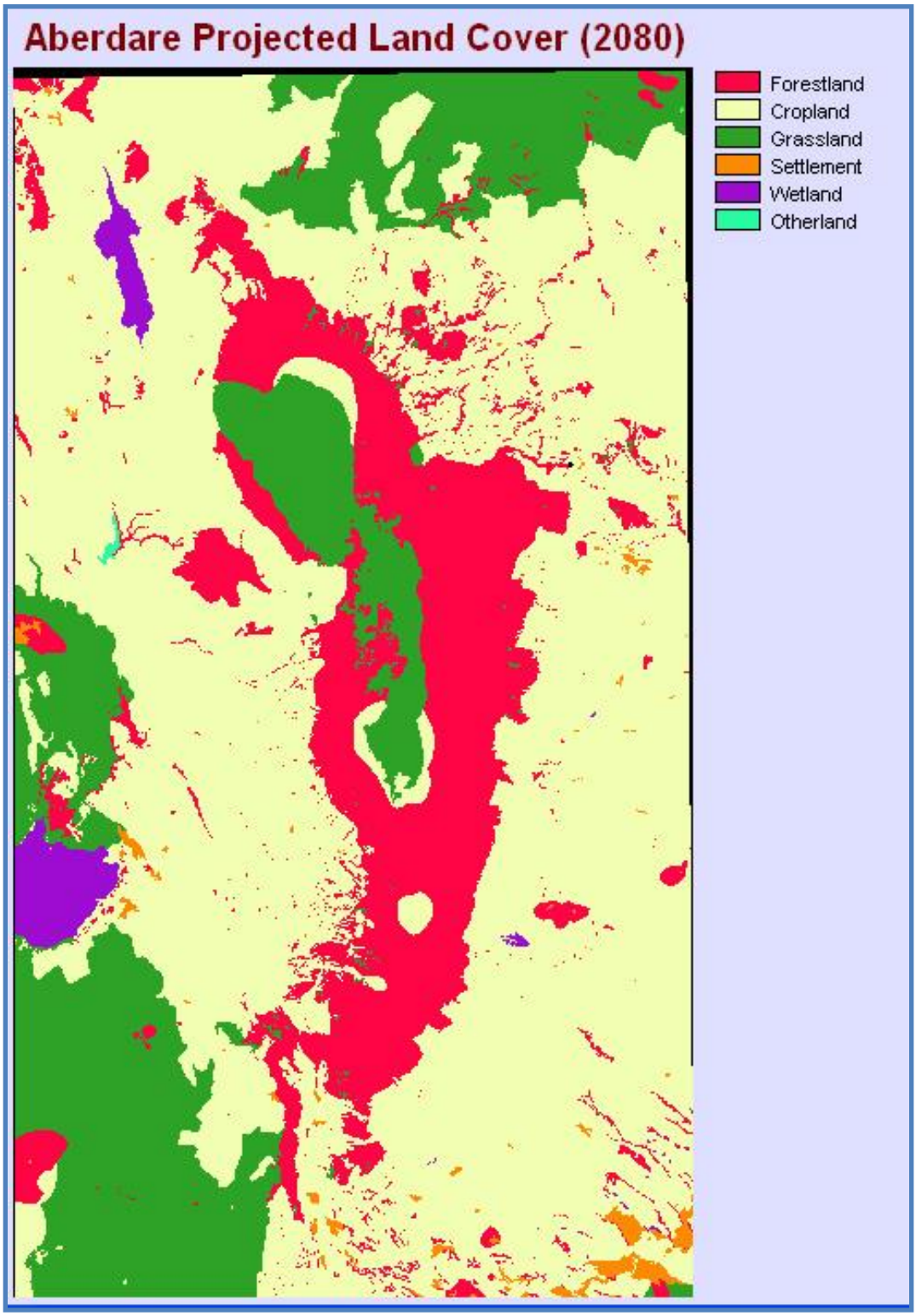

Figure 38 Aberdare 9

MT. ELGON LAND COVER CHANGE ANALYSIS

1. Elgon: Potential for Transition From Class to Class

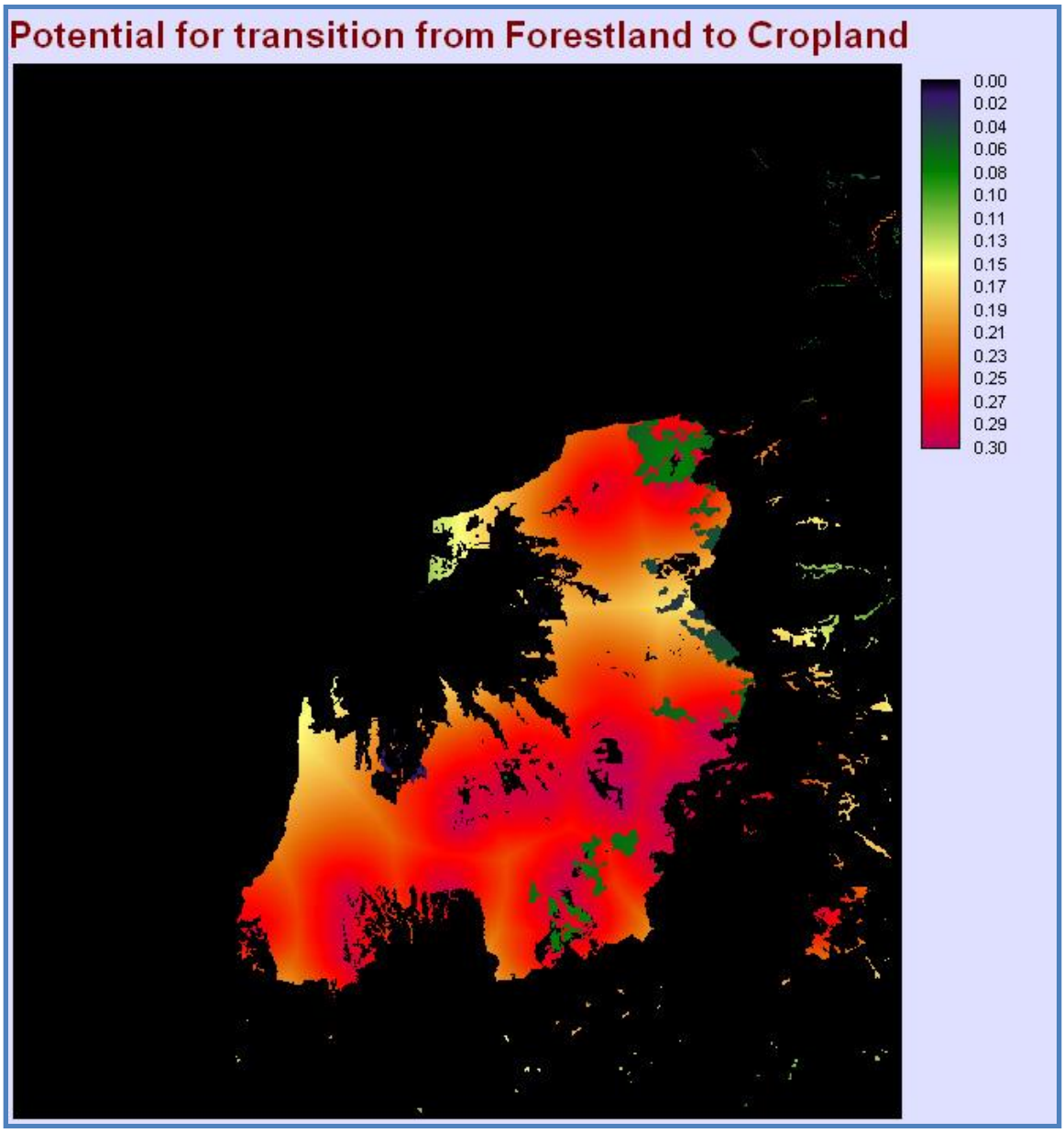

Figure 39 Elgon 1

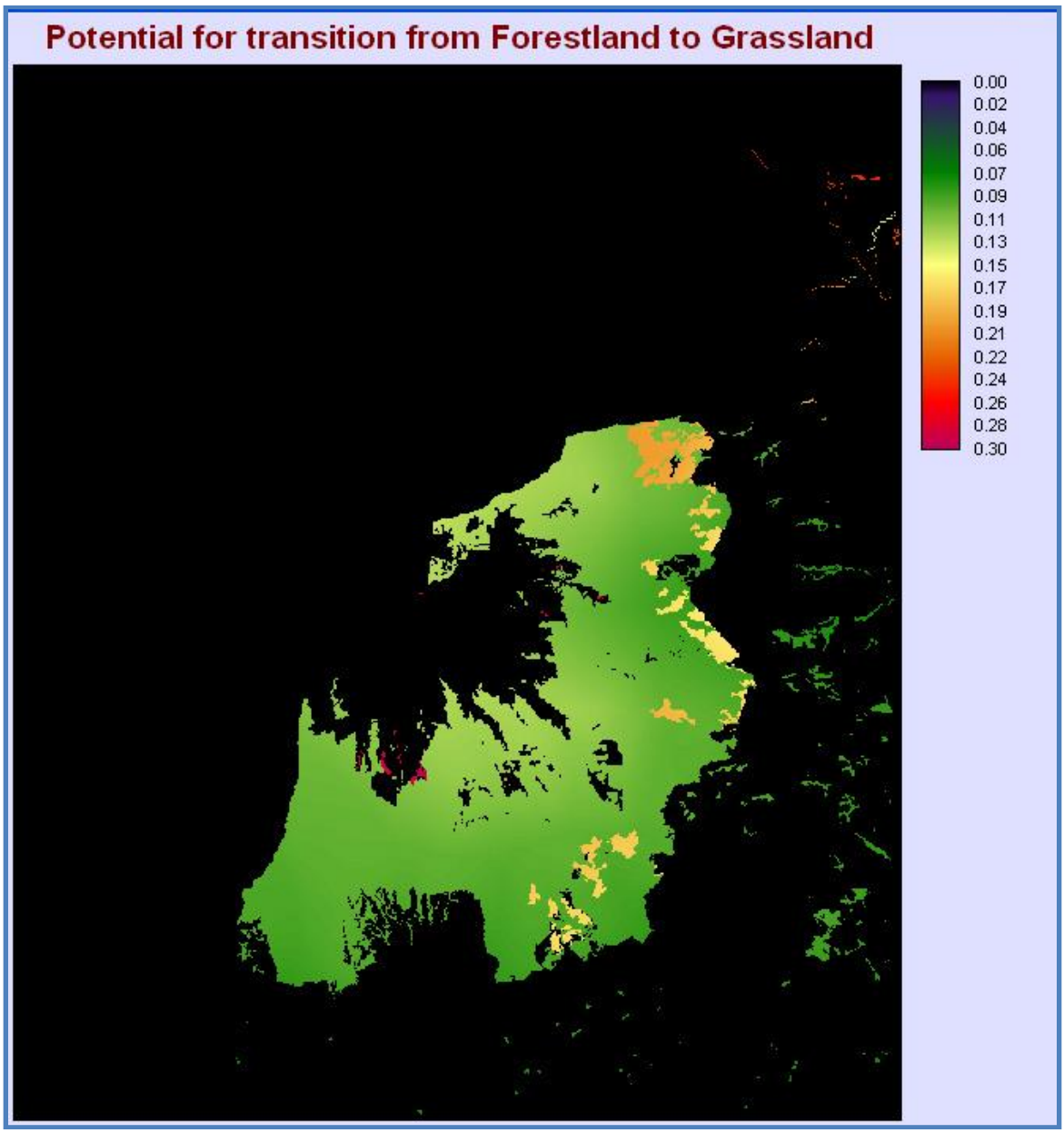

Figure 40 ***Elgon 2***

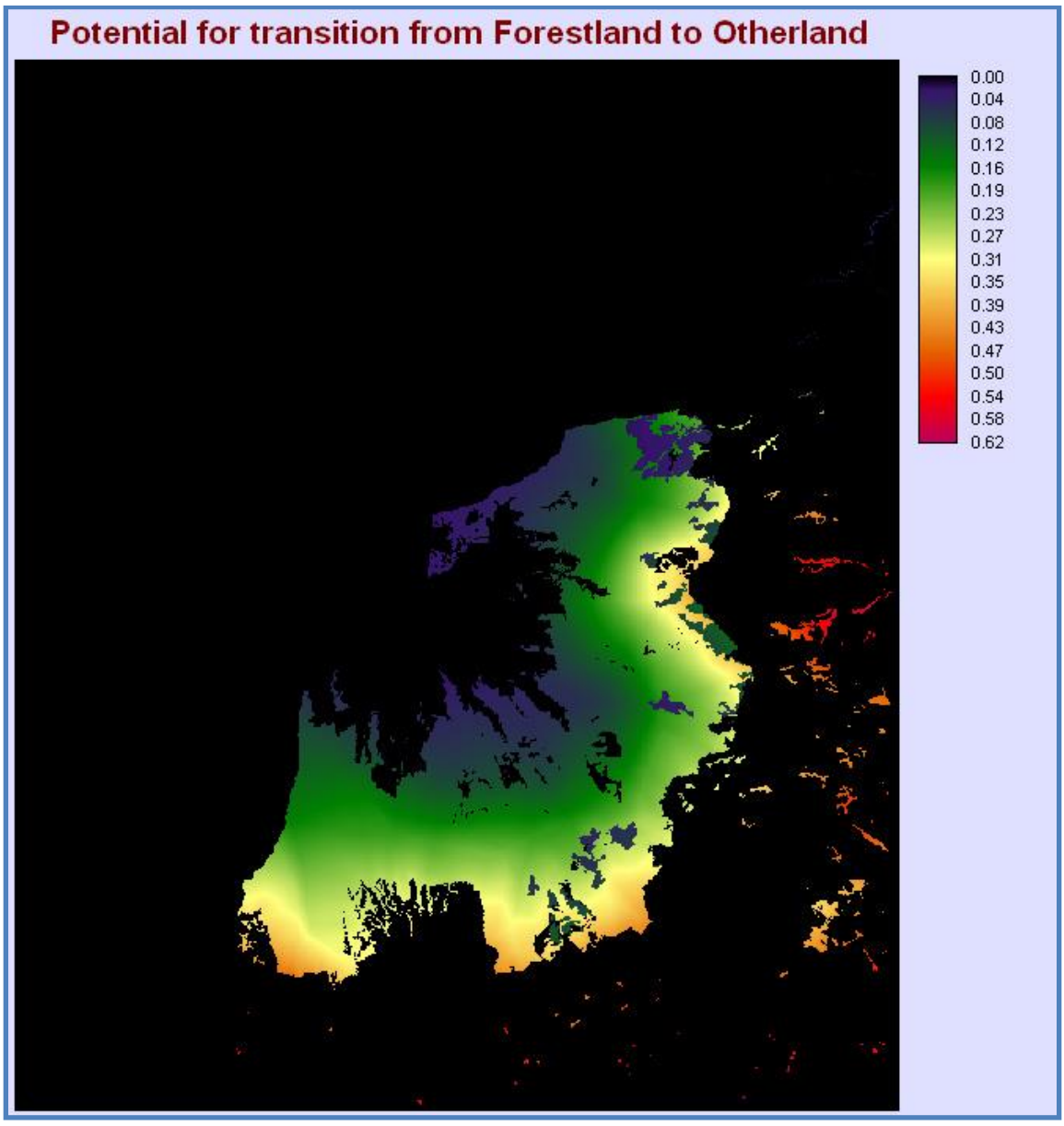

Figure 41 Elgon 3

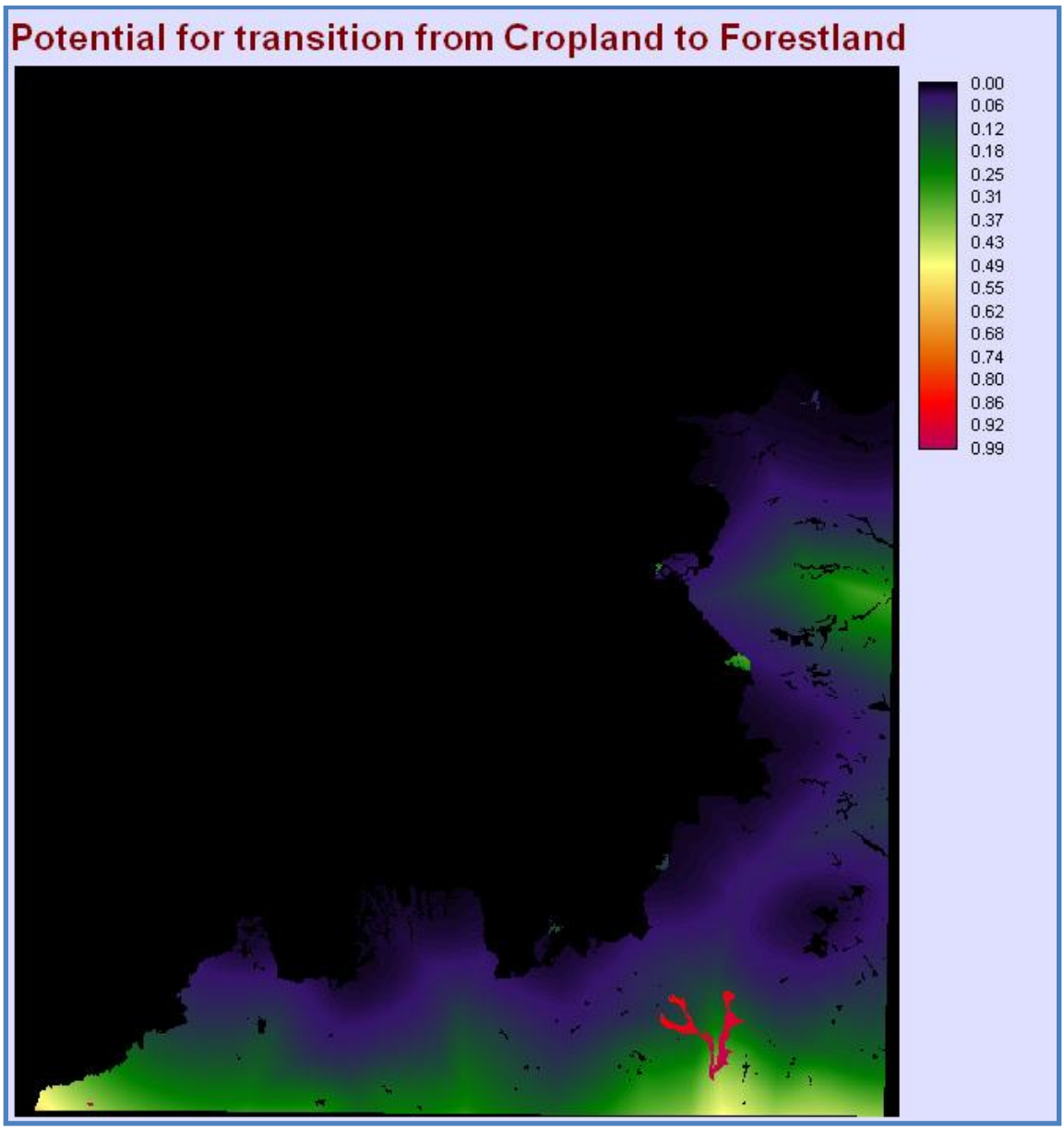

Figure 42 Elgon 4

