
# Policy Outcomes and Community Perceptions of a Dryland Invasive Species: A Case Study of *Prosopis juliflora* in Baringo County, Kenya.

A Research Paper presented by:

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(Kenya)

in partial fulfilment of the requirements for obtaining the degree of

MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:

**Agrarian and Environmental Studies**

**(AES)**

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The Hague, The Netherlands

December 2013

### *Disclaimer:*

This document represents part of the author's study programme while at the International Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

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## Dedication

*This paper is dedicated to my beloved husband Kennedy Aseda and our little gem Sifa Aseda as she celebrates her 4th birthday on the 24th November.*

**Acknowledgement**

The whole process of this thesis has been both challenging and amazing. Many people have been very supportive along this journey and without them this thesis would never have been possible.

First, I am grateful to God for the life, strength and good health throughout this MA process. To my parents, thank you so much for your support, encouragement and prayers. My sisters and brothers, you have been amazing people. You kept me sane and always reminded me that I can make it. Rose and your family, God bless you always, through your support and kindness, I was able to follow my dreams.

To my supervisor, Dr. Carol Hunsberger, thank you for your guidance, knowledge and inspiration throughout this process. I am glad I had a chance to work with you. Dr. Murat Arsel, even though at first you intimidated me by your comments, I am grateful that your interesting way of looking at things helped me think out of the box. Thank you very much.

To my key informants, thank you for your time and willingness to share your knowledge and experiences with me. Special thanks to Mr. Moses Cheseba for his support on getting a contact from Marigat and not forgetting Mr. Welimo for your time and knowledge. Mr. Kahiga, I will forever be grateful for your support, inspiration and time during my stay in Marigat. To the CPA chairmen, thank you for ensuring I could get my community respondents. The Cummins Cogeneration Kenya Ltd officers, I am grateful for your time and willingness to share your knowledge and plans with me.

My research Assistant Maria Nandako, you are highly appreciated. And to my friends in Kenya and in the Netherlands, you are all awesome people and thank you very much.

I wish also to acknowledge NUFFIC for the financial support to undertake my studies in Holland as well as carry out my field study. I will forever be grateful

And finally, my husband Kennedy Aseda, your love, support, visits and encouragement has pulled me through this whole process, you are the best. My little girl Sifa, you brightened up my days especially with your unending questions and the new discoveries you made each single day.

*Thank you.*

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**List of Acronyms**

| | |
|---|---|
| ASALs | Arid and Semi –Arid Lands |
| CBD | Convention on Biological Diversity |
| CBOs | Community Based Organisations |
| CPAs | Charcoal Producer Associations |
| CCKL | Cummins Cogeneration Kenya Limited |
| DFO | District Forest Officer |
| DLPO | District Livestock Production Officer |
| EIAs | Environmental Impact Assessment |
| FAO | Food and Agriculture Organization |
| FGDs | Focus Group Discussions |
| GISP | Global Invasive Species Programme |
| GoK | Government of Kenya |
| IAS | Invasive Alien Species |
| ICC | International Criminal Court |
| IUCN | International Union for Conservation of Nature |
| KEFRI | Kenya Forestry Research Institute |
| KFS | Kenya Forest Service |
| KPLC | Kenya Power and Lighting Company |
| Kshs | Kenya Shillings |
| MEA | Millennium Ecosystem Assessment |
| NEMA | National Environment Management Authority |
| SIDS | Small Island Developing States |
| UNCED | United Nations Conference on Environment and Development |
| UNFCCC | United Nations Framework Convention on Climate Change |

## Abstract

This paper explores the outcomes of policy interventions related to *Prosopis juliflora* and how these outcomes have shaped communities' perceptions towards the tree. It set out to narrate the story of Prosopis in Baringo County, Kenya. An inductive research approach was used drawing its inspiration from the core ideas of political economy and political ecology. Findings indicate that Prosopis was introduced in Kenya's ASALs as a way of curbing desertification and soil erosion but later, the tree became a problem due to its invasiveness. The invasion of this tree to farmland, homesteads and pasturelands led to loss of communities' livelihood, human and animal health impacts as well as some perceived environmental problems like flooding. This resulted in communities suing the government demanding for its eradication as well as compensation for their losses. As a way of responding to the problem, the government lifted the ban on charcoal production, which in turn enabled a livelihood activity that has been widely taken up by some but not so much by others. There are indications that the tree is currently being appreciated due to its economic benefits from charcoal production as well as the halted desertification. Currently, a planned power plant that intends to use Prosopis for electricity generation has added a new dilemma to debates over Prosopis and local livelihoods. It can therefore concluded that, while planning of this intervention may not have been perfect in terms of ensuring educating the people on how to manage the tree to avoid or control invasion, the adaptive management approach that was used to minimise the impacts played a big role. The government's flexibility and willingness to adjust its policy through lifting of the ban on charcoal made a big difference. Further, ensuring continuous monitoring and research on ways of managing the tree through KEFRI and KFS is also playing a key role in helping the affected residents to adapt and benefit from the tree.

## Relevance to Development Studies

Shifts in people's perceptions have a direct influence on the acceptance of a project or programme that is to be implemented. These perceptions can also help evaluate the effectiveness of past interventions, including the criteria that those who initiated the intervention did not think of in the first place. For instance, IAS present complex situation especially when they present both positive and negative outcomes to the environment and people's livelihood. In such circumstances, the policy makers or initiators of these interventions should be flexible and allow the adjustments of policies or programmes in cases of un-intended outcomes. Adjustment of the policies or programmes helps in reducing the impacts of the intervention, while at the same time achieving it's the intended goals.

## Keywords

Invasive Alien Species, *Prosopis juliflora*, charcoal production, electricity, perceptions, policies, interventions, Baringo County.

# Chapter 1: Introduction

## 1.1 The toothless goat episode

Standing before the three distinguished judges, was a hungry, toothless, confused and depressed goat struggling to chew its cud as it awaited the judges' decision. But wait a minute, why was the goat in the court room? Who brought it there and from where? What was its accusation, or was it bleating for its innocence? And what happened to its teeth? This is not a common sight, but on 10th July 2006, a toothless goat, claimed to be a "victim of a weed gone berserk" (AllAfrica 2006) was brought before three judges in Nairobi's courtroom by the llchamus community representatives from Baringo County. This community was accusing the government for introducing *Prosopis juliflora* tree (locally known as "Mathenge") to their environment which had later turned out to be invasive leading to loss of their farmland, pastureland, livestock as well as causing harm on human beings due to its strong thorns. They were demanding for its eradication as well as compensation for the losses they had incurred as a result of the tree. As one old man indicated in a personal interview:

> I was among the people who took along the goat to the court to sue the government. We had previously complained about this tree (Mathenge) but no action had been taken. We had to give them evidence of how we were suffering. We were losing livestock, which is our wealth. Our people were getting very horrible wounds that had resulted from the pricking thorns. I think these thorns have some poison of some kind. Now that the government was not taking any measures, we had to show the entire world our plight.

*Prosopis juliflora* is a tree species native to Mexico, Central and Northern South America. It is a fast growing, perennial and more often, ever-green and drought resistant plant that grows well in ASALs as well as areas with desert like conditions (Robbins 2004).

**Picture 1: Prosopis juliflora tree**

*Source: Field study 2013*

This tree has long lateral root system that enables it to successfully compete for soil moisture with other species while its roots have the ability of developing so fast following germination, and within eight weeks, they are able to go as deep as 40cm while its thorns are about 5cm (ibid).

While the plant is considered to be a nitrogen fixer, it has been indicated that its leaves contain some chemicals that hinders other competing herbaceous plants, especially grass from growing under it (Robbins 2004). According to Robbins, livestock and specifically goats like eating the pods which are usually very sugary and later excrete them through their droppings, which later germinate during the rainy season.

Concerns over deforestation, fuel wood shortages and desertification in Kenya during the period of 1970s and 1980s facilitated a wave of projects that introduced *Prosopis juliflora* to new environments across the country (Mwangi and Swallow 2008). The tree later presented a new dilemma and opportunity as it spread. As a female respondent indicated:

> The tree came into my home and refused to go away. The more I tried to cut it down, the more trees sprouted from it.

This is a case of Invasive Alien Species (IAS), defined by the Convention on Biological Diversity (CBD) as those organisms that are introduced, establish, naturalize and spread beyond their home range, while their impacts involve significant harm (Perrings et al. 2002). The problem of IAS is not only being experienced in Kenya, but on a global level (MacNeely 2001). So then, how did the situation reach this point and where has it gone since then? This paper seeks to discuss the story of Mathenge tree in Kenya, and basically in Baringo County, by looking at how and why Mathenge was introduced, who introduced it and for whom. The paper will further discuss the political, economic, environmental as well as the social changes that have occurred since the introduction of this tree. Greater emphasis will be placed on the changes in communities' perceptions and attitudes towards the tree and how these changes have and are shaping the decisions and choices they make. This story reveals how policy interventions have the ability to influence the outcomes and opportunities of IAS on people and their environment; and also how community perceptions can influence policy interventions.

This study also acknowledges the controversial meaning of "the communities", whereby the term has been used with an assumption that communities are a homogeneous group. My working definition of community for this paper will be based on the administration sense, meaning a geographically defined jurisdiction consisting of, as per Kull (2002) a heterogeneous, contentious, unstable social grouping, differentiated by wealth, gender, ethnicity and caste among others. Therefore, the communities' perceptions, attitudes as well as decisions taken towards Mathenge will be analysed based on the above definition. I will first start by giving a global overview of IAS, followed by the local overview with focus on Kenya and finally highlight some of the international and regional initiatives working towards controlling IAS, before embarking on Mathenge as an IAS in Baringo County.

## 1.2 Invasive Alien Species (IAS)

There has been an increase in the introduction of alien species in different countries around the globe. This has mainly been facilitated by the increased transport, trade, travel and tourism and the extraordinary accessibility of goods as a result of globalisation (Genovesi and Shine 2004). Such activities have provided pathways through which plants, animals and other biological materials have found their way into different geographical regions. In most cases, these alien species do not cause any problems in their new environment (ibid), but only become problematic when they start becoming invasive.

The introduction of these organisms into the new habitats can either be carried out non- intentionally, for instance, pathogens and invertebrates; intentionally or through negligence where organisms are introduced for one purpose but end up spreading into new un-intended environments (McNeely 2001). For instance, the spread of disease causing pathogens are known to have been facilitated by militaries; where the conquistadors are believed to have facilitated the spread of measles from Europe to the Americas (ibid). Besides, most organisms introduced deliberately have mainly been as a result of human interests of promoting species that are either helpful or useful to people for agricultural, forestry, ornamental or even psychological purposes (McNeely 2001). An example is the introduction of Miconia (*Miconia calvescens)* tree to Tahiti in 1937. This is a highly ornamental tree that was introduced from South America to a botanical garden on the Island of Tahiti (Lowe et al. 2000). The tree has led to extinction of the native trees within the Island, while its root system has resulted in increased landslides on the Island. This tree was also introduced to Pacific Islands like the Hawaiian Islands and it's still being sold as an ornamental plant in the tropics.

