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**THE ENVIRONMENTAL AND SOCIO- ECONOMIC IMPLICATIONS  
OF CHARCOAL MAKING IN SOIN LOCATION OF AINAMOI  
DIVISION, KERICHO DISTRICT. //**

BY

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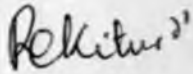
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A thesis submitted in 'part' fulfilment for the degree of Master of Arts (Planning) at the Department of Urban and Regional Planning, University of Nairobi.

September, 1997

## Declaration

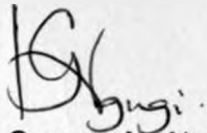
This thesis is my original work and has not been presented for a degree in any other University.



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Student

This thesis has been submitted for examination with my approval as University supervisor.



Dr. George N. Ngugi

Supervisor

## **Dedication**

For my late father Mr. Kiplangat Kilele who did not live long enough to see me graduate. And my mother Mrs Anna Kilele whose love, patience and support have seen me through many challenges.

## Acknowledgement

Several people have contributed to the success of this work. It would be extremely difficult to name them all by name but to all those who contributed in one way or another, big or small, I say thank you very much.

I am greatly indebted to the Government of Kenya through the Physical Planning Department, ministry of lands and Settlement for Awarding me a scholarship to pursue this course. To the members of staff of the Department of Urban and Regional Planning together with my student colleagues thank you for your constructive criticisms especially during the thesis review seminars. Special thanks to DR. G. Ngugi for his support and useful guidance as the thesis supervisor. I would also want to thank Mr. Mukira for his technical assistance in drawing the maps.

I would also like to express my sincere gratitude to various Government officials in Kericho District notably at the ministry of Energy- Energy Centre and Mr. Kirui of Ministry of Agriculture. To Mr. Chege Gitau of KENGO for his useful contribution, Thank you.

Most importantly, I want to express my sincere appreciation for the useful assistance, patience and understanding from my husband David. To my sons; Kipkorir, Kipkirui and Kiplangat thank you very much for your patience. To all

of you, THANK YOU VERY MUCH and God Bless you.

However despite all the contributions received from various sources, the errors and misinterpretations that may appear in this thesis are my responsibility.

## **Abstract**

Energy in all its various forms is important in the development of any nation. Man requires energy for survival and for Development. A great percentage of energy requirements in the developing nations, Kenya included are met by woodfuel. Commonly firewood is used in the rural areas and charcoal in the urban areas. As the urbanisation trends continue to go up so do the demand for charcoal.

This study examined the Socio-economic and environmental implications of charcoal making in a Rural setting of Kenya.

Both Secondary and Primary data was collected using various techniques. The Primary Data was obtained through, observation, interviews and a household questionnaire was administered to 58 households in the study area sampled from charcoal making sites in the location. The Secondary Data was obtained from library research, from Government Publications and from research findings by various NGO's.

Major findings from this study indicate that charcoal making has been gaining popularity such that more and more people are getting engaged in the practise. It was observed that anybody can make charcoal including women and children. The effect of charcoal making on education was also drawn whereby many residents noted that children were getting attracted to this practise and thus

neglecting school. Some parents were noted to be using child labour in the charcoal making. A link was drawn between charcoal making and food security whereby it was concluded that more time was spent on charcoal making than on food production while also noting that continued charcoal making has degraded the soil thus reducing the productivity of the soil.

It was further established that the widespread charcoal making has had implications on the environment. It came out from the study that there has been vegetation change whereby the original tree cover has been removed mainly for charcoal making. Opportunistic weeds have taken over.

In addition charcoal making has encroached onto water courses and has contributed to seasonal drying up of rivers.

There is no tree planting going on to replace the felled ones.

The direction that has been taken in giving the recommendations is that of ensuring food security. Improving agricultural production and diversifying production is seen to provide solutions to poverty and food problems.

On the same note, more effort should be put into cutting consumption of charcoal at the consumption point notably in urban areas and this may call for more conservation of the fuel and policy interventions as regards the prohibitive nature of the alternative fuels.

## **Abbreviations and synonyms used**

UNEP: United Nations Environment Programme

GOK: Government of Kenya.

UNDP: United Nations Development Programme.

SEP: Special Energy programme

FAO: Food Aid Organisations

KWAP: Kenya Woodfuel and Agro- forestry Programme.

KENGO: Kenya Energy and Environment Organisations.

KPCU: Kenya Planters Cooperative Union.

RAES: Rural Agro- forestry extension service.

MENR: Ministry of Environment and Natural Resources.

LDC : Least Developed countries

GTZ: German Technical cooperation

NEAP: National Environmental Action Plan.

Chang'aa: Traditional alcohol



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## **CHAPTER ONE**

### **1.0 INTRODUCTION**

Energy is a critical factor in any country's economic and social Development. Man needs energy to survive and he needs energy to develop. There are various sources of energy. The notable ones are: Electricity, petroleum, solar, biogas and woodfuel.

Energy is an essential commodity for all human activities. Odum (1970) has gone so far as to suggest that all commodities be valued in terms of their cash value. The sources of energy are varied and there are many factors that determine what type of energy is to be used. Some of these factors include among others;

1. Income of the user.
2. Activity for which the energy is required.
3. Availability of the energy type.

### **1.1 STATEMENT OF THE PROBLEM**

In the developing countries, wood is the main source of fuel being used both as firewood and as charcoal. Earl (1975) maintains that over 90% of the wood produced in Latin America and Africa serves as wood fuel in one form or another. This high level of woodfuel consumption means that more wood is

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consumed on a yearly basis than is produced on a sustainable basis.

Trees supply well over 90 % of the total energy used in poorer nations. This means that deforestation and tree loss are crucial to meeting Africa's needs. Africa needs energy for development. To fuel its transport, industry, agriculture and cities. It also needs energy for survival. this is in the form of wood and charcoal on which the majority of the people rely for cooking their food and heating their homes. Environmental bankruptcy is hitting hard at these supplies making the energy crisis a real and immediate one for millions of rural and urban residents. Timberlake, (1988: 96).

Digerness (1977) indicates that for much of the Sudan woodfuel consumption has aggravated the problem of desertification. Eckholm (1975) refers to the heavy dependence on increasingly scarce resources by much of the world's population as "the other oil crisis".

In this respect one can agree with Timberlake's assertion that, "The African droughts and famines are not sudden natural disasters nor are they simply caused by a lack of rainfall, they are the end results of a long deterioration in the ability of Africans to feed themselves. A decline caused largely by mistakes and mismanagement both inside and outside the continent" Timberlake,

(1988:2). He further argues that it was long term political and economic policies and systems not weather patterns which lay behind the emergency of 1984-1985.

Timberlake goes on to say that these policies have been bankrupting Africa's fragile, complex environment. And that a fragile environment makes development impossible in a continent in which three quarters of the population rely directly for their livelihood upon the environmental resources of top soil, plants, trees, animals, and water. Timberlake 1988:xi.

The petroleum hikes that were initiated by OPEC in 1973 and 1978 signalled the end of an era of cheap oil. The repercussions of these price hikes have created a new awareness of the importance of energy for sustained economic activity. However, the OPEC price hikes have served to usher the world from a universe perceived to be energy abundant to one perceived of as energy scarcity.

In view of the above, it is important to note that the prohibitive nature of the costs of other forms of energy have forced many people to use what they can easily obtain from their surroundings- woodfuel.

Virtually the whole population of Sub Saharan Africa now depends on fuelwood and Charcoal for its basic energy needs. In the countryside, wood and charcoal do the cooking and heating and provide the only source of light for many families. Even in cities like Nairobi, lower income people also rely on wood and charcoal. Timberlake, L. (1988:100). Timberlake further argues that trees supply well over 90% of the total energy used in poorer nations. This means that deforestation and tree loss are inevitable.

Kenya faces serious difficulties in assuring adequate and economic supplies of key forms of energy. As yet the country has no proven reserves of fossil fuels but the search is still going on. However, the fossil fuels are expensive for most Kenyans and this has forced them to use woodfuel.

Woodfuel is, by far, the largest and most important element of all energy sources in Kenya. Fuelwood and charcoal constitute the backbone of the Social and economic wellbeing of the vast majority of the Kenyan population. It accounts for 80% of fuels used both in the rural and urban areas. In order to see the woodfuel in correct perspective, there is need to realise that fuelwood and charcoal represent about 75% of our total national energy consumption.<sup>1</sup>

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<sup>1</sup> A speech by the permanent secretary ministry of energy, 1983.

Charcoal is gaining popularity among the urban residents especially in Kenya. 19 % of Kenya's population live in urban areas.<sup>2</sup> . With the estimated figure above showing that 80% of this population use woodfuel as a main source of fuel for cooking then the demand of charcoal is quite high and it is expected to increase. This is because the urbanisation rate is increasing and it is increasingly evident that most Kenyans are becoming poorer indicated by the Economic survey (1997) that more than 11 million Kenyans are living below the poverty line.

Charcoal has gained popularity because of various reasons among them;

- 1.It's ease in storage as compared to firewood.
2. Cleaner as compared to firewood.
3. Cheaper as compared to electricity and gas.
4. Is more energy efficient as compared to firewood.

With increasing demand for the charcoal there is an increase in supply in an attempt to satisfy the demand. This study sought to find out the environmental implications of charcoal making in Soin location of Kericho district. The study was also interested in finding out the implications that the charcoal making has had on the socio economic wellbeing of the residents.

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<sup>2</sup>. Obudho R.A 1996

In Soin location of Kericho district charcoal making is a common practise. To the charcoal makers it appears the easiest way to earn money. The rise in the oil prices has even increased the demand for charcoal since most urban residents now prefer charcoal since it is comparatively cheap. In an attempt to satisfy the demand the charcoal makers in Soin location have to burn more wood to supply more to meet the demand.

The indiscriminate felling down of trees in this place is a great concern for planners, development agents and environmentalists alike since the trees are not being replaced. The most critical problem is that how can one convince a charcoal maker to stop making charcoal while an alternative source of income is not being offered? Several attempts by the administration through the assistant chief, the chief and even the District Officer(D.O) with the administration police to curb the practise have failed.

Which is the best way to curb this? These people are slowly but surely impoverishing themselves yet they do not seem to see that as an immediate problem. It appears that they see the trees as an indepletable resource that will continue to satisfy their needs forever.

This study therefore sought to highlight this problem which in the researcher's view is of national importance. It also sought to understand from the residents



what motivates this activity, how can it be alleviated since the administration efforts have been fruitless is there a better way to do this and what in their opinion is a viable source of income which does not endanger the environment and the lives of the future generations.

## **1.2 Objectives of the study**

### General

To assess the environmental and socio- economic implications of charcoal making in Soin location of Kericho district.

### Specific

1. To find out to what extent charcoal making is an income generating sector in the study area.
2. To assess the Socio-economic effects of charcoal making.
3. To find out the environmental problems that have arisen as a result of charcoal making.
4. To make recommendations as concerns alternative sources of income and ways of sensitising the resident population on the dangers of the practise on the environment.

### **1.3 Assumptions of the study**

1. That charcoal making is a source of income in the study area.
2. That charcoal making has given rise to environmental problems in the study area..
3. That poverty will rise in the area as the food production deteriorates due to deteriorating soil quality.

### **1.4 Scope of the study**

There are several aspects of the charcoal industry that can be investigated. These include inter alia the supply side of the business, the demand side, the environmental implications, efficiency of utilisation, economics of the trade etc.

This study was mainly focused on the effects charcoal making has had on the people who are engaged in the production of the charcoal, their families and their neighbourhoods in general. It was mainly concerned with the implications that this activity has on the individual households and the community of Soin Location. It focused on the environmental consequences of this activity and the Socio- economic consequences of the same.

This study was carried out in Soin location of Ainamoi Division, Kericho district. The study was confined to the charcoal making areas as identified by the local area chiefs and by the local residents and from personal observation.

### **1.5.0 Research methodology.**

The primary data was obtained through interviews with the charcoal makers and with the households within the study area.

Questionnaires were administered to households within the study area.

#### **1.5.1 Interviews**

The researcher had interviews with the assistant chiefs in the locations and the area chiefs.

Interviews were carried out with the following persons;

1. The Community Development Assistant
2. The head teachers of selected primary schools in the area
3. Selected elders from various villages in the study area.

Interviews were also carried out with other relevant Government ministries like:

1. The ministry of Energy specifically the Energy Centre
2. Ministry of agriculture specifically the soil conservation unit
3. Ministry of Environment and natural resources, Forestry Department, Ainamoi Division.

### **1.5.2 Photography**

Photographs were taken as evidence of the existence of some activities and to demonstrate the extent of deforestation.

### **1.5.3 Observation**

Another method that was used is observation of the various activities that take place and their possible implications.

### **1.5.4 Secondary data**

The secondary data was obtained from researches that have been done by other people in other places on the same subject. Other sources included relevant books in libraries and other relevant publications from various ministries and Non governmental organisations dealing with these issues.

## **1.6 Sampling frame**

Through reconnaissance survey and from interviews with the local administrators and the residents, the researcher was able to select the sample. From observation and through informants it was found that there are some clusters where charcoal making was rampant. These clusters went beyond the administrative boundaries.

One cluster of charcoal making was in the area lying in Kaitui and Kipsitet sub locations.

The other cluster which was noted was one covering Kaitui and Soliat Sub locations.

Another cluster of Charcoal making was that at Kapsorok sub location.

It can also be noted that these are areas whereby there are still a lot of trees to be cut for charcoal making.

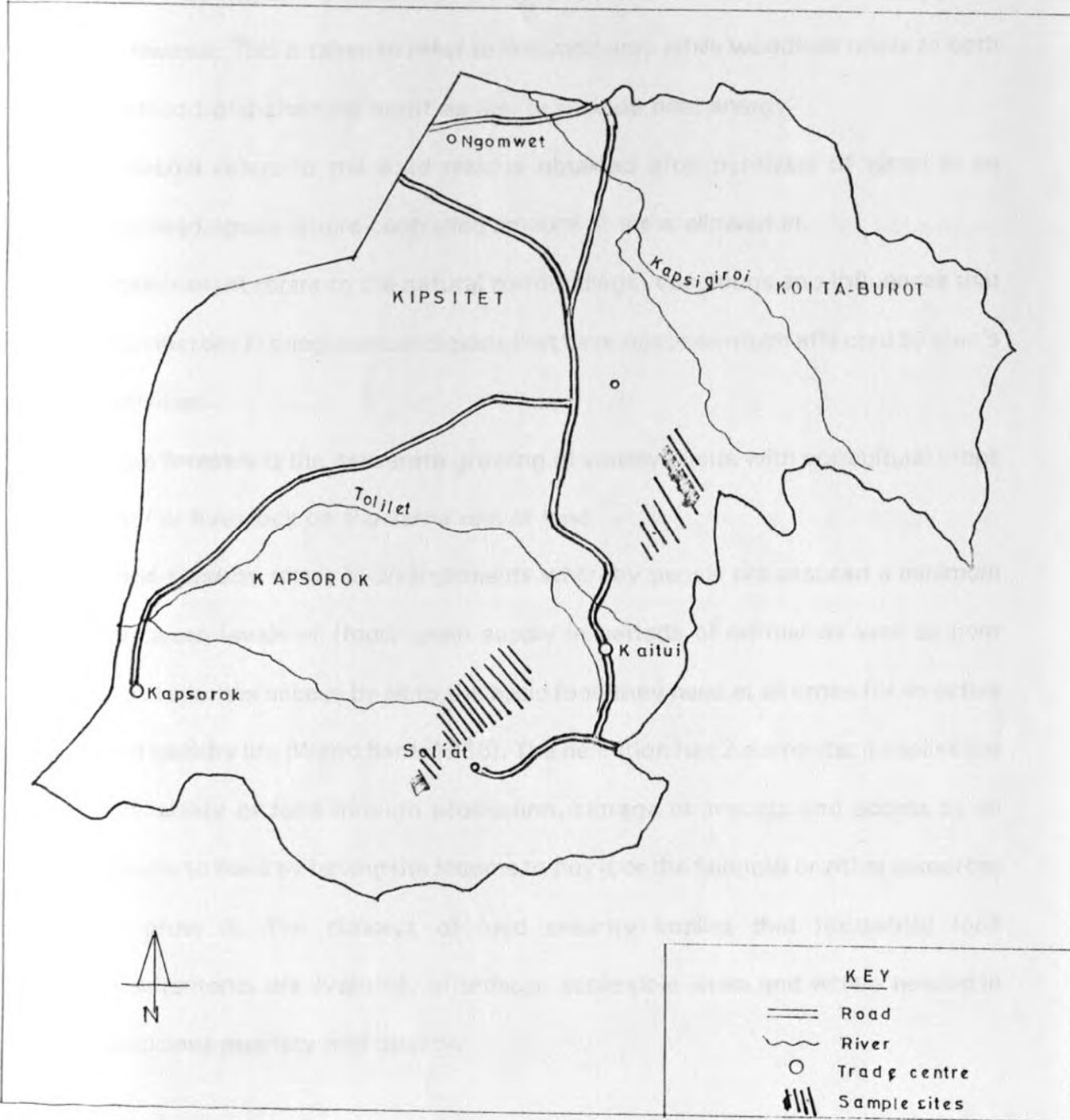
For detailed study of the various elements of the study, a sample had to be chosen. The researcher therefore selected some of the clusters identified. For the purpose of this research two clusters were chosen namely, The one covering Kipsitet and Kaitui sublocations and the one covering Soliat and Kaitui sub locations. See Map 1 overleaf.