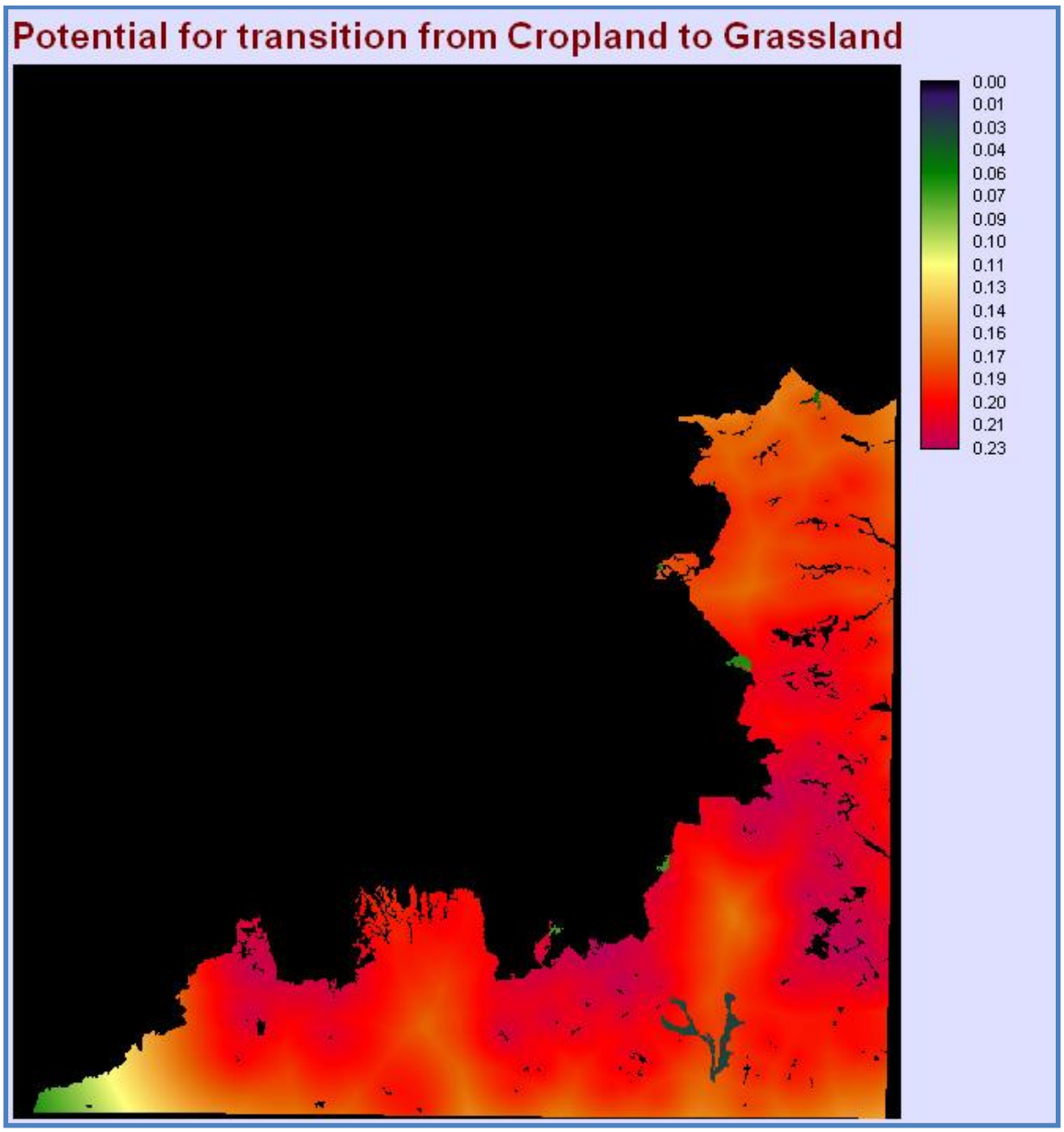

Figure 43Elgon 5

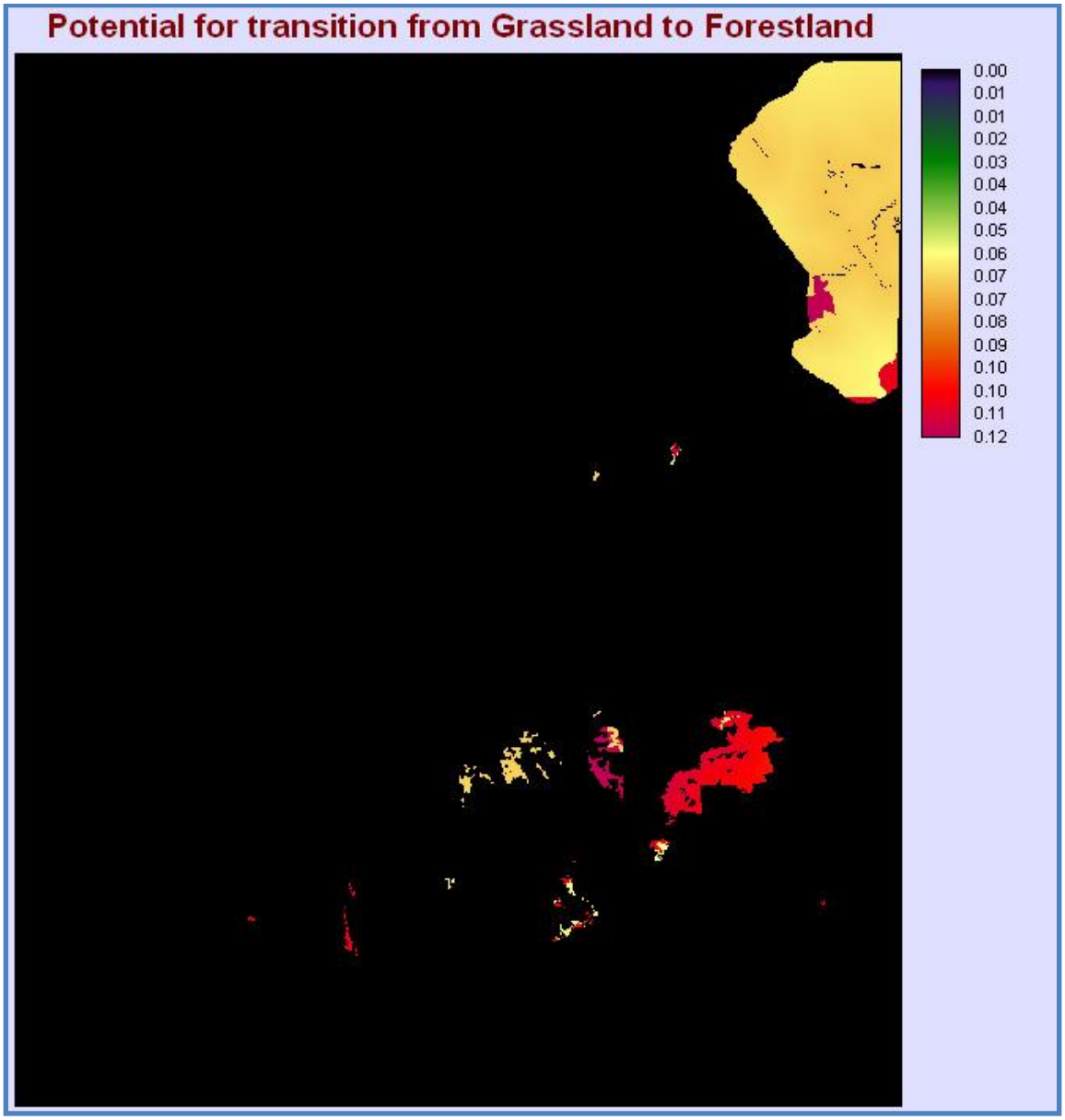

Figure 44 Elgon 6

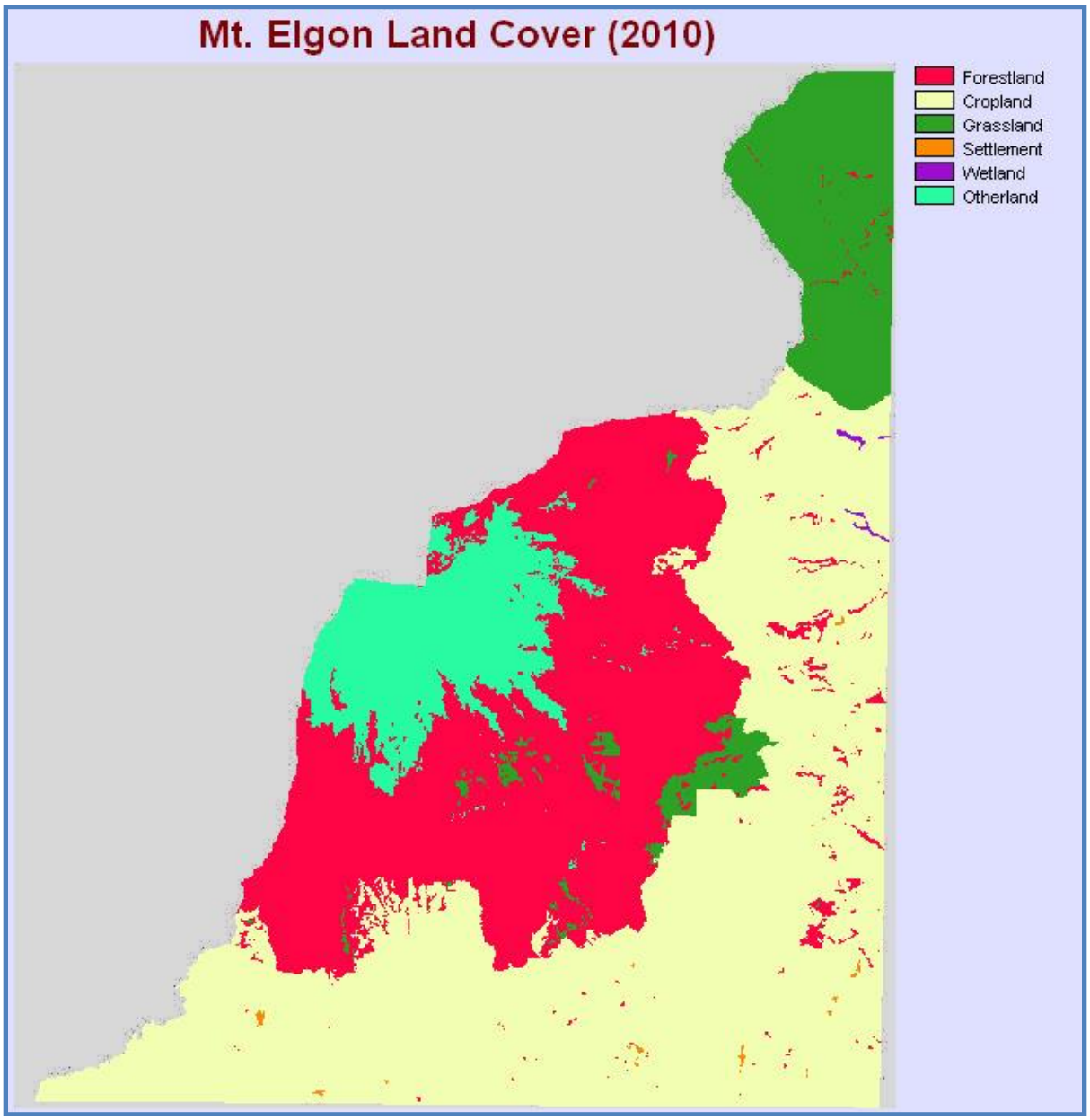

Figure 45Elgon 7

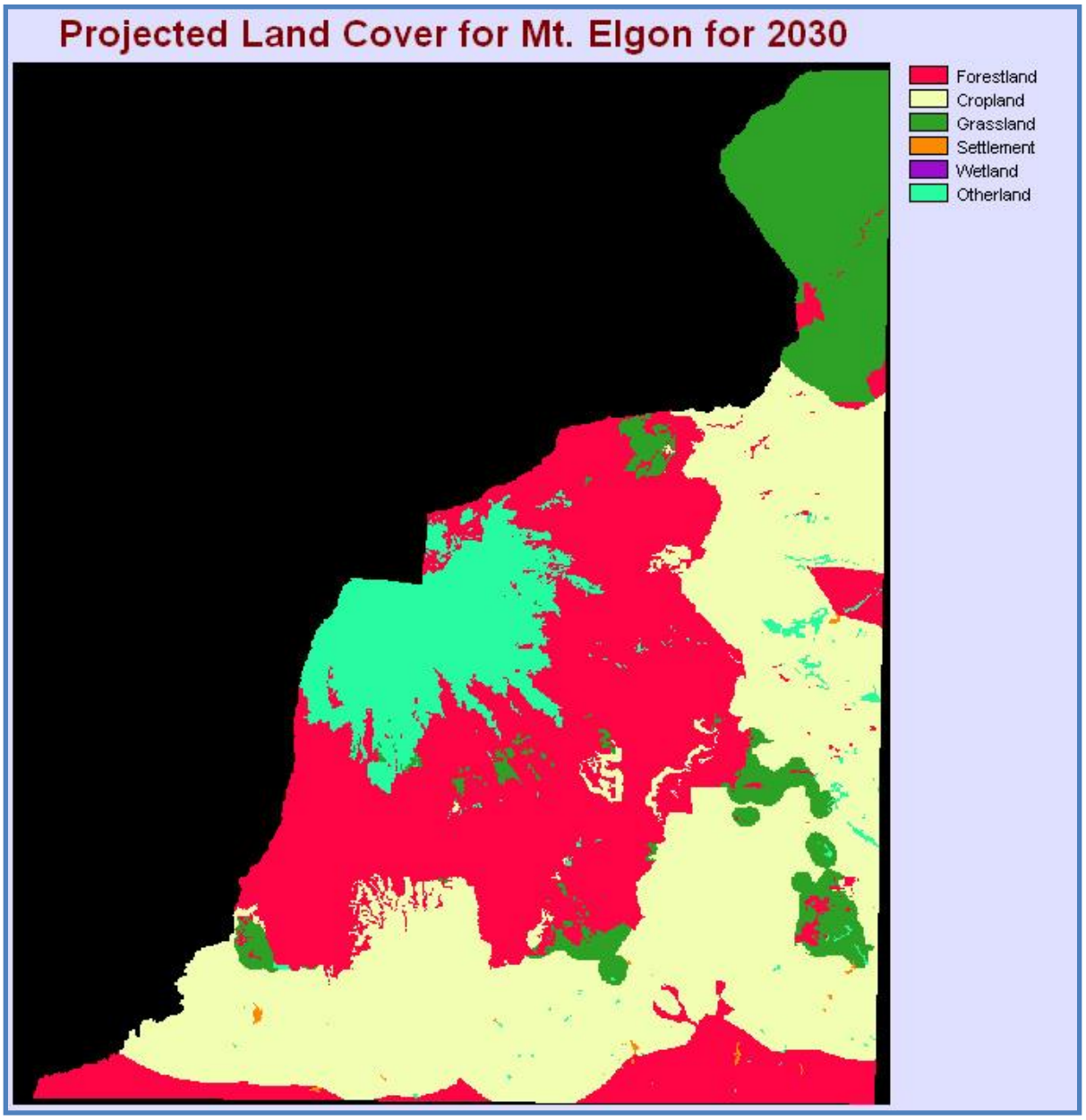

Figure 46Elgon 8

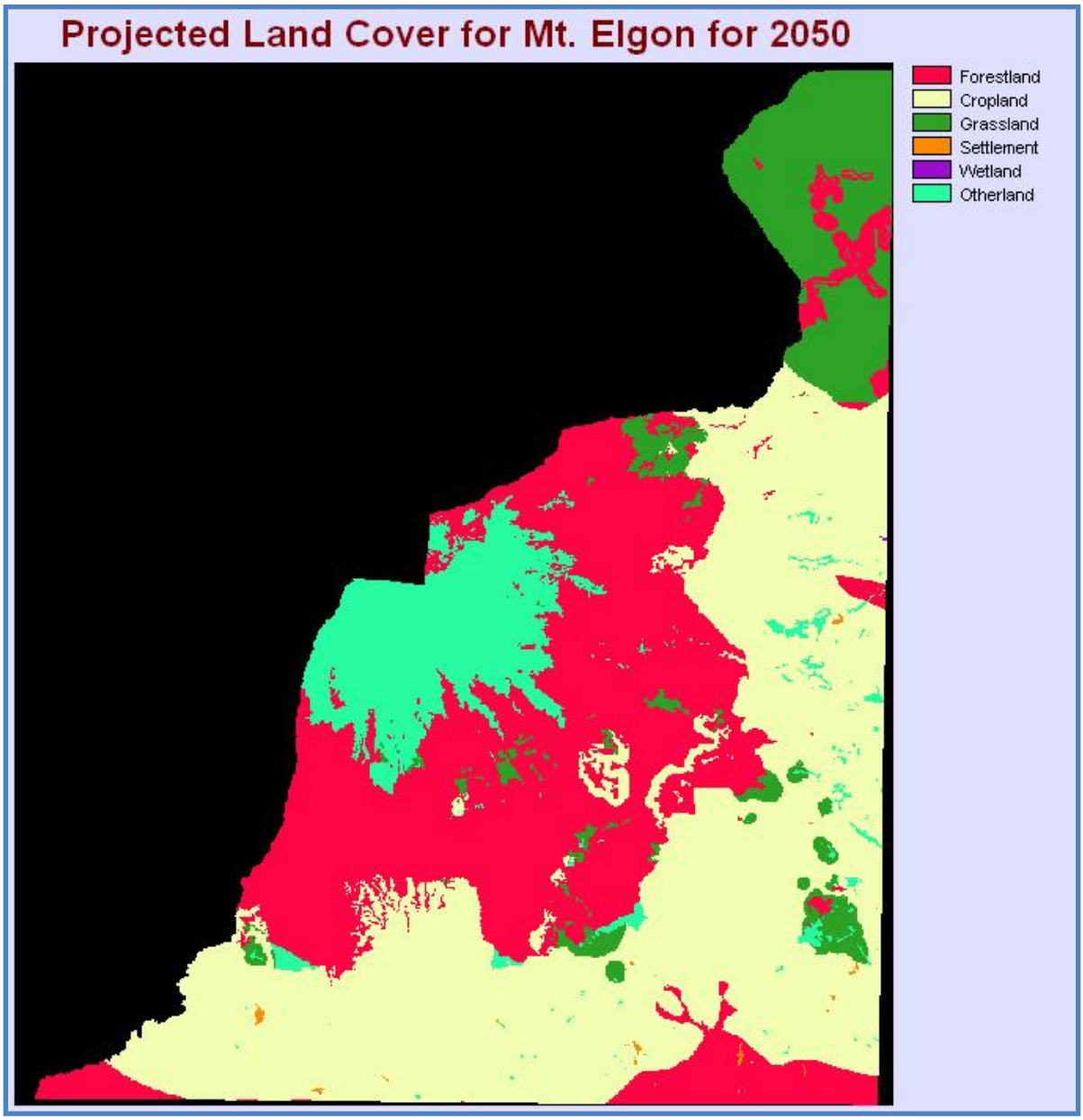

Figure 47 Elgon 9

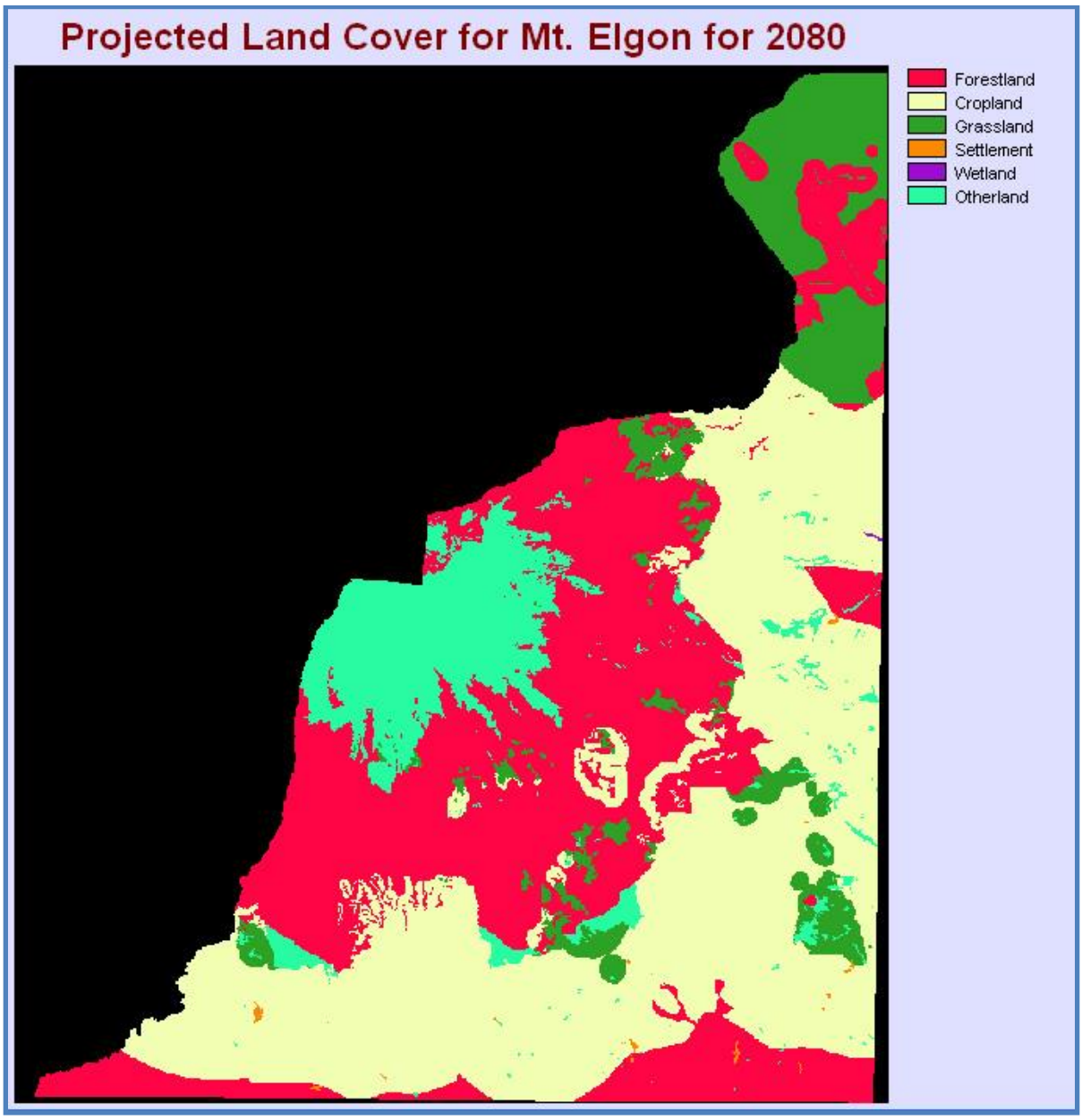

Figure 48 Elgon 10

MAU LAND COVER CHANGE ANALYSIS

(Units: Square Kilometers)