While introduction of new species into new environments has resulted to incredible contributions to the societal development whereby human welfare has improved as a result of the introduction of crops out of their native range (Ewel et al. 1999), some deliberate and accidental introductions have resulted to unexpected outcomes, whereby the species have become invasive hence presenting complex and dynamic problems to the society (Tessema 2012). For instance, the accidental introduction of cassava Mealybug (*Phenacoccus manihoti Matile-Ferrero*) in Democratic Republic of Congo in 1973 led to the loss of 80% yields 'with an estimated cost to smallholders and subsistence farmers of US$ 4.5 billion' Zeddies et al. 2001 in (Borokini and Babalola 2012:46). Another example is the *Lantana camara* grows into thicket interfering with farming and forestry activities as well as providing breeding sites for tsetseflies which causes "sleeping sickness" in animals Ng'ayo et al., 2005 in (Borokini and Babalola 2012). IAS can therefore cause various forms of disruptions including loss of biodiversity and people's livelihoods, economic losses as well as effect on human and animal health.

To deal with the issues of IAS, there are different International and Regional instruments and institutions with programmes/ provisions/ activities related to IAS. For instance, in the Millennium Ecosystem Assessment report (MA), IAS

have now been considered the second most important cause of global biodiversity loss after habitat destruction, land use change, climate change, over exploitation and pollution (MA 2005). It is also indicated that developing countries have been the most affected by IAS due to the dependence of its population on agriculture for livelihood (Tessema 2012). Since IAS has become a global problem, it has prompted the formation of different programmes and international instruments to deal with the problem. For instance, the Global Invasive Species Programme (GISP) that actively promotes regional cooperation has developed and published a Global strategy on IAS and a toolkit of best prevention and management practices.

Further, the Convention on Biological Diversity (CBD) has also identified IAS as a major cross cutting theme (Genovesi and Shine 2004:9), and hence the CBD (article 8(h)) calls on parties 'as far as possible and as appropriate to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species' (CBD 1992:8). Other binding international and regional instruments dealing with IAS include the Cartagena Protocol on Biosafety, UN convention on the law of the sea, UNFCC, Convention for establishment of the Lake Victoria Fisheries organization among others (Shine 2000). Further other non-binding instruments have been formed and this includes the IUCN, International maritime organization, UNCED, Global conference on the sustainable development of SIDs (small island developing states) and FAO (Shine 2000). IUCN has also developed a list of hundred (100) of the world's worst IAS. These range from micro-organisms, micro-fungi, aquatic and land plants as well as mammals, fish and birds. Mathenge is among the plants listed in IUCN's lists of world's 100 worst IAS. The next section discusses some of the IAS' that were introduced in Kenya and their outcomes as well.

## 1.3 Invasive Alien Species in Kenya

Non-native species have been introduced into new habitats by people mainly for economic reasons, with a belief that they may increase their profits from agriculture or maybe the public may like the new discovered flower from a different part of the globe, or the species may perform better than native species, McNeely 1999 in (McNeely 2001) . Kenya, like many other countries has been faced with the problem of IAS, for instance, the introduction of Nile perch (*Lates niloticus*), a large and predatory fish from its native waters in the separate sub-catchment of the Albertine Rift lakes and Lake Turkana in the 1950s. This fish was mainly brought for economic reasons, that is, to enhance fishery as well make large fish available for the residents in the region. Unfortunately this IAS led to the extinction of hundreds of cichlid fish which have always been common to the lake as well as more than 200 other fish species through predation and competition for food (Lowe et al. 2000, McNeely 2001, and Shine 2000). There has also been increased deforestation around the lake due to increased demand of firewood for drying the oily perch.

The Nile Perch fishery is a major export industry to markets in Europe, North America and other countries, whereby a total of US $400 million income is generated per year (McNeely 2001). Unfortunately, very few people around the

lake are enjoying the economic benefit of this industry, while protein malnutrition is also exacerbating among the people living around the lake (ibid). McNeely (2001:14) indicates that, 'great economic benefits are flowing to a few people from this IAS, but none of the money is being spent on managing the considerable economic and ecological costs imposed on the poor, or on the Lake Victoria ecosystem.' Further, commercial exploitation has led to the displacement of local men and women from their traditional fishing and processing work (Lowe et al. 2000)

Another example is the water hyacinth (*Eichornia crassipes*) which has invaded many water systems in both tropical and sub-tropical regions. This South American native plant (Lowe et al. 2000) has been indicated as the worst aquatic weed in the world. Before spreading into Lake Victoria in the early 1990s, the water hyacinth was being grown as an ornamental plant. According to Shine (2000), the impacts of the plant in Lake Victoria included loss of biodiversity, poor water quality, and poor navigation within the lake as well as hindered generation of hydroelectric power. Mathenge is therefore not the first non-native species to cause un-intended consequences in Kenya. However, as this research investigates, its story is not as simple as turning from "good intentions" to entirely "bad outcomes" but it has also involved policy changes aimed at turning the bad outcomes into "opportunities" not only for the affected residents but the private sector as well

## 1.4 *Prosopis juliflora* as an IAS in Kenya

This tree was first planted in Kenya in the 1970s to rehabilitate a quarry in Bamburi, near Mombasa. It was later introduced in Lake Baringo area; Tana River and Garissa in the early 1980s through a fuel wood afforestation extension project (Choge et al. 2007) as a way combating desertification. The introduction of Prosopis tree brought a lot of excitement among the communities due to its ability to grow on barren land, easy to plant as well as was able to prevent soil erosion. Its pods also served as a fodder for their livestock, especially the goats (Mwangi and Swallow 2008). The problems of this tree were visible ten years after its introduction, where it started spreading so fast forming dense thickets as well as preventing other plants from growing underneath (Andersson 2005).

According to Andersson, there were claims that the sugary pods were leading to loss of teeth among the goats hence resulting to death from starvation. Other complaints included the tough thorns that affected people, livestock as well as punctures on vehicles and the blockage of irrigation schemes whenever they grew near watercourses (ibid). Choge et al. (2007) indicates that no management strategies were initiated during its plantation hence this resulted in its invasion. The negative impacts experienced prompted the communities to have a negative perception of the tree to a point of referring to it as "devil tree" (Pasiecznik et al. 2006:4) The issue became a national concern after the community living on the shore of Lake Baringo, mainly the Ilchamus community filed a case at the high court claiming compensation for their loss of livelihood as well as demanding the government eradicate the tree from their homesteads (Choge et al. 2007). The matter was even taken further when the community

took along a toothless goat to court as evidence of overwhelming impacts of the tree.

While the government was opting for its eradication, experiences from countries in America, Asia and Australia had indicated the impossibility of its eradication (Choge and Pasiecznik 2009). It therefore appointed KEFRI to find ways of managing the tree. Some of the interventions used to manage it included exploitation of the tree through charcoal production, timber, furniture well as milling of pods for livestock and human food (ibid). Given that charcoal production was prohibited by then, the ban on charcoal production was also lifted, although on a trial basis to enable communities produce and transport charcoal from Mathenge (Choge et al. 2007). Previous studies indicate that charcoal production and sell had gone up as a result of the government lifting the ban in 2007 Choge et al. 2012 in (Pasieczik et al. 2012) where the surveys indicate that communities in Garissa, Tana River and Baringo county are now earning more than $10,000, $20,000 and $60,000 respectively from charcoal sales.

Other interventions also included the authorization of a private company to set up a biomass-based plant that would use the tree for electricity generation. Cummins Cogeneration Kenya Ltd (CCKL), a multimillion dollar power production enterprise received funds from a local bank to use Prosopis as a raw material for its biomas-based power generation (The East African 2013). According to interview with CCKL, the company has already acquired 15ha of land in Marigat area to set up a factory with annual production of 12MW of power for 20 year. It has also received permits and licences from the Kenya Forestry Service (KFS), the Kenya Forestry Research Institute (KEFRI), and National Environment Management Authority (NEMA), the Lands Department, Energy Ministry and provincial administration to carry out its project. According to CCKL officer, the company plans involve communities in supplying trees to the company as well as seek a power purchasing agreement (PPA) with Kenya Power and Lighting Company (KPLC), the country's electricity distributor, so as to offload the electricity into the national grid.

## 1.5 Problem Statement

Prosopis was introduced in the Arid and Semi- arid lands (ASALs) of Kenya to curb the problem of desertification, control soil erosion as well as provide fuel wood for the communities. From the initial goal of its introduction, this tree was meant for the good of the society and country as a whole. Unfortunately, and to the surprise of many, the state included, the tree turned out be hazardous, ten years late after its introduction. There are also indications to show that there has been shift in terms of the value of the tree from the period of its introduction till now; from the tree being perceived as good therefore generating a lot of excitement among the communities, to the tree being perceived as bad to an extent that its labelled "the devil tree" after its invasion causing the destruction; and now a "hot cake" for communities and multinational companies like CCKL for its economic potential.

It is also important to note that whenever an IAS has both beneficial and harmful aspects, it ends up posing a policy challenge among the policy makers in that particular country (Tessema 2012). Mathenge is an example of such kind of an IAS which was not only introduced in Kenya, but other countries in East Africa like Ethiopia (ibid). This species has become a policy dilemma in the countries in which it was introduced. Ethiopia is one of the countries where invasion of the tree is particularly on internationally important biodiversity sites. While Mathenge is considered among "the worst" IASs, this portrayal is complicated by the fact that people have found ways to live with and make use of the plant. For instance, recent studies have indicated the tree has provided economic potential for the communities in Kenya's ASALs (Mwangi and Swallow 2008). This study therefore takes a critical and nuanced look at both the discourses and livelihood outcomes attached to Mathenge and how these have shifted over time.

## 1.6 Relevance and Justification

The motivation of this research is to reflect on the outcomes of a series of policy interventions on the people and the environment that it was meant to help. More than 80% of Kenya's land area is occupied by ASALs, which further is a home for over 10 million people, who are mainly pastoralists and agro-pastoralists. Furthermore, more than 60% of this population are poor, surviving on less than 1 USD per day (ALRMP 2005). Despite the high poverty levels in ASALs, the regions are well endowed with natural resources, where 70% of livestock are found, while they also consist 90% of wild game that supports the country's tourism sector. These regions have therefore been recognised as the major drivers to economic growth, hence accelerated development of the country (ibid). Prosopis trees are widespread in these ASALs, as it was introduced as a way of curbing desertification and reducing drought impacts as well as provide fuel wood to the local communities in these regions. Indeed, the introduction achieved its objectives, whereby desertification has been curbed in the areas it was introduced (Maundu et al. 2009). Ironically, by the time the tree was introduced, the government had put a ban on charcoal production and transportation; hence these communities could not produce charcoal from the same tree.

The negative impacts that resulted from the tree ten years later were not only felt by the local communities, but also by the government, when the local communities had to sue and seek compensation for introduction of the tree and the harm it had caused. This aftermath of Prosopis represents the undesirable and unexpected outcomes of the government's intervention. While the communities have tried to control further invasion through utilization of the tree, the government has also provided an enabling policy (The Forests (charcoal) Regulations 2009) to allow the exploitation of the tree for economic benefit (GoK, 2009). Another policy that has been launched is the session paper No. 8 of 2012 on National policy for sustainable development of Northern Kenya and other ASALs; where eradication of Prosopis is one of the policy interventions (GoK, 2012). But the question at hand is what are the communities current perception of the tree after the discovery its economic potential? To what extent are they using the tree? Are all the communities using the tree?