This sample were, according to the researcher representative of the other areas in the location. However, despite choosing the sample for more detailed study information was also obtained about the other areas in the location from the assistant chiefs, and the chiefs.

Map 1.1: Data Sample sites in Soin Location

Map 1

DATA SAMPLE SITES



## 1.7 Operational definition of terms used in the study.

The following terms need to be defined.

**Fuelwood:** This is taken to refer to firewood only while **woodfuel** refers to both firewood and charcoal burnt as fuel to provide heat energy.

**Charcoal** refers to the solid residue obtained after pyrolysis of wood in an enclosed space where controlled amount of air is allowed in.

**Environment** refers to the natural surroundings, conditions and influences that are inherent in geographical regions that have not been much affected by man's activities.

**Agro forestry** is the deliberate growing of woody plants with agricultural crops and/ or livestock on the same unit of land.

**Food security** refers to arrangements whereby people are assured a minimum adequate levels of (food) grain supply in periods of normal as well as poor harvests. It is access by all to the basic food they need at all times for an active and healthy life (World Bank 1986). The definition has 2 elements; it implies the availability of food through production, storage or imports and access by all people to food by having the income to buy it or the financial or other resources to grow it. The concept of food security implies that household food requirements are available, affordable, accessible when and where needed in sufficient quantity and quality.

## 1.8 Study limitations

The study was faced with several limitations which included;

The researcher set out to undertake research in Soin location. When embarking on the study, it was found that the location had been further sub divided into three locations with further creation of new sublocations. This offered great challenges especially as regards the sampling frame which had to be re addressed to suit the new administrative boundaries. It must however be noted that the research was carried out in Soin Location as it existed before it was subdivided to form Soliat, Koitaburot and Soin locations.

There was the problem of scarcity of records as regards the division. In addition it became difficult to come across other research that has been done in this area therefore literature was hard to come by.

Considering all these and the time limit that the researcher was faced with the researcher had to strain harder to be able to accomplish her task on time.

Another limitation arose from the fact that charcoal making is illegal in the area. There was a lot of suspicion especially when it came to interviewing the charcoal makers and in the process of taking photographs of the respondents with their commodities. In many instances they did not agree to be photographed together with the charcoal.



The administration in the area posed another bottleneck. They argued that the researcher might expose the charcoal issue and in so doing they will be accused of inefficiency as regards eradicating charcoal making.

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# CHAPTER TWO

## 2.0 LITERATURE REVIEW

### 2.1 Overview

The problem associated of charcoal making has been treated in the debate associated with environmental degradation in general and deforestation in particular. This debate falls into the following strands of arguments:

1. Population stress
2. Land clearing for Agriculture
3. Poverty and Environmental degradation
4. Environmental mismanagement
5. Commercial demand.

Issues concerning woodfuel and charcoal making have been tackled by various scholars and have postulated various lines of thought concerning the charcoal making.

O'Keefe et al (1984) noted that the problems of fuelwood supply and demand are linked closely to other factors such as demographic trends, alternative fuel availability and Government policies.

However in analysing issues concerning energy especially woodfuel, it is difficult to divorce the arguments from the general development issues. It is therefore important to note that Africa faces a series of crises which are

interrelated.

1. There is the food crisis. The gradual decline of production of food and cash crops per person with no compensating rise in non- agricultural output that could finance food imports. Kenya has recently witnessed this and the implications were far reaching. It can also be noted that the causes of this were varied ranging from unwise use of resources to Government policies.

2. Poverty crisis, a gradual and inexorable increase in the numbers of people suffering from absolute poverty and malnutrition. Perhaps Kenya attests to this by virtue of the fact that about 11 million Kenyans live in abject poverty as reported in the 1997 Economic Survey.

3. Africa's exports have fallen in value while the costs of imports have risen this has led to the debt crisis, a crippling burden which places in jeopardy all conventional development efforts up to the next millennium.

4. Environmental crisis, Africa's soils and vegetation are being degraded and impoverished at an accelerating rate. If these processes continue unabated, Africa's future will be grimmer even than her recent past. Unlike the rest of the third world most of the continent is not developing but regressing. Africa is now and will remain for the next two decades the greatest challenge of world development. Harrison P, (1987:19)

It can be noted that the arguments concerning charcoal making are closely interrelated with the crises that Africa is facing. This indicates a cause - effect

relationship between the various factors which can be identified as Economic, Social and Physical.

## **2.2 POPULATION STRESS**

As the high population growth rate combines with the escalating world fossil fuel prices, depletion of indigenous woodfuel resources and the increasing constraints on high quality agricultural land availability, the need for appropriate policy intervention becomes increasingly urgent. Such planning must occur on a regional as well as national basis in order that development goals for balanced growth be reached.

The Developing countries tend to have burgeoning populations whose need for food, fuel and shelter strains the supporting capacity of the local environment. Overgrazing and over fishing lead to deterioration of the food base, lack of water, or misuse of it. It also leads to desertification, to deforestation and thus to erosion, siltation and floods. Construction of roads, dams, airports, irrigation systems power and industrial plants frequently exacerbates these problems or creates new hazards.

For more than two decades now, food production has failed to keep up with the growth of population. Africa's population is growing at a rate of 3.0% per annum, total food production has infact grown but not fast enough to keep

pace. This means that food production per person has fell by around 12% between 1965 and 1982 just before the 83/84 drought. Even in the most favoured regions of Africa food production per person fell by 8% between 1969 and 1971 and 1981 -1982. While Latin America and Asia have become almost self sufficient in cereals, Africa has grown more and more dependent on imports and food aid. Back in 1963, she grew no less than 90% of her cereal requirements.

Cash crops are often blamed for Africa's food crisis, but there is no Africa wide evidence of them doing well at the expense of food crops. The food crisis and poverty crisis affect the immediate present. While the financial and environmental crises portend an even gloomier future.

As our population continues to grow more and more forested lands have to be cleared to house the increasing numbers. And as lifestyles change, demand for other commodities like charcoal become a reality. The urbanisation process has given rise to the need for more charcoal and this has been accompanied by other problems among them, deforestation.

In Kenya, the Kenya woodfuel development programme was set up in 1983 following the Kenya fuelwood cycle study carried out by the Beijer Institute. The most important conclusion of the study was that, while the wood resources

of the sparsely populated semi-arid regions of Kenya are effectively being mined to meet pre dominantly urban woodfuel needs. The greatest woodfuel shortages are infact being felt in the densely populated areas of the country with high agricultural potential.

The declining state of our forest wealth and heritage constitutes a threat to soil fertility, agricultural productivity and infact to quality of life generally. Successional changes within ecosystems are normal processes. Semi arid ecosystems may fluctuate between grassland and shrubland thicket with a periodicity of a few decades dependent upon grazing and burning intensity and frequency. Such cyclical changes may do no long term harm depending upon the desired product of the land in question. A rancher wants more grass for his cattle and regards the shrubland as "bush encroachment". A village community values the shrubland as a source of fuelwood.

We find that much has been written about the plight of Africa and the environmental crisis which underlies it. In many parts of the continent food production lags behind population growth, hunger and famine strike with dreadful persistence, soils are degraded, forests and trees are disappearing at unprecedented rates and poverty deepens in the countryside and cities.

Two main processes occur in many instances of vegetation degradation i.e the loss of the herb layer and the loss of trees and shrubs. Sometimes too little importance is attached to the first of these. In savannah ecosystems, the first stage of degradation namely the destruction of herb layer may benefit the growth of seedlings and sapling trees owing to the reduced competition for water and nutrients. Thus an apparently flourishing woodland or shrubland may be seriously degraded grassland.

The importance of maintaining ecosystems relatively intact with their diverse plant and animal communities hardly needs emphasis. Numerous plant species are used as food plants particularly during drought, for medicinal purposes, natural gums and resins. Wild animals also provide a reserve of food. They are ecologically linked to the indigenous vegetation and perform such functions as seed dispersal and opening up thicket vegetation. The interrelationship of indigenous plants and animals strengthens the resilience of ecosystems in the face of drought conditions.

### **2.3.0 LAND CLEARING FOR AGRICULTURE**

Land that is best suited for tree production is also suitable for agricultural practises as food and cash crop production. This means that there is direct competition between these land uses for medium and high potential agricultural land.



Traditionally agricultural produce have taken priority over tree growing especially tree growing for woodfuel. The trees have often been regarded as a hindrance to expansion and higher agricultural productivity per unit. Often trees are cleared to give room for agriculture.

It is evident that tree planting for fuelwood was rarely thought of. Trees were seen as natural, free commodity which occurred in abundance. This made it difficult for trees to be grown on land suitable for agriculture. In many instances trees are not planted at all. And when planted they are planted on unsuitable land and not cared for therefore do not do well.

Forested land is often viewed as an enemy to Agricultural Development. In many instances, Forested land is viewed as fallow land and when need arises, it is quickly cleared to pave way for farm land. Kenya for instance relies so much on Agriculture as a source of income to finance many of its activities. Agriculture is overtaxed to meet the government's expenditure on industry, education etc.

But in taking too much from its farmers, Africa has taken too much from its land as well. It has overdrawn its environmental accounts and the result has been environmental bankruptcy, as the soils erode so do Africa's living standards. It logically follows that bankrupt environments lead to bankrupt

nations and may eventually lead to a bankrupt continent. This is evident in Africa today manifested by famines, wars, disease etc.

### **2.3.1 Usefulness of vegetation cover.**

Forests and their products enter into many aspects of our daily lives. An aspect of forests that is largely ignored is the protective function. Forests perform irreplaceable ecological services as well as economic products and recreation. They assist in the global cycling of water, carbon, oxygen and nitrogen. Forests stabilize hydrological systems, reduce the severity of floods and regulate streams and underground waters. Trees protect the soils on slopes and keep sand from blowing off deserts, they prevent sedimentation of rivers and reservoirs and when properly placed, help hold top soils on agricultural land. Adeneyi E.O et al, 1986:37.

Forests house millions of plant and animal species that will disappear if the forests are destroyed. But man ignores it at his own peril. Trees and hence forests are the climax vegetation type throughout the world. The pattern of development is therefore similar and tends to take the following pattern;

1. The forest is kept intact and used as a source of protein through hunting and vegetable matter, fruits fuelwood, dye stuffs, medicines and so on. It serves as a refuge in time of war.
2. Change from a nomadic hunter/gatherer existence into a settled pastoralist

existence based on the growing of arable crops lead to clearing of the forest and creation of settlement. The forest here is viewed as an " enemy".

3. These cleared areas are gradually enlarged and they eventually join up. The process is intensified by modern techniques, the use of fire and increased population pressure due to better medical care.

4. Increased land pressure leads to overuse of the land, soil degradation and environmental problems.

5. Migration away from such areas result particularly in times of adverse climatic conditions (drought or floods which are no longer ameliorated by forest cover). This migration tends to be directed to urban centres which in turn begins to suffer from overpopulation leading to electricity and water supply shortage, problems in refuse collection and security among others.

In addition woodfuel and related energy problems are important and pressing topics in their own right since most Africans are poor and can afford little other than firewood, charcoal or crop and animal residues to meet their basic energy needs. Woodfuel dominate the energy economies of virtually all African countries.

#### **2.4.0 POVERTY AND ENVIRONMENTAL DEGRADATION**

According to World Bank, environmental pressures stem from diverse roots: poverty, ignorance, greed, customs, climatic and geographic insufficiency, lacks

in technology and Development itself. Poverty is the worst form of pollution yet any intense effort to establish much less maintain a higher standard of living involves modifying the natural environment often perilously.

Environmental problems differ in the amount of time they take to become identifiable e.g although a global problem may eventually result from the gradual build up of Carbon dioxide in the atmosphere over a long period, the effects of persistent use of pesticides can be seen more quickly. Another variant related to timing is the degree of certainty. The more time it takes for a cause-effect relationship to be observed and understood, the greater the uncertainty as to its manifestations or impact.

Two other variables may be noted, **severity** and **reversibility**.

Severity cannot easily be compared because effects are of different types and occur in different aspects of life systems. Reversibility concerns the possibility of returning an ecological system to its former state.

Developing countries are faced with a dual energy problem. Oil price hikes constrict the monetary economy while wood fuel shortages beset the individual household.

In Kenya, land privatization and the establishment of individual rights over resources have led to a decline in access to common goods and their products

such as roofing thatch, "bushfoods," fuelwood and free grazing. This has put increased pressure on family plots since more needs have to be satisfied by them. At the same time the commodification of previously free or bartered subsistence goods is increasing the family's needs for cash to buy essentials including fuelwood. Juma C. (1984).

#### **2.4.1 Deforestation**

The importance of trees in the existence of man cannot be overemphasized. Animals rely on them for food and shelter and plants rely on the conditions they provide, like shade moisture etc. for their continued existence and man uses them in every aspect of his life; shelter, food, medicines, fuel, clothing, hunting and other accessories. They are of great economic, Social and ecological significance. In addition to hosting a large number of plants and animals it has been proven that tropical forests offer "environmental services" well beyond the local level. For instance these human forests protect water catchment areas, generate rainfall for downwind areas which would experience reductions in rainfall with subsequent losses to agriculture, livestock and plant growth. The role of forests in affecting global climate has been determined to be as important as the role of oceans. Some of the factors leading to deforestation include;

- a). Encroachment by local and other communities into the forested areas in an attempt to convert them to agricultural, urbanisation or other activities.

- b. Overuse of forests for timber, fuel and medicinal products.
- c. Pollution
- d. Poverty
- e. Desertification
- f. Natural and man made disasters like fires.

Deforestation is therefore one of the gravest threats to ecological stability and food production in Africa. The level of that threat varies widely between regions. Regionally the deforestation threat is more serious in the densely populated areas of West, East and Southern Africa. Major causes of degradation of forests are threefold;

1. Repeated fires deliberately lit by farmers to ease the task of clearing and by pastoralists to force the desiccating grasses to sprout a few green shoots.
2. Overcutting for fuelwood and charcoal. This usually starts with branches gradually weakening the tree until it dies then major limbs and trunks will be taken.

Deforestation often accelerates during a drought, when the trees contribution in exploiting deep underground water is most needed. Drought itself kills many trees while humans under the compulsion of drought kill many more. Drought often forces people in stricken areas to destroy and sell off their tree stock to get cash to buy extra food. These processes leave areas more vulnerable when

it does occur. Drought in this case creates the condition for its own perpetuation.

Cutting trees for firewood and charcoal making puts heavy pressure on the wood resources in many areas. Over the whole of tropical Africa, fuelwood consumption is thought to use up to 15 times more wood than commercial logging but logging takes place in the forests. According to FAO the annual rate of fuelwood consumption now exceeds the rate at which tree stocks are being naturally regenerated or planted over large areas of Africa.

In the Sahel it is estimated that fuelwood is being depleted 30% faster than it is re-growing in the accessible woodland areas. In Niger The rate of cutting for fuelwood is thought to be twice the rate of natural regeneration. Charcoal makers in the Rift Valley in Ethiopia are converting the acacia forest to semi desert at the rate of 60000 ha. per year.

In Kenya we find that the disastrous effects of dwindling forest and wood reserves both on the country's ecological system and on the standard of living of the Kenyan people make it imperative that action be taken immediately on a scale which requires international cooperation. The Government of Kenya is aware of this problem and has instituted a number of forestry programmes designed to increase supplies of firewood in rural areas and to promote the

establishment of peri-urban plantations to meet the growing demand of city dwellers.

The special energy programme supported this policy in a number of different ways.

1. Through promotion of improved stoves.-
2. Substitution of woodfuel by other forms of energy such as biogas from animal wastes.
3. Introduction of improved Kiln technologies for charcoal production.
4. Woodfuel production and afforestation

## **2.5.0 ENVIRONMENTAL MIS MANAGEMENT**

The need for human beings to be conscious of the effects of their actions and to conduct their activities so as to **optimise benefit** and **minimise** costs to the environment has become widely accepted. Management of the environment is closely allied to sustainable development, i.e the use of renewable and non renewable resources to satisfy present needs without jeopardizing future or long term needs not only those of human beings but also those of the other biotic components in the Environment. In this case humans are perceived as both manipulators and managers of the biosphere and that part of the earth where life exists.



Development and human survival is a balance between Economic, social and environmental sustainability. Here the environment may be taken to refer to the natural environment encompassing land, air, water and all living things and any additions arising from man's developmental activities. The NEAP ( National Environmental Action Plan) has categorised environmental issues thus,

- a. Economic challenges
- b. Physical environment
- c. Water resources
- d. Bio- diversity
- e. Agriculture and food security
- f. Desertification and drought
- g. Pollution control and waste management
- h. Human settlements and urbanisation
- i. Public participation and environmental education.
- j. Environmental information system
- k. institutional and legal framework.