1. **Potential for Transition From Class to Class**

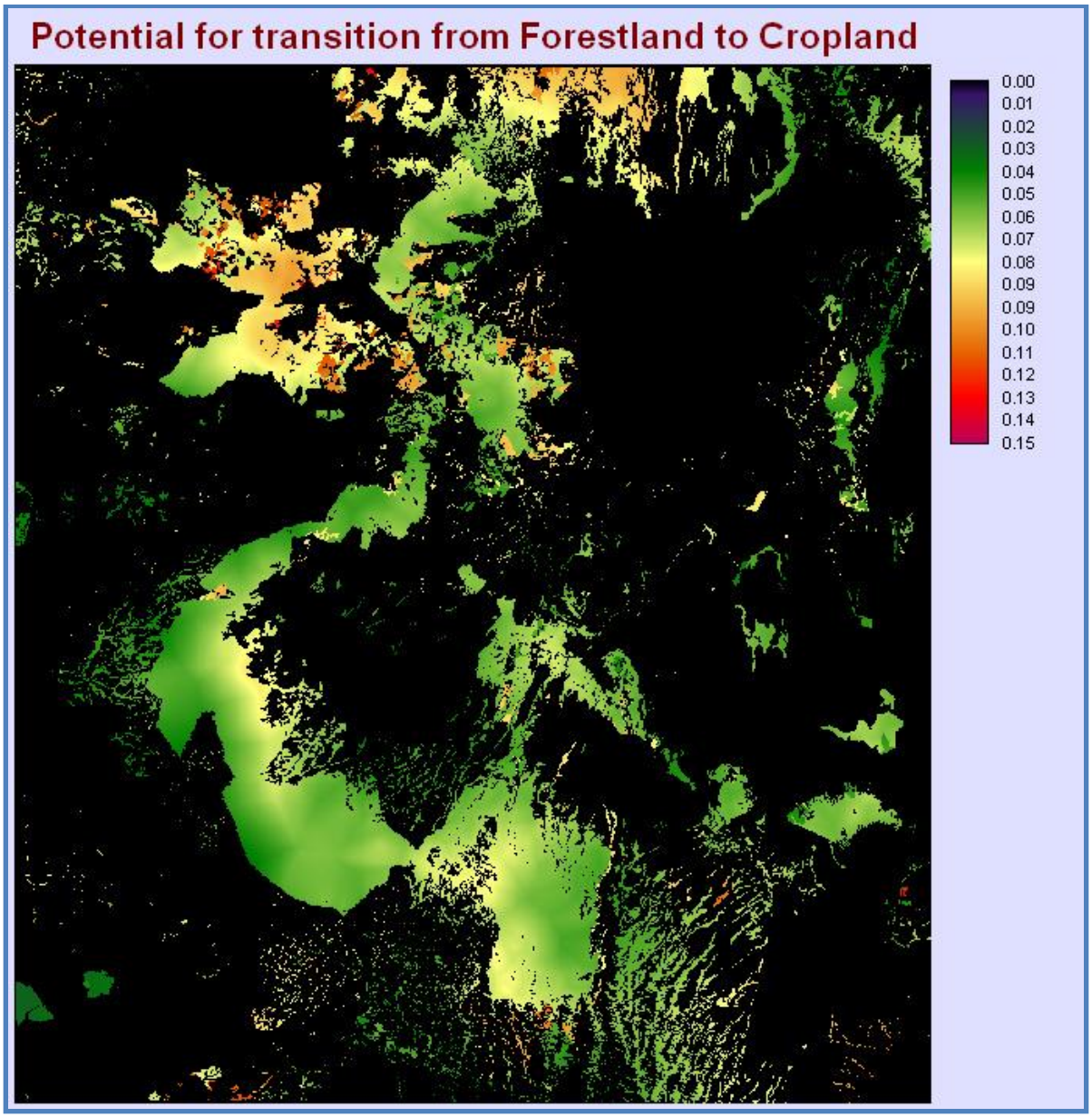

Figure 49 Mau 1

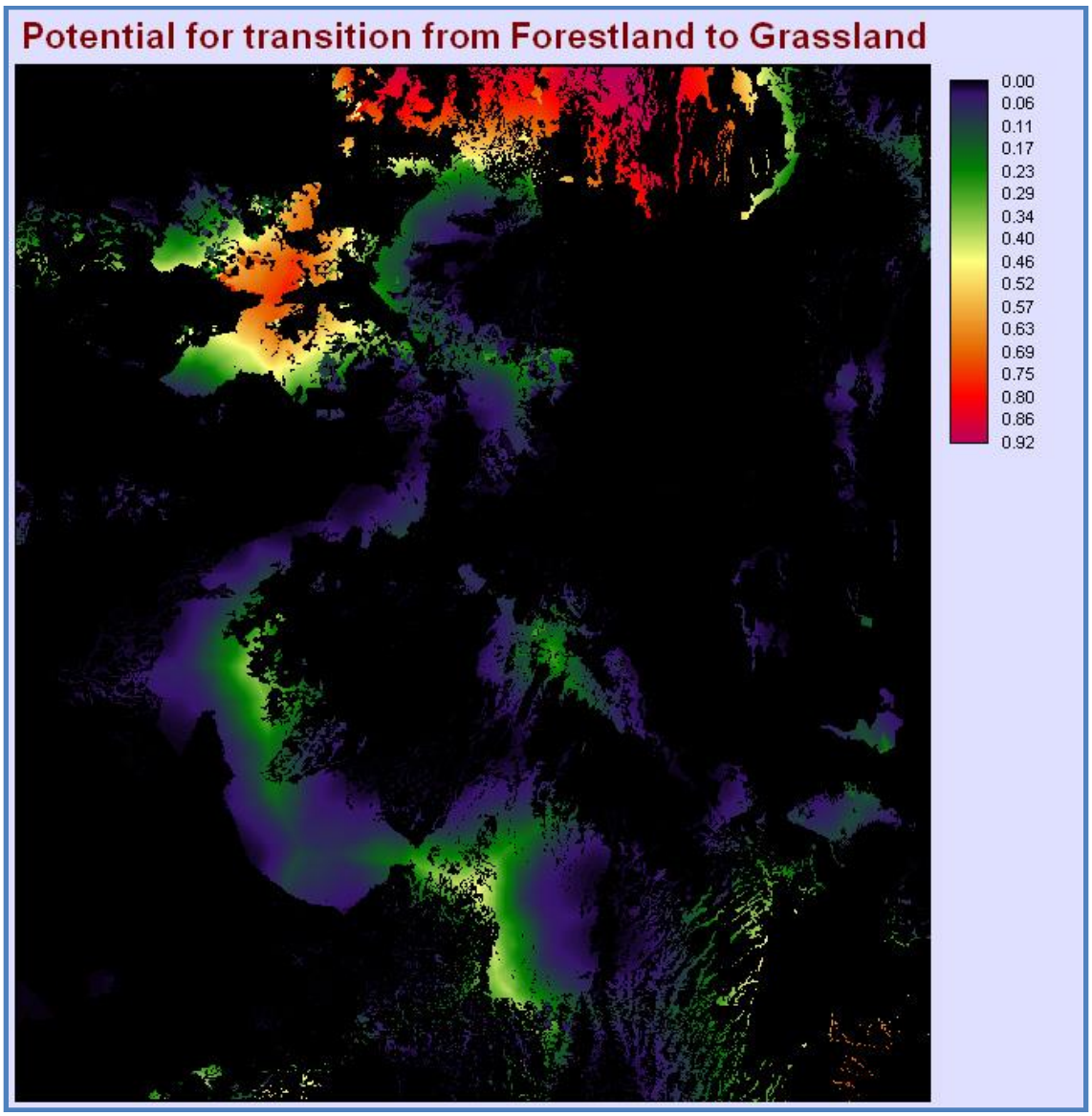

Figure 50 Mau 2

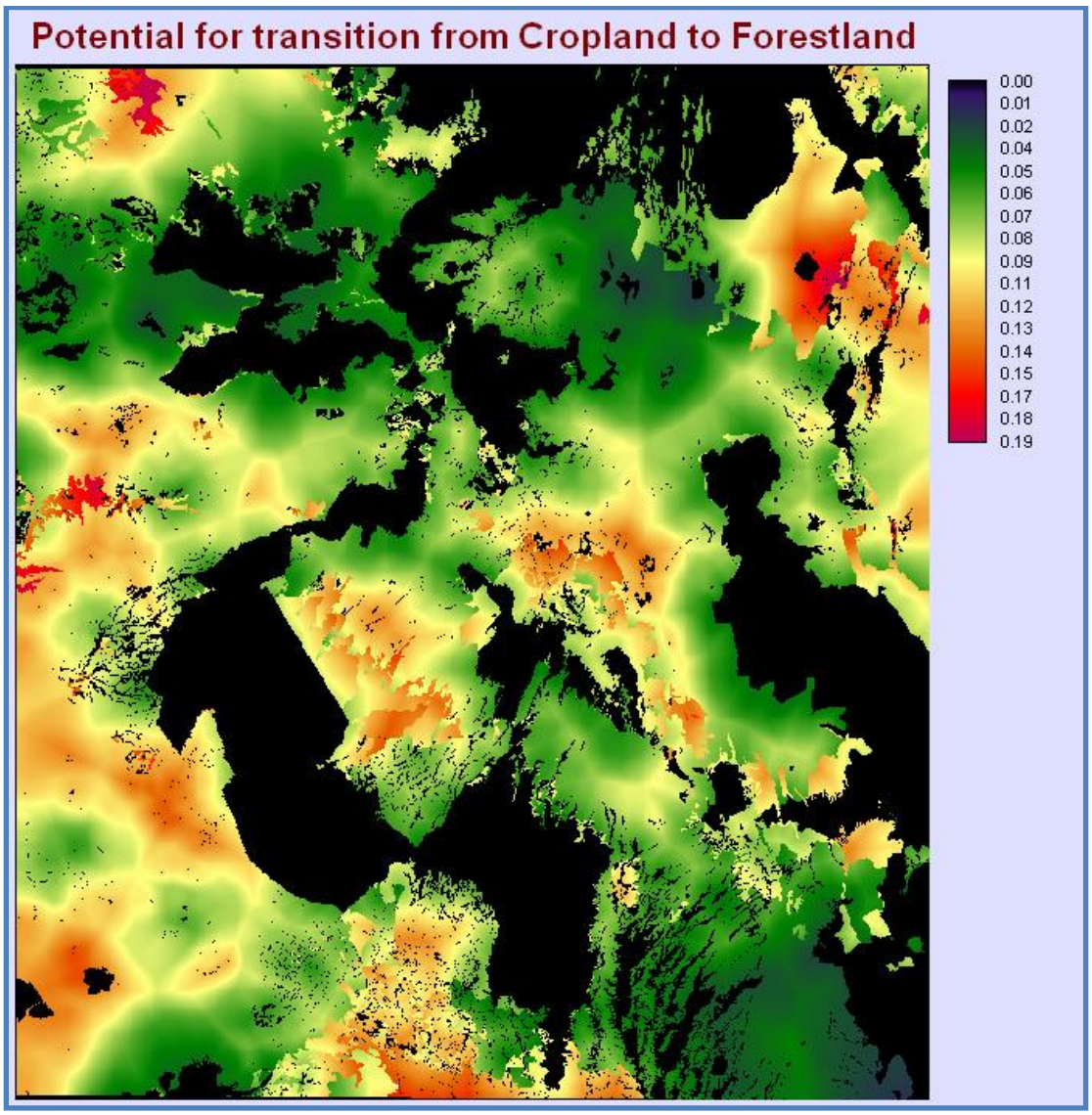

Figure 51 Mau 3

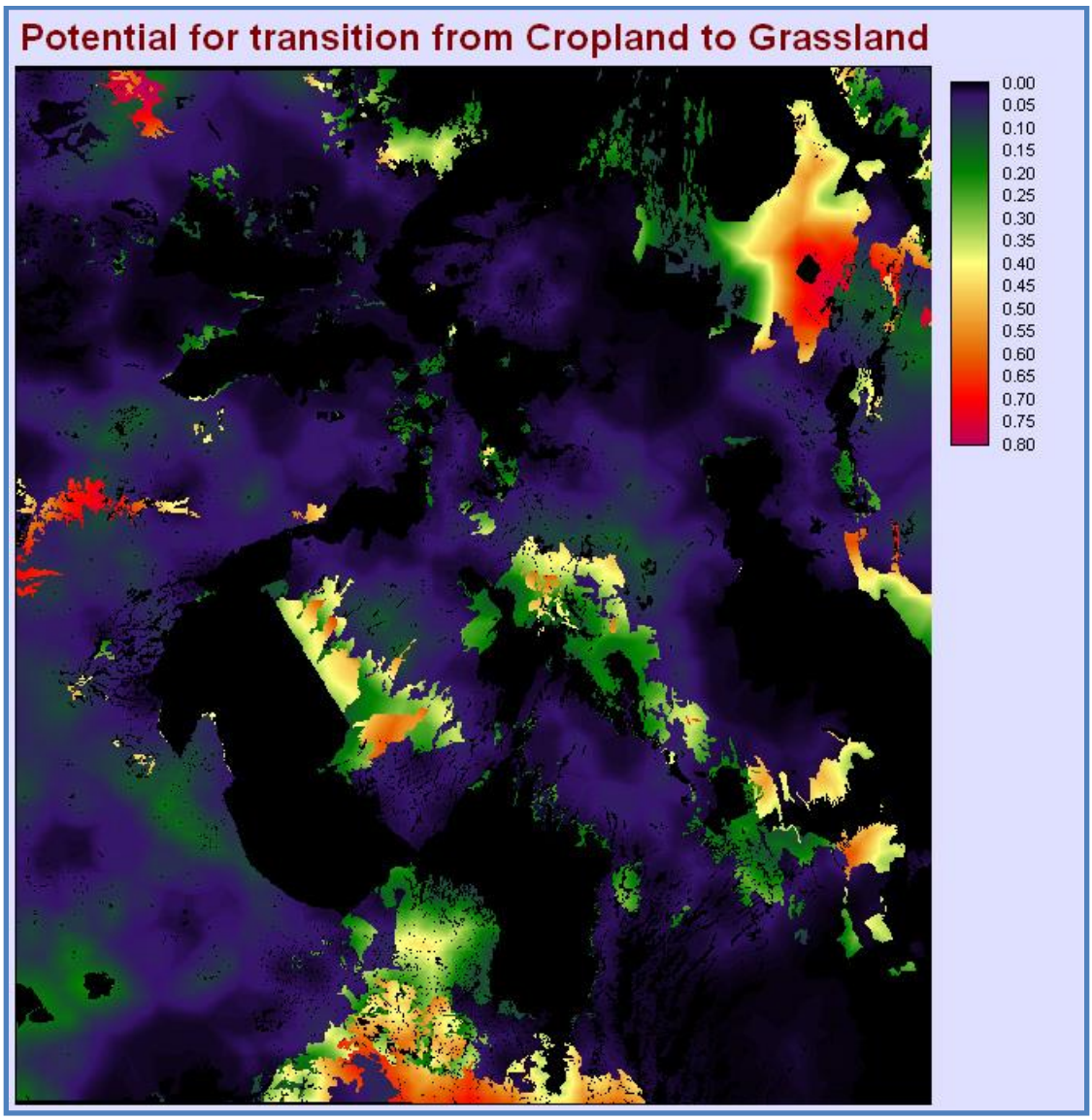

Figure 52 Mau 4