Who is benefitting and who is losing out? Do they still want the tree to be eradicated? Studying communities' perceptions of this tree could therefore guide the policy makers on the formulation and implementation policies related to Mathenge and ASAL areas in general.

## 1.7 Research Objectives and questions

This research seeks to achieve two main objectives. First is to investigate the outcomes of policy interventions related to Mathenge and consider how appropriate they have been for the people and environments affected. Secondly, to understand communities' perceptions of Prosopis tree overtime and how these perceptions influenced the decisions and the actions they make or have taken.

**Research Questions**
This research addresses the following central question: What have been the outcomes of Policy interventions related to Mathenge and how have these outcomes been influenced by or influenced the change of community perceptions towards the tree over time?

**Sub-questions**

1. How are residents of Baringo County currently using Prosopis for their livelihood generation?
2. How have the communities' perceptions of the tree changed over time?
3. What factors have been influencing these changes in communities' perception of Prosopis?
4. How is Cummin Cogeneration's plan to set up a biomass-based power generation factory, already affecting the communities' and actions decisions towards the tree?

This paper argues that the outcomes of the different policy interventions in relation to Mathenge have played a major role on how the communities have experienced and perceived the tree. This draws back from the presidential directive on prohibiting charcoal production as a way reducing deforestation in early 1970s, followed by initiation of tree planting through the afforestation programme saw the plantation of Mathenge as a way of curbing desertification, to the lifting of the ban on charcoal to enable exploitation of the tree and hence control its spread and finally the authorization of the private company to also exploit the tree for electricity.

## 1.8 Organization of the Paper

The upcoming section (Chapter 2) presents the methodology of study highlighting the data collection techniques used, analysis as well as the description of the study area. In chapter 3, an overview of the Baringo County before the introduction of the Prosopis is explored followed its introduction, the outcomes of the tree as well as government intervention. Chapter 4 focuses on the major policy change which was charcoal production from Mathenge. It also presents the winners and losers within the charcoal business. Chapter 5 makes

a shift from charcoal production to other opportunities presented by this IAS. The focus is now placed on a private company, CCKL, its plans to generate electricity using Mathenge and how these plans are already shaping the attitudes of communities towards the tree. Chapter 6 marks the end of the paper by presenting the conclusion on research findings.

# Chapter 2: Research Methodology and Analysis

This was an inductive research that has drawn its inspiration from political economy and political ecology. Political economy aids in understanding the forces behind the introduction of Mathenge as well as the nature of production and reproduction through Bernstein's four questions of agrarian political economy, 'who owns what? Who does what? Who gets what? And what do they do with it?' (Bernstein 2010:22). Political ecology on the other challenges the prevailing views about human actions and environmental changes. It therefore 'seeks to understand the complex relations between nature and society through a careful analysis of what one might call the forms of access and control over resources and their implications for environmental health and sustainable livelihoods' (Paulson et al. 2003:257). Special attention is given to the unequal outcomes of policy interventions related to the environment where some people lose while others gain while critically examining power relations where those with least power seek for more just and sustainable outcomes.

## 2.1 Methodology

This was an exploratory study that was undertaken in Baringo, Kenya from July to August 2013. The methodology employed was a qualitative approach since it allows for both deductive and inductive logic as well as provides room for several view points and truths and 'strongly argues the value of depth over quantity' (O'Leary 2010:113). With this methodology, one is able to get in-depth information on certain social complexities through understanding the relations, experiences, perceptions and beliefs of a certain society, institution, groups of people or individuals. Getting information on the communities' perceptions of Mathenge as well as factors influencing their perception requires interaction of the interviewer with the respondents to get more information, different views as well as realities that can be excluded through a solely quantitative approach.

## 2.2 Data collection techniques

The study employed both primary and secondary data collection techniques. Secondary data involved a comprehensive review of academic literature as well as relevant documents on IAS and specifically Mathenge, both on a global and local (implying Kenya) situation basis. For primary data, the study used semi-structured interviews and focus group discussions. Both methods are interviews that only vary in form, since one involves an individual participant while the other consists of more individuals (O'Leary 2010). Laws et al. (2003) indicates that interviews are mainly used when you need to get in depth information, understand people's experiences, when you can be able to rely on information from a small group of people or when your respondents may not fully express themselves through a questionnaire This method of data collection also allows for open ended answers that are in relation to different questions, topic areas or themes (O'Leary 2010). During the study, this technique was very useful since I was able to probe the participants on their perceptions of

Mathenge, how they are currently using it as well as their feelings about an upcoming private company that intends to use the tree for electricity generation. Prior to the study, an interview guide, with main issues defined was prepared to help guide the interview session, but the responses were left open. Preference was given to semi-structured interviews due to their flexibility that provided room for the interviewer to seek clarification and elaborations on issues under study. Follow up questions were further asked depending on the participant's response.

Focus group discussions were also carried out. This method was considered advantageous, not only for its low cost, but since it is rich in data, stimulating the participants and helped them to remember events. Further, the method is also efficient since it provides quality controls on data collection. During the study, this ended being the case since the participants would often clarify, challenge or supports each other's views. This was considered useful because it provided an opportunity to cross check information and expose otherwise latent details. Just as O'Leary indicates, focus group discussions are good in terms of drawing out opinions that might not have come during individual interviews (O'Leary 2010). Most of the interviews and FGDs were tape recorded and transcribed for research analysis. For those participants that were not comfortable with tape recording, interview notes were prepared by the interviewer, with the help of a research assistant. The analysis of the results was further done manually by comparing the various responses and grouping the themes that emerged into categories. The results from the FGDs are however not intended to be generalised but to provide a clear understanding of communities' perception of Mathenge as well as the factors that were driving their perceptions. The interviewer did not encounter any language barrier since all the respondents were able to understand and speak Swahili and not the local language as she had anticipated.

## 2.3 Selection of respondents

Three main categories of participants were targeted; the government, community and Cummins Cogeneration Kenya limited (CCKL) representatives. While the research design had targeted a District Environment Officer (DEO), DFO, CCKL and KEFRI representative, the researcher only managed to interview the DFO, KEFRI, CCKL representative and an additional District Livestock and Production Officer (DLPO). These together with the assistant chiefs were my main key informants. Other respondents interviewed included seventeen (17) community representatives, contrary to the research design's target of eleven (11), two (2) assistant chiefs and three FGDs with participants respectively as 4, 5 and 8.

**Table 1: Study Participants**

| Locations | Data collection method | Research participants |
|---|---|---|
| Salabani<br>Ng'ambo<br>Loboi | Semi-structured interviews | Key informants (6)<br>• 1 District Forest Officer<br>• 1 Director, Kenya Forestry Research Institute, Marigat Office<br>• 1 District Livestock Production Officer<br>• 2 local Assistant chiefs<br>• 1 Cummins Cogeneration Officers |
| | | Community Representatives<br>• 17 community representatives |
| | Focus Group Discussion | 4 FGDs of Community Representatives<br>• 1 Women ( 4women)<br>• 1 CPA representatives (5 rep)<br>• 2 Community rep (8 rep per group) |

*Source: Researcher's construction*

In total, 23 study participants were reached through semi-structured interviews, (this includes the 9 key informants) and 4 focus group discussion. The key informants were selected through purposive sampling, where the method mainly relies on choosing the sample for its relevance and rather than representation. From the research design, the study had intended to interview farmers, traders and pastoralists independently, but unfortunately, the researcher was not able to interview any participant that practised any of these activities independently. All the community representatives interviewed except one carried out all the three activities. The reason behind this was that all this activities were determined by climatic seasons, whereby, during rainy seasons, the participants mainly concentrated on agriculture and livestock while concentrated more on charcoal production during the dry season. For the FGDs, One of it consisted of women alone, with a total of 4 women in attendance. While the 2nd FGD consisted of 5 participants who were Charcoal Producer Association representatives (CPAs), the last 2 FGD, each consisted 8 participants drawn CPAs and

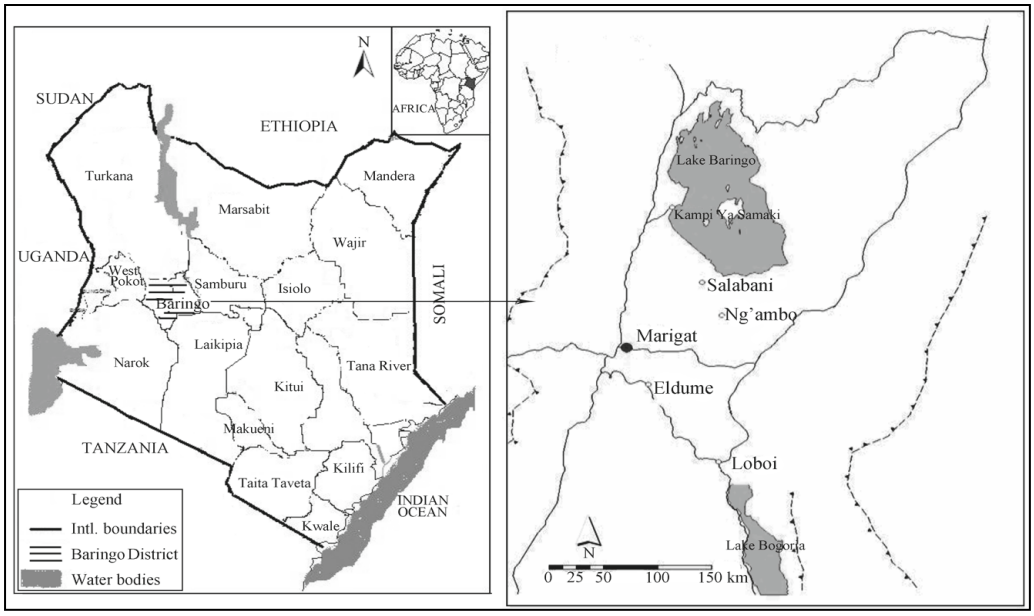
non CPA members. The respondents had been interviewed individually first before having the FGDs. The study design had targeted between 6-10 participants per FGD. This was not the case since one of the research days was a market day, and therefore it was hard to get respondents

## 2.4 Description of the Study Area

Baringo County is located in the Northern part of the Rift Valley province of Kenya. It borders boarders Turkana and Samburu districts on the North and Pokot on its West. The County covers an area of 8,655Km$^2$ with a total human population of 555,561 (KNBS 2009). This County is inhabited by people from four ethnic groups, who include the Tugens, Pokot, Endorois and the IIlchamus. The Tugens are known to be the predominant group while the Endorois and IIchamus are considered a minority group due to small population (Ghai et al. 2013). For instance the IIchamus has a total population of 27,888 people and only occupy five divisions of Salabani, IIchamus, Ng'ambo, Makutani and part of Marigat (Ghai et al. 2013), and only have five elected councillors with no member of parliament.