World Bank has categorized the priority environmental issues facing developing world in the following 5 areas;

1. Destruction of the natural habitats
2. Land degradation
3. Degradation of Global commons

4. Degradation of fresh water resources.

5. Urban industrial and agricultural pollution

For the purpose of this work, destruction of natural habitats, land degradation and degradation of fresh water resources will be addressed.

### **2.5.1 Land degradation**

Land is the backdrop on which all terrestrial life is sustained. It is one of the primary resource bases for sustainable development. Soil management is an integral part of the management of all terrestrial ecosystems. Soil erosion has been reported from almost every country in the world and it has been estimated that humanity causes the loss of several million tonnes of top soil from world cropland every year.

Declines in soil fertility or even total losses of land to agriculture and other activities are common in many parts of the world. In many nations especially in Africa the capacity of the land to support rapidly growing populations is being reduced by soil degradation and loss at unprecedented rate and scale. Kenya with its wide variety of landscapes and many different types of soils has soil erosion and degradation as a major problem.

Some causes of land degradation include;

1. Mining which includes mineral extraction, sand and gravel extraction.
2. Deforestation and bush burning.

3. Land fragmentation resulting in very small holdings being overused or poorly managed.
4. Desertification
5. Pollution through the excessive use of agro chemicals.
6. Unsuitable farming practises like inappropriate irrigation and use of heavy machinery.

### **2.5.2 Forests, fuel and energy**

Logging for export, clearing for agriculture and cutting for fuelwood all consume trees for human benefit. But these uses are often short term, foreclosing even on future National Development options. Africa cannot afford to conserve untouched all, its vast areas of forests but Africa can afford even less to squander the economic and social benefits which proper forests and woodland management can bring. Mismanagement often results in wastelands unable to produce timber, fuelwood or crops. Timberlake,(1988:87).

"How can African countries use their forests and the lands on which they stand in the most effective ways possible? What is the role of deforestation in environmental bankruptcy?"

### **2.5.3 Loss of bio-diversity**

The world's bio-diversity is made up of millions of micro organisms, plant and animal species that inhabit the planet. Within each species is a variety of

populations that have naturally evolved particular characteristics over millennia. Some species have become adapted to a particular environment and can flourish in some of the most hostile regions of the earth in which other species including humans would quickly perish. The very existence of many species is almost immeasurable and is greatest in micro-organisms which play a large part in maintaining ecosystems, the biosphere and global ecology. The human race depends upon microbial plant and animal species for food and uses them as raw materials for a wide range of products.

#### **2.6.0 COMMERCIAL DEMAND FOR WOOD FUEL.**

Woodfuel as a forest produce in Kenya has declined in importance over the years according to the Forest department annual report 1995. In the earlier years of this century up to the mid 1950's the forest department was the main supplier of woodfuel mainly for running rail transport. Thereafter the Railways ceased to be a major a consumer and the percentage revenue earned by the forest Department from the sale of fuelwood declined from about 40.5% on average for the period 1930 to 7.2% in 1965.

#### **2.6.1 Woodfuel for industry**

Baking, brewing, tea and coffee drying, tobacco curing, fish smoking, sugar production, pottery, brick and lime making are some of the industries that heavily depend on woodfuel in many countries. Barnard G. et al (1986) report

that in Kenya industries and small commercial enterprises account for 26% of the total national fuelwood and 12% of charcoal used. In some industries this role is increasing rather than diminishing. Many brickworks in Nepal have switched back to woodfuel because the cost of imported Indian coal has become too high. Some tea processing factories in Kenya prefer woodfuel rather than oil.

These industries like urban settlements may form the principle cause of wood resource depletion unless some special arrangements are made to meet their demand on sustainable basis. In Kenya tobacco farmers are encouraged to grow the trees required to cure the tobacco. They are offered free seedlings and technical advice to enable them to do this. Sale of trees for fuel for such industries may stimulate more tree growing as an incentive to dedicate land, effort and resources. Often harvesting of other commodities such as timber, poles and posts also offer an appreciable quantity of woodfuel.

### **2.6.2 Inter regional charcoal movements**

Charcoal demand in any particular region in Kenya are met by wood resources within the region itself and from neighbouring regions. As a result, inter regional charcoal movements have arisen between resource areas and the charcoal markets. The relationships are geographic and economic in that charcoal is transported from areas of production to areas of consumption while at the same

time avoiding the dis- economies of transporting fuelwood itself over long distances.

In the 1980 energy survey in Kenya it was found that demand for wood from other regions is significant in only 4 provinces. Eastern, Rift valley, Western and North Eastern this is probably explained by the charcoal requirements in the cities and towns in the surrounding region.

It was found that Eastern and Rift Valley are charcoal exporters to Nairobi. Western and Rift Valley supply charcoal to Kisumu and North Eastern supplies a small amount to Mombasa. Charcoal demand in Central/ Nairobi is met through various channels , 10% comes from within the province, 30% from Eastern and 60% from Rift valley. This shows that major charcoal markets especially in form of major towns draw on wood resources that are fairly far away. This is facilitated by the road networks that reach out to these regions. While roads have been known to expand opportunities for development in an area, they have also been found to accelerate the drain on remote and environmentally precarious regions of some of their most important resources i.e tree cover. For example the provision of access road in Mbeere, Embu district has reportedly led to substantial increase in the number of trees being felled for charcoal. Especially for urban markets with a total disappearance of large hardwoods such as *Albizia Tanganykiensis*. Brokensha and Riley found

that the road introduced through SRDP made the trees to be more accessible to depletion.

### **2.7.0 EVOLUTION OF ENVIRONMENTAL MANAGEMENT IN KENYA.**

Soil conservation and land development practises have continued to be significant aspects of Environmental Management. The land and farm management unit of the ministry of agriculture enforced the implementation of the soil conservation measures throughout the republic. As the human population continue to increase the pressure on land has become intensive and extensive. The Kenya government has developed and implemented an educational programme to educate farmers about the need for improved soil conservation practises and various legal actions regarding seriously eroded regions on farms.

From 1974 to 1978, the concept of environmental conservation picked up momentum. In the early 70's the Government established an *ad hoc* committee on the human environment to identify environment problems and provide potential solutions. From these initiatives came the report that the Kenya Government presented at the UN conference on the human environment at Stockholm in 1972. Added to this was the decision to locate the UNEP in Nairobi, Kenya and also the establishment of institutions and environmental programmes in many countries. The Kenya Government established the National

environment secretariat, soil and water conservation programme, the watershed and catchment conservation programme and many others. This has come due to the need to protect, conserve and manage resources for the present and future generations.

The first National Development plan 1966-1970 titled "Redistribution and growth" noted that in Kenya, the traditional view of property rights has been that no matter who owned or managed property it was to be used in the best interests of the society. This view of property was also applicable to income derived from property ( Kenya, 1966:xi).

The plan maintained that various forms of ownership would be permitted and encouraged but in all cases the state would retain the right to plan and control the uses of resources and to limit the excessive accumulation of wealth. The plan goes on to add that the planning and control of resource use are the principal tools for managing the nation's economy. The plan noted that Kenya's forests are valuable assets (natural resources). At the time, the country had approximately 6000 square miles of indigenous forests which served important functions of protecting soil and water catchment and of supplying local timber requirements. The plan further emphasized that without forests to protect its catchment areas, much of Kenya's land would be lost.



The 1984-1988 National development plan had its theme as "mobilisation of domestic resources". This policy document emphasized the importance of energy in accelerating the pace of Kenya's economic and social development. Traditionally the vast majority of our population has depended on fuelwood and charcoal. Because of this dependence, the nation's wood resources were seen to be rapidly declining due to the combined effects of the unprecedented population growth rate and low conversion and end use efficiency.

During this plan period only 70% of woodfuel demand was satisfied from yields, the remaining 30% was met through depletion of woodstock. This level of deforestation were seen to be having a number of negative effects such as lowering of the water table in catchment areas and the early siltation of dams.

The Government woodfuel supply strategy was based on a combination of options to meet medium and long term supply requirements.

These options include;

1. Agro- forestry
2. Peri--urban plantation
3. Industrial woodfuel plantation
4. Rural afforestation and soil conservation programme.

The traditional role of forests in Kenya has been to provide people with fuelwood and raw materials for buildings tools and implements.

The 1989--1993 National development plan with the theme "Participation for progress" estimated that the woodfuel would remain the main source of energy for domestic use. The plan also noted that vegetative and forestry resources of the country were limited. Though they were potentially renewable, the rate of exploitation was seen to be exceedingly high rendering them practically non-renewable. Where depletion has taken place rehabilitation of already denuded areas could only be accomplished at enormous costs and over periods of time.

Destruction of forests was seen to be threatening their critical functions which include, prevention of soil erosion, protection of water catchment and wildlife habitats and conservation of valuable gene pools of flora and fauna. This process is seen to impact negatively on agriculture and the tourist industry which are vital to the national economy. It also threatens water supplies for a large proportion of the population and causes severe siltation problems for the major hydro--electric and irrigation schemes.

A critical factor which was foreseen in the design and implementation of strategies for the management and preservation of forest resources is the ever growing demand for wood fuel for rural households and for low income urban households in form of charcoal. In the plan period 1994--1996 about three quarters of the charcoal used was derived from rangeland vegetation. The consequences of widespread deforestation and the laying bare of the

rangelands through fuelwood harvesting are seen to be extremely serious.

The 1994-1996 National Development Plan with the theme "Resource mobilisation for sustainable development" noted that forests in Kenya have been considered mainly as a source of fuelwood, raw material for building tools, medicine, forage for domestic animals and in some cases cultural values. Forestry is seen to be providing a linkage with agriculture and livestock sectors which are the backbone of Kenya's economy.

In Kenya, degradation of forests and vegetation generally is attributed to illegal cutting of trees, overgrazing, fires, excision of forests and aphid attack on cypress plantation. Generally, environmental policies have been incorporated in the development plans of 1979-1983, 1984-1988, 1989--1993, 1994--1996.

### **2.7.1 Environment policy in Kenya**

The Government of Kenya (GOK), UNEP, and UNDP did a project which was the first attempt by UNEP to undertake a comprehensive study of the environment/development relationship in a national planning context.

The objectives of the research were;

1. To analyze the scope of environmental considerations into development

planning and decision making.

2. To assist the GOK in identifying and promoting environmentally sound development strategies within the framework of national development planning and to layout practical medium term solutions.

3. To propose policies, actions, and institutional arrangement necessary for the formulation and implementation of this kind of development planning.

At the moment in Kenya, many of the most critical environmental issues that must be faced involve the destructive use of Kenya's natural resources. In the past it may have been freely available. It may have seemed that forests and wildlife were abundant and there was land to spare nowadays depletion of the forest, degradation of the soil and the destruction of wildlife for short term gains may have negative productive consequences not for some remote generation but in the immediate future.

More economic use of Kenya's natural resources and proper environmental management are therefore viewed as luxuries but an immediate practical necessity.

In relation to decision making there are three main barriers to a proper response to environmental considerations;

1. The remoteness of some of the critical effects over time or space may suggest to the impatient decision maker or even the community at large that

environmental effects are second order issues that can reasonably be ignored in considering current options.

2. The hidden and cumulative nature of some of the natural interconnections mean that some environmental costs may not be recognised or may be a matter of controversy among experts when a biological system has apparently withstood the deteriorating effects of damaging inputs for long periods it may be difficult to believe that an underlying process is underway which could lead to irretrievable and sudden collapse as is sometimes the case.

3. The institutions making the decision be it private or public individuals or corporate entities may not bear the cost or enjoy the benefits of the negative or the positive environmental consequences of their acts. This sort of issue is handled in project evaluation by attempting to adjust private costs and returns to approximate their social value.

Regulations or taxation may encourage different behaviour which is feasible given an institutional capacity to make a choice to invest and innovate i.e for big companies. Small and poor institutions may find it very difficult to devise and implement preferable behaviour. Where environmental degradation results from a larger number of small acts which satisfy a basic human need, regulation by itself is insufficient. Such is the case for charcoal burning. In this case social action is required to devise preferable alternatives.

One important form of self destructive activity which illustrates a number of the points above is the current heavy dependence on charcoal and wood which are very inefficiently utilized as an energy source for large segments of the population. The current patterns of wood use for fuel will not be sustainable as the combination of increased demand and depletion of timber reserves means that wood cannot long remain a low cost fuel alternative. This is because they are not economic in over- utilizing a resource without recognizing its real value and are destructive in the wide sense of contributing to the depletion of forest cover with the dangerous environmental consequences.

The use of woodfuel is of interest as a general example as it illustrates a number the complexities of environmental policy. It is now very widely recognised as a problem but simple instantaneous solutions are not available. Woodfuel is used by the poorer sections of the community who would have no ready alternative if supply was to be restricted.

The charcoal example illustrates the interplay between economics, social and ecological factors. Here the term ecological could be referring to the consequences of the patterns of development for soil, water systems, plant and animal life etc.

Solutions could be sustainable only if they were consistent with both the natural conditions to human initiatives on the one hand and on the other hand

outcomes are politically and socially acceptable.

At the national level the changing energy situation manifests itself through the increasing economic burden of importing energy. No less important in the Kenyan context is the difficulties arising from the use of woodfuel and charcoal as an important energy source by the large majority of households. As sources of available wood are depleted there is both an increasing cost to the domestic use and the dangerous effects of denuding the countryside of forest cover. Developing new energy sources and economising on existing ones is therefore a matter of great urgency.

### **2.7.2 Woodfuel conservation**

Even outside the forest proper, trees are a key element in the stability of all but the most arid ecosystems in Africa. They are effective in counteracting the effects of erosive, torrential rainstorms and infertile soils. Their roots anchor the earth, their canopies protect it from the sweep of wind and the splash of raindrops. They draw up nutrients from the deeper soil layers and deposit them by leaf fall on the surface increasing the organic content of the soil thus improving its fertility. The trees increase the infiltration of rain into the soil raising water tables and reducing dangerous run-off. Harrison, P., (1987: 171).

Once the tree cover is weakened or removed the benefits are curtailed , soil temperatures rise to the point where plants are stressed and evaporation increases. Soil moisture, fertility and stability decline, more water is lost to run-off, wind or water erosion increase.

### **2.7.3 Kenya's energy sector.**

Kenya exhibits an exceptionally high energy import dependency. The present commercial energy resource endowment is quite limited. HEP, geothermal power and alcohol production account for only 5% of total commercial energy consumption and 95% of energy supplies must be imported. But Kenya faces



2 major energy problems:

1. There are no proven oil or gas reserves which could be substituted for imported petroleum products in the near future 2. The long term supply of traditional energy (fuelwood) is endangered. 70% of total energy demand in Kenya is still met by fuelwood.

Emphasis must be placed on strategies and technologies which help alleviate the second energy crisis that is the fuelwood problem. Increasing fuelwood and other types of biomass such as agriculture wastes must be regarded as priorities for future action.

#### **2.7.4 Sources of wood for charcoal**

Foley's study of charcoal supply revealed that charcoal is more often found in dry open savannah types of woodland than in dense humid forest. This is because wood found in dry savannah is usually hard and dense and has a low moisture content and thus tend to yield high quality charcoal. The open nature of the savannah terrain simplifies the task of collecting the wood and transporting the charcoal in addition the climate is favourable to charcoal making throughout the year.

The trees that are used for charcoal making in the open savannah are often unsuitable for timber therefore there is little economic competition for their use.

Perhaps this explains why there is a lot of charcoal making in Soin, many of the people do not see any other importance of the trees apart from charcoal making. In addition they see the trees as a menace and they want to clear it to create space for agriculture. However, they do not see that their cutting of these trees exposes them to greater dangers of soil erosion and the drying up of streams. The same people who cut down the trees for charcoal making do not replace them by planting more trees preferably the exotic type which would take shorter time to mature. These would be a source of firewood to the local residents and also be a source of building materials and shelter for wild game.

Tree species used for charcoal vary but almost always, those which are hard and slow growing are preferred because they have a high density. Acacia and combretum species are widely used in the drier areas of Africa, teak and other hardwoods are used in Thailand mangrove is particularly favoured in the areas where it is available. But as preferred species disappear, charcoal makers are forced to cut whatever trees are available leading to production of poor quality charcoal some of which produce cascades of flying sparks when used others do not produce the desired amount of heat.

The indiscriminate use of whatever biomass is available worsens the environmental impact. In the study area, originally the charcoal makers used to use the best woody biomass but at present they have no choice they just fell

whatever tree they can find to make charcoal with total disregard of the implications.

### **2.8.0 Improved charcoal production technologies**

Charcoal is a commercial fuel which is consumed mainly by urban households whereas fuelwood serves as the principal energy resource base in rural areas. In 1980, total household demand for energy was divided among fuelwood (86%) charcoal (9.5%), Petroleum products 4% and electricity 5%. Apparently however, due to constraints on the supply side the consumption pattern of both rural and urban households is changing. Recent findings support the view that charcoal consumption is gaining in importance. Consequently, charcoal production was designated as a priority area for the (SEP) special energy programme activities.