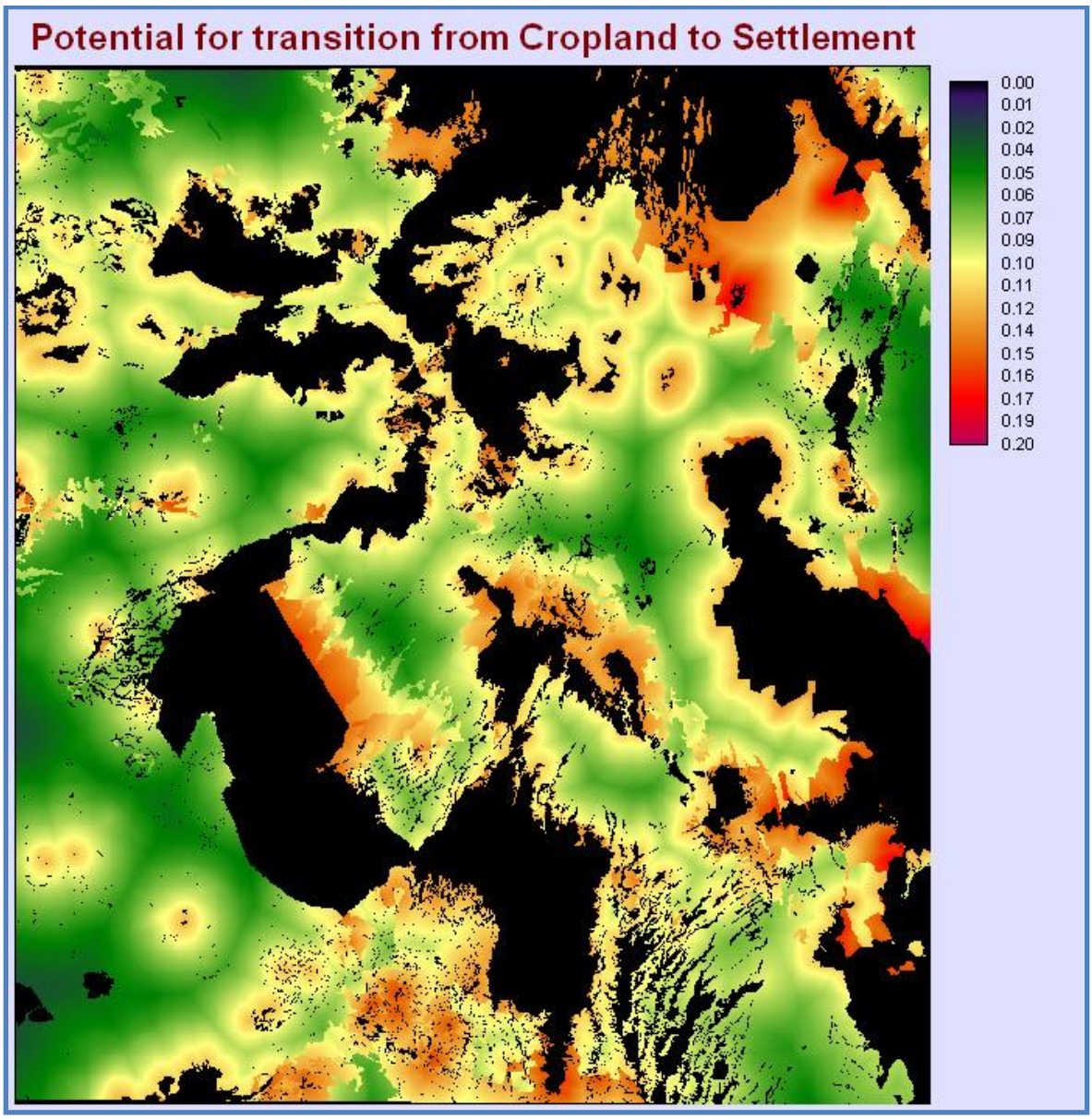

Figure 53 Mau 5

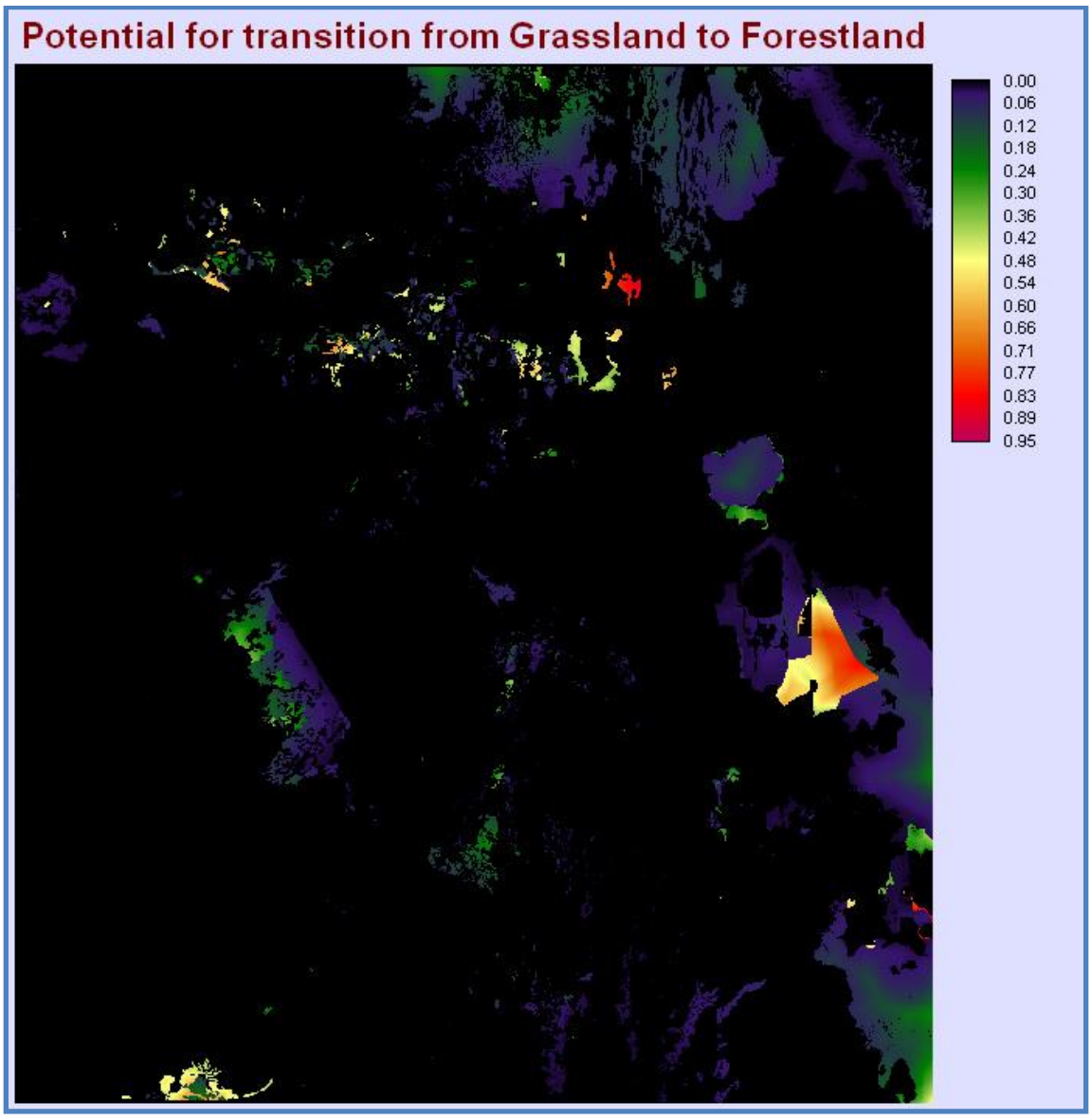

Figure 54 Mau 6

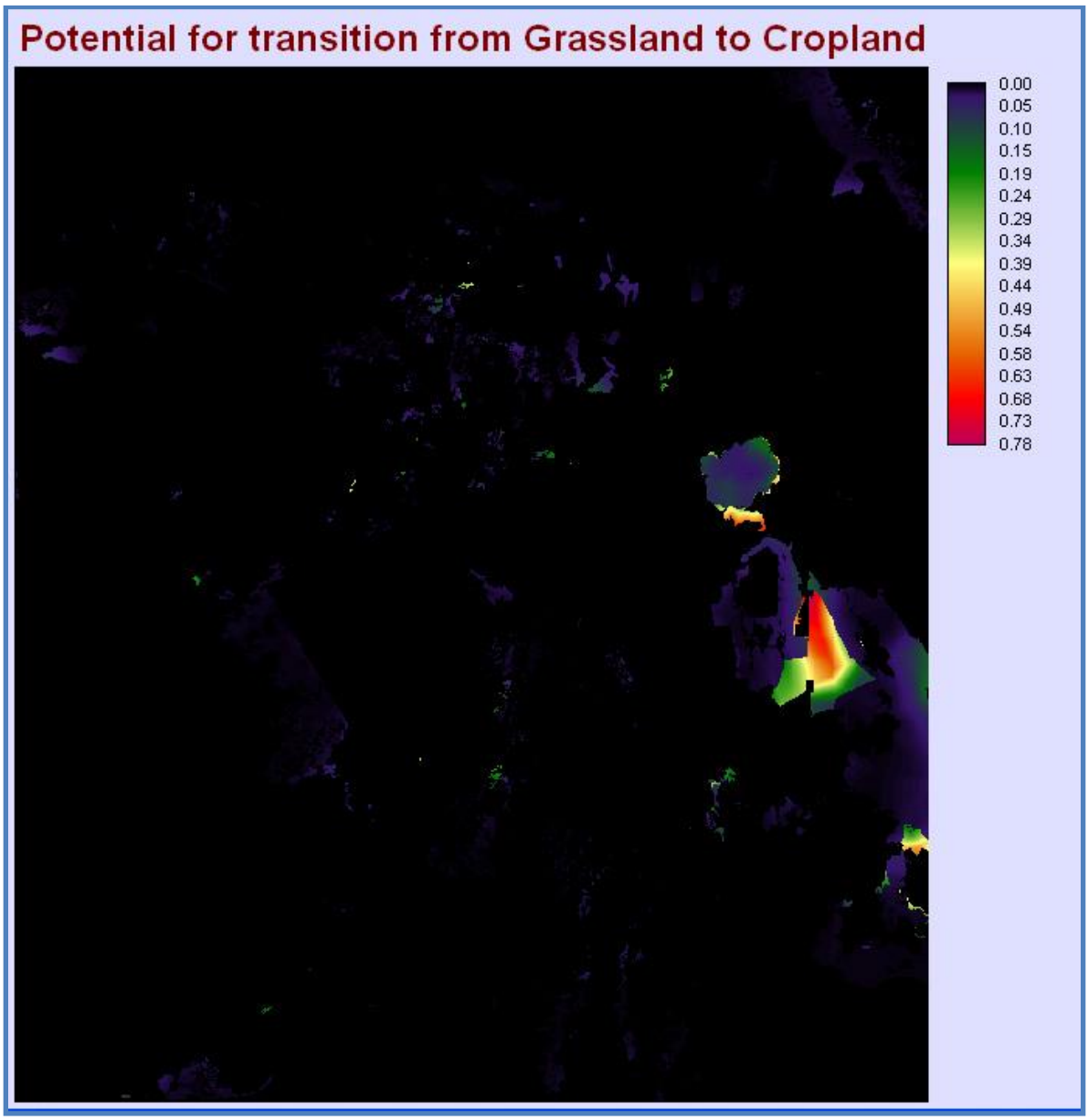

Figure 55 Mau 7

Future Land Cover Predictions

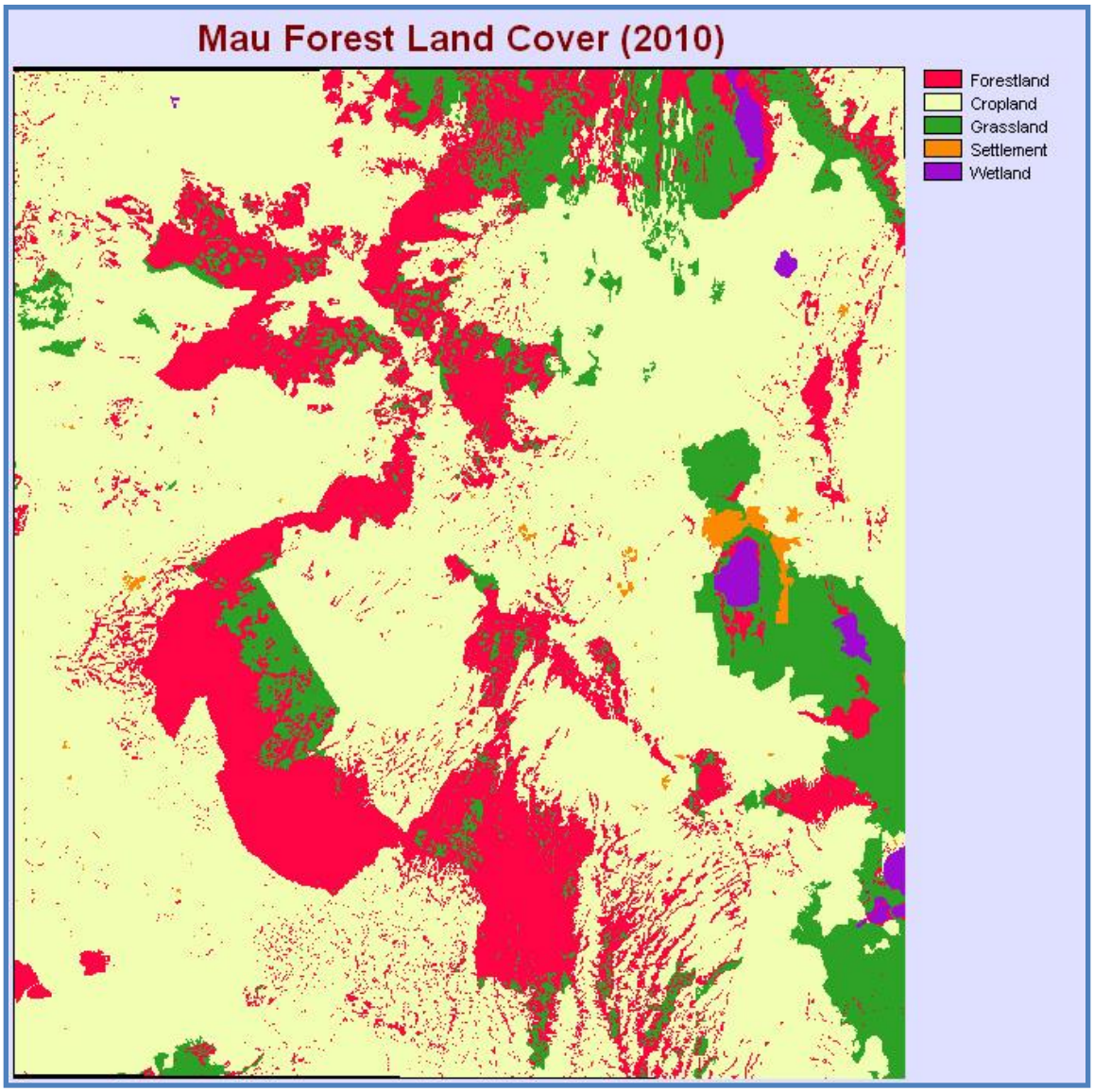

Figure 56 Mau 8