The climate of the area is mainly semi-arid with an average minimum and maximum temperature of 20ºC and 30ºC respectively. Further, the region is characterised by two rainy seasons, whose annual rainfall is 650mm per annum (Mwangi and Swallow 2008). Soils within the region are moderately to poorly drained, with strongly calcareous soils. Vegetation is mainly bushy characterised by indigenous tree species like the *Acacia spp*, *Acalypha fruticosa*, *Maerna endulis a*mong others (ibid). Exotic trees include *Lantana camara* and *Prosopis spp.* The region has two lakes, Lake Baringo which is a freshwater lake while Lake Bogoria as one of the soda lakes.

**Map 1: Map indicating the location of Baringo County and the specific study areas**




*Source: Adopted from (Njoroge et al. 2012)*

The main source of income of the people is from sale of livestock, honey as well as fishing. All the ethnic groups are more less agro-pastoralist although the IIchamus are known to concentrate more on livestock keeping (Johansson and Svensson 2002). Additionally, livestock grazing together with crop farming within homesteads as well as irrigated agriculture are the major land use of the region. Most of the land is held under communal land tenure regime of the group ranch, an institution that was established in the early 1960s (Mwangi and Swallow 2008). This study was conducted in Salabani, Loboi and Ng'ambo, the administrative locations of Baringo County, whereby Salabani and Ng'ambo are mainly occupied by the IIchamus group while Loboi is for the Tugen group.

## 2.5 Reflexivity and ethical challenges

> 'The decision of how to present oneself is very important because after one's presentational self is 'cast', it leaves profound impression on the respondents and has great influence on the success (or failure) of the study' (Fontana and Frey 1994:367).

As a researcher who was preparing to carry out semi-structured interviews and FGDs, I had to reflect on how my position and views on the subject at hand might play a role in influencing the amount and kind of information the participants would either provide or even withhold from me. I therefore had to clearly state my role as a student and explained to the research participants what the research was about.

The political context of my study was equally important. Being a student at the International Institute of Social Studies (ISS) at The Hague where the International Criminal Tribunal (ICC) is located, displayed mixed reactions among the participants. Following the 2007/2008 post-election violent, the term "Hague" has always been associated with the prosecution of the perpetuator's of the violence, of which Kenya's current president and his deputy are among the accused persons, and also considering that, Rift valley province, in which Baringo County lies, was one of the most affected areas. For instance, one of the participants was quick to raise his opinion on the cases going at the ICC. "Those people should jailed there and never come back", was one of the comments from one of the participants. He even went further to ask my opinion about the case. Noticing the participant's fury , I had to take charge of the situation and diplomatically shifted our conversation from the Hague topic to providing the participant in depth information about my study, which included showing him my student identity card as well as the recommendation letter that I had received from ISS

The researcher's initial plan was to interview participants found in the location of the proposed site of biomass-based power plant. On reaching the ground, the researcher was informed that the site had been changed. At this point, the researcher decided to get samples from two more locations that had high densities of Prosopis, but within the same district. Since the factory was not yet set

up and in operation, the researcher decided to change the research questions from how the factory might affect the communities' livelihood, to how its plans were already affecting the decisions that the community were currently taking. Other ethical measures for instance, the researcher's dress code and language use were observed. I was conscious on my manner of my speech, utilising Swahili most of the times and dressing casually for interviews to reduce perceived class and status demarcation.

## 2.6 Limitations of the study

My entry and accessibility of the local communities in the different locations was conducted by the DFO, who gave me the contacts persons on the ground. The contact people I used from the three locations were mainly the chairmen of Charcoal Producer Associations (CPAs). My expectation was to meet the different participants at their homes, but on reaching locations, I found the participants gathered at a central place waiting for me. At first, I became a little confused because that was not my expectation. The groups' expectation was a one-time meeting with all of them at ago. I talked to chairman and indicated that I wanted to do individual interviews before carrying out the focus group discussions. And since most of the participants were members of CPAs, they already had a perception that I was going to ask them about charcoal business and Prosopis tree. Since so much research had been done on Prosopis, I had decided to use a different approach in asking questions, whereby my initial questions were fully detached from Prosopis. For instance, when I asked about the participants' source of livelihood, the participant would mention give the list and get in details of explaining how they are benefitting a lot from charcoal from Prosopis tree. At some point, I felt like they were pre-empting my questions. To take control of the situation, I had to keep to my interview guidelines while probing and asking for clarification where needed.

# Chapter 3: Good Intentions: Let's "Chase" Away Desertification

The following three chapters, that is, 3, 4 and 5 are going present a narration of Mathenge in Baringo County. Specifically, chapter three will entail the factors that led to its introduction, who was behind this intervention and what were the outcomes. It will further present the government's response to the outcomes of the tree as well as communities' perceptions.

## 3.1 Baringo County before the 1980s

During the 19th century, Baringo was an area known to have a lot of water and grass throughout the year. Many pastoralists from other regions were attracted to this area leading to an accelerated increase in human population as well as overgrazing activities (Johansson and Svensson 2002:15). This situation further worsened when large parts of the high potential areas were allocated to the European farmers by the colonial government in the early 1900s while majority of the African farmers were left in small pieces of land allocated to each ethnic group, controlled by chiefs and headsmen appointed by the colonial government, (ibid). According to Bryan and Sutherland 1992, as cited in (Johansson and Svensson 2002), soil erosion was widespread in the area between the years 1920-1930, as a result of the high human population and increased livestock numbers. Further, people started to clear native forests so as to create land for cultivation.

This colonial administration period was characterised by severe droughts as well as increased overgrazing that led to land degradation. In as much conservation measures were being carried out, for instance, prohibition of cultivation on steep slopes, Eriksson 1992 in (Johansson and Svensson 2002) the native farmers did not like these initiatives since they were forced to dig terraces on their farms as well as schools using their hands, while those who declined the work were punished. After independence in 1963, soil erosion worsened since no politician could talk about soil conservation measures as it had already been tainted as a connotation of forced labor during the colonial administration (ibid). Even though different agencies like FAO and World Bank initiated projects on soil conservation and reclamation in the 1970s (Johansson and Svensson 2002), this were mainly done through top down approach and people only accepted to work on them as long as they were paid, and once the project ended, they did not continue with any conservation measures.

Baringo was not the only area experiencing drought in the country, but other drylands as well. The prolonged drought of the 1970s resulted in severe degradation of drylands causing extensive vegetation loss. Mwangi and Swallow (2008) indicate that the problem of drought, deforestation and land degradation experienced during the periods of 1970 and 1980, led to the introduction of Mathenge together with tree species across the country. As one old man respondent in this study indicated:

> Before this tree was planted, this area was so bare. You could see Marigat town as well as the lake (Lake Baringo). Dust storms were common phenomena in this place especially at mid-day. The temperatures were very high and area was so dry. You could easily tell when a vehicle was coming to this place due to the dust that rose up.

These environmental conditions of this region were confirmed by all the other community respondents as well as the key informants. It is also important to note that the retired President Daniel Moi was the then MP of this region. According to one key respondent, the retired President, using his presidential directive powers ordered for tree planting activities to help curb the harsh conditions that the region was experiencing. The next section will give an over view of the project through which Mathenge was introduced.

## 3.2 The Fuelwood/Afforestation Extension Project

Mathenge was introduced in Baringo through the Fuelwood/ Afforestation extension project. This was a joint initiative of the Food and Agriculture Organization (FAO) and the Government of Kenya. This project became operational in February 1982. The implementation of the project was carried out in two phase whereby the first phase took place between 1983 and 1985 while the 2nd phase took place from 1987 to 1990, FAO 1985 in (Mwangi and Swallow 2005:30). According to FAO 1985, the main objectives of the project were to establish demonstration plantations incorporating trials of tree species and development techniques suitable for ASAL conditions; support and strengthen forestry extension activities in the Baringo district; demonstrate integrated land use practices by incorporating fuel wood production as an important component as well as management practices for community forestry.

Besides, the project operated under the Forestry Department of the Ministry of Environment and Natural Resources, coordinated by the chief conservator of forests and the provincial forest officer. The project mainly focused on the establishment of demonstration plantations, Kariuki 1993 in (Mwangi and Swallow 2005), recruitment of nomadic pastoralists and agro pastoralists into individual tree planting, training of beneficiaries, provision of employment to pastoral communities through 'food for work', and the establishment of a central seedling nursery and nineteen smaller nurseries. Even though the project became operational in 1982, the planting process was carried out in 1983 and 1984 on plots that had been established by the local community members (ibid).

The communities were working through food aid programmes established by the World food Programme, where a total of 1000 local men and women were employed. The identification of plots was done through lengthy talks between the local pastoralist communities and the project staff, Kariuki 1993 in (Mwangi and Swallow 2005). Initially, the communities were reluctant on committing their land for the project due to the fear that the forestry department might end up gazetting it and rendering them landless and unable to access and use their traditional land. A total of twelve extension nurseries with a

potential annual output of 620,000 tree seedlings were established by the end of the first phase of planting.

Further, 246 ha of demonstration plantation were established on thirty six sites around the area, with 14 located in the IIchamus area while the remaining twelve were located in the Tugen plateau. All the sites were planted with Prosopis Juliflora except six sites within the Tugen site, FAO 1985 (Mwangi and Swallow 2008:134). A total of twenty eight species was introduced whereby eighteen species were indigenous while the ten were exotic trees of which Prosopis Juliflora was among them. The trees that were introduced were those that were believed to be hardy, drought resistant and fast growing, Ndegwa 1987 in (Mwangi and Swallow 2008). Moreover, a favourable appraisal was carried out of the first phase that led to the extension of the project for a further 3 years. By the end of the project in 1990, a total of 740ha of demonstration plantations had been established.

## 3.3 Mathenge: Was it Baringo's "Saviour"?

Following the conditions of Baringo, and specifically the study sites before the introduction of Mathenge, as previously discussed and indicated by respondents, we can confidently assert that Mathenge was indeed the "saviour" of the region. As one old man commented:

> Right now, this place is beautiful, it is so green, and the dust storms have reduced while temperatures have also gone. We now can afford to sit under a tree and chat without the fear of dust and strong winds.

His sentiments were confirmed by all other respondents, including the KFS, KEFRI and the local chiefs. The presence of the tree appeared to have changed what was previously termed as "desert" like conditions of the area to a better environment. It was also indicated that the area receives frequent rainfall since it has a lot of vegetation cover. KFS further stressed that vegetation cover is key for any environment and that Mathenge has been able to offer this. Besides, the DLPO also indicated that the residents livestock, especially goats love eating the pods, which are believed to be very sugary. It was therefore evident that the residents of this region appreciated this tree for its initial outcomes of better environment and fodder for livestock.

## 3.4 But something went wrong: Invasion of Mathenge

According to the DFO, the tree was well established within the 1st three years of planting. Its invasion began ten years later through the re-distribution of the tree's seeds which was facilitated by goats. As one female respondent stated:

> The goats are the ones that led to the widespread of this tree because they love eating the pods, and when they move from one place to another, they leave their droppings there. This how the tree ended up spreading all over the place where it was not intended.