A Pilot project was undertaken at Muka Mukuu estate in Machakos district. Two half orange Kilns were constructed using commercially produced fire bricks. Total investment cost did not exceed Kshs. 8500 per Kiln. For experimental purposes, project staff members also built a half orange Kiln using locally made firebricks this required the construction of two ovens, each with a filling capacity of 200 bricks. The half orange brick kiln proved to be the more profitable carbonization option for Muka Mukuu.

### **2.8.1 Woodfuel resources in Kenya**

Trees the basic raw material for firewood and charcoal are grown on land. They are therefore subject to all aspects of climate and soil conditions but the best productivity would be expected where these are favourable. Some tree types however are adapted to harsh conditions but most of these though suitable for firewood and charcoal are often small and slow growing making them unsuitable for regular harvesting.

Beyond the immediate wood production characteristics of the various land areas other factors influence the relationship between the availability of wood resources and the demand for them. These include geographic and Socio-economic conditions affecting access to and movements of wood and wood derived commodities.

Charcoal making is often accelerated by the availability of trees often seen as a common good and obtained at very low price if any at all. In view of the high and increasing demand for charcoal particularly from the urban areas of the country, how adequate can charcoal supply be ensured on a sustainable basis?. Various suggestions have been made with peri-urban wood plantation particularly earmarked for production and supply of firewood and charcoal to urban settlements. Indeed this is one strategy that has been emphasized in the

National development plans and perhaps this is quite applicable in that the urban settlements are the single main users of charcoal.

### **2.9.0 Overview of the Charcoal trade in Soin Location**

In Soin location, the demand for the charcoal has perpetrated the charcoal trade and since the commodity can be sold off without many problems, many view it as an easy source of money. As long as the tree is there it can easily be converted to charcoal and sold off to the increasing buyers.

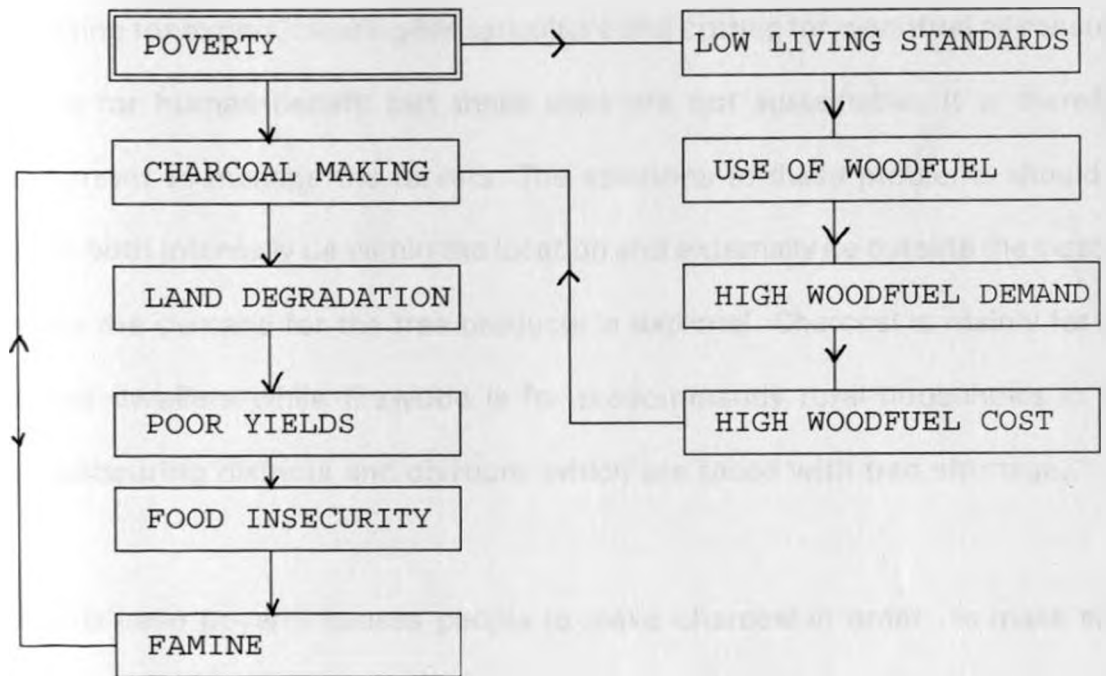
The charcoal trade in Soin is a complex issue, the demand for this commodity is from outside and when the demand goes up the price goes up thus motivating more people to engage in this activity hence worsening the effects of tree loss. Even though charcoal making is banned by the administration it is difficult for them to stop since they need the money to buy basic necessities. And with the increasing rate of unemployment many youths find a job in charcoal making.

In view of the above arguments, the conceptual model that arises to explain the charcoal making problem can be formulated in the following manner; The key issues identified especially as regards Soin location are:

- 1. Poverty
- 2. Low living standards
- 3. Food insufficiency

### 2.9.1 Conceptual Framework of the Charcoal making in Soia

#### Location



SOURCE: Author, 1997.

In the author’s view, the effects of charcoal making are cyclical. The primary factor behind charcoal making is poverty. One therefore makes charcoal to raise some money to buy basic necessities. Charcoal making in turn leads to environmental degradation whereby tree loss reduces the soil productivity in

that the leaf fall that adds humus to the soil will have been eliminated. Tree loss also increases the intensity of the heat and a reduction of the animal life that require vegetation to thrive e.g the wild game like the antelopes, which traditionally were a source of meat for people and bees which were and still are important for honey.

Logging for export, clearing for agriculture and cutting for woodfuel all consume trees for human benefit but these uses are not sustainable, it is therefore important to manage the forests. The solutions to these problems should be seen both internally i.e within the location and externally i.e outside the location since the demand for the tree products is external. Charcoal is mainly for the urban dwellers while firewood is for predominantly rural households in the neighbouring districts and divisions which are faced with tree shortage.

In this case poverty causes people to make charcoal in order to make ends meet. The charcoal making in turn leads to land degradation due to depletion of vegetation cover which lead to soil erosion and other related problems. This in turn leads to poor yields of crops which results in food insufficiency and hence frequent famines. In this case people will have to employ some coping mechanisms and in many instances, people engage in more charcoal making.

The challenge therefore is what happens when there is no tree left to be sold

as firewood or to be turned to charcoal. What will the many young school dropouts and school leavers do to earn a living, where will they get their firewood and where will their neighbours get their woodfuel as well? There is need for urgent education for these people so that as they fell trees which they seemingly must they also plant more to replace the felled ones. This calls for keen cooperation among field staff in the relevant ministries, departments e.g forestry department of the ministry of environment and natural resources, soil and water conservation unit under the ministry of agriculture and the local people.

### **2.9.2 Summary**

The literature review covered touched on various issues notably how poverty leads to environmental degradation. Various issues have been addressed concerning how poverty leads to the use of trees for various needs such as; Provision of fuel, and the conversion of these trees into money in the form of selling it as firewood and charcoal.

The chapter has also addressed the environmental policy in Kenya. It notes that problems of fuelwood supply and demand are linked closely to other factors such as demographic trends, alternative fuel availability and government policies.



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## **CHAPTER THREE**

### **THE STUDY AREA**

#### **3.0 Introduction**

Any activity carried out in an area reflects the Social, Cultural, Economic and Physical aspects of the area. Charcoal making as an economic activity is done where the vegetation and terrain allows and there is availability of market. This chapter addresses the background of the study area and will emphasise the key issues as they relate to charcoal making.

#### **3.1 Geographical position:**

Kericho district is one of the districts in the Rift Valley which is bordered by Uasin Gishu to the North, Koibatek, Nandi to the Northwest, Nakuru to the East, Bomet to the South, Nyamira and Homa Bay to the South West and Kisumu to the West.

The district lies between Longitude  $35^{\circ} 02'$  and  $35^{\circ} 45'$  and between the equator and latitude  $0^{\circ} 23$  South. The district occupies an area of 2515 square Kilometres comprising six divisions namely; Londiani, Bureti, Belgut, Kipkelion, Fort ternal and Ainamoi. Table 3.1 indicate the area covered by each division in Square Kilometres. Map 3.1 shows the location of Kericho district magnified from the National setting and also shows all the divisions of the District.

**Table 3.1****Area of the district by division**

DIVISION	AREA SQ KM
Fort Ternan	158
Londiani	523
Bureti	312
Ainamoi	540
Kipkelion	321
Belgut	660

Source: District Survey office Kericho, 1993

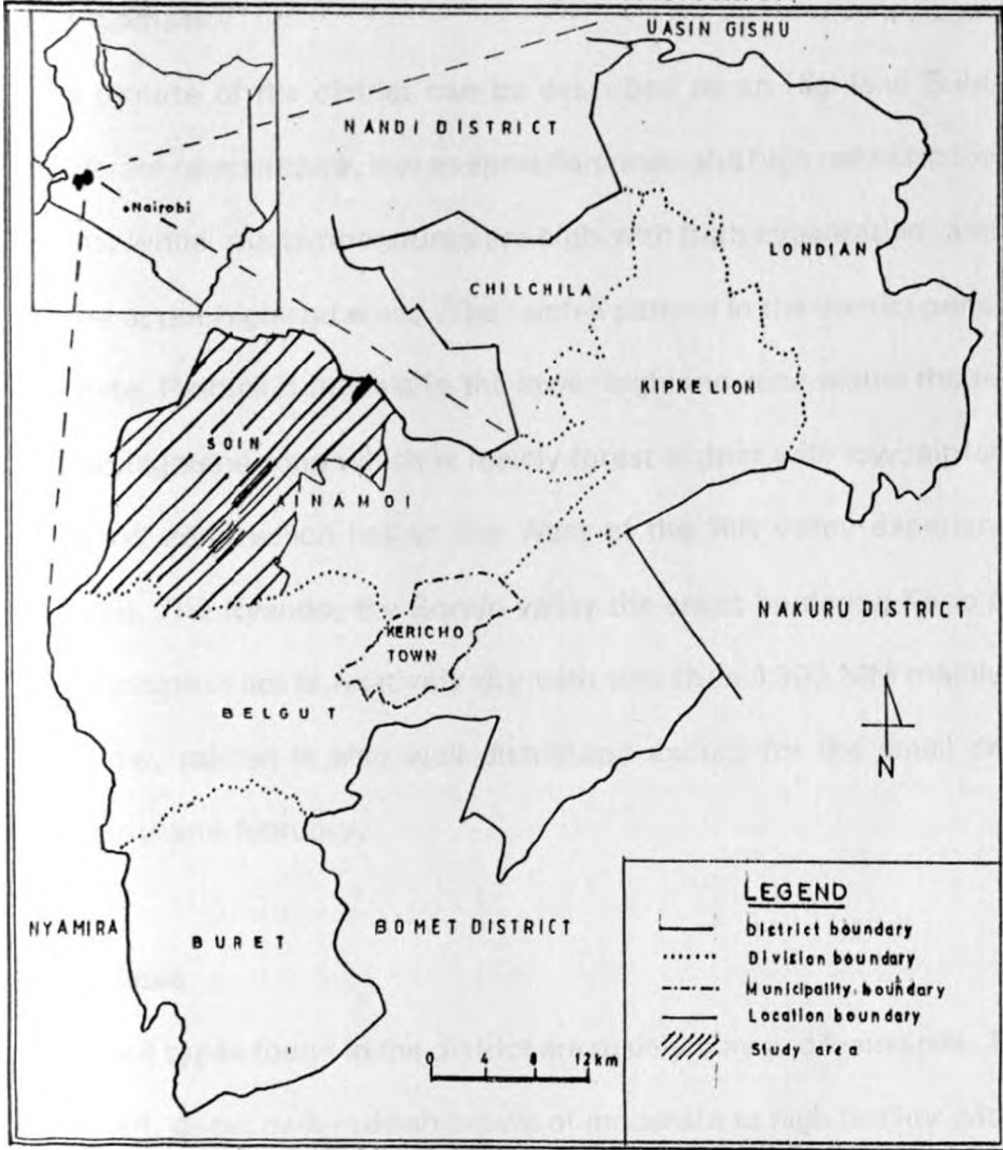
### 3.2 Topography and geology

The major part of Kericho district is characterised by undulating topography. The overall slope of the land is towards West. Consequently drainage is in that direction. The district forms a hilly shelf between the Mau Escarpment and the lowlands of Nyanza.

To the North and North East are Tinderet hills and Mau escarpment and between them is the gently rolling land forming Londiani Division. The North and central part of the district is well watered with rivers some of the main rivers include; Yurith, Kiptaret, Timbilil, Maramara, Nyando, Kipchorian and malaget. They are characterised by rapids and falls which could be used for H.E.P generation.

Map 3.1 : Location of the study area in Kericho district.

THE STUDY AREA IN KERICHO DISTRICT



### **3.3 Climate**

The climate of the district can be described as an Highland Subtropical with moderate temperature, low evaporation rates and high rainfall in lower highland areas, while the temperatures are high with high evaporation and low rainfall at the upper highland areas. The rainfall pattern in the district generally follows altitude. Rainfall is highest in the lower highland zone within the tea zone. The upper highland zone which is mainly forest is drier with low rainfall. The upper midland zone which lies to the West of the Rift valley experiences uniform rainfall. The Nyando, the Sondu valley the areas bordering Kano plains where Soin location lies is relatively dry with less than 1300 MM mainly due to rain shadow, rainfall is also well distributed except for the small dry season in January and february.

### **3.4 Soils**

The soil types found in the district are mainly clay and loam soils. They are well drained, deep, dark reddish brown of moderate to high fertility with acid humic top soil. Loam soils have a similar profile as clay soils but are shallow partly with lithic contact. Clay soils occupies about 47% of the district. Loamy soils cover about 25% of the agricultural land and is mainly in areas bordering Kisumu district. In addition to growing other crops in the high potential zone,

sugarcane and coffee dominates the area. The district can be divided into 4 main agro-ecological zones which can further be subdivided into minor agro-ecological subzones.

Soin location mainly consists of Black cotton soils which is mainly suitable for cotton, beef, Zebu cattle and maize. The major part of Kericho district exhibits undulating to rolling topography that gives way to flatter terrain in the South. Overall slope of the land is towards the West, consequently drainage is also in that direction at least in the Eastern part cutting deep valleys.

Intermediate and basic volcanic rocks (Phonolites) underlie most of the area while undifferentiated basement system rocks mainly granites outcrop in the South. The Agro Ecological Zone where Soin Location lies is the marginal sugar cane zone with a long to medium cropping season followed by a weak medium to short one. Crops that can do well in this Zone include:

Sorghum, sweet potatoes soya beans, sunflower, sweet pepper, chillies, pumpkins, fingermillet, beans, pigeons, peas, ground nuts, egg plants, tomatoes, onions. Second rains, start indistinctly towards end of August.

### **3.5 Agro ecological zones**

**Upper highland (UH):** This zone is further sub divided into 2 main sub zones.

UH1 is suitable for sheep rearing and dairy production and pyrethrum

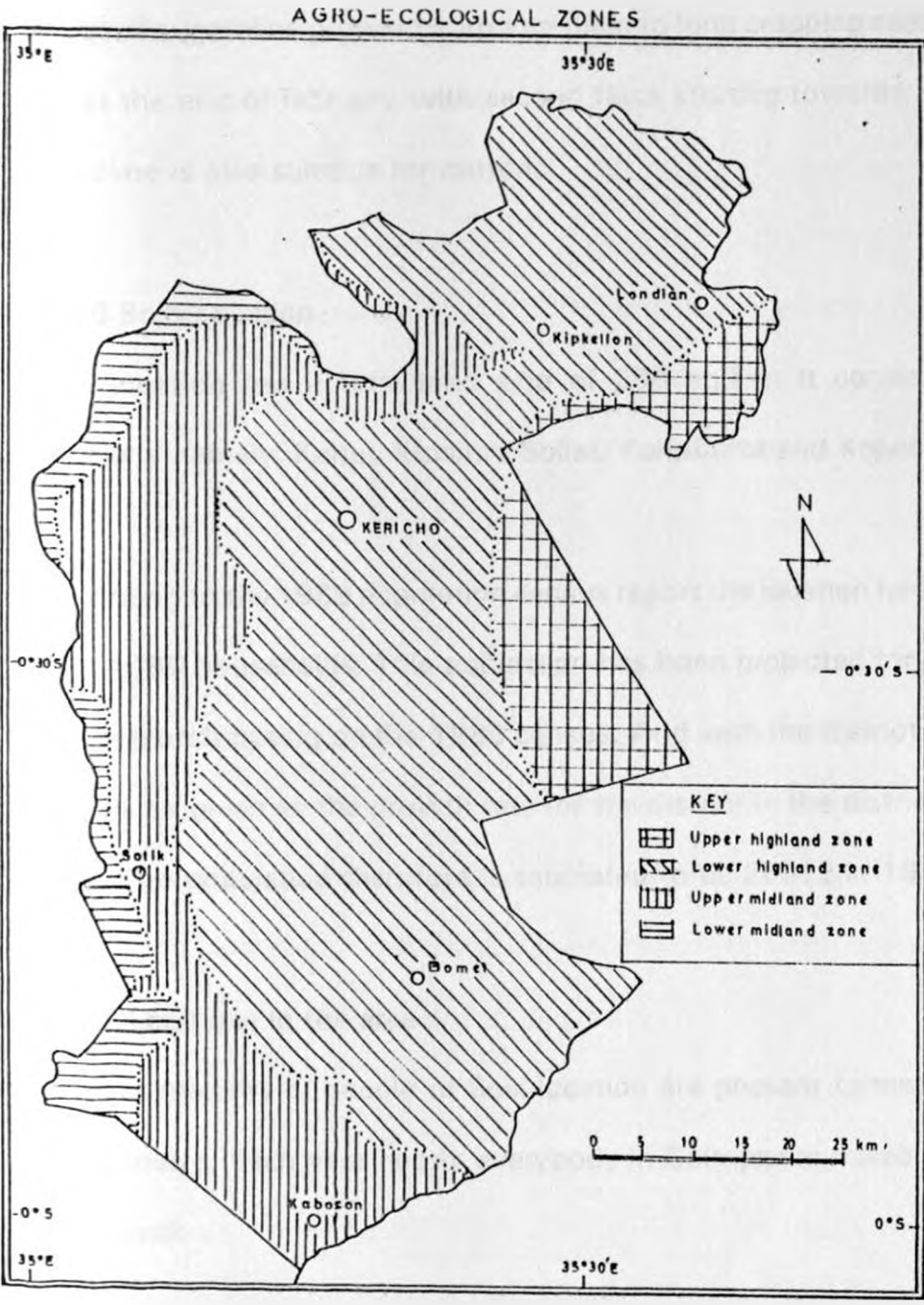
production. The UH2 zone is suitable for wheat and pyrethrum production. The UH3 zone is characterised by very long cropping seasons and intermediate rains divided into variable cropping seasons. First rains normally start around march and second rains around June/ July.