Future Land Cover (2030)

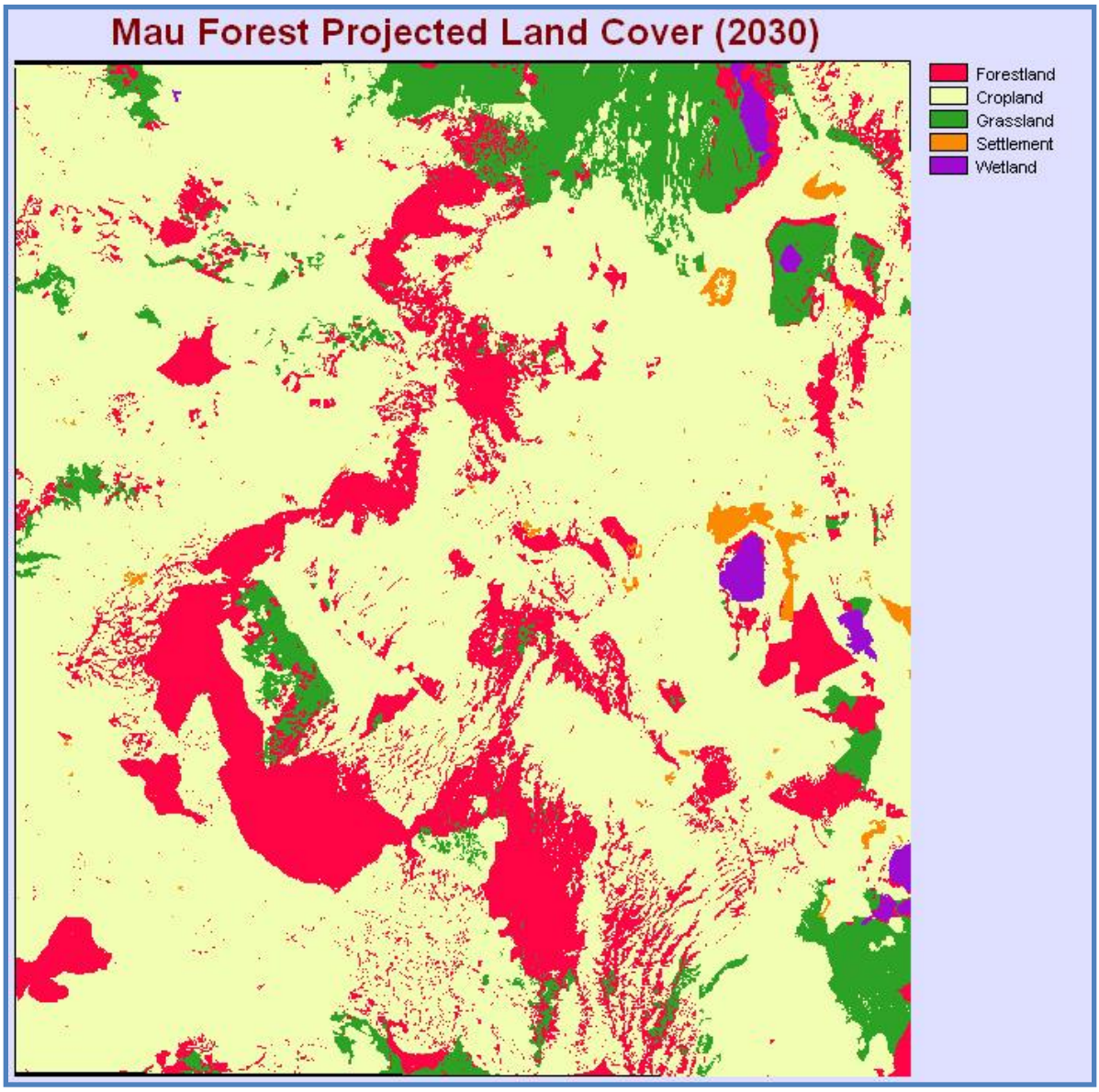

Figure 57 Mau 9

Future Land Cover (2050)

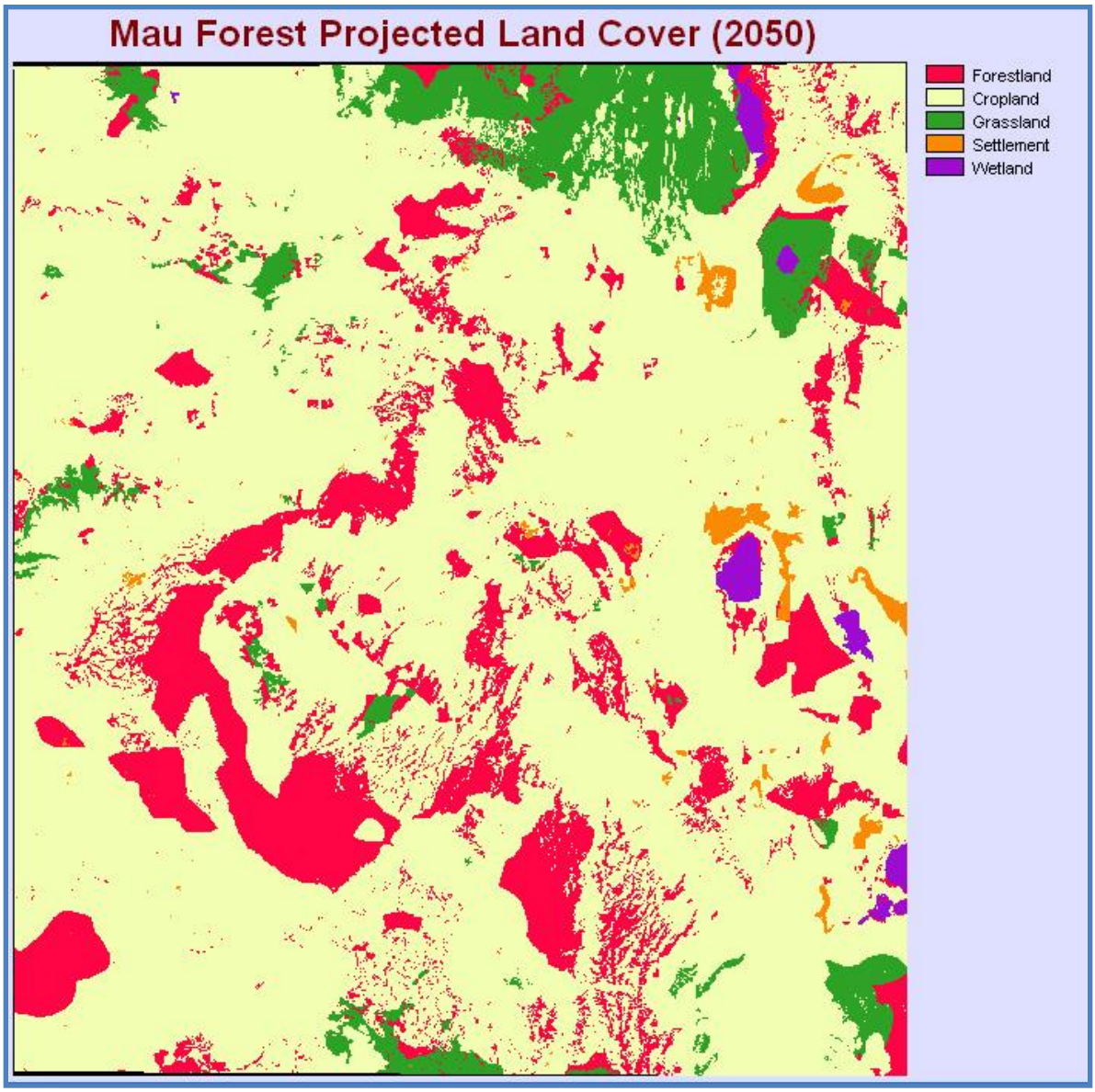

Figure 58 Mau 10

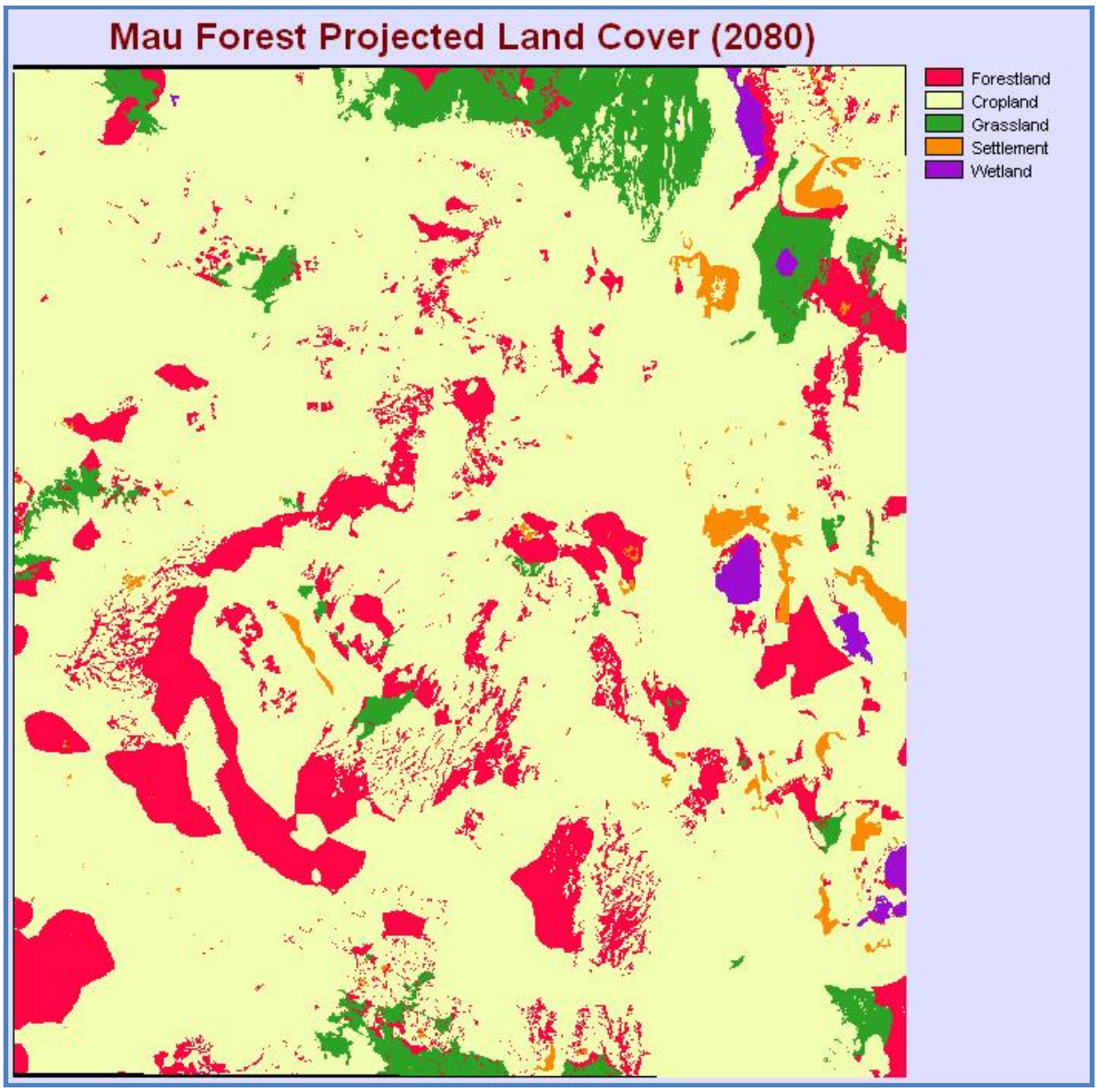

Figure 59 Mau 11

MARSABIT LAND COVER CHANGE ANALYSIS

(Units: Square Kilometers)