Sakai et al. (2001), notes that wind, water, birds and animals are common agents of seed dispersal that not only transport the seeds from the parent plant, but further spread them to areas with similar conditions, making them easy to

adapt, hence their increased survival. The IIchamus community in the study area keep large herds of livestock as their main source of livelihood. As Mr. Elijah Lentangule indicated: 'people walk tall if they own large herds of cattle' (Daily Nation Wednesday, August 3, 2011), and as another male respondent pointed out during an interview; 'When I harvested my first products from farming, I was able to get money to buy goats which I am rearing while I farm. I have even introduced my children to farming and animal keeping.' With this kind of lifestyle, it is therefore clear that the tree had higher chances of spreading from the piloted plots to other areas within the region.

**Picture 2: Livestock feeding on Mathenge pods**

Source: Field study 2013

While the communities' lifestyle and cultural practice facilitated the spread of the tree, other factors also contributed to the invasion. Studies indicate that the communities were never enlightened on how to manage the tree (Choge et al. 2007), and it was expected that they would automatically know how to cope and manage a tree as aggressive as Mathenge (FAO 2008), which unfortunately did not happen. As one respondent indicated; 'the problem with this tree is that it lacked management.' KFS and KEFRI also confirmed that information gap was the major issue. It can therefore be argued that the residents' ignorance on management of the tree also played a major role continued spread of the tree. In States like Tamil Nadu in India, Prosopis grows naturally on "wastelands". Studies indicate that the rural poor in Tamil Nadu have been using this tree for provision of firewood, charcoal, and reclamation of wastelands (Jambulingam and Fernandes 1986). Other management strategies like coppicing and prunning had also been used and hence this helped to control invasion of the tree. This is the kind of knowledge was what the communities in Kenya's ASALs, hence leading to the accelerated invasion of the tree.

Lastly, charcoal production and transportation had been banned during the time at which Mathenge was introduced in Kenya. The ban had been initiated in 1986 through a Presidential directive, as a way of reducing deforestation in the country (WRI 2007). This therefore implies that, even if the community had wanted to produce charcoal, the policies at that time could not allow them. The respondents also indicated that being pastoralists, they had never known how to produce charcoal. One respondent further pointed out that despite the

ban, some individuals were secretly producing charcoal from indigenous trees. It can therefore be concluded that lack of an enabling policy at that particular time, in some way, also accelerated the invasion of the tree, since the communities were not able to exploit the tree in ways that would contain its spread.

## 3.5 The Mathenge "menace"

> But we all know that there is no free lunch. Introduced species can carry a heavy price tag, in terms of reduced crop and livestock production, loss of native biodiversity, increased production costs, and so forth (McNeely 20017).

The devastating impacts of different IAS in different countries has been extensively discussed, see (Genovesi and Shine 2004, Lowe et al. 2000, McNeely 2001, Perrings et al. 2002, Shine 2000). Mathenge, like many other IAS had a price tag too. Findings indicated that the invasion of Mathenge had loss of pastureland, homesteads and farmlands; strong thorns that cause injury to both human and animals while also destroying bicycle tyres; formation of impenetrable. According to the respondents, loss of livestock was indicated as the greatest impact of the tree. One female respondent indicated: 'No grass grows where the tree is,' and as another male respondent indicated: 'there was a lot of grass before these trees came, but after its spread, the grass could no longer grow hence we started losing our wealth (livestock).' The loss of livestock especially the goats was indicated to be as a result of the sugary pods that caused the decay of the animals' teeth. It was also noted that reduction of pasture of pastureland caused loss of livestock due to starvation. As pointed out by one old man who is a former teacher and a village elder: 'This shrub is threatening our very source of livelihood – our livestock' (IQ4 News, 2012). Other media features had also previously pointed how the communities were being affected by the tree. For instance:

> It dawned on me that my life was in danger when my finger and arm started swelling and paining. I was taken to hospital where doctors performed the operation. Now, I no longer fend for myself or perform simple tasks as my hand is paralyzed (The African executive, 2006)

This was a case of woman who had been pricked by the strong thorn of the tree. These kinds of health impacts were also indicated by the interviewed respondents, where cases of amputations as well as permanent disabilities were had been experienced. A female respondent went further and indicated that she prays before embarking on firewood collection.

Further, flooding was also raised as one of the major problems being experienced in the area. It was not clear what the cause of the floods was but there were speculation that it was as a result of the tree. While some respondents indicated that major floods had been experienced before the introduction of the tree, a majority of the interviewees indicated that the tree had blocked the waterways of rivers resulting to floods. Others indicated that too much rain was also causing the water in the lake (Lake Baringo) to increase. They further indicated that the lake is moving closer to the land causing displacement of the

people. One of the female respondent indicated that she relocated from her previous home due to the floods.

**Picture 3: Flooding in Ng'ambo location**

*Source: Field study July 2013*

As I walked down to the lake, it was evident that water from the lake was moving to the land. Several homes and even a school had been submerged and some of the routes had not only been narrowed by Mathenge but were impassable due to the water. At one of the homesteads, (that was next to other submerged homes) I met two young women and after a small "chitchat", the lady with her child told me that she had come to seek refuge at her cousin's place after being displaced by the floods. She further indicated that that was the 3rd time she had displaced within the past 4 months and was thinking of next "refuge home" since the water had already reached at the cousin's house.

The impacts of Prosopis were felt by people of different status, gender, age and class. Children could not play freely due to the fear of thorns; women had to say a prayer before embarking on their chores of firewood collection while men had to wear "thorn proof" sandals as they took their livestock for pasture. The chiefs were also not spared from the floods that are believed to be as a result of Mathenge. As stated by a paramount chief's wife who lost their house: 'We built it as our family home. I never thought I would be living in a rented house in town, whereas I have a good home' (BBC News Kenya, 2006). Considering the actual and perceived impacts of Mathenge, these impacts have not been shared equally. For instance, while the poor lady has been moving from home to home begging for shelter, and as of now, she is still not settled, the chief and his family are already re-settled in town. They can afford to rent a house while this displaced respond cannot afford to rent a house in town and settle.

## 3.6 Eradication Vs Management

The problems of Mathenge could no longer be ignored and therefore action had to be taken. At this point, the communities hated the tree to an extent of

labelling it as the "devil tree". Besides, the media did not make the situation any better, and this can be seen throughout the titles of the newspaper features[1]. For the communities, eradication was the only option, and the major decision made at the point of their desperation was to sue the government, whose intention was to see a "better Baringo", a place with no drought, no dust storms, no soil erosion and full of vegetation cover. As indicated by KFS: 'all that the community wanted was for the government to come and take back "its" tree'. Pasiecznik et al. (2006) points out that the IIchamus community, with the help of Community Museums of Kenya (an NGO), started seeking legal action against FAO and the Kenyan government in 2004, for the introduction of the tree without proper assessment of its potential risk. But owing to FAO's immunity status at the UN organization, the case continued against the government (ibid). As reported in, (Daily Nation Newspaper 2011*):* 'the intention was good as the shrub stopped soil erosion but what the government failed to do is to carry out proper research on its side effects'. The court cases went on until the point where the toothless goat was presented in court as a proof of what the Mathenge was doing to their livelihood source. The communities were also demanding for the compensation of the losses incurred as a result of the tree.

The toothless goat court scenario resulted to Mathenge becoming the topic of discussion at the policy level. The Parliamentary debates of 19th and 20th July 2006 had discussions that focused on Mathenge in terms of declaring it a "national disaster." The debate also pointed out that, 3 billion Kenya shillings was to be used to eradicate Mathenge (Parliamentary debates 2006). This was very expensive for the country and besides, experiences from countries in America, Asia and Australia indicate the impossibility of eradicating the tree species (Choge and Pasiecznik 2009). This study revealed that, KEFRI was appointed to research on how the tree could be exploited for the benefit of the community as well as contain its spread. According to KEFRI, the communities were trained to furniture, timber and posts; milling of the pods for human food as well as animal feed, where the milled pods would be mixed with other animal feeds as well as production of charcoal through use of improved kilns. And since charcoal production and transportation had been banned, KEFRI together with other actors lobbied the government to legalize charcoal production. Other policy interventions at this point included the creation of a national task force to look into ways through which the tree could be exploited as well as formation of Farmer Field Schools (FFS) where farmers in five locations of Baringo were trained on these exploitation ways (FAO 2008).

Legalization of charcoal production was the major policy change during this time. According to KEFRI and KFS, the lifting of the ban was first done on trial basis, where Baringo was the only district allowed to produce and trans-

[1] Killer weed hits Kenyan herders, (BBC News, August 7, 2006)
Good intentions turn harmful, ( The African executive, July 26 2006)
How weed from hell has made village life a horror (Daily Nation, July 30 2006)
Anguish grows as weed wrecks havoc in Baringo, (Daily Nation, July 7, 2006)

port charcoal from Prosopis tree. It is evident that this is the point of dilemma for the government since the tree was having both benefits and harm. Eradication of the tree meant loss of the vegetation cover, which meant returning to the initial conditions of desertification. Further, considering that ASALs have been recognised as the major drivers of economic growth in Kenya due to their endowment with natural resources and livestock, changes on this environment may translate in changes in the economy. Therefore despite the financial constraints of eradicating the tree, the government had to find ways of managing Mathenge through the interventions mentioned above. The court case, therefore served as a defining moment where people's perceptions of the outcomes of an intervention led to the adjustment of policies

# Chapter 4: Devastation or Diversification of Livelihood

> This species is here with us and it's going nowhere, unless we capitalise on its advantages, we will keep on complaining about its disadvantages and hence not benefit from it (Interview with KEFRI 23 July 2013)

This chapter will highlight on ways in which the communities are currently using the tree. While the respondents indicated using the tree in many different ways, a special focus will be placed on charcoal production due to its legalization, something that had been prohibited for over two decades.

## 4.1. Benefits of Prosopis tree

While the respondents could not resist pointing out the problems of the tree seven years after the court case, they acknowledged that they are also benefitting from it. There was no agreement whether the advantages of the tree outweighed its disadvantages, but it was very clear that the respondents no longer wanted the tree to be eradicated. As indicated by one female respondent:

> I get a lot of benefits from this tree. I use this tree for charcoal production, which I later sell and get money for educating my children and buy food. I also get firewood, fencing materials as wells as posts and materials required for construction of the house. Since the trees are all over, I don't worry of walking long distances to look for construction materials. During the dry season, I feed the tree pods to my goats, but first, I have to crush them and mix with it other leaves. This is a very beneficial tree to me and would not want to see it eradicated

Charcoal production was the outstanding benefit of Prosopis that the respondents highlighted. All the community respondents interviewed except one, indicated that they produce charcoal from Prosopis tree. This single respondent indicated that he is too old; hence charcoal production is only done by his children and wife. KFS and KEFRI also confirmed that, in as much as the community representatives from this study areas had been trained on different ways of exploiting the tree, charcoal production was an activity that had been fully been taken up compared to other activities.