**Lower highland (LH):** This zone can be further divided into 3 sub zones; LH1, LH2, LH3. LH1 is the tea and dairy zones with permanent cropping possibilities divided into 2 variable cropping seasons with first rains starting in february and second rains around end of July. LH2 is the wheat maize and pyrethrum zone with a very long cropping season with first rains starting in february and second rains around end of July. LH3 is the wheat, maize and barley zone. it is characterised by a very long cropping season and intermediate rains divided into two variable cropping seasons with first rains around march and second rains starting around June/July.

**Upper midland (UM):** This zone can be divided into 4 subzones. This zone is suitable for tea and coffee growing. In some portions both tea and coffee can be grown while in others only coffee can be grown. The zone is characterised by a long cropping season. Rains starting in July in the coffee and tea zones. In the portion that is marginal for coffee the rains start in august. Other activities in this zone include growing of sunflower, maize and Livestock keeping.



Map 3.2 Kericho District agro- ecological zones



**Lower midland (LM):** Can be divided into 2 subzones. The zone is suitable for marginal sugarcane growing with a medium to long cropping season. First rains fall at the end of february with second rains starting towards end of august. The zone is also suitable for cotton.

### **3.6.0 Soin Location**

Soin location has a total land area of 298 sq.km. It consists of five sub locations namely; Kaitui, Kipsitet, Soliat, Koitaburot and Kapsorok.

According to the 1989 population census report the location had 21 162 people with 4080 households. This population has been projected for the purpose of this research basing on the 1989 census. And with the district growth rate of 3.05% as given as the growth rate for the district in the district development plan. The population therefore is estimated to be 26912 in 1997.

### **3.6.1 Land use in the area**

A great majority of people of Soin location are peasant farmers. They mainly grow maize. Each year nearly everybody in Soin plants maize on a portion of their land.

A new occurrence now is that many land owners now lease out part of their

land especially to people who are growing sugarcane. These people who lease land are residents of this location while others come from neighbouring locations. One acre of land leased out for growing sugarcane is worth Kshs. 10000<sup>3</sup>. It is important to note here that the farmers who lease the land use the land for about five years because they harvest the first harvest and the ratoon. This has great implications to the family that has leased out the land for their land will be "mortgaged" for five years long. In addition the land which is leased out in most instances is flat and highly productive and stoneless. In this case therefore many families are left to till the low productive portions for at the five years.

This has great implications as concerns food sufficiency and security not forgetting the fact that an enormous gap will be created between the rich and the poor. Not to be lost sight of is the fact that full grown cane normally become habitat for destructive animals like the warthog and antelopes. The warthogs are known to be destructive to maize, cassava, sweet potatoes and even the sugarcane itself. The antelopes destroy beans.

The cane has also been known to reduce the fertility of the soil such that after several years on the farm, the farm will be less productive afterwards. This could be attributed to the fact that sugarcane growing has encroached on land

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<sup>3</sup> This figure was obtained from various cooperative societies in the Location.

which is not suitable for cane growing.

In addition, the sugar cane plant is known to take long on the farm between 20 and 24 months. This means that the plant will feed on the soil nutrients for a long time, on the same note the nature of harvesting the cane in the area require that the cane leaves be burnt. The burning of the leaves means that all the nutrients which could have otherwise been put back in the soil is destroyed. In many instances those who lease the land do not care since the land is not theirs. This goes ahead in widening the gap between the rich and the poor. In many instances the poor have immediate needs to satisfy and in many instances the only resource that they have to convert into money is the land.

From the field findings a big proportion of the land in Soin location is under sugarcane. Over the years the acreage under food crops has been reducing and the productivity too has been reducing. This has great implications especially as regards food security in the area.

In the past, the cane has been profitable to the people in that it would be harvested on time and processed. This would earn them income on time and they would in turn purchase food, pay school fees, medical expenses etc. Since sugarcane has been a relatively new crop many more people have been adopting this crop. Previously it was just the areas nearest to Kisumu district

that were planted with cane, currently cane has moved further to the uplands and even to the neighbouring division of Belgut. ( Chebii,1993).

### **3.6.2 Land tenure**

Most of the land in Soin location is privately owned. Most of the land owners have title deeds to their pieces of land. 98.3% of the respondents own land and the average land size is 12 acres. Among the residents of this area men own land and not women. They only inherit it from their husbands when they become widowed. But the women can use their husbands' land to farm and do other economic activities as well.

### **3.6.3 Drainage in Soin location**

Soin location is in the low land side of Kericho district. It borders Kano plains. It is drained by several rivers. The main river that passes at the border of this location is the River Nyando commonly referred by the residents as Kipchorian river. Other rivers in the area include; Senetwet river, Birirbei, Kiboywo rivers.

Most of these rivers collect to form bigger rivers downstream and normally overflow during the rainy seasons. Some of these rivers have been drying up during the dry seasons but some notable ones have been all season. However in the past four years they have been drying up due to several reasons to be

discussed later in the paper.

The location has also been gifted with springs which normally spring up during the rains however as was noted by the residents, over time these springs have ceased to spring up mainly due to devegetation.

#### **3.6.4 Vegetation**

The study area currently is characterised by the *Lantana camara* plant species (cheboterik). This kind of vegetation type is a relatively new vegetation type in the study area. It started growing in large quantities in the late 1970's. Otherwise the most common vegetation type have been the indigenous plants such as *Combretum* species (Kemelyet), *Teclea* species (kuryot), "Sirinik", "osenonik", *Quava* plants (Maberek), *Eucle divinorium* (Usuet) .

These indigenous species of trees have however been reducing at a very fast rate. this is because they have been the favourable species of trees for use as building poles, fencing and not to forget they have been victims of the charcoal making mania and fuel wood as well. These plant species are hard and have been favourable in producing good charcoal and providing all the other needs such as firewood, building poles and fencing. *Croton macrostachyus* (Tebeswet) has become almost non existent because for a long time it has been a favourite

for various uses. The lower parts of Soin location nearest the border with Kisumu District is covered by the acacia type of vegetation.

*Lantana camara* (cheboterik) on the other hand is a shrub that has occupied most parts of the study area. It sprouts very fast and is so dense that if not cleared completely covers the soil. From observation this shrub thrives very much in areas where bushes have been burnt. Through the process of dispersion the birds and other animals disperse the seeds to other areas where they also sprout and multiply and are in turn spread to other areas.

### **3.6.6 Origin of *Lantana camara* (cheboterik)**

This weed has its origins in South America and the name is also derived from this area. However, in the study area it was found from various key sources and principally from a retired community development assistant (CDA) that the *Lantana camara* plant is a new plant species that has recently become a dominant vegetation species in the study area.

It is traced back to the early 1950's when an old man from this location brought a stem of this plant from Western province to plant as a flower. However, this plant could not be controlled for it spread uncontrollably throughout the entire location. However this plant has its origin in South America where the name *Lantana camara* originates. This plant is dispersed

quite rapidly through the animals and birds this plant thrives best in a place that has been cleared and left bare.

Some of the observed properties of this plant include the fact that where these bushes have been cleared and the land ploughed for agriculture the land is very fertile and various crops can do well. It was the observation of several people that this plant raises the fertility of the soil.

It was suggested by the District Soil and water conservation officer in the Ministry of Agriculture, that the study area may be going through an evolutionary stage whereby a new layer of soil which is more productive is being formed. Considering that it takes 30 years for one inch of soil layer to be formed, the study area may be going through this evolutionary stage and if undisturbed may be useful to the area.

This plant is a favourite for the goats though it inhibits the growth of grass for the cattle.

### **3.7.0 History of charcoal making in Soin location.**

It was established from field findings that charcoal making started in the early 1970's in Soin location. The skill to make charcoal was acquired from people from other districts. In the study area it was clearly established that it is one man whose origin is traced to Kakamega district that brought the skill of



charcoal making to the residents of the study area.

This man settled in the study area on other people's land and engaged in charcoal making as he was preparing land for agriculture. As he burnt charcoal others learnt from him. Gradually, charcoal making ceased to be one way of disposing trees felled after land was cleared for agriculture.

It continued to become an occupation among some people and with time several people have learnt the skill of making charcoal and are doing it full scale. At first, selected tree species were felled for charcoal but now as the trees reduce no selection is done and any tree available is felled.

### **3.8.0 Enterprises in soin**

There are 2 stone crushing factories in the study area one is in Kaptalamwa in Kipsitet sub location and the other is in Baregeiwet in Kaitui sub location. These two factories have been crushing stones in this area. This is because there are too many stones in this area. However the sale of the stones does not benefit the residents much because a lorry of stones is sold at Kshs 60.00 this is too little considering the amount of time and labour required to gather a lorry full of stones.

These stones have been cited as a hindrance to agricultural productivity by the residents of this area. The stones therefore are of no economic importance to the residents though it earns a lot to the entrepreneurs who sell the crushed stones to be used to build houses. There is also a coffee factory in Kaitui sub location of Soin this crushes the coffee which is mainly grown in Kaitui and Soliat sublocations.

### **3.8.1 Farmers' Cooperative Societies**

There are about nine farmers' cooperative societies in Soin location. These are mainly for marketing agricultural produce especially sugarcane. These cooperative societies are; Kaitui Farmers' cooperative society, Kapkisasi cooperative society, Kapsegut farmers' cooperative society, Kapsorok Farmers' cooperative society, Kabokyek Farmers' cooperative society, Soliat Farmers' cooperative society, Kapchebwai Farmers' cooperative society, Koitaburot and Kipsitet Farmers' cooperative societies.

These Societies have been useful in marketing farm produce especially sugarcane. Farmers have been getting loans and advances from the societies when they are in need and have been repaying after harvesting the cane. They have also served to facilitate harvesting and transportation of the sugarcane.

### **3.9.0 Demographic and settlement patterns.**

The population of the district totalled 423811 in 1979 with an annual growth rate of about 3.7% in 1989 the population was 900934 with a growth rate of 3.05%. Using the 1979 population projections the population of the district was projected to be 645000 in 1996.

The annual population growth rate has decreased from 3.7% in 1979 to 3.05 in 1989. 54% of the total population were dependents in 1993. This was projected to reach 339915 in 1996 i.e 52.7% of the total population. The young people 0 - 14 constituted 50.4% of the total population in 1993 and was projected to be 49.1% of the total population in 1996. Those aged above 59 years constituted 3.5 % of the total population in 1993. This was projected to remain constant throughout the plan period.

### **3.9.1 Socio cultural issues**

Soin location is pre dominantly settled by the Kipsigis people. However there are a few other tribes especially the Luos who have come here to work mainly as casual labourers. The Kipsigis people are patrilineal and for a long time they have been pastoralists though now they are turning to farming activities.

The Kipsigis people for a long time have been fond of growing traditional food crops such as millet, sorghum and traditional vegetables. Residents of Soin

location particularly have, for a long time been the main growers of sorghum and millet. Seemingly these crops have been the most suitable to the climatic conditions of this area. But with the coming up of the maize culture, many people thought it was easier to plant maize than to plant sorghum which is apparently more tedious in management and harvesting.

The shift from traditional grains to maize has had far reaching implications in that the location now is unable to feed itself. what has even worsened the situation is the introduction of the sugar cane. The sugar cane has been luring most farmers to the extent that people put a bigger portion of their land under sugar cane. This has aggravated the food deficiency further.

Among the Kipsigis people, the men have been looked upon for a long time to provide their families with basic necessities. But currently what seems to be happening is that the men have slowly absconded from their responsibilities and the women have had to put more effort in their activities as they try to do the work of the men as well as their own. Perhaps this problem emanates from the fact that the Kipsigis for a long time were pastoralists and the men used to be the herdsmen. Now that there are no cows to herd and the men do not want to adjust and do other things. As was found out the women who sell the charcoal clearly asserted that what they earn from the charcoal sale benefits the whole family whereas whatever earnings the man gets belongs to him

alone. As one female teacher asserted "these women toil as though they were not married".

### **3.9.2 Summary**

This chapter has focused on the dynamics of the study area first based on the district findings and focusing more on the location. The location of the study area in the district context and in the National context is given.

The climate was also addressed with a view to determine viable agricultural activities for the study area. In this respect an agro- ecological zone map is provided to indicate the potentialities of the study area with respect to the entire district. The land use patterns in the study area are also provided. All these aspects have a pointer to the kind of recommendations to be made together with the field findings to be discussed in the next chapter.

The indeginous vegetation of the study area has encouraged the charcoal making. The presence of hard indeginous plant species has motivated this activity.

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## CHAPTER FOUR

### 4.0 SOCIO ECONOMIC EFFECTS OF CHARCOAL MAKING

#### 4.1.0 Introduction

The study set out to find out the Environmental and Socio-economic effects of charcoal making in a rural setting of Kenya.

The objectives that guided this work are:

1. To find out to what extent charcoal making is an income generating sector in the study area.
2. To assess the Socio-Economic effects of charcoal making.
3. To find out the environmental problems that have arisen as a result of charcoal making.
4. To make recommendations as concerns alternative sources of income and ways of sensitising the resident population on the dangers of the practise on the environment.

This chapter will address the first two objectives above summarised as the Socio- Economic implications of charcoal making.

For the purpose of this work, the Socio- economic factors considered include; Food sufficiency, income levels, employment, education, behavioural patterns and other emerging activities similar to charcoal making such as firewood sale

and local alcohol (chang'aa) trade.

Several Socio- economic effects of charcoal making were identified and it came out clearly that this practise has had far reaching implications on the lives of Soin residents. The researcher learnt from the field that almost everything has been valued in terms of sacks of charcoal one is required to make in order to be able to purchase something.

It was establish from field findings that in many cases the value of an item is measured in terms of number of bags of charcoal.

It was learnt that charcoal making has been gaining popularity in the last few years and this was attributed to several factors among them: Increased demand, inflation which has necessitated that people look for alternative sources of income and reduced food production which has led to frequent food shortages which has forced many people to engage in charcoal making in order to buy food. Others noted that unemployment has also played a key role in attracting many school leavers to the charcoal making.

The researcher learnt that charcoal making originally was the domain of male adults but now even females and young children engage in this activity. This has far reaching implications on the social wellbeing of the families in the study



area. This is because mothers are exposed to hard labour and this has in fact made them to abscond from their domestic chores. Especially the most important duty of rearing children. Children who are abandoned may pose social problems in the future for they may end up being misfits in the society.

#### **4.1.1 Characteristics of the study area**

From the field findings, 79.3% of those interviewed were household heads while 13.8% were the spouses. 84.5% of those interviewed were males whereas only 15.5% were females. This was mainly due to the cultural element whereby a man will always be the spokesman.

In many instances the women would decline to respond to the questionnaire citing the fact that their husbands were not present and that they did not know what to say. 86.2% were married, 3.4% were divorced and 5.2% widowed all the people interviewed were Kipsigis.

This element of tribe is important in that the cultural aspects of the Kipsigis will determine their perception of resources and influence their resource management among other things.

#### **4.1.2 Income**

Charcoal making is a source of income for many residents of Soin location.

15.5% of the respondents from the field findings mentioned that charcoal making is their main source of income this being their major occupation. However a large number mentioned that they are farmers. however, from observation the researcher was able to conclude that nearly all those who say they are farmers are in the real sense of the word charcoal makers. This is because they only farm for a small proportion of time in the year.