1. **Potential for Transition From Class to Class**

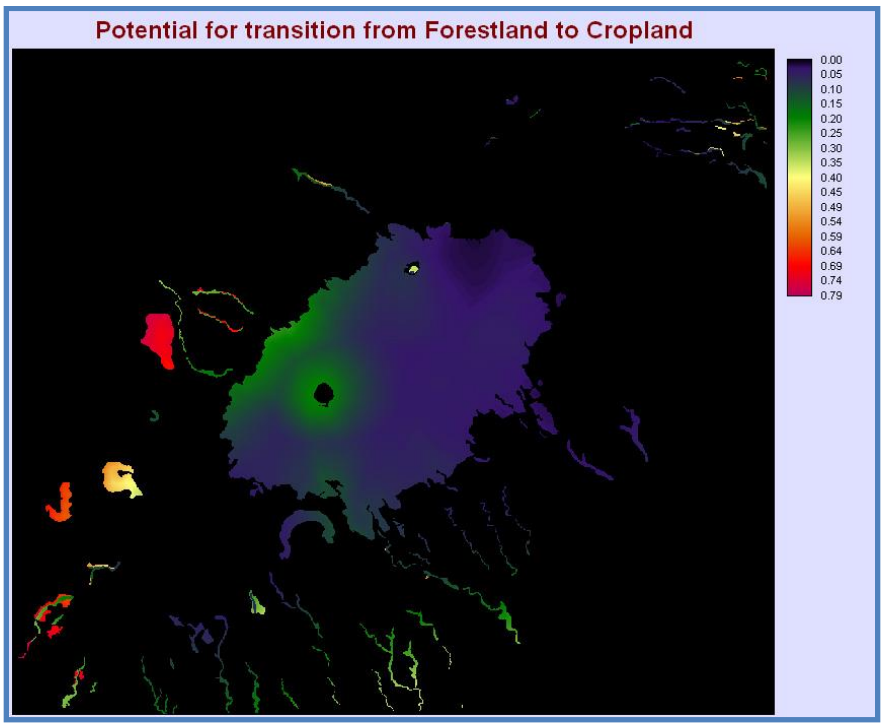

Figure 60 Marsabit 1

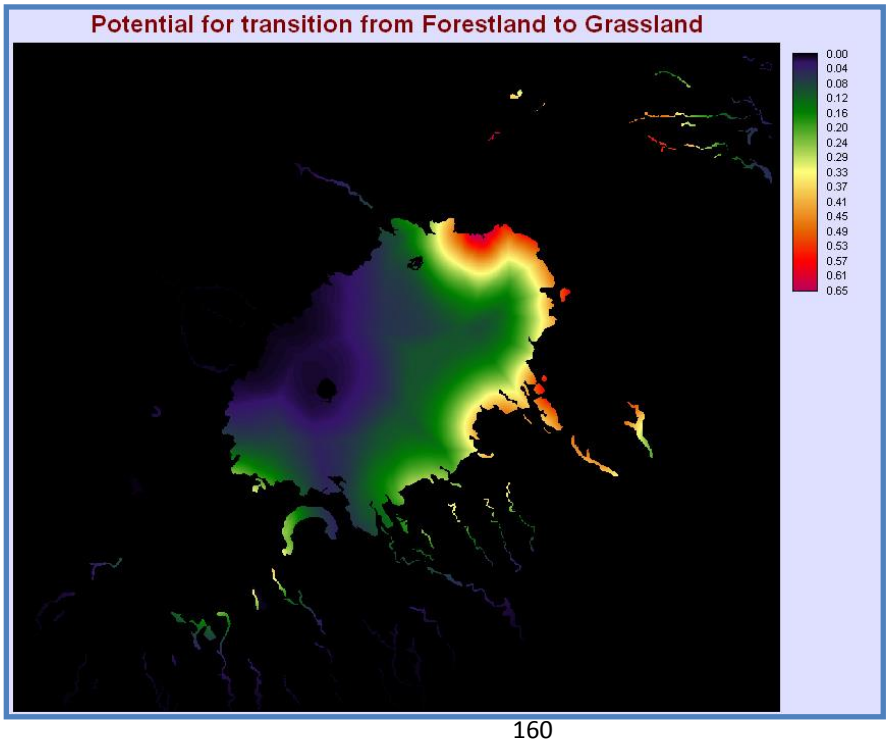

Figure 61 Figure 62 Marsabit 2

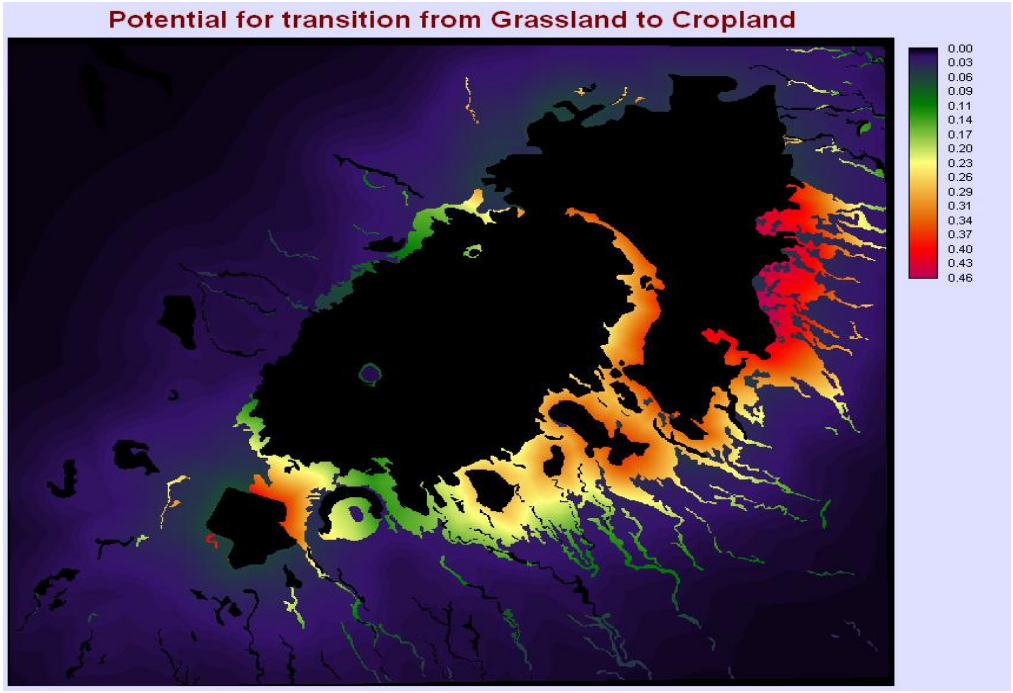

Figure 63

Figure 64

Marsabit 3

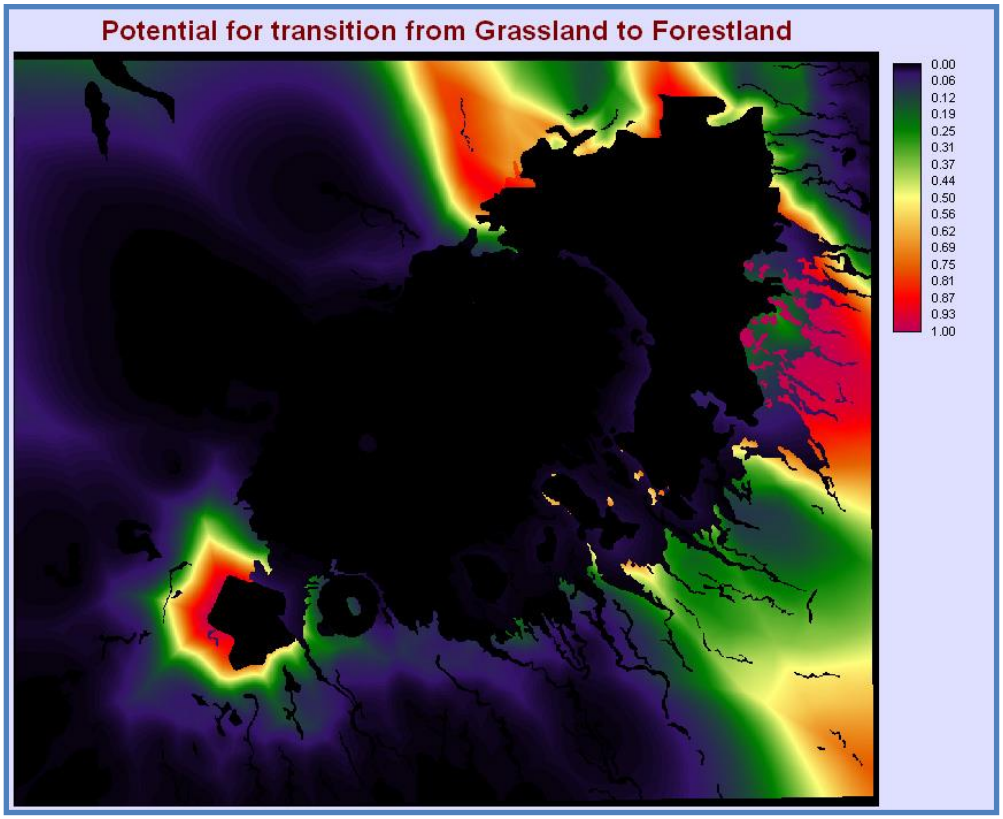

Figure 65 Figure 66 Marsabit 4

Future Land Cover Predictions

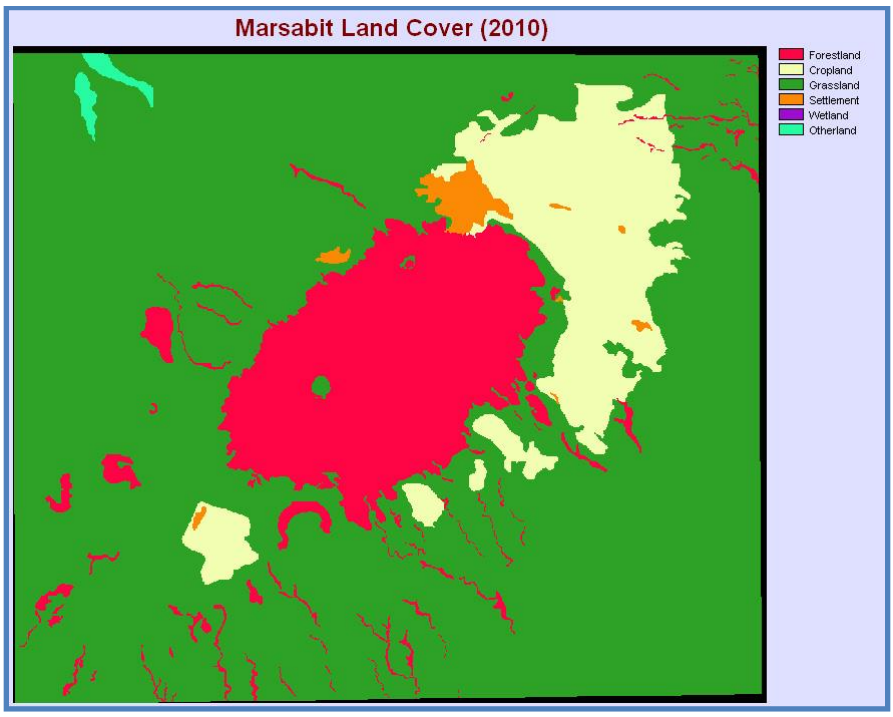

Figure 67 Figure 68 Marsabit 5

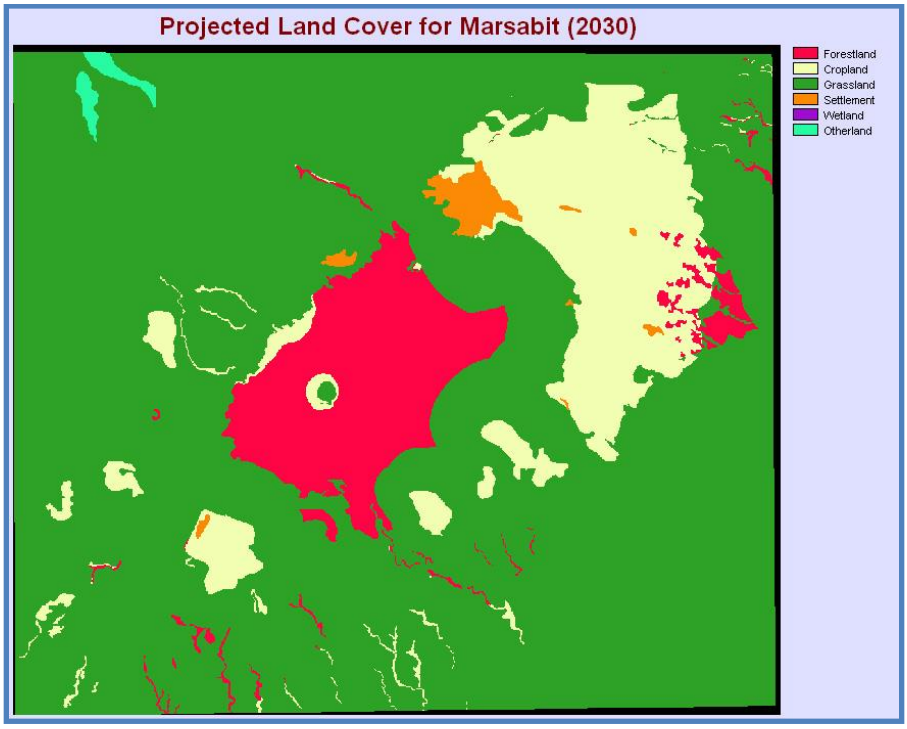

Figure 69 Figure 70 Marsabit 6

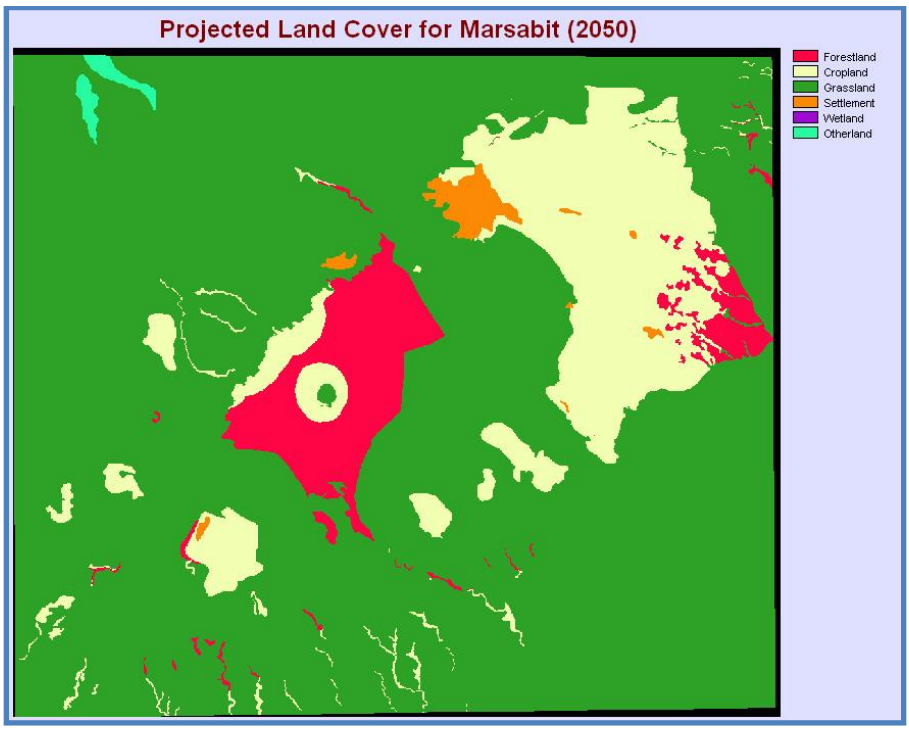

Figure 71 Figure 72 Marsabit 7

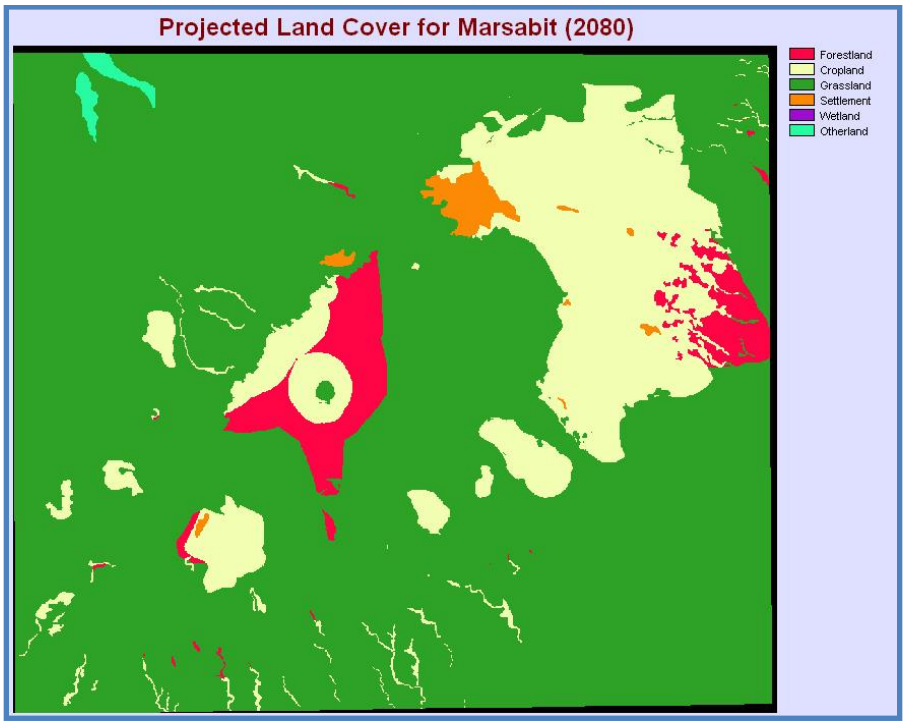

Figure 73 Figure 74 Marsabit 8

TAITA HILLS LAND COVER CHANGE ANALYSIS

(Units: Square Kilometers)