## 4.2 Forests (Charcoal) Regulations 2009

The main aim of this regulation is to provide guidelines on the legal requirements for producers, transporters, and traders engaged in the charcoal business. According to these regulations, all commercial charcoal producers are required to organize themselves and form Charcoal Producers Associations (CPAs) which are registered under the registrar of societies. A registered CPA is eligible to engage in charcoal production. The role of a CPA is to encourage sustainable charcoal production by members; ensure that members implement reforestation and conservation plans for sustainable charcoal production; assist

KFS in enforcing the provision of the Forests Act 2005 relating to sustainable charcoal production, transportation and marketing among others..

Further, a valid license from KFS is issued for commercial charcoal production while any person involved in the movement of charcoal or charcoal products from one place to another also requires a valid charcoal movement permit. According to KFS and KEFRI, Prosopis is the only tree species that communities have been allowed to engage in charcoal production and transportation. This was termed as a special permission and hence communities are not allowed to produce charcoal from any other indigenous tree apart from Prosopis.

## 4.3 "Toxic" Plant can be Black Gold?

It is evident that the local communities in the study area are generating their income from charcoal production and sale. Despite the fact that this is an agro pastoralist community, charcoal production from prosopis has become the people's alternative source of livelihood.

**Picture 4: Bags of charcoal ready for sale**

*Source: Field study July 2013*

According to interview with the DFO, there are currently five registered CPAs operational in Marigat district. These CPAs include Salabani, Ng'ambo, Iling'arwa Nalepo, Loboi and Ill'chamus. He also indicated that KFS was able to earn a total of Kshs 2,788,860 (USD 34,860.75)[2] from Marigat district through

[2] Used an exchange rate of 1USD= 80Kshs

issuing of charcoal transportation permits during the 2012/2013 financial year, whereby, for one bag of charcoal, the charcoal transporter is charged Kshs 20. Records from the KFS indicate that a total of 139,443 bags of charcoal were transported out of Marigat district to other urban areas in the country during that particular financial year. Besides, the communities in Marigat district, through sell of charcoal at Kshs 400 (USD 5.0), were able to earn a total of Kshs 55,777,200 (USD 697,215).

While charcoal is being produced by the local communities, it was evident that the number of vary bags of charcoal produced per individual varied. Findings indicate that while the women interviewed each produced 4-6 bags per week, younger men may produce up to 20 bags per week. One young man indicated: 'When I decide that I am making charcoal alone within that week, then am able to produce at least 20bags'. Others, for instance a female respondent who is a teacher indicated that she does not depend so much on charcoal and therefore would only produce it as a supplement to her salary, while an old male respondent who is formally employed indicated that he never makes charcoal. The female respondents indicated that charcoal production was quite tedious job and therefore could only afford to make few bags of charcoal. From this findings, it is therefore evident that gender and age plays a key role in the benefits from charcoal business. While the youth were able to produce more, the female respondents could not make as much charcoal as the them. The tree is believed to be hard and hence one needs a lot of energy to cut it or rather hire a power saw. Further, most of the respondents indicated that they sell their charcoal through the CPAs. The next section discusses how one of the CPA's (Loboi) works.

## 4.4 The Loboi CPA: How does it operate?

The Loboi CPA is one of the registered CPA that has been in operation for one year. Findings indicate that the CPA sells at least 390 bags of charcoal per week and ensures no charcoal leaves the division without their knowledge. They also coordinate the number of Lorries coming into their division, in that, only one lorry per trip is allowed to collect the charcoal. This, according to the CPA, helps to ensure order and reduce the scrambling for charcoal by the different buyers. It was also indicated that the CPA's help the residents to sell their charcoal at a better price. As indicated by the CPA chairman:

> Before the CPAs came into place, communities used to be exploited by the charcoal buyers. Most of these charcoal buyers used to buy a bag of charcoal at Kshs 150 and sold it later for over Kshs1, 000 per bag. But by selling through the CPAs, the communities are now getting better prices for their charcoal.

According to the chairman, the CPA's have helped in reducing the exploitation of the residents. Njenga et al. (2013) indicate that, while the charcoal producers sell charcoal at a very low price, the consumer price is always very high in the urban areas, where a 90kg of charcoal would be around Kshs. 1,000. This a very big difference in terms of price, but at the same time, the producers are able to get a better price through the CPAs. Further, the CPA works with KFS

in helping the buyers acquire the charcoal transportation permits from KFS. Once the charcoal is assembled at the collection centre, the charcoal buyer pays a total of Kshs 480 per bag, whereby, Kshs 400 per bag goes to the community member who supplied the charcoal, Kshs 20 per bag to KFS for permit, Kshs 10 per bag to the CPA, Kshs 30 per bag is given to the agent and lastly Kshs.20 per bag is allocated for the work of loading on to the lorries. On average, the Loboi CPA earns a total of Kshs 3,900 per week whereby Kshs 1,950 is channelled into community project while the remaining Kshs. 1,950 is banked and used for logistical issues within the association. Through the charcoal business, the CPA has been able to support six schools going children, built drainage canals, allocated seedlings to three schools for tree planting as well as assisted the farmers to transport maize from their farms to the market. It is clear that the charcoal is not only benefitting individual households but the community at large

## 4.5. "Black Gold" for whom?

This section will discuss the previous sections of this chapter with a key interest on the different actors involved in Prosopis in the study area. It will examine their activities in line with Bernstein's four key questions of Agrarian political economy; 'Who owns what?' 'Who does what?' 'Who gets what?' 'What do they do with it?' (Bernstein 2010:22). First, land in the study area is communally owned, this therefore means that the communities automatically 'own' the Prosopis trees on this land. Further, at the point when the government needed a solution for the problem of Mathenge, KEFRI was mandated to carry out research on turning the tree into use. Through 'doing' research KEFRI was able to produce knowledge needed by other actors like the government and communities, hence this translates into KEFRI's 'ownership' of the knowledge. The results released by KEFRI was what prompted the government to lift the ban on charcoal production and transportation since it was not going to be practical for KEFRI to train the communities on how to produce charcoal yet it was prohibited.

By the fact that the government through KEFRI's advice lifted the ban and later through KFS and stakeholders formulated the Charcoal regulations and later gazetted them, this action can also be viewed as a form of 'ownership' where it controls charcoal transportation through issuance of charcoal movement permits as well as licences for commercial charcoal production. The CPAs on the other hand 'do' the monitoring of charcoal transportation and marketing process within their divisions, while communities produce the charcoal. Additionally, the agents are in charge of getting the charcoal buyers as well as ensuring that all the charcoal leaving the division is collected at one location. Charcoal produced in the study area is usually sold out in larger cities whereby buyers come with Lorries, and through the CPAs collect the charcoal. What these actors 'get' and what they do with it varies between and within the groups. For instance, while KFS 'gets' Kshs20 per bag, CPAs get Kshs10 only. In this case, the actor who seems to be benefitting more is the buyer, who buys the charcoal at Kshs480 per bag from the CPAs , but later on sells it for about Kshs.1,000, which more than double what the owner of the raw material.

In as much as the women and youth were the groups mostly producing charcoal, their benefits varied since the youth tend to produce more bags of charcoal than women. This can be attributed to their roles in the community and ability to handle the tedious work. For instance, the women have to perform other domestic chores apart making charcoal. While the CPA in Loboi location was performing much better, the CPAs in Salabani and Ngámbo location appeared to have a low performance. This can be attributed to their cultural value of livestock keeping and are slowly learning to make charcoal. Furthermore, their perception towards charcoal production was not good, 'in our tradition, charcoal burning is done by the most poor or low level people, otherwise people walk tall if they own large herds of livestock. So how do you tell them to turn into charcoal business' (Daily Nation newspaper 2011). This was a comment by the lawyer who was not only representing the Ilchamus community's case in court, but is a member of that community as well.

Lastly, what the actors do with what they got also differed. While the women reportedly used the money from charcoal selling to provide for the family's basic needs, the men were more focused on increasing their wealth (livestock numbers). One female respondent indicated that the tree has been so beneficial to her since she is able to pay fees for her children. On the other hand, the youths selling charcoal were more concerned about technology as well as doing business. As indicated by one old man: 'most of our youth and women have bought phones after selling charcoal. One young man has even bought a lorry and is now using it to ferry charcoal to the town for sale.' It is therefore clear that, in as much as there is a variation in benefit sharing as well as what is being done with the benefits, charcoal production has become an alternative source of livelihood to most of the residents.

Following this, the perception of the communities' towards Mathenge has changed, as they are now appreciating the tree for its economic as well as environmental benefits. One respondent indicated: 'we have now learnt to live with the tree and are "milking" its benefits' and as another one indicated, 'when my goat is affected, I sell it before it dies'. The tree is now being referred to as the "black cow", which implied that despite the cow appearing black on the outside, it was able to produce milk, which is beneficial and the cow also be sold out to get money. In the case of Mathenge, it meant that despite invasiveness and hard thorns, the communities can still get some benefits from it. The change in perceptions has been as a result of the knowledge received on Mathenge, as well as the economic benefits from charcoal production which can be attributed to the policy change.

# Chapter 5: Biomass based power generation

While the "toothless goat court case" acted as a wakeup call for the government and its institutions on the impacts of Prosopis, it also provided an opportunity for the private sector. The tree that was once "hated" is now providing a source of livelihood to the affected residents and it hoped to later provide "green" and renewable energy for the nation. This chapter will focus on Cummins Cogeneration (Kenya) Ltd (CCKL), a private company that intends to establish a renewable energy plant using Mathenge tree Baringo. Emphasis will be placed on the company's current plans and how these plans are already shaping the local residents perceptions and decisions towards the tree.

## 5.1 Cummins Cogeneration (Kenya) Ltd (CCKL)

CCKL, a branch of Cummins Cogeneration Limited (UK), plans to establish several sustainable renewable energy plants in Kenya and other countries of sub –Saharan Africa. The technology mainly used by the company is gasification process which has been developed by the company and its partners (CCKL 2013). According to the interview with CCKL officer, CCKL and Tower Power Ltd are the same company, whereby Tower Power Ltd had the business plan while CCL had the gasification technology. The two companies merged and formed one company which is now CCKL. CCKL has plans of using Prosopis tree as wood biomass for electricity generation and is currently in the process of developing a 10MW plant which will feed electricity directly to the national grid. The wood biomass used in the factory will be supplied by the community members from the different locations.

**Picture 5: Upcoming Biomass-based power generation factory**


*Source: Field study July 2013*

## 5.2 The current Plans of CCKL

The company intends to work with eleven Community Based Organizations (CBOs)[3] formed by community members of the eleven different locations of Baringo County. According to CCKL, a 20 year contract will be signed between the company and the CBO. Each CBO will act as a link between the Company and the local community of that particular location and will consist of members from its location with an appointed executive committee to manage it. Currently, CCKL has already signed contracts with the Marigat CBO and intends to sign three more contracts with Salabani, Ng'ambo and Eldume locations. The main role of the CBOs is to demarcate and manage Prosopis sites within their locations, create wood collection centres as well as ensure that the quality and quantity requirements of the wood biomass per day are met, for collection by the company from the collection centres. For sustainability purposes, the CBOs are supposed to ensure that the trees in the demarcated sites are harvested on rotational basis and therefore only designated sites can be accessed for harvesting during a particular time. According to CCKL interview, the local communities will be paid for the quantity of wood they supply to the centre, while payments will be made through the CBOs, fourteen days after delivery of wood. From the payment made for wood supplied, 80 percent will be paid to the supplier while 20 percent will be channeled to the CBO.