From the field findings it was noted that 86.2% of all the respondents have made charcoal at one time in their lives. A great majority of respondents make charcoal to meet basic necessities this was accounted for by 80% of the respondents. It is only a small percentage of charcoal making that is explained by land preparation for agriculture.

#### **4.1.3 Occupation**

Of all the respondents, 44.8% were farmers. 8.6% were teachers while 15.5% of all the respondents said their main occupation is charcoal making. 6.9% were business men while 24.1% were casual labourers. All this have a pointer towards the dominance of charcoal making.

The average monthly income in the study area was found to be 3221.00 K.shs. The modal income was 2000.00 K.shs. The minimum income was 700.00 Kshs while the maximum was 20000.00 Kshs. Most of these incomes are earned

from charcoal.

**Table 4.1: Occupation of Soin residents**

OCCUPATION	FREQUENCY	PERCENT
FARMER	26	44.8
TEACHER	5	8.6
CHARCOAL MAKER	9	15.5
BUSINESS	4	6.9
CASUAL LABOUR	14	24.1

SOURCE: Field survey 1996

However one can note that despite the fact that a big proportion of Soin residents claim to be farmers they substitute their earnings with earnings from charcoal making. In addition those who do casual labour also engage in charcoal making at one time or another.

#### 4.2.0 Education

From the field finding, 13.8% of the respondents have had no schooling.

**Table 4.2: Education levels in the study area**

	No schooling	Primary	Secondary	college
Frequency	8	36	11	3
percent	13.8	61.4	19	5.2

Source: field survey 1996

What comes out clearly from the table above is that the levels of education

among the residents is low. Despite the changaa business that has contributed to the low levels of education, charcoal making has also got its share. 70.7% of respondents said that charcoal making affects education. This is a big percentage which shows how strongly people feel about charcoal and education relationship. Some of the reasons cited for this are;

1. Young kids make charcoal which earns them money and this makes them feel there is no need to go to school.
2. Parents use child labour in making charcoal thus discouraging them from going to school.
3. That the earnings from charcoal is so little and cannot send a child to school. This can further be explained in that the mentality of people that charcoal is a source of income has deprived them of the ability to explore other possible means of earning money for use in their homes.

In addition several kids who have gone to school and completed secondary school still go back to the charcoal making activity. In this case the young ones who are supposed to be going to school get discouraged for it doesn't make sense for them to go to school and still come back and do the same thing.

#### **4.3.0 Housing**

Out of the households interviewed 86.2% had mud floored dwellings while

13.8% were cemented. 88.9% had mud walled dwellings, 8.7% had concrete walls while 3.4% had stone walled. 81% were grass roofed, 17.3% had iron sheet roofs while 1.7% had tiled roofs.

100% of all the respondents used firewood as main fuel for cooking.

#### **4.4.0 Poverty**

What came out clearly is that there is poverty in the study area. One of the indicators of this poverty is the housing situation. A great majority of respondents in the study area have mud walled, mud floored and grass thatched shelters. All this goes to demonstrate low levels of income and general poverty because according to them these are the cheapest construction materials that they can afford.

In addition, those who had slightly higher income have iron sheet roofed shelters showing that if every body could afford they would prefer iron sheet roofed shelters. Another indicator of the poverty levels is the fact that 100% of the residents of this area use firewood for cooking.

#### **4.4.1 Land ownership**

98.3% of the respondents owned land, 1.7% did not own any land. The average land size is 12 acres and the maximum was found to be 40 acres. Some people lease out land and the average size of land leased is 2.7 acres and

the maximum is 5 acres.

#### **4.5.0 Community participation**

It was found that 37.9% of the respondents are members of community groups. The most common activities engaged in by the community groups include:

1. Raising money for each other in turns.
2. Poultry keeping
3. Farming activities
4. Business activities

Those who have not joined any community group cited the following reasons;

1. That groups are non- existent
2. Others cited disinterest
3. Corruption of group leaders was also cited.

60.3% of the respondents were willing to join community groups. Among these people who were willing to join community groups the most favourable activities that they would like to engage in include;

1. Farming
2. Collecting stones and selling for crushing.
3. Bee keeping
4. Raising money in turns

## 5. Running kiosk business.

The first step in running a kiosk business is to identify the right location. This is crucial because the success of a kiosk business depends heavily on foot traffic and visibility. Potential locations include shopping malls, transit stations, airports, and busy commercial districts. Once a location is chosen, the next step is to secure the necessary permits and licenses. This process can vary significantly by location and jurisdiction, so it's essential to consult with local authorities or a legal advisor. Additionally, you'll need to establish a budget and secure financing. Kiosk businesses typically require an initial investment for the kiosk unit, software, and initial inventory. Ongoing costs include rent, utilities, and maintenance.

Another key consideration is the selection of the kiosk software and the products or services to be offered. The software should be user-friendly, reliable, and capable of handling transactions efficiently. The products or services should be appealing to the target audience at the location. For example, a kiosk in a shopping mall might offer fast-food items or retail products, while a kiosk in a transit station might offer travel-related services or snacks. It's also important to consider the kiosk's physical design and durability. The kiosk should be attractive, easy to use, and able to withstand the wear and tear of a public environment. Finally, you'll need to develop a marketing strategy to attract customers to the kiosk. This could involve offering promotions, discounts, or loyalty programs. Regular maintenance and updates to the kiosk and software are also essential for long-term success.

Running a kiosk business is a relatively low-cost and low-risk way to enter the retail market. However, it's not without its challenges. The kiosk business is highly competitive, and success depends on a combination of factors, including location, product selection, and operational efficiency. It's important to monitor sales and customer feedback closely to make adjustments as needed. Additionally, the kiosk business is subject to changes in technology and consumer preferences, so it's essential to stay up-to-date on industry trends. Despite these challenges, a well-planned and executed kiosk business can be a profitable and rewarding venture.

#### **4.6.0 Charcoal making dynamics**

Of all the respondents, 86.2% they have been involved in charcoal making. The average number of years that the respondents had been involved in charcoal making was found to be 11 years. The modal duration in charcoal making was found to be 5 years. The longest duration in charcoal making was 26 years.

#### **4.6.1 Reasons for charcoal making**

Many respondents cited the main reason for charcoal making as being to meet household requirements. This was cited by 80% of the respondents. 14% of the respondents cited joblessness as a reason for charcoal making. 6% cited the reason for charcoal making as being preparation of land for farming. This clearly shows that it is only a small percentage of charcoal making that is explained by agriculture the rest is done as a source of income.

#### **4.6.2 Amount of charcoal produced in a week**

The average number of bags of charcoal produced in a week is 5 bags per person. The modal number was 4 bags. The maximum amount of bags of charcoal produced in a week is 15 bags. On the other hand the mean time spent on charcoal making in a week is 15 hours. The modal time is 10 hours while the maximum time was found to be 60 hours.



#### **4.6.3 Plant species used for charcoal**

It is only 30% of the respondents claimed to use a particular tree species to make charcoal while 70% said that they use any tree available. Among the 30% of the respondents who said that they use a particular tree species, the commonly cited species included; *Teclea Simplicifolia* (Kuriot), *Combretum molle* (Kemelyet) among others.

#### **4.6.4 Who makes charcoal**

74.6% of the respondents said that the father made charcoal. 51.7% of the respondents say that the mother makes charcoal. 46.5% said that the sons make charcoal. 3.4% respondents that daughters make charcoal. It is important to note here that in some households everybody made charcoal while in others it was the parents and the sons while in other cases the parents only made the charcoal. In other instances the fathers alone made the charcoal.

What came out clearly is the fact that every body in Soin can make charcoal. The parents i.e both father and mother together with the children.

#### **4.6.5 Problems of charcoal making**

87.5% of the respondents cited that there are problems with charcoal making. 12.5% did not see any problem with the charcoal making. Among the problems identified were;

1. That charcoal making is a tedious exercise this was cited as a problem by

96.2% of the respondents.

2. Depletion of tree species was cited as a problem by 25.9% of the respondents.

3. Transport and marketing of the charcoal was cited as a problem by 12% of the respondents.

4. That charcoal making affects the health status of an individual was cited by 5.1% of the respondents.

Some of the solutions suggested for these problems include;

1. Stop charcoal making was cited as a solution by 18.9% of the respondents.

2. Increase the price of charcoal was cited as a solution by 13.8% of the respondents.

3. Reforestation was cited as a solution by 12%.

4. Buying power saws as a solution to the tedious nature of the charcoal making job was cited by 5.2% of the respondents.

5. Mass education was cited as a solution by 5.2% of the respondents.

6. Look for another source of income was suggested as a solution by 22.4% of the respondents.

It is important to note that many of the solutions given were not given singly but in combination.

#### 4.6.6 Changes in charcoal making

88.7% of the respondents affirmed that there have been changes taking place in charcoal making while 11.3% did not see any changes. The common changes that were identified as having taken place include;

1. That more people have got engaged in the charcoal making activity. This was seen as a change by 28% of the respondents.
2. Competition for market was seen as a change by 18% of the respondents. This was with a view that many people have got engaged in the charcoal making.
3. High demand for charcoal was seen as a change by 26% of the respondents.
4. More land has been cleared for agriculture was seen as a change by 12% of the respondents.
5. Forested area has been cleared was seen as a change by 16% of the respondents.

The explanations given for the changes include:

1. Joblessness identified by 25.8% of the respondents.
2. High demand and low supply was identified by 24.1% of the respondents.
3. School dropouts was seen as an explanation for the changes by 5.8% of the respondents.
4. Reduced crop yield was given as an explanation by 6.9% of the respondents.
5. Over exploitation of forest was seen as an explanation by 12.1% of the respondents.

#### **4.7.0 Food sufficiency**

The food produced in the location is not sufficient to meet the whole family needs. 79.3% of all respondents said that the food they produce each year is not sufficient to meet the whole family needs. Some of the reasons cited for this inadequacy include;

1. That the land is unproductive. This was cited by 72.4% of the respondents.
2. That there are too many stones on the farm. cited by 70.7% of the respondents.
3. That there is less land put on food crops. This was cited by 18.9% of the respondents

It was further established that to some extent food production would increase if charcoal making was stopped. This was an opinion that was held by 50% of the respondents. Some of the reasons given for this opinion include:

1. That more time would be spent on the farm.
2. That more people would go to the farm
3. Soil erosion would be reduced.
4. More emphasis would be placed on farm improvements.

Some of the food crops grown in Soin include;

1. Maize which is the most popular food crop among Soin residents.

2. sorghum which is grown by about 67.2% of the residents.
3. Sweet potatoes grown by only 29.3% of the residents.
4. Beans is grown by 81 % of the residents being intercropped with maize.

However it is imperative to note that even though there are other food crops grown apart from maize, it is in very small quantities. Maize yields were measured in bags and the mean number of bags of maize in a year was found to be 10 bags. The maximum being 33 bags and minimum being 1 bag.( one bag here is approximately 90 kg). The other food crops such as beans were harvested in small quantities and could only be measured in 2kg tins or 20kg tins.

**Table 4.3** Food crops grown in Soin

	FREQUENCY	PERCENT
MAIZE	58	100
BEANS	46	78
SORGHUM	39	66
SWEET POTATOES	16	27

SOURCE: Field survey 1998

It is evident that many people like planting maize as a food crop. However, what came out clearly is the fact that even after planting this crop, no proper care is taken. The farmers do not prepare the land properly and when it comes

to weeding, the maize is not adequately weeded. In fact cases were reported of maize not being weeded at all. This has great implications on the productivity from this crop. This is mainly due to the fact that a lot of time is spent making charcoal since the outcomes from charcoal are quick unlike those from the crops which may take several months. The earnings from charcoal are not always spent on the farm but many of these charcoal makers spend it on drinking and after drinking they will still have to make more charcoal to buy necessities for the household which means a lot of time will have been stolen from the farm.

From the field findings the mean time spent on charcoal making in a week is 15 hours with the maximum time being 60 hours. With the new phenomenon of firewood trade, many hands are involved in the woodfuel business. Even the youngest and the oldest of the residents of Soin Location get involved in this trade.

Another factor comes in the case of mode of spending the income from the sale of charcoal. It came out clearly that the earnings does not get repatriated back to the soil. It was found that 44% of the respondents spend their earnings on buying school equipment for their kids. 83.1% spend earnings on household requirements. 12% of respondents spend earnings on taking alcohol (chang'aa). 55% spend it on preparing their farms.

At this point it must be noted that all these modes of spending are in combination such that one family may spend earnings on both the farm, and for buying school equipment. On further probing however, and from various key respondents, it was noted that nearly all the males who burn charcoal spend most of the charcoal earning on drinking alcohol.

#### 4.8.0 External dependence on Soil resources

The field findings clearly demonstrate the fact that nearly all the charcoal produced from the study area is sold to meet woodfuel requirements outside the study area. Very little charcoal was found to meet the requirements within the study area. This is clearly demonstrated by the common selling place of the charcoal.

**Table 4.4 Charcoal selling place**

	Frequency	Percent
Roadside	45	91.8
Kisumu	3	6.1
Hotel	1	2.1

Source: field survey 1998

From field findings 85.7% of charcoal is sold at the road side. 6.1% is sold at Kisumu while 2.0% is sold to the hotels. 6.1% of the charcoal produced is sold to charcoal traders who in turn sell it to roadside customers.

The common modes of transporting this charcoal to the markets included: Donkey which was used by 83.7% of respondents. 6.1% of the charcoal was transported using stretchers, 6.1% transported manually. 4.1% is transported on wheelbarrow. See plate 1



**Plate1: Charcoal just off loaded from a donkey**



The most common mode of spending the earnings from charcoal includes: Education of the children was given priority by 55% of the respondents. 83.1% of the respondents spend their earnings on household requirements while 12% of the respondents spend it on alcohol.

The mode of selling the charcoal shows that most customers are from outside the study area and are drawn from as far as Nairobi, Kisumu, Nakuru, Kericho town and its environs etc.



**Plate2: Charcoal with the owners, waiting for buyers at the road side.**

This serves to demonstrate how the natural resource of this area is satisfying outside requirements. It shows that there is exploitation of the resources for outside use which do not benefit the area in a meaningful way. Angelique Haugerud in her study on economy, ecology and the unequal impact of woodfuel scarcity in Embu found that heavy demand from upper Embu, availability of trees and lack of alternative income sources encourage greater rates of charcoal production by lower zone farmers. This may reflect also what happens in Soin for there is a lot of woodfuel trade to meet external demands and needs.

#### **4.8.1 Individualization and commercialization of resources.**

It was found that previously communal resources have become individualized. In earlier days, people could cut down building poles from anywhere but this is not the case now. Similarly women would gather firewood from wherever they could find it but now every family is confined to their piece of land which has to satisfy all the family needs.

To the people of Soin, there is a cash value to everything which of course does not reflect what used to be in the past. Everybody is the owner of his property and he guards that which he owns jealously. Somebody caught gathering firewood on someone else's land will pay dearly. Similarly those who need building poles will have to pay for each pole they get from someone's land even

if they are from indigenous trees. This explains why several women have to walk long distances with headloads of firewood because they can't just gather from near the roadside.

We find that as population continues to increase, the land also has to be continually fragmented as it will have to house more households. The land also has to feed more people, this has implications as concerns the land use priorities that people will choose. The more productive parts of Soin location namely Kabokyek sub location have less land size per household this means that there is no land left for other vegetation apart from food crops or other more "valuable" uses like livestock rearing and cash cropping.

The more productive areas of Ainamoi division and Belgut have always relied on Soin location for their fuelwood. For along time they would visit relatives or acquaintances here and get firewood from their shambas but now they have to pay for it. According to the various key respondents identified, it was clearly noted that the firewood sale is the practise that is likely to lead to total excision of forest cover. This is because the demand for firewood is higher than that of the charcoal. In addition the rural households that need it are more and use large quantities as compared to the urban households that may have other alternative fuel like gas and electricity.

#### **4.8.2: Fuelwood:**

A new occurrence in the trade with woody products is the sale of firewood. Along the main Kericho- Kisumu highway bundles of firewood can be found. Several women and children are common as they wait for buyers. This in the author's opinion can be attributed to higher demand for fuelwood by rural households in the neighbouring Belgut division and Kisumu district. The target buyers are women from Belgut Division and institutions such as schools within Ainamoi Division and outside. More firewood is sold at Awasi market in Kisumu district which is transported by women in matatus.

What comes out clearly in this trade is that those who may not be able to fell down trees to make charcoal prefer to fell down smaller plants and gather twigs to be sold as firewood. In this trade even very small children as young as four years are eligible since they just gather smaller twigs though they sell at a low price. Their mothers help them to sell and it is important to note here that these small children however young they may be will have to be given their money and they use it to buy what they please like buying bread and clothes. In this way small children have learnt the importance of money and have learnt how to earn it. So one can rightfully ask at this stage what are the implications of this kind of practise?



**Plate3: A buyer has just bought a bundle of firewood**

From the field observation several women were found at the roadside waiting for buyers with their little babies. Several of these women had walked long distances with their babies strapped on the back and firewood on their heads. Some had walked for four Kilometres carrying only the youngest child with them leaving the others to fend for themselves throughout the day. What comes out clearly is that young children have to learn to stay on their own as

mothers go out in search of a few coins.