1. Potential for Transition From Class to Class

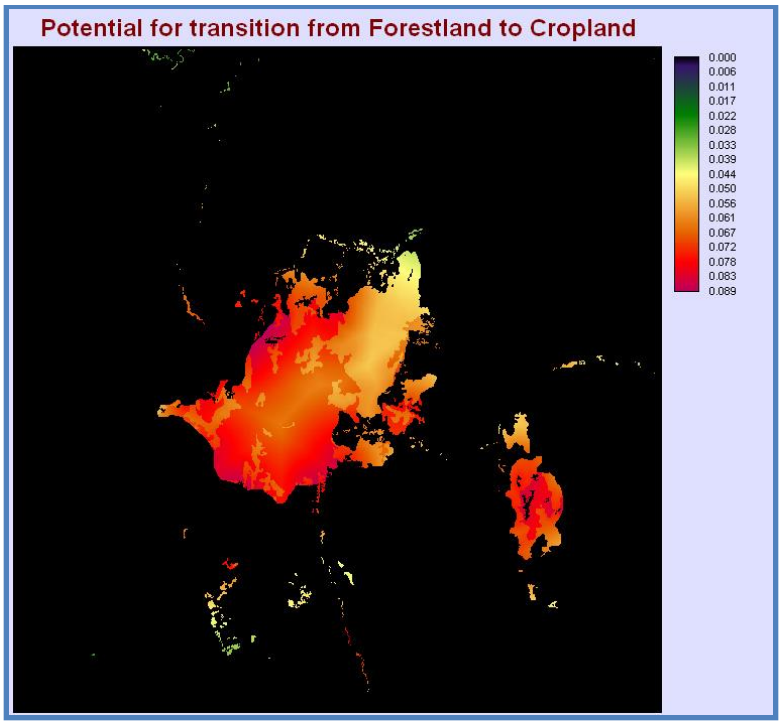

Figure 75 Taita Hills 1

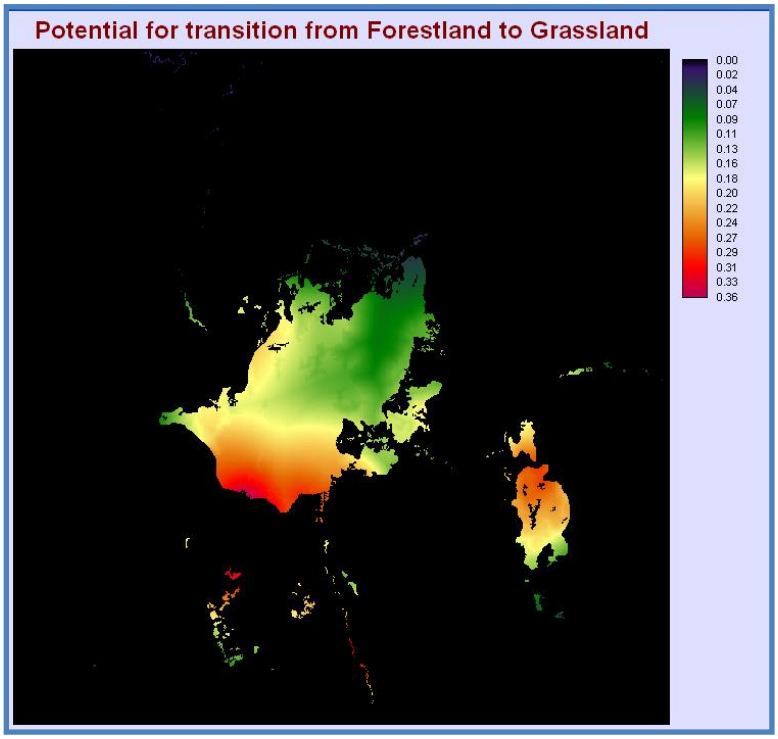

Figure 76 Taita Hills 2

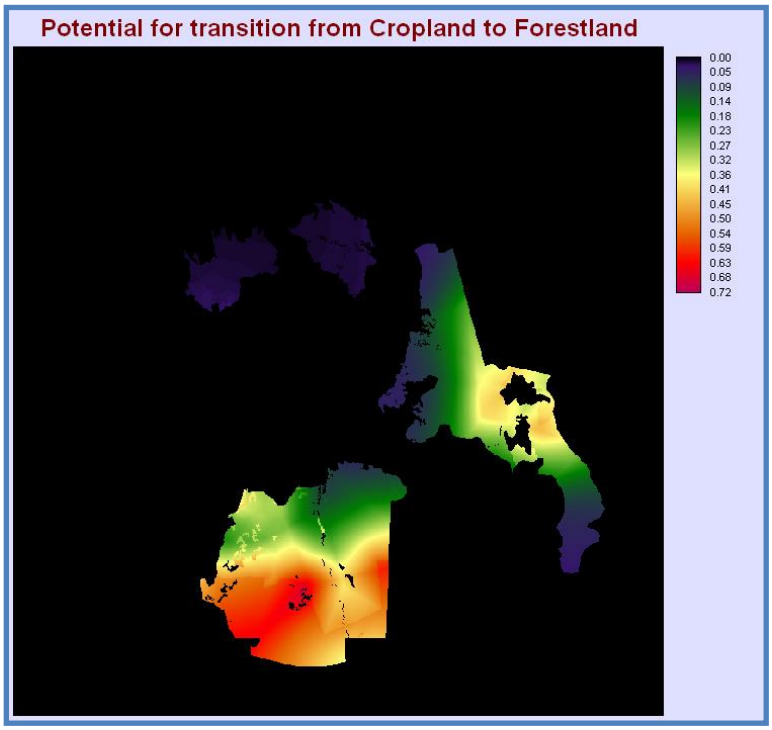

Figure 77: Taita Hills 3

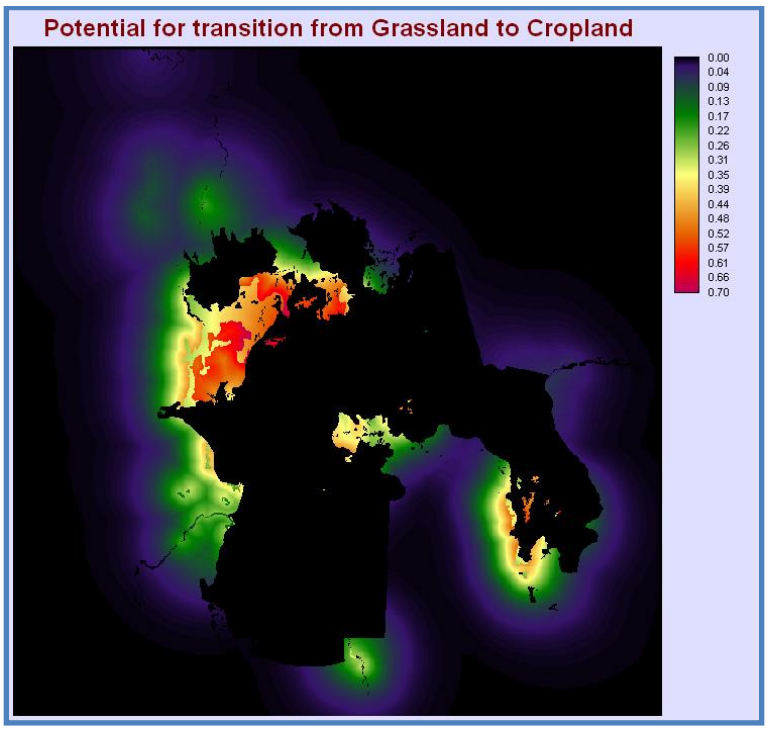

Figure 78 Taita Hills 4

Future Land Cover Predictions

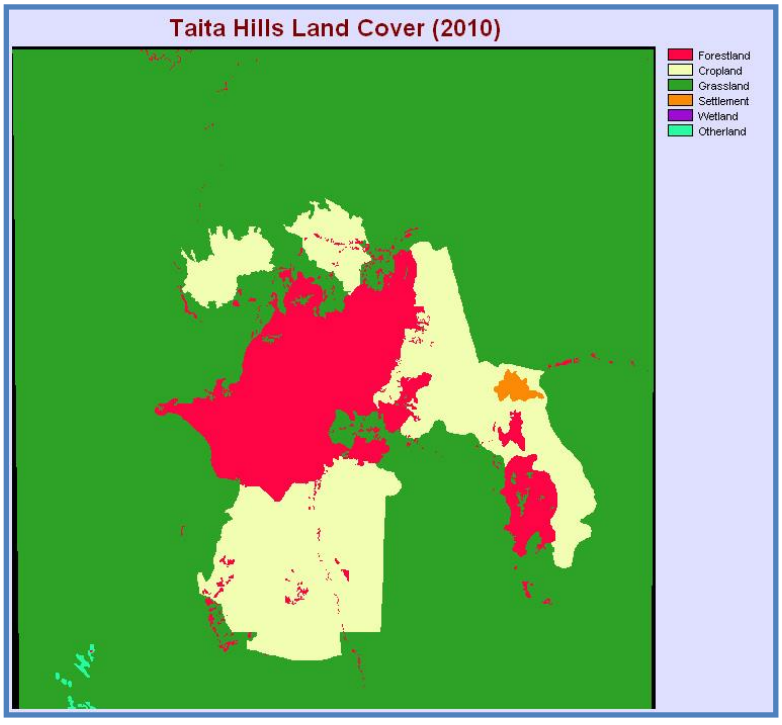

Figure 79 Taita Hills 5

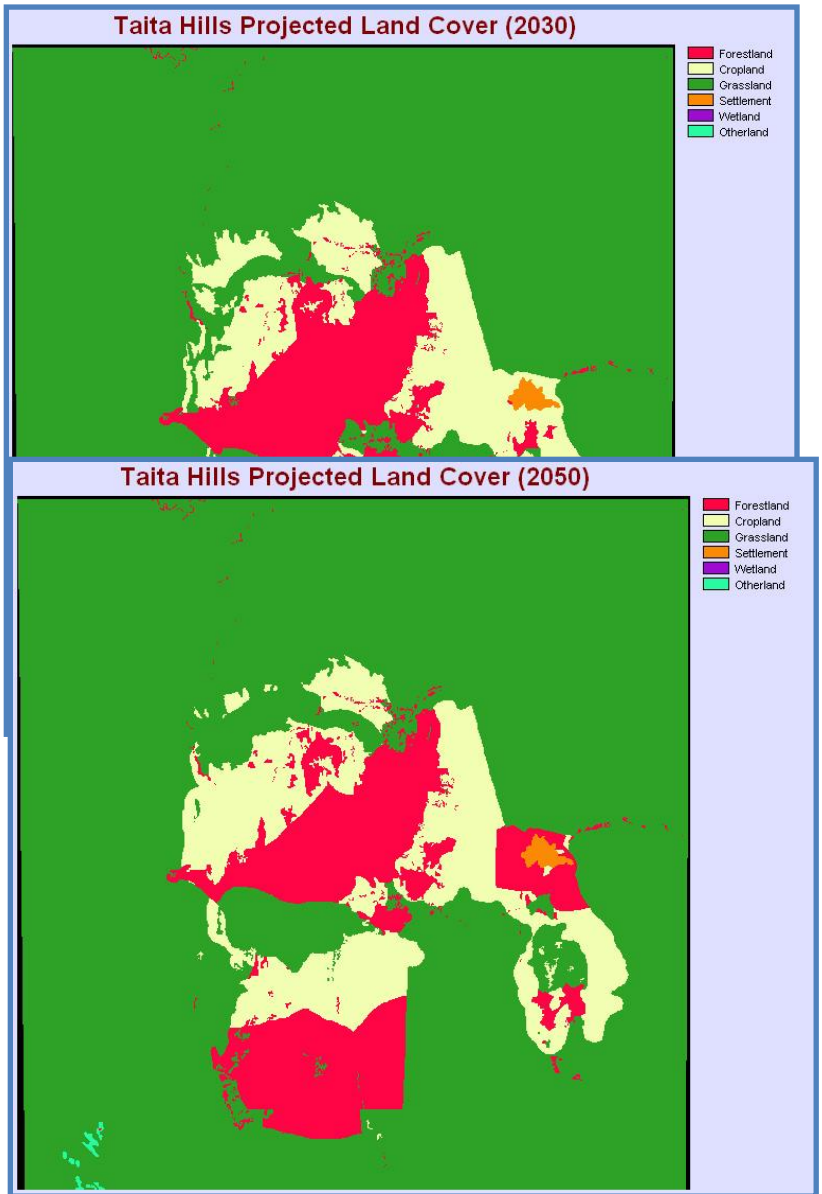

Figure 80 Taita Hills 6

Figure 81 Taita Hills 7

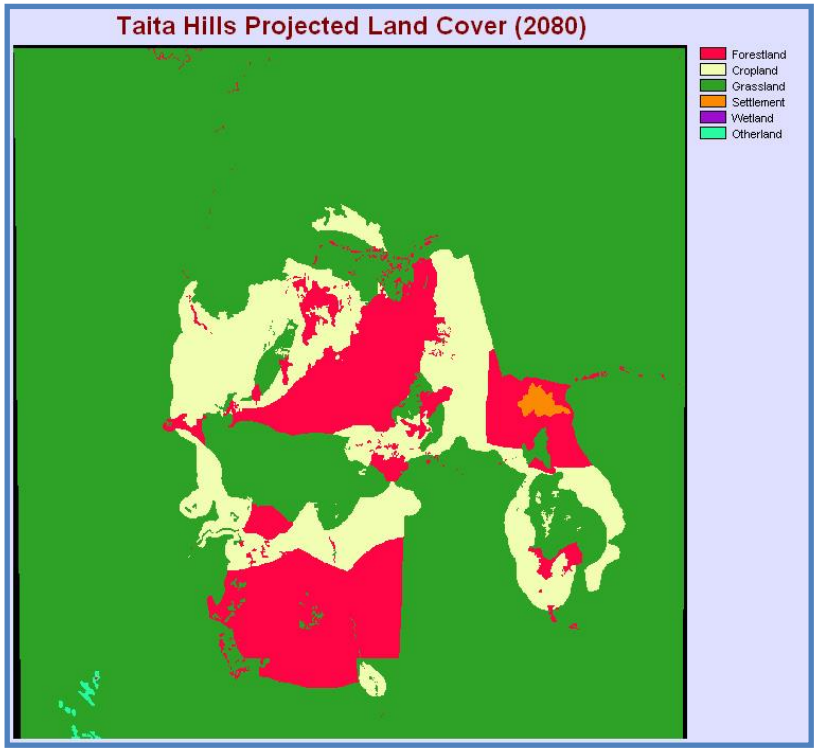

Figure 82 Taita Hills 8

11.3 ANNEX III. REPORT ON THE INCEPTION WORKSHOP ENTITLED, DETAILED ANALYSIS OF DRIVERS AND UNDERLYING CAUSES OF FOREST COVER CHANGE IN THE VARIOUS FOREST TYPES OF KENYA".APRIL 4TH 2013 AT THE UTALII HOTEL, NAIROBI, KENYA

1. Forest types to be included in the analysis

A member noted that all of the case studies seemed to concentrate on protected forests and suggested that one case study include unprotected forests. The participant noted that increased protection of protected forests could displace deforestation (i.e. cause leakage) in unprotected forests and hence the need to examine non-protected forests. Another member (Mr. Kiplagat, WWF) noted that in working outside protected forests group ranches such those that are prevalent in Trans Mara could be considered.

Another member noted that although most of the forest blocks have been degraded, there could be those that have remained relatively intact. He wondered detailed analyses of such intact forests could also be included in the case studies. Mr. Soikan(Consultant for FCPF) noted that there is 'intact' forest located between Kenya and Tanzania which has been managed traditional and which could be studied. He noted that Mr. Stanley Kimarenhas conducted some studies on this forest and could be contacted for information. He emphasized that a case study of this forest could give information on how traditional institutions of governance have hindered and or contributed to deforestation and degradation. Mr. Kimarennoted that it would also be prudent to examine the relationship between community values and deforestation and degradation.