It was also noted that the project anticipates on employing 230 youths (17-30 years) at the factory while another 1,000 at the collection centres once the company starts working at full capacity. Further, through its corporate social responsibility programme, CCKL anticipates building schools and health centres for the community. According to CCKL, these projects will be initiated once the company starts making profits. It was indicated that the electricity generated by CCKL will be supplied to the national grid, which is KPLC. KPLC is charged with the task of transmission, distribution and retail supply of electrical energy to end users. It purchases power through bilateral contracts or Power Purchasing Agreements (PPAs) that are approved by the Energy Regulatory Commission (ERC). The interview revealed that CCKL has already signed a 20 year PPA with KPLC and is therefore ready to start supplying its power once its operations kick off. Further, CCKL also intends to participate in Cleaner Development Mechanism (CDM) where it has a target of receiving 50,000 Certified Emission Reductions (CERs) from the 12MW it will generate.

## 5.3 Charcoal production Vs Electricity generation

This section gives a comparison between charcoal and electricity generation from Prosopis, where focus will placed on the local respondents, key informants and CCKL's opinions. Two major issues emerged while comparing livelihood benefits from charcoal production verses electricity generation by CCKL. First were the anticipated changes in land and resource ownership

[3] CBOs are the same as the Cooperatives indicated in the CCKL's EIA report

while the second one was income generation. Other concerns were in relation to the terms provided by the company and its sustainability.

### *5.3.1 Land and resource ownership*

Baringo County is mainly under communal land regime. With this regime, communities are regarded to own land even though it allocates this land to members mainly for the purpose of cultivation. The rights of the members to this land are mainly use rights and hence households or individuals have a right to use the land for a long period of time. The holders are not allowed to sell it (Bruce 1998:3) but can pass it down to its generations within a household. This system also entails both use rights to individuals or households as well as the common property in other resources. Within the study area, Mathenge is found on people's homesteads, farms and communal pasturelands. The interviewed respondents indicated that charcoal is normally produced from the trees found on these lands. There are indications of the possibility of change in land tenure system as a result of the presence of this factory. As indicated in CCKL's EIA report:

> This project will remove brokers as the community members will benefit directly from the project since a cooperative will be formed per location and each co-operative will bring in a portion of the Prosopis they own on specific days and paid for it. Co-operatives will acquire the land ownership and subsequently resources ownership and P.juliflora will no longer be considered as a communal property resource (CPR) (Kiragu 2011:12).

These plans raised a lot of anxiety among the respondents. For instance, one female respondent indicated; 'I am afraid the company may decide to own my tree.' Her fears were felt among most community respondents who thought at some point, the company may decide to restrict them from using the tree or even make charcoal. Further, the respondents also indicated that the economic benefits they were accruing from the Mathenge had resulted in some people controlling access over the trees on their homesteads and farmlands, something that never used to happen. One female respondent indicated that she cannot allow anyone cut the trees from her homestead since she now knows its benefit; while male respondent in the FGD indicated that giving out his tree was like giving out his goat, an animal considered as a sign of wealth within this community.

It is evident that while the land in the study area is still under the communal land system, there are tendencies of Mathenge being owned by individuals. This can be observed from the way respondents kept personalizing the trees, like "my tree", "our trees" and also the tree being compared to a goat, an animal that is owned individually. It appears that Mathenge is now being guarded and the respondents' perception of the tree has also changed from not just appreciating it but owning it as well. If CCKL's plans go through, then it means that there shall be control of access of residents to Mathenge and hence the benefits accruing from this resource might be controlled.

### *5.3.2 Income generation*

Residents of Baringo are meant to be paid for supplying the wood to the factory. While CCKL was convinced that the communities will earn more money through supply of wood, local respondents on the other hand were sceptical about this claim. As indicated by one young man; 'I am afraid the money that CCKL intends to pay me might be lower than what I get from charcoal selling.' This claim was backed up by another respondent who indicated:

> I have many options in selling charcoal. If one lorry comes and I do not like his price offer, then I do not sell to him. I wait for the next one who has a better price. But dealing with only one company (CCKL) to buy my wood would be very tricky for me.

And yet another comment from a female respondent; 'I am better off selling my charcoal, a business I am used to. This people (CCKL) might come and finish all the trees.' On the contrary, CCKL was prompt to point out that they were neither going to neither fight charcoal people nor compete with any sector. As indicated by CCKL:

> There is more than enough biomass for everyone to share as well as room for both activities to take place at the same time, but we believe the charcoal business will "die a natural death" since our business is more lucrative.

According to CCKL, the available standing biomass can sustain the company for over 30 years. CCKL in a way contradicts itself. In one a way, the company indicates that the resource available is enough for all actors enjoy, but at the same, it intends, through CBOs to privatise the same resource. Privatisation of this resource implies control of access to the resource as well as the benefit that accrues from it. Therefore, how are the other actors (residents) going to benefit from it? Furthermore it is also confident about the "death" .of charcoal business. If the resource is more than enough, then the charcoal business should not be part of their concern

Besides, KEFRI disputed the Company's' claim of the abundance of trees. As indicated:

> I am worried CCKL may not get enough materials to sustain them for even a year. For how long are they going to operate before they run short of materials, and after running short of the materials, what else are they going to land on? The company wants the tree for electricity and at the same time, the community wants it for charcoal. We may end up with a situation of scrambling for the material, hence leading to conflict.

It was also clear that the local residents had already exhausted the bigger trees and were currently depending on the younger ones. Furthermore, charcoal production is also being carried out on a daily basis since this has become the communities' immediate source of livelihood. KFS indicated that the trend in charcoal production has gone down due to the reduction in the materials. In as much the community respondents believed they may not earn a better income from supplying wood to CCKL, they were also afraid of the Company's sustainability.

### *5.3.3 Do the terms matter?*

While the benefit from CCKL was doubted, the company's terms of payment and the contracts provided did not seem favourable to the local respondents. Currently, CCKL has set a price of Kshs. 1.80 per kilogram of wood. According to the CPA representative, the outcomes of KEFRI's research on weight of trees indicated that one mature tree weighs about 250-300kg. It therefore indicates that a supplier will earn a total of Kshs. 540. However, the respondents indicated that, that will be a great loss to them since they are able to harvest at least 4 bags of charcoal from the same kind of tree, which translates to Kshs 1,600 when sold at Kshs 400 per bag. As indicated by a CPA chairman:

> This CCKL people have to reconsider their prices or else these charcoal producers are going to defeat them. You know, it's better to go on with this charcoal business, because everyone makes their own charcoal and you are assured of selling all your charcoal in a day. This thing (company) will slowly "die on its own" because the price they are offering is unbearable. The factory will be there but we will not supply it with the tree unless they change their terms.

While the company believes charcoal business will "die", the CPAs also believe the company will "die." The reaction from both sides exposes how each actor believes in the power they possess. It might be that CPAs feel more powerful by the fact they are a group, own the material as well as the confidence they get from the powers vested in them by the current charcoal policy. On the other hand, CCKL believes it is powerful by the fact that they have received licenses from the government as well as possess the finances and technology.

Other respondents were also concerned at the time duration at which it would take them to get their payments. Even though respondents expressed their fears, they also indicated that if the company changes its terms of payment and duration of the contract, then they will be able to consider selling the wood to them. Similarly, the DFO also indicated that CCKL was not clear on how the communities were going to benefit from the project. He further indicated that the approach that the company used was not community based, but instead passed through the opinion leaders, mainly the administration chiefs and who are not always in good terms with the locals. In His conclusion, he indicated that the communities were more interested in "willing buyer willing seller" than the CCKL approach.

According to CCKL, supply of wood biomass is supposed to be done on voluntary basis. This implies that no individual will be forced to sell their trees to CCKL. It is therefore upon the community members to decide whether they want to supply the trees to CCKL or continue producing and selling charcoal. As one CPA representative pointed out;

> This people (CCKL) have received a licence from KFS, but Mathenge is on people's own farms. KFS cannot force the community to supply the trees to the company, it upon the community to voluntarily supply their trees to the company. Communities are the ones with power to decide on what to do with the tree. While CCKL has the licences as well as the technology, it doesn't have the tree and hence they are depending on the

> community. This people should not even bother with KFS or any other office that has given them licences. The trees are on our farms and they belong to us (with emphasis).

It is clear that in as much as CCKL has undergone all the bureaucratic procedures, the local respondents do not seem convinced by their plans, considering that they are already benefiting from the tree. It is also interesting to note that while most community respondents were sceptical about the projects, some respondents thought the project is good since it would make their work easier since it would reduce the burden of charcoal production. The women respondents also indicated that charcoal production has had health impacts on them and would therefore prefer supplying the wood to the factory.

## 5.4 Location of the Factory

The company has already has leased 15ha of land for a period of 50 years from Marigat group ranch, in Marigat centre. This group ranch owns a total of 6,000ha the land in Marigat. The land was previously used for grazing as well as settlement by a few families. According to CCKL, the land will be used for construction of the factory as well as a location for the Company's operations. Asked whether acquiring of the land led to any disruptions, CCKL indicated:

> There is more than enough land in the group ranch hence grazing of the livestock will not be a problem for those who were depending on that particular piece of land. Furth more, there were no major displacements of people since only a few people were relocated from that particular piece of land to a different place within the ranch.

The acquired land is next to the main road leading to Kabarnet town and just after the Marigat town junction. The boundary of the land has already been marked while a big sign board of the upcoming factory placed next to it. Previous reports had indicated that the factory was meant to be set up in Ng'ambo location; see (Kenya Gazette Notice No. 10839, CCKL webpage). According to CCKL, Ng'ambo was chosen as a site due to the abundance of standing biomass of Mathenge. The change of site from Ng'ambo to Marigat centre was done after it was realized that the site was not suitable for its business since it was prone to flooding, which was evident in December 2010, where the whole site was flooded. The company was later re-allocated to another site within the location, but again, the land was covered with water after the April 2011 floods. Even though the community still went ahead and re-allocate them another piece of land, CCKL decided to completely move away from the location. CCKL's main reason for the complete shift of the location was mainly the floods that kept occurring in the region, the road network within the location was also poor while the sites were also very far away from the KPLC substation. According to CCKL, proximity to the power substation was a key requirement for their business since having the factory at Ng'ambo meant they would be forced to build a power export facility, and this did not make any "economic sense" to them.

It is evident that CCKL represents typical features of capitalism; one of them being profit maximization where the company has to identify the most efficient way of obtaining the highest returns from its business, and for CCKL,

its most efficient way was to relocate the factory. Relocation for them meant that they would cut down on the costs of building its own power export facility, construction of roads as well as building, for instance, dams that would help control the floods to its site. This relocation was not taken lightly by the respondents from Ng'ambo location. The next section will look into re-location and how it was perceived by the local respondents.