These women evidently have to wait for as long as it takes to get their commodities bought. Many times they arrive home when it is dark when the children have gone to sleep. In times when the firewood is not bought there would certainly be no food.



**Plate4: A group of women with children selling firewood at the road side**

It was learnt from various key respondents that children start at an early age to take responsibility for themselves. They learn for instance that they do not necessarily have to wait for their parents to buy for them what they need. So they engage in income earning activities such as fuelwood selling and charcoal making at the earliest opportunity. The implications of this practise are far reaching. This goes on to show the extent to which woody products is a source of income in Soin location.

#### **4.8.3 Chang'aa business in Soin Location**

Changaa business was noted to be rampant in the study area. Various key respondents including the area chiefs noted this as a serious issue. It was even noted that charcoal making per se is not the main problem but the root cause of the charcoal problem is chang'aa. The main explanations given for this is that many people strive very hard to earn money to be able to buy chang'aa. From the various people's analysis it was found that those people who make charcoal and do not engage in changaa drinking have prospered. Some have even left the charcoal activity altogether and now engage in other activities such as farming and business. So it was the conclusion of many people that charcoal making has been motivated much by the drinking habits.

This chang'aa business has even led to several Social evils that are blamed for the poverty in the area. In the study area many people drink this stuff. This has

made them to be irresponsible to their duties e.g they neglect their children. This has made their children to learn at a very tender age to fend for themselves.

The bad example from the parents in the study area has contributed to several children dropping out of school. It was also observed that many school going children engage in chang'aa drinking, and with time they drop out of school this has had great implications on the development of the area. In addition among the households interviewed, the main household problems cited include:

Financial cited by 98.3% of the respondents, Food shortage cited by 79.3% of respondents. Diseases cited by 89.6% of the respondents. Drunkenness by 43.1% of the respondents.

Drunkenness comes out clearly as a problem despite the fact that some respondents did not want to acknowledge it as a problem. This is due to the fact that the majority of the respondents were men accounting for 84.5% of the respondents. In cases where they were culprits they did not want to affirm it. In addition most comments that people gave as final observations hinged on drunkenness, they cited that drunkenness spoils plans. In this case, they were referring to plans for progress e.g enhancing the education levels in the area.



#### 4.9.0 Summary

This chapter has addressed the Socio- economic aspects of the study area especially as they have been influenced by charcoal making. Education levels in the study area are low with 61.4% of the respondents having primary level of education and 13.8% having no education at all. This kind of scenario has been affected by charcoal making and is likely to have even more negative effects if not checked immediately.

Income levels are also low with most of the earnings being got from charcoal. This indicates the level at which charcoal making is a source of employment.

Another related activity which came up is that of fuelwood sale which is seen to contribute heavily to deforestation and will raise the level of school dropouts in the study area.

## **CHAPTER FIVE**

### **5.0.0 ENVIRONMENTAL IMPLICATIONS OF CHARCOAL**

#### **MAKING IN SOIN LOCATION**

The study set out to find out various issues as concerns charcoal making in Soin Location. In the previous chapter, the Socio- Economic aspects of charcoal making were addressed. This chapter will focus on the environmental effects of charcoal making in a rural setting of Kenya.

The charcoal business in Soin location is increasing as more and more people engage in the charcoal making. This is clearly evidenced by the large numbers of charcoal sacks on display on the roadside. What came out clearly from the field findings is that a lot of trade in the area revolves around wood products. A new occurrence is that of the sale of firewood and this is clearly evidenced by the presence of firewood stacks on the road side. The increasing demand of the charcoal motivates charcoal production this is explained by the urbanisation trends, income levels, poverty and the fact that alternative fuels are expensive.

#### **5.2.0 What are the environmental effects of charcoal making?**

From the field findings it was established that there are several environmental problems in the study area that have been attributed to charcoal making. Some of these environmental problems include:

1. **Vegetation change:** There is excision of the indigenous vegetation and

opportunistic weeds coming to replace the excised vegetation.

2. Soil erosion

3. Depletion of tree species

4. Ecosystem disruption which has led to migration of bees and other wild game.

5. Encroachment on water courses.

### **5.2.1 Vegetation change**

When charcoal making first started, the most popular tree species were the hard indigenous woods. As time went by, these good trees became too scarce therefore people had no choice than to just use whatever tree was available. Currently any tree is felled to make charcoal. This has led to large scale tree felling as the demand for charcoal has gone up and the price has also gone up motivating more people to make charcoal.

The clearing and burning of the trees has left the land bare and this has enhanced the spread of the opportunistic weeds notably *lantana camara* weed. This weed sprouts very fast on bare land and covers the land completely to the extent that no other vegetation including grass can sprout underneath it. It was the observation of many residents that the vegetation canopy that used to exist before charcoal making took root has been distorted and what can be seen now is an ugly appearance. This indicates that charcoal making has interfered with

the aesthetic quality in the study area. Previously the various canopies of the vegetation in the study area had been making the area beautiful. But it is not there now.

Charcoal makers in Soin location view the trees as being able to grow and replace themselves but they do not seem to consider how long this will take. According to the charcoal makers, the trees they fell down regenerate and soon they start providing the same service that they have been receiving from the trees.

The most popular tree species for charcoal like the *Combretum molle*, *Teclea simplicifolia*, *Euclea divinorum*, *Croton macrostachyus* have become scarce. This has forced the charcoal makers to use any available tree this has contributed to large scale extinction of tree species in the area. 70% of the respondents fell any tree available for charcoal making. Some of the already felled trees sprout but do not grow as fast as to keep pace with the rate of depletion.

With the depletion of most vegetation species, some medicinal herbs have disappeared. This has forced herbalists and other people who use herbal medicines to travel far to get the herbs. In addition the tree species that have been popular for charcoal making have also been popular for building poles and for fencing. This has led to people using any tree for building poles. This has

reduced the lifespan of shelter constructed with such poles as compared to those constructed with the original tree. The trees available are less strong unlike the ones which have almost been excised by the charcoal business.



**Plate5: A charcoal kiln that is "cooking". Notice the amount of leaves, even sugarcane leaves used. Notice also the smoke in the background.**

The extinction of some of these tree species could be attributed to several factors revolving around the charcoal making business:

1. That the trees are cut and not given a chance to regenerate. This is because after a tree has grown to a certain level it is cut before it can grow to maturity to even get seeds.
2. In the study area the traditional kiln is used, this kiln requires the use of green leaves to cover the kiln. This means that a large number of trees surrounding the kiln will have the branches cut off to serve this purpose therefore, this hampers the growth of these plants and may even cause their death.
3. The gases emitted from the charcoal kilns affect the vegetation nearby.
4. The traditional kiln has been known to open up causing wild fires. The wild fires destroy everything in the surrounding causing vegetation imbalance.

So in people are aware of these changes occurring in the vegetational resource base. So how are they viewing it? From the research it was found that they are increasingly becoming aware of the fact that trees are becoming scarce and that some important species that use to serve important functions such as constructions are hard to come by. Whenever they are found the land owner sells them at exorbitant prices. In addition the coping mechanisms that are being employed include using any tree available regardless of whether they will be suitable or not.

The people of Soin traditionally, had ways of conserving their environments. Some trees were considered sacred and could not be cut down without any good reason. Some plants were used for medication others were for special ceremonies this meant that this kind of sanctity ensured that some of these plants were protected from wanton destruction.

It is clear therefore that the traditional values that enabled the protection of some tree species have been eroded. The young generation who are now engaging in this destructive activity do not care or may be unaware of the importance of these species.

The use of fire has also been very critical and has aggravated the depletion of vegetation as climbers and small herbaceous species which are not cut for charcoal are razed down by fire. Kokwaro (1974) said that in parts of Eastern and Coast Province where charcoal production is prevalent some plant species have become endangered, He cited acacia senegal and terminalia brownii as examples. He said that once these trees are eliminated the vegetation changes from a woodland to a drier part of shrubland and if immediately followed by overgrazing it can become desert.

From the Soin findings this charcoal making activity which is quite rampant has led to the endangering of some plant species. This has reduced the vegetation to shrubs and with time the shrub may also get endangered. One area chief noted "if nothing is done to stop charcoal making there will be no tree left in Soin in the next seven years." Vegetation change is likely to have far reaching effects on climate and rainfall, on soil and on economic development generally.

### **5.2.2 Disruption of the ecosystem**

One clear issue that arose from the research is that the bees which used to be popular for honey have migrated. The honey which used to be common in Soin is now not there. The most popular explanation is that the smoke that emanates from the charcoal Kilns scares away the bees. This can further be confirmed by the fact that normally when honey is being harvested smoking twigs are used to chase away the bees and to make them inactive. This shows that the constant smoke in the bushes where beehives are mounted have scared the bees away and over time a large number of them have migrated to greener pastures.

In addition the beehives for along time have been mounted on trees in the forested areas, with vegetation change, the most common tree species are shorter and not strong enough to support the beehives. Not to forget is the fact that charcoal makers have cut trees up to the river courses. In several instances



there are no strong trees left to support the bee hives.



**Plate6: Charcoal made in the bush. Notice the extent of vegetation destruction by fire. Note: A river is just on the left.**

Brokensha and Riley (1977) found that in Mbere bee keeping was dying out

because of modernisation and land adjudication. However the case seems to be different in Soin for some people still would like to keep bees but they are not yielding since the bees have moved.

Not to be lost sight of is the fact that originally, Soin location with its varied vegetation formed a habitat for different animals. Many animals like the gazelles which would graze in the grassland are now uncommon this is attributed to the fact that the land has been cleared and in many instances they cannot get a place to hide. Moreover, the dominant vegetation now does not allow grass to grow therefore these animals do not get appropriate pasture. other factors that might have sent them away include the issue that there are frequent fires from charcoal kilns which scare them away.

We also find that insects do not like repellent smoke, this constant smoke in the study area has chased away the bees.

Experiences from Zaire as reported by KENGO reveal that when refugees started making charcoal in the Virunga park animals started moving away. This indicates that charcoal making has some unpleasant effect on the fauna of an area.

Brokensha and Riley in their study in Mbere found that evidence of vegetation change in Mbere was provided by a comprehensive list of birds seen by a

missionary lady, a keen competent Ornithologist. Many species mentioned in her findings were not present by the time Brokensha and colleague did their work. This could be because they prefer densely wooded areas indicating that more than fifty years ago there was thicker tree cover.

### **5.2.3 Soil erosion**

The felling down of trees has been done indiscriminately, not sparing the slopes of highlands and along the riverbank. This has exposed the soil to the dangers of erosion. This is so widely spread in the study area since several sites have been cleared of vegetation and burnt. This has left the land to be extremely bare so when it rains, the soil is eroded downhill. This can be attested to by the occurrence of several gullies in the study area. In addition the eroded soil is deposited on the river bed this has gone ahead to reduce the depth of the river and has resulted to frequent drying up of the streams. 70.2% of the respondents cited soil erosion as a problem in the study area. This goes to indicate the magnitude of this problem.

Other environmental problems cited include strong winds which was attributed to the strong velocity of wind movement after the trees which act as wind breakers are felled thus exposing the land to the effects of strong winds.

Some of the suggested solutions to these problems include; 1. Planting of trees on slopes 3.4%.

2. Terracing 20.7%
3. Stop overgrazing 1.7%
4. Planting trees 86.2%

This may further suggest that erosion is mostly caused by lack of trees.

### **5.3.0 Tree planting**

51 % of the respondents plant trees while 44.8% do not. The most common environmental problems cited by the respondents include strong winds and soil erosion. Among the solutions cited for the environmental problems are; tree planting, planting trees on slopes terracing and stopping overgrazing.

### **5.4.0 Encroachment on water courses and sources.**

One environmental problem that was cited as an effect of charcoal making is encroachment onto water courses. It was noted that people have felled trees without sparing the riverside. This has exposed the rivers and has led to increased evaporation.

This can explain the fact that some rivers like Senetwet in the study area have been drying up during the dry season in the last five years yet before, this used to be the watering point for many livestock owners in the study area. Another cause for the drying up of the streams was attributed to soil erosion which has deposited the soil onto the river. This has made the river bed full of deposits

and has made it shallow. This has made the river to be prone to drying up seasonally.



**Plate7: deforestation close to river course, notice the amount of water is dwindling.**

In addition we find that areas which were deeply forested with some bamboo bushes and were sources of springs have been cleared for farming activities as well as for charcoal making. Some of these springs used to be sources of water during the rainy seasons but unfortunately, they have disappeared. This may not be conclusively due to charcoal making but due to an interplay of several factors such as clearing for agriculture and for settlement. However the major cause of deforestation in the area has been charcoal making and not clearing for agriculture nor human settlement. Since many cleared sites did not show any agricultural activity going on or settlement but were just idle.

Some earth dams have also dried up, for along time these earth dams have been watering places for livestock in the area but sediments have been deposited onto the earth dams and has led to the drying up of these earth dams.

#### **5.2.4 Health implications of charcoal making**

It was learnt from various key respondents that some charcoal makers have had their health status reduced by the kind of work they do. Many of them agreed that charcoal making is a tedious job yet it pays less. The charcoal makers use a lot of energy which they do not manage to replace since they cannot afford to buy good nutritious food from the earnings.

It was reported that charcoal makers look weak, sickly and some have even been reported to die after long hours in charcoal making. This was attributed to the smoke emanating from the charcoal kilns which they breathe in and after long exposure to this, it begins to have its toll on them. The man who is credited to have introduced Soin residents to charcoal making made charcoal until he died.

Needless to say, the charcoal making activity itself is too tedious and the maker has to strain too hard. With inadequate rest their health begins to deteriorate.

### **5.3.0 Summary**

The chapter has addressed various environmental problems that have arisen as a result of charcoal making. Key environmental problems include:

1. Soil erosion.
2. Vegetation change
3. Devetation
4. Encroachment onto water courses.

These problems have either a direct or indirect link to charcoal making. In addition the environmental effects also help to perpetrate the Socio- Economic effects.

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## **CHAPTER SIX**

### **POLICY IMPLICATION OF RESEARCH FINDINGS, RECOMMENDATIONS, CONCLUSIONS AND AREAS FOR FURTHER RESEARCH**

#### **6.0.0 SYNTHESIS OF RESEARCH FINDINGS**

The study set out to find the environmental implications of charcoal making and the socio economic implications of the same in Soin location of Ainamoi division in Kericho district.

From the study various key issues emerged these are;

1. That charcoal making has given rise to some environmental problems the notable ones being;
  - a. Encroachment on water causes by charcoal makers making charcoal right into the water courses this has led to seasonal drying up of water courses as the streams and rivers have been exposed. In addition charcoal has been made on hill sides which has encouraged soil erosion which in turns leads to soil deposition in the rivers making them shallow.
  - b. That charcoal making has led to vegetation changes as the trees cut for charcoal have almost been excised and other fast growing weeds taken over.
  - c. From various key respondents it was learnt that charcoal making has reduced the health status of the actors. It was learnt that charcoal makers look weak, sickly, have lung problems, are thin.
  - d. Disturbance of the ecosystem came out from the fact that various residents

observed that the charcoal smoke has scared away the bees that make honey in the area.

2. That charcoal making has had some socio-economic effects. some of these Socio-economic effects include;

a. Food inadequacy: The food produce each year is not sufficient to meet household requirements throughout the year. The reasons for this include:

i. That less time is devoted to food production as opposed to charcoal making which offers quick money.

b) That over the years soil erosion has reduced quality and productivity of the soil.

c) Less land is put under food crops this also had a pointer to charcoal making in the sense that people cannot get enough to prepare land for farming as they are busy making charcoal and later spending the earnings in local beer.

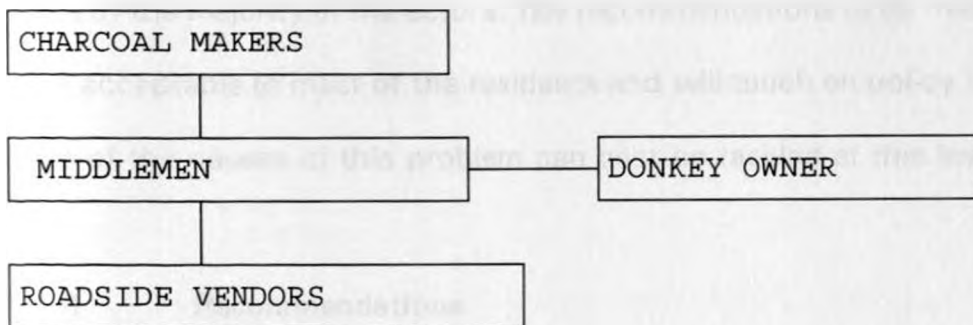
A link was made between charcoal making and widespread local beer drinking by various key respondents. It was noted that if the local brew was not taking away most of the earnings from charcoal many would have invested on other projects and subsequently done away with charcoal making. So it was concluded basing on the key informant's information that the local brew making and drinking has motivated and encouraged the continued practise of charcoal making.