2. Base map for the analysis: forests vs. forest land

Another participant noted that REDD+ as defined in the UNFCCC documents covers 'forest lands' and not just 'forests.' He noted that recent studies have shown that Kenya's forests constitute 3.5% of the land area while forest lands constitute 6.9% of the land area. He advised that the study be based on and cover all forest lands. He also observed that if this is adopted, the study will have to go beyond government forest lands and include also private and trust land forest. He noted that there exist two base maps for forests in the country: the 1990 and the 2000 base maps. He noted that the 2000 base map covers all forest land while the 1990 base map covers only forests. He therefore sought to know which of the two would be adopted. In his response, Mr. Alfred Gichu noted that when it comes to REDD+ the ownership of forests is immaterial. He noted that the study will cover all forests: government, trust land and private forests across the entire country. He noted, however, that since some parts of the country and certain forests have been studied, there would be need for the consultant to concentrate in the Northern and Eastern parts of the country whose forests have not been studied. However, Mr. Obonyoand a number of participants recommended that heavily studied such forest blocks or areas such as the Mau, Mt. Kenya, Aberdare, etc. must still be included and regional consultations held for them.

3. Spatial-temporal analyses

Reacting to the consultants' proposal to calculate from satellite images the acreage of forest that has been lost since 1990, the participant (Mr. Kinyanjui – DRSRS) wondered why this should be repeated yet this has already been done. The consultants noted that this will be done for only those areas where such spatial-temporal analyses have not been done. The consultants noted that they will indeed be happy if the participant could share reports of such spatial-temporal analyses. The participant indicated that he will be willing to share the information that is available with his organization – Department of Resource Survey and Remote Sensing. It was also noted that KFS has also conducted similar analyses and that this information is available and will be shared with the consultants. Mr Patrick Kariuki also noted there is forest cover map for Mau and the buffer around it which would be made available to the consultants. He also noted that KFS has a report on pilot inventory on biomass in several parts of Mau which will be shared. He also noted that some land cover mapping work has been on the Mt. Kenya forest and the Tana River catchments especially on the Eastern part. He cited Mr. Njuguna (Ministry of Water) and Ms. Jane Wamboi (KWS) as contacts for the two land cover works. The consultants indicated that figures from these reports and analysis would be used in developing models to estimate impacts of selected socio-economic parameters on land cover change.

4. Modeling impact of socio-economic and natural factors

Mr. Kinyanjui also noted the proposal to quantitatively model the impact of socio-economic factors on forest cover change. He wondered whether in modeling these impacts, the emissions associated with the quantified impacts could be estimated. The Consultant responded that such was outside the terms of reference but that this study would contribute to and inform the development of RELs. He particularly singled out elephant damage in Kwale as an example and wondered how these could be captured in modeling impacts of such natural occurrences on deforestation and degradation. The consultants noted a great deal of work has been conducted on impact of wildlife damage on forest cover change especially in the Southern Africa region and noted that such works will be reviewed to inform integration of animal damage in the study. A member noted that such natural factors as wildlife damage and others should be discerned from anthropogenic causes as it may not be easy to develop measures to mitigate natural causes of deforestation.

Still on modeling impact of socio-economic parameters on forest cover change, participants wondered whether data would be available for the exercise. The consultants noted that they are conscious of this possible challenge but noted that data on such parameters as population, economic growth, prices increases, etc. would definitely be available with such organizations as the Kenya Bureau of Statistics and KIPPRA among others. Another member noted that while data on socio-economic parameters could be available at the national level, these may be missing at the regional level. However, the consultants noted that at this level defined proxies could be used. In his contribution, Mr Joshua Laichena (KIPPRA) noted that KIPPRA could share the information that it has. He also noted that the KBS has developed district development plans for each district which could provide some of the data needed. He further suggested that these could be aggregated into

county / regional data. Mr. Laichena also noted that population is a major factor of deforestation. He noted that the kind of energy used by households also contribute massively to deforestation and degradation and should therefore be considered. He also emphasized the need to determine what socio-economic practices are likely to support afforestation / reforestation and or deforestation and degradation and model their probable impacts. Emphasizing the importance of energy, another participant noted that clearing of forests for fuel wood is a major driver of degradation. He noted that some work is being carried out by such organizations the Green Forest Social Initiative in Gwasii has done some work to address this menace and it would be informative to get their perspectives.

Another participant while querying the availability of data for the modeling exercise also wondered whether there is sufficient time to carry out the modeling exercise. He also noted that climatic factors such as rainfall and temperature could have contributed to deforestation and degradation either directly or indirectly and wondered whether these factors would be considered. He also wondered whether issues of water and river flows would be considered in the analysis. The consultants noted that these factors would be considered and physical factors as presented in the conceptual framework. Mr. Obonyo (KEFRI) noted that the works in SW Mau could give some ideas on the nexus between forest cover change and river flows. He noted, however, the study did not find any relations between climatic factors and forest cover changes in SW Mau.

MrLaichena also noted that the type of data that will be available will not be time series which is usually ideal for modeling. He noted that in terms of modeling and testing the model this would not such a serious drawback as such statistical analyses programs a STATA could be ideal in testing the model. He therefore noted that the consultants should be careful in choosing which statistical analyses software to use with him preferring the STATA. The consultants agreed with observation on difficulty in getting time series data. However, they noted that the available data could be split into time segments to allow data treatment as time series. The consultants also noted that in developing the model, they would consider all possible factors for which data is available. They noted, however, only those factors for which sufficient data is available and which are statistically significant will be included in the final model.

A participant noted that when modeling, it is also important to develop regional or forest-specific models rather than just a national forest cover change model. The consultants noted that indeed they will strive to develop national and sub-regional models as will be dictated by the available data.

5. External vs. internal factors of deforestation and degradation

Prof. Kun'gu observed that although most of the degradation is caused by local factors, some form of deforestation and degradation arises from international forces. He particularly noted that a lot of charcoal is exported to the Middle East. He therefore impressed upon the consultants to also consider drivers / forces that operate outside the country. In welcoming this proposal, the consultants also noted that they are also conscious of impacts of such international drivers and will endeavor to determine their impacts on forest cover change in the country.

6. PRA as a method

In response to the consultants' call for participants to volunteer any information on PRAs that they could be having, Mr. Obonyo indicated that KEFRI has conducted PRAs on a number of forests including SW Mau and Ramogi forests which it could share. He noted that reports on these works are available with Mr. Ongugo and encouraged the consultants to contact him for the same. He also noted that he would be willing to share information available with him. Another participant (Kiplagat, WWF) also noted that WWF has carried out some PRA work in Dondori forest and a report on the same is available with him and it would be his pleasure to share the same. He also noted that he has similar report for the Kayas which he would be willing to share. Mr Brian (WWC) also noted that the project document for Kisagau REDD+ project available at the VCS website could provide some information of DD in the specific forest area.

7. Regional consultations and case studies

On issues of regional consultations and case studies, Mr. Gichu noted that there extensive consultations have been carried out in some forests / regions which have been studied extensively and noted that further consultations on the same issues could result in fatigue by communities. He therefore suggested that for such forests only the regional consultations should be conducted and not in-depth household surveys since a lot of information and data is already available with a number of organizations especially KEFRI. He noted, for instance, there is a recent report that examined deforestation related issues for Mt. Elgon forest which could provide most of the information of Mt. Elgon forest. He therefore noted more detailed interviews of households and forest adjacent communities should be carried out only in the Northern Rangelands and Eastern Forests. Mr. Karuiki noted that in studying the Northern Rangelands it is important to target organizations that have been there longest. He singled out the Northern Rangeland Trust as one of the organizations that could have information on the Northern Rangelands. Mr. Stanley Kimaren observed that while a lot of studies have been conducted in many of the forest blocks, each study has its own focus and therefore it would be important to identify what gaps and there and try to fulfill these gaps by carrying out more studies.

8. Sampling framework and methodology

On sampling for expert interviews and or identifying for to be invited to the regional workshops, a participant wondered what sort of sampling frame would be used. She also wondered whether drivers of deforestation and degradation and mitigation measures would be analyzed and presented at regional and sub-regional levels. The consultant noted that given the nature of the study, the principal people to be interviewed would be experts and people who have interacted with forests at the national and the regional / forest-landscape levels. He noted that a list of such people at the national and regional level would be developed in consultation with KFS and the participants in this inception workshop. The consultant also noted that in some cases there may be need to interview such specialized groups as forest dependent communities and those involved in formal and informal forest trade. The consultants noted that the latter group is known to forest officers at the regional

and forest land scape level and that these officers would be used to identify such people for interviews. As for those households, randomly selected households could be interviewed. However, since the study does not aim for statistical generalization since this is a case study, the team will not aim to have a representative sample (see Yin et al. 2001). Mr. Laichena also noted that the study does not necessarily need to go to household level but that localized consultations could give households views on causes of deforestation and degradation.

9. Secondary sources of data and information

On secondary sources of data, Prof. Kungu (Kenyatta University) noted that there are also a number of MSc and PhD theses that have focused on deforestation and forest degradation which could be useful for the study. He also noted that the Kenya Wildlife Service and the GTZ has some good data on Mt. Marsabit and Mt. Kulal forests which could be useful. He also noted that the National Museums of Kenya also have valuable information on the same forests. Mr. Laichena also noted that there is currently a lot of land that is not under any use. He noted, however, that these lands likely to be used given that the current land policy imposes tax on unused land. He therefore impressed upon the consultants to explore also the probable impacts of the land policy on deforestation and forest degradation.

A participant (Orina representing the Transparency International) noted that international documents could also give some insight into the causes of degradation and deforestation. He referred the Consultants to a REDD+ Manual developed by Transparency International. The participant also noted that Kwale and Kilifi forests could also be sampled to give information on especially governance as a driver of deforestation and forest degradation. A participant (representing / Ethics and Anti-Corruption) also noted that she would be keen to see how issues of governance and corruption contribute to deforestation and noted that these should be included in the analysis. The consultants noted that indeed issues of governance have been considered in and will be operationalized in the conceptual framework. Another member emphasized the need to align the literature to international documents

10. Position of Kenya on the Forest Transition Curve

Participants discussed the position of Kenya on the 'Forest Transition' curve that was presented by the consultants. Participants had differing views with others indicating that Kenya is still on the deforestation stage while others noted that the country was in the early state of the recovery phase.

11. Closing remarks by consultants

In closing, the consultants thanked the participants for their valuation contribution and for offering to volunteer information. The consultants noted that a lot of the information and suggestions provided are food for thought and that many of them would be included / factored in the study. They however, noted that in modeling the impacts of a range of socio-economic factors on forest cover change they will explicitly state the limitations of the resulting model.

Table 19: List of participants who have volunteered information / data and the information / data volunteered

Name of Participant	Organization	Information Volunteered
Dr Mwangi Kinyanjui	DRSRS	➢ Forest cover maps for 1990, 2000 and 2010 ➢ Detailed forest-specific analyses of cover changes
Mr. Gichu / Mr. Karuiki	KFS	➢ PASCO reports ➢ Detailed land cover map for Mau and buffer zone ➢ Pilot inventory for Mau ➢ Report on Mt. Elgon forest ➢ Many other background documents
Mr. Obonyo (Dr. Ongugo)	KEFRI	➢ PRA for SW Mau, Ramogi and others
Mr. Joshua Laichena	KIPPRA	➢ Socio-economic data ➢ Report of energy needs
Ms. Jane Wamboi	KWS	➢ Land cover map for Tana R. catchment
Mr. Njuguna	KEFRI	➢ Land cover map for Mt. Kenya
Prof. Kun'gu	Kenyatta Uni.	➢ Relevant MSc. and PhD theses ➢ Contacts at NMK, KWS and GTZ for information on Mt. Marsabit and Mt. Kulal forest
Mr Orina	Transparency International	➢ REDD+ Manual
Dr. James Kairu	-	➢ Paper on deforestation in the Mangroves
Mr. Kiplagat	WWF	➢ Work on group ranches in Trans Mara ➢ PRA work on Dondori forest ➢ PRA work on Kaya forest
Northern Rangelands	Northern Rangeland Trust ENNDA Laikipia Wildlife Forum Mpala Research Centre	➢
Brian	VSF	➢ PDD for Kisagau REDD+ project

Table 20: List of participants to the Inception workshop

NO	NAME	ORGANISATION	TEL/MOBILE NO	EMAIL ADDRESS
1.	Bryan Adkins	WILDLIFE WORKS	0720014445	bryan@wildlifeworks.com
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30.	MichealGachanja	EAWLS	0722499891	gachanja@eawildlife.org
31.	MeshackWamalwa	MFW	0739678221	msumbule875@gmail.com

Table 21: Tentative schedule for regional workshops: maximum of three working days and 2 days of travel for consultants

Date	Region	Venue
22nd – 25th April 2013	Coastal	Mombasa
6th – 10th May 2013	Northern and Eastern	Isiolo
13th – 17th May 2013	Rift Valley / North Rift	Eldoret
27th – 30th May 2013	Nyanza and Western	Kisumu
5-6th June 2013	Expert Workshop	Nairobi

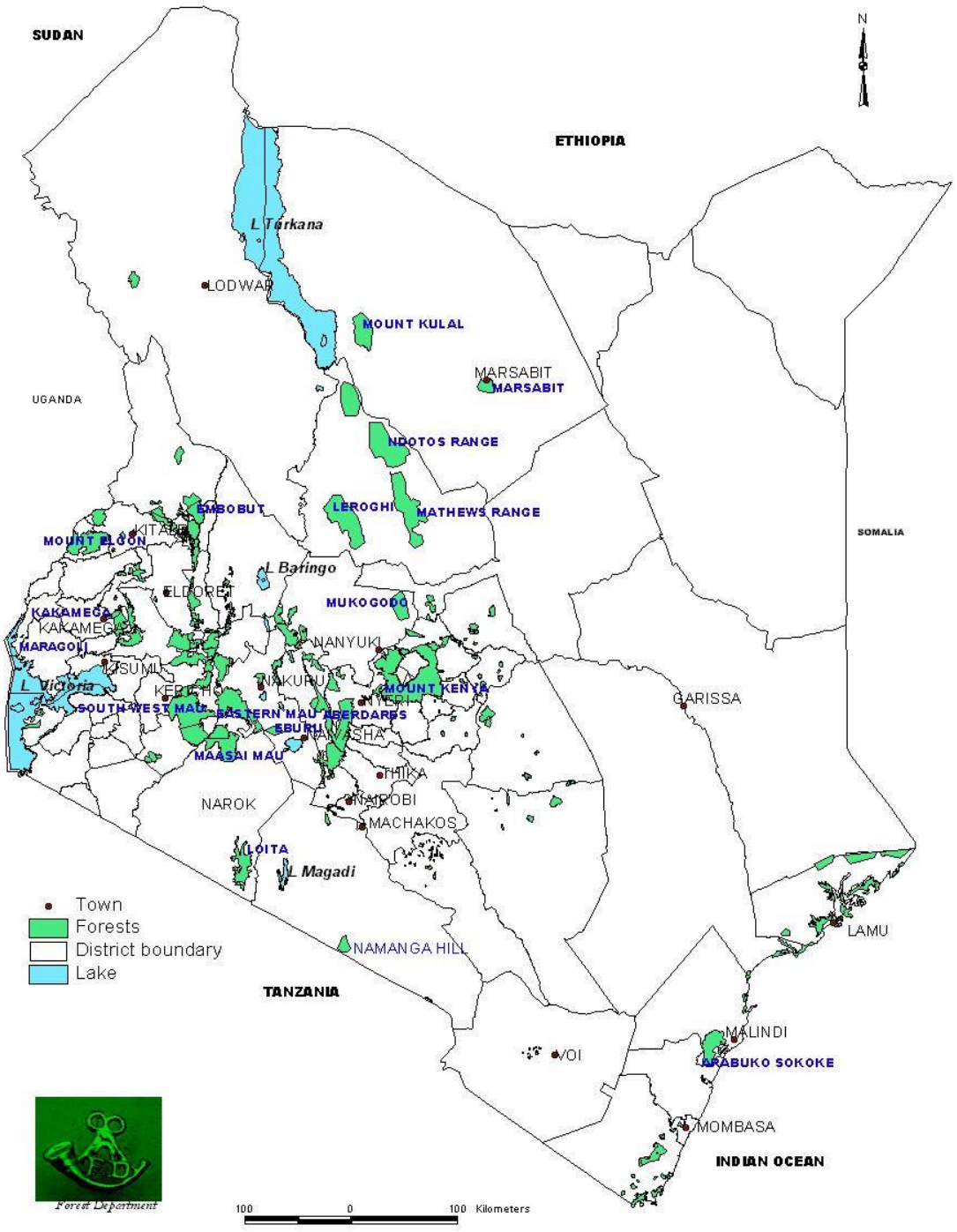

Figure 83: Forest Blocks (Gazetted) of Kenya (GOK 2007)