## 5.5 Relocation of the factory

While CCKL got a factory site that was in line with its "economic calculations", the residents of Ng'ambo on the other hand were furious about this decision. But the big question is, why would the residents get angry after a company decides to relocate its operations? This company had not bought the land from them and neither had they started their operations in the area? One of the members of the FGD's had this to say:

> We feel disadvantaged because of who we are as the IIchamus community and not what we are. Somebody somewhere within this County must have influenced the shift of this factory. Our only representation within the County is the Ward representatives who have no power. We therefore have no voice.

It was also indicated that Baringo consists of thirty seven locations, of which, the IIchamus community occupy six locations while the remaining thirty one are occupied by the Tugens. The District Development Committee and County Development Committee members were all drawn from the Tugen community. Issues of political representation and exclusion were also brought out at the time goat court case, where the lawyer representing the case stressed out that it was unthinkable for the IIchamus community to contest for any parliamentary seat since the Tugens, who are their rivals would never let go of the sit.

The respondents were therefore convinced that CCKL's relocation of the factory was not based on flooding, poor roads and proximity to the power substation as it had been indicated but believe it was more of a political issue. In support of this claim, the respondents indicated that they were ready to relocate some of their members for the sake of giving the company a better site for free, but the company still went ahead and bought land from a group ranch in Marigat. As one respondent (very unhappily) indicated:

> The company has denied has us the benefits it was going bring with it. We had hopes of seeing development in our location as well as improvement of the living standards of the IIchamus community. Our youths would have gotten jobs, health centres built as well as schools for our people. Now all this has been taken to Marigat location.

The disappointment and displeasure of the residents is a result of the high social and economic expectation they had from this project. This is in line with CCKL's, where it intends to employ 230 youths to work in its factory while about 1,000 to work in the biomass collection centres on both permanent and temporal basis. The company's EIA report also indicates plans of setting up

health centres, boreholes among others. CCKL on the other hand had this to say:

> We know the community was not very happy by the fact that we had to shift our factory's site to another location. They feel like we played some sort of game on them, but it is all about business. We have been able to iron out the issues with some of them, while some are still in denial. We will therefore move forward with whoever is on board and the rest will just catch up.

Looking at CCKL's statement, it is obvious that the community that the company was referring to was the Ng'ambo residents. But while the company is thinking about its business, the raw material that is supposed to be used to run the factory are on the community land being owned by the community. As indicated by one old man:

> If the company does not build its factory in this location, then we are not going to supply our trees to them. We are better off making our charcoal. The company should be informed that they are not going to harvest any of our trees unless we get into agreeable terms, even it means going to court, then we are ready to do so.

These residents, due to their political exclusion and powerlessness have always chosen to use court to address their issues. And the fact they are the ones who filed the Prosopis case in court, which drew the attention of different actors, CCKL included, strongly feel that they should be given first priority when it comes to projects that deal with Mathenge. This is also because they were the most affected by the tree as a result of loss of their livestock and are now concentrating on finding alternative livelihood sources.

But interestingly, while the respondents from Ng'ambo expressed displeasure with shifting of the company's site, the respondents from Loboi were quite happy about this. As one respondent indicated:

> It is a good thing that the company has been shifted to Marigat. That location is more central for all of us and hence all of us will experience the same expenses and hustle of transporting the wood to the factory. Furthermore, the communities of Ng'ambo were going to benefit more than us. With the current site, we are now equal. I would not have taken my trees to the factory if it were to be situated in Ng'ambo.

The reactions from the two locations clearly expose the potential tensions and rivalry between the two ethnic groups over the location of the factory. It is not surprising that the respondents from Loboi would prefer taking their trees to Marigat, since they both belong to the same ethnic group, while the IIchamus feel entitled to the project given that their case was what gave CCKL the opportunity to pursue its project.

# Chapter 6: Reflections and Conclusion

This study situates itself in the existing literature of the introduction and the outcomes of Invasive Alien Species. In doing so, the study has focused on the story of Mathenge in Baringo County, which was intentionally introduced in different parts of the country to curb desertification, but like other IAS, came along with un-intended consequences. The main objectives of the study were: firstly, to investigate outcomes of policy interventions related to Mathenge and consider how appropriate they have been for the people and environments affected. Secondly, it also aimed to understand communities' perceptions of Prosopis tree overtime and how these perceptions influenced the decisions and the actions they make or have taken. In line with this objective, the paper has tackled the question: *What have been the outcomes of Policy interventions related to Mathenge and how have these outcomes been influenced by or influenced the change of community perceptions towards the tree over time?* The methodology for the study was a qualitative approach and, an inductive logic was used, drawing its inspiration from the core values of political ecology and political economy.

Unlike other IAS, the story of Mathenge presents a complex scenario for both the government and the communities as its invasion has not only had detrimental effects, but also presented an opportunity for the affected community as well as the private sector. The government in an effort to curb desertification introduced Mathenge which later became invasive causing social, economic and environmental impacts. On realisation of the impacts and further being sued by the local communities for this introduction, the government had to find ways of controlling further invasion. This included lifting the ban on charcoal production and transportation, appointment of KEFRI to carry out research on exploitation the tree, setting up a national task force on management of Mathenge and lastly authorisation of CCKL to set up a biomass based power plant for electricity generation.

Field study findings as well as previous reports on Mathenge indicate a gap in knowledge on management of the tree at the time of its introduction. This is an indication of lack of proper planning at the formulation and implementation of the policy intervention that led to the introduction of Mathenge in Kenya. More research and better planning could have been carried before the introduction of the tree. Although the planning of this intervention may not have been perfect, subsequent policy interventions were introduced to help in the management of the tree. This story presents a good example of an adaptive management as a way of approaching the problem of IAS, and more specifically Mathenge. Lessard (1998:81) describes adaptive management as a 'continuing process of action-based planning, monitoring, researching and adjusting with the objective of improving the implementation and achieving the desired goals and outcomes.' This approach acknowledges that changes in managed resources are due to human intervention and that there are bound to be surprises and uncertainties (Gunderson 1999), hence policies must be continually be modified and flexible to adapt to this uncertainties (ibid). McLain and Lee (1996) further indicate that interventions should be structured in such

a way that they permit to anticipate or take advantage of a surprise as a tool for learning instead of avoiding the inevitable surprise that arise, as well as having ad hoc changes in managing environmental resources where there is no proper planning and monitoring (Schreiber et al. 2004). In the case of Mathenge, the government's flexibility and willingness to lift the ban on charcoal production made a big difference in terms of controlling the spread of Mathenge. Further, the appointment of KEFRI to carry out research and develop management strategies together with KFS and as well as formation of a task force to work on the management Mathenge has been key in ensuring that the people and environment is minimally affected by the tree, but at the same time ensuring its initial goal curbing desertification is achieved.

Findings also indicate major changes in communities' perception over time with outcomes of these interventions. In general, community members interviewed for this research stated that they appreciated the tree at the point when it was introduced since it was able to curb desertification, dust storms had reduced, there was vegetation cover in the area and the temperatures had become much better. The appreciation of the tree started declining after it became invasive leading to loss of their livelihood, health problems as a result of the thorns as well as environmental impacts like the floods that were perceived to be as a result of the tree. This resulted in the communities' suing the government for its interventions that had later resulted to un-intended consequences and even demanded for its eradication and compensation for their losses. This negative perception slowly changed back to appreciation of the tree after the communities were sensitised on how to exploit it tree for their economic and social benefits. This coupled with legalization of charcoal production has resulted to most of the community members earning a living from charcoal production.

Legalization of charcoal production and transportation generates benefits that have further reproduced the existing economic inequalities within the local communities and the society as a whole. The youths and charcoal buyers tend to benefit more while the women and old men have less benefit. Further, the Tugens in Loboi were more active in charcoal production compared to the IIchamus in Salabani and Ng'ambo who seemed to be less active. Their slow uptake of charcoal production can be linked to their cultural value of livestock keeping where livestock is believed to be one's source of wealth. We therefore cannot expect revenues from charcoal business to be equitably distributed since the capacity to produce and sell the charcoal vary between and within households as well as the between the different ethnic groups. This is in line with Political ecology's core idea of unequal outcomes of policy interventions related to the environment, which has exposed winners and losers within charcoal production. Mathenge is now being regarded as a means of earning livelihood through sale of charcoal while other non charcoal producers like the brokers are selling their labor power through getting charcoal buyers as well as ensuring charcoal is at the collection centres and loaded to the available Lorries. It is also evident that there has been a social shift in the relation between the plant and the people, in that, the tree is no longer being viewed as a community asset but a resource to be exploited for personal gain.

A different twist comes in when a private company, CCKL, develops plans of using the tree for electricity generation. The factory is not yet in operation, but its plans are already exposing the tensions, power relations and rivalry that exist among the local residents. While one may imagine that its presence may help eradicate the invasive tree, it instead presents a situation of foreseen competition between the charcoal producers and the company for the resource. This is revealed when each party, that is, the CPAs and CCKL, each think that their business is more lucrative and the other party's business will "die a natural death." Besides, CCKL's plans of having the CBO's demarcate the land with Prosopis to ensure rotational harvesting of the tree presents a situation of changing the current land tenure regime of communal ownership to private lands. Through its plans, it is evident that CCKL in one way is attempting, through the CBO's, to control the access of communities to the resource (Prosopis).

The objective of CCKL here could be to monopolise Mathenge so as to control the ensuing economic benefits that may be derived from exploitation of this resource. And in anyway, the generated electricity will be supplied to the national grid for national distribution and not just to the residents of Baringo. Currently, the communities have power over this resource since it is on their farms, homesteads and on common use areas like pasturelands. Demarcation of these Prosopis sites will call for consensus among all the community members since the tree is not only on in homesteads but has become a communal property resource. Like many other trans-national corporations, for instance the case of ProCana in Mozambique (Borras Jr et al. 2011), CCKL presents itself as a powerful non-state actor that seeks to justify its actions on grounds other than self-interest. For instance, it justifies its activities in terms of employment and other benefits that will be available to the community as a result of its presence. It is this kind of foreseen benefits that in one way is triggering and exposing the rivalry and political tensions that exist between the respondents from the two ethnic communities. The shift of planned factory location from Ng'ambo to Marigat has exposes a sense of powerlessness among the IIchamus in Ng'ambo. Being a minority group with very little political representation, any action that does not go as per their expectation is likely to be viewed as political issue, where the dominating group has the ability to benefit due their political representation. Potential rivalry is also exposed when the respondents chose where to supply their wood and why the location of the factory is contested.

While CCKL is still on its plans, Parliamentary discussions are still on going on how to exploit this tree for economic benefit of the country. Recent parliamentary debates have seen senators push for the control of Mathenge through its exploitation (Daily Nation Newspaper, 5 October 2013). Besides, recent research has also revealed that the tree can be used as de-wormer among ruminants (Daily Nation Newspaper, 3 October 2013). Following this story, I can conclude that IAS can be a blessing in disguise while at the same time further provoking conflict over the species as a result of the perceived and actual opportunities the species presents.

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