3. charcoal making and employment

The charcoal issue has created employment at various levels;

1. To the charcoal maker in the bush who fells trees and makes charcoal i.e the person who converts the tree into charcoal.

2. The charcoal trader who may here be called middlemen. These are the ones who go around in the bushes buying charcoal from the makers at a lower price they will sell at the market or roadside. These people later transport the charcoal on donkeys which in most cases are hired from donkey owners. This means the donkey owner also benefits in the cycle.



Source: Author

3. The middlemen bring the charcoal to the roadside and leave it to the roadside vendors who will be in charge of charcoal. These vendors sell the charcoal at any price above Kshs. 150. But the trader gets Kshs 150, whatever balance is left is their commission. The person who makes the charcoal gets Kshs 100 from the middleman. This kind of structure depicts four levels of employment created by charcoal.

It is important to note here that the roadside vendors in most cases are very young unemployed youths who have either completed form four level of education or have dropped out of school due to one reason or another. These youths also engage in other illegal activities such as buying petroleum oil from transporting tankers at cheap price and selling it at a profit. They were seen as potential criminals for they are idle for most parts of the day.

In view of the above, recommendations will have to be made to address the needs of the majority of the actors. The recommendations to be made will need to be acceptable to most of the residents and will touch on policy issues since some of the causes of this problem can best be tackled at this level.

#### **6.1.0 Recommendations**

It is good to note from the onset that the charcoal making/fuelwood business is a complex issue. It is difficult to make sound, practical recommendations in the sense that these people are engaging in an activity which to them is an income generating activity which helps them to meet basic requirements. This means that careful thought has to be given to the recommendations for this will determine the effectiveness of the same.

In addressing this there is need to consider the culture of the local people, learn from them about what resources mean to them and from the sages in the

area, learn how the older generations conserved the environment.

Past efforts by the government in the various Government publications have not been successful in some parts of the country. For example in the 1989- 1993 National Development, the Government had the following broad policy objectives concerning energy and Development:

1. Ensuring adequate supplies of energy are made efficiently available at reasonable costs.
2. Promotion of conservation of all forms of energy.
3. Intensification of exploration of indigenous fossil fuels particularly oil.
4. Increase in wood products , both from on farm plantations and efficiency in wood fuel conservation.
5. Continuation of rapid Development of domestic HEP and Geothermal electricity.
6. Encouraging Domestic substitution where possible
7. Introduction of alternative energy sources to broaden the National energy mix and lessen reliance on imported energy.

In view of the above one can note that Soin Location is unique in the sense that the policies stipulated are tackling energy problems in areas already facing deficit. What about a place like Soin which is not facing any deficit now and is playing a role of woodfuel supplier? It appears that as yet the government has not addressed the issue of areas facing resource exportation like Soin is doing

at its own peril.

### **6.1.1 Diversify agriculture**

The first thing would be to eliminate food inadequacy in the area. This is because it was identified as a motivating force towards charcoal making. The land in the study area according to the agro- ecological zone map in the farm management handbook is suitable for a variety of crops. The area has very good yield potential for the following;

Sorghum, sweet potatoes, Soya beans, Pumpkins, fingermillet, beans,peas,groundnuts,cassava and Yams. All these are food crops that would very much boost the food situation to the extent that food inadequacy will be non existent.

In addition, some of these food crops will be more resistant to dry spells that are common in Soin. Sorghum and millet were the traditional foods of the study area but somehow somewhere people got lazy and decided to grow maize which is comparatively easier to manage.

Other crops identified as having very good yield potential include:

Tomatoes, Onions, sunflower, Sweet pepper, Chillies, Paw paws and bananas. These can be sold to earn income and also can be food crops. other crops that have fair yield potential include;

Citrus fruits, Mangoes, pineapples, sugarcane, and maize.

With a variety of crops the Soin residents will boost their food supply. The present insufficiency is brought about by a combination of factors some of which were identified as;

1. Less time spent on food crops
2. Continued planting of maize alone.

In order to encourage people to adopt these new crops there is need for training and education by the administration and agriculture extension officers. This is to enlighten residents on the possibility of planting these crops and their likelihood to do well. To further enhance this, The community development officers through the Provincial administration should encourage the community groups which are existing to try out these crops. Through this other people may adopt when they have seen the performance from the groups. It was also learnt that a large number of people in Soin are willing to join groups and would like to engage in agriculture activities. This means therefore that people should be encouraged to join together in groups and it may be easier to get them to experiment with some of these crops. This recommendation is being given with an understanding that it will be easier to train the group members as a group as it will require less resources. This in addition will mean that the group will set targets for itself e.g some group members may plant kales, cabbages and the group as a long term investment may plant citrus fruits, pineapples or

mangoes. These will be for sale and will be appropriate in that there is good communication network to good markets in Kericho town, Kisumu and Eldoret. Tomatoes for instance have been doing well among those who have been planting them but more people should be encouraged to take up this and additionally, onions be introduced.

It is hoped therefore that as the people become self reliant in food, there will be less need to make charcoal.

#### **6.1.2 Tree planting**

This endeavour should be done hand in hand with education on **tree planting**. This calls for the relevant government ministries to avail seeds to the community. The energy Centre based at the district head quarters has been doing this but only to the highland areas of the district not Soin. The officers from this department should therefore move further to Soin and supply suitable seedlings and education to Soin residents.

It was found that many people in the study area are willing to plant trees, what inhibits them is the fact that they are unable to get the seedlings when they want them. Some even reiterated that sometimes they travel as far as Kisumu town to buy tree seedlings. This is quite expensive and is a demonstration that if these were supplied close by, and at cheaper prices the people would plant



trees in large quantities.

### **6.1.3 Income Generating Activities**

1. Poultry keeping: charcoal makers can be encouraged to start poultry keeping with their earnings from charcoal. For example after crop harvests they can use charcoal earnings to buy a few chicken since they will not be urgently requiring money to buy food. The poultry will in turn generate money and may in the long run stop the actor from making charcoal. However this needs training especially on how to tend the poultry and how to market the product. Therefore there is need for cooperation between ministry of agriculture staff and ministry of commerce whereby the trade officers will be handy in training them on trade. This also requires less land and will be welcome for those who have very small land sizes.

2. Goat rearing: This will be encouraged particularly among community groups. These groups can rear a few goats on some communal land which they will need to make arrangements for. However goats are known to multiply fast so with this in mind they may need to make arrangements to acquire more space to keep them. The goats are preferred because they multiply fast and have been observed to do well in Soin. In addition there will be market for these goats in that the area is within the reach of many major urban centres like Kisumu, Eldoret, Kericho, Kisii etc.

In areas like Kapsorok, Simbi and Cheramor, goats can be more profitable than sugarcane which in the past few years has been frustrating farmers. This is because the farmer waits for two years for his crop to be harvested yet it may not be harvested on time and when it does get harvested, payments are delayed. When the payments are received they have been greatly chopped to the extent that the farmer goes at a loss.

However, this will require good leadership in the community groups to ensure that the undertaking is a success and to eliminate possible misunderstanding among the members.

#### **6.1.4 Other sources of charcoal**

Various agencies have tried to formulate project proposals on the making of charcoal from all kinds of forests and agricultural waste which include; coffee husks, rice husks, cotton stalks, cashew nut shells, coconut shells, saw dust and chippings. KPCU has been successful in its charcoal making project in Dandora which started in 1978 and produces charcoal from parchments and Mbuni husks.

Energy NGO's should continue in their search for appropriate technologies that may enable Kenyans to make charcoal from Agricultural residues. In maize growing areas for example the maize cobs can be used to produce charcoal, dried cane can be used to produce charcoal. though these may not satisfy the

demand, it may help to reduce the strain on forest resources from small scale charcoal makers.

On the same note, the improved charcoal production technologies as referred to earlier should be made available to many places. This means that research findings and new innovations should be disseminated to the users. In the case of Soin, it appears difficult to tell them to stop making charcoal therefore it would be more appropriate to give them a more efficient technology that would reduce wastage.

#### **6.2.0 Cultural orientation**

Much of the problems that have arisen in Soin could be attributed to the cultural values. A great majority of Soin residents would not be having problems of unemployment. From the research findings quite a number have been getting jobs to pick tea and to work in sugar cane farms. But it appears that they do not fancy jobs where they are supervised. They prefer to do jobs that they are their own managers and jobs that earns them quick money. This perhaps explains why many of them turn to charcoal making for it meets their needs.

In addition, it has become deeply rooted among Soin residents that planting sugarcane is a sign of progress. Such that everybody is waiting for time when he or she will have enough money to plant cane since cane requires large

capital inputs. However this puts a large number off. In 1994 the Cooperative Development Fund CDF gave loans to the farmers but unfortunately several did not get. And among those who got the majority of them did not use it the way it was intended. There is therefore need to educate these people on the importance of diversifying agriculture and not relying so much on one cash crop.

They should be made aware that food crops can also be cash crops and there are other crops that one can plant in order to get money and not necessarily sugarcane alone.

Presently a great majority of Soin residents are viewing charcoal as a cash crop mainly for export, this attitude should be changed in the right way by the provincial administration through the chief, the assistants and other community leaders.

### **6.2.1 Mass education.**

It was established from the field findings that awareness programmes are non-existent in the study area. It is therefore recommended from this research that the Government through the relevant ministries become more involved on training and educating the public on the importance of trees. It was learnt that some people even think that their plots stretch right into the river, when it is

clearly stated in the water Act that there should be a riparian reserve.

The environmental education programme should be introduced in primary schools and it be enforced so that school children learn right from the beginning the importance of conserving natural resources.

The policies that may be pursued to correct or to contain such situation have to be all embracing. Such that they will address the problem of poverty i.e both urban and rural poverty. The pricing of fuels in this case both commercial and traditional fuels should receive keen observation and policy measures.

Currently for instance, the charcoal is undervalued because the price of charcoal does not reflect the value of the tree. Both in terms of how long it has taken to reach maturity and also in terms of how long it will take the same tree to regenerate and reach maturity. Considerations has not also been placed on the opportunity costs accruing from the tree if it was not used for charcoal making.

The current pricing of the charcoal just depicts the labour involved and the tree in this case is seen as a free commodity together with the whole process which involves cutting green leaves or grass to cover the kiln. If all this was considered charcoal would be a very expensive fuel. If for instance the time the

tree takes to mature were to be considered then the value of the tree would be higher.

At the local level if incomes were to be raised through other means then charcoal making would significantly reduce. This is because many of the charcoal makers make charcoal to meet basic necessities. At the macro-level, policies should be put in place to encourage use of other forms of fuel to discourage over reliance on woodfuel. This would cut down the demand for the woodfuel.

In addition the Ministry of Energy and related NGO's should continue the crusade on fuel saving devices. This would reduce consumption at the consumption point thus reducing the demand for the commodity at the production point. This infact would be more responsive as compared to the first one and less demand would make the charcoal producers to seek alternative sources of income.

The pricing of the cooking implements for other forms of energy such as gas cookers and electric cookers clearly excludes the low income earners. In this respect the goverment should lift taxes on imported cooking equipments and control the pricing, this will encourage other woodfuel users to buy them.

### 6.3.0 Conclusion

It was concluded that the motivating factor behind charcoal making is the demand for this commodity. This implies that most solutions to this problem will be sought from the root cause of the problem. There has been frequent hikes in petroleum products and inflation has been biting Kenyans to the extent that most households both urban and rural have been facing difficulties in meeting their basic needs.

The high rate of urbanisation in Kenya coupled with increasing poverty especially among the urban dwellers has condemned the majority to use woodfuel. Increasingly many urban dwellers are opting for charcoal as their main fuel for cooking. Many newly employed people will find charcoal a cheap fuel for the cooking appliance for charcoal is comparatively cheap. Valued at current market rates a charcoal cooker can be bought for just about Kshs 100.00. On the other hand other appliances like gas cookers, electric cookers cost more for an average Kenyan.

This demand has motivated many people in Soin to engage in charcoal production. This has led to several environmental and Socio- Economic consequences. These consequences in the author's view, have in fact aggravated the problem of poverty and therefore has led to many more people seeking employment in charcoal making. However this practise has far reaching

implications especially as regards the sustainability of our life support system. This is because tree felling has been known to cause various problems like soil erosion, change in climate and thus leads to inability of the soil to produce enough food for man. This indicates that more famines, droughts etc. will be witnessed if such practises go on unchecked in our country side.

#### **6.4.0 Areas for further research**

1. It is recommended from this study that further research be done on the health implications of charcoal making. This may reveal the extent charcoal making especially using traditional technologies can be harmful to the maker and may reduce quality of his life generally.
2. Further research should be done on the applicability of the modern improved charcoal production technologies especially at a small scale.
3. It is also recommended that further research be done to find out vegetation change, its causes and the repercussions of this event.



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**Appendix : Sample questionnaire**

HOUSEHOLD QUESTIONNAIRE

PERSONAL INFORMATION

N A M E	R/ H H H	S E X	A G E	M - S T A T	E D U C	O C C	I N C O M E	T R I B E

1. NAME OF RESPONDENT AND ALL THE OTHER MEMBERS OF THE FAMILY. INCLUDE ALSO THE PARTICULARS OF THE OTHER FAMILY MEMBERS.

2. R/HHH-- relation ship to head of household
1. Head of household
  2. Spouse
  3. Son
  4. Daughter
  5. Other (Specify)

3. SEX 1. male  
2. Female
4. AGE in years
5. M-STAT 1. Married 2. Divorced 3. Single 4. Widowed 5. Other (specify)
6. EDUC. LEVEL 1.No schooling 2. Std three 3. Upper primary  
4. Standard seven or 8 5. Form 2 6. Form 4 7. form 6 8. College
7. OCCUPATION 1. Farmer 2. Teacher (primary school) 3. Teacher (secondary school). 4. Charcoal maker  
5. Business(specify).6.Casual labourer
8. TRIBE 1. Kipsigis 2. Kisii 3. Luo 4. Luhya 5. Other (specify)

2. HOUSING CONSTRUCTION MATERIAL

- a. Observe whether floor is made of,
  1. mud
  2. cement
  3. wood
- b. Observe whether wall is made of,
  1. mud
  2. concrete
  3. wood
  4. stones
- c. Observe whether roof is made of,
  1. Grass
  2. iron sheets
  3. tiles
- 3a. Fuel used
  1. Firewood
  2. Charcoal
  3. Paraffin
- b. If firewood state the source
- c. Who is responsible for fetching firewood?
- d. Do you fell trees for firewood?
- e. Do you just gather?

## CHARCOAL BURNING

4. Have you ever been involved in charcoal burning? \_\_\_\_\_
  - b. If yes, when did you start? \_\_\_\_\_
  - c. Why did you start to burn charcoal \_\_\_\_\_
  - d. How many sacks of charcoal do you make in a week? \_\_\_\_\_
  - e. How many hours in a week do you spend on charcoal making? \_\_\_\_\_
  - f. Is there a particular tree species that you use to make charcoal? \_\_\_\_\_  
If yes which species . . . . .
  - g. Who in the family makes charcoal?  
Father  
Mother  
Sons  
Daughters  
Others (specify).
  - h. Where do you sell the charcoal? \_\_\_\_\_
  - i. How do you transport the charcoal to the market? \_\_\_\_\_
  - j. How do you spend the earnings from the charcoal. \_\_\_\_\_
1. Education 2. On the farm 3. Household requirements 4. Drinking alcohol.

## 5. TREE PLANTING

- a. Do you plant trees in your compound?
- b. Do you attend tree planting demonstrations?
- c. How often do you attend them?
- d. Are you given any seedlings when you attend these meetings?
- e. Do you plant them when you receive them?

f. What are the common environmental problems that you experience?

Windy, soil erosion, flooding.

g. How do you think the problems can be solved? \_\_\_\_\_

h. In your opinion is there a problem with charcoal burning? \_\_\_\_\_

i. If yes what do you see as being problem (s) with the charcoal making? \_\_\_\_\_

j. In your opinion how do you think they can be solved? \_\_\_\_\_

k. In your view have there been any changes taking place in the charcoal making business?

l. If yes what are they? \_\_\_\_\_

m. What can explain the changes? \_\_\_\_\_  
\_\_\_\_\_

n. In your opinion does charcoal making contribute to the low level of education in the area? \_\_\_\_\_  
\_\_\_\_\_

o. If yes, how does it contribute? \_\_\_\_\_  
\_\_\_\_\_

## 6. FOOD SECURITY

a. Does the food you produce in a year satisfy all your family's food requirements for the same year?

b. If no why do you think it does not satisfy;

- i. Land is unproductive
- ii. Too many stones in the farms
- iii. Less land put on food crops
- iv. Other (specify).

c. If charcoal making was to be stopped would there be more food per year? \_\_\_\_\_

d. If yes why? .....

e. What food crops do you produce? 1. Maize 2. Millet 3. sorghum

4. Cassava 5. sweet potatoes 6. beans 7. others (specify).

f. What are their yields per year?

record yields in the table overleaf for the past three years.

YIELDS IN BAGS

	1	1	1
	9	9	9
	9	9	9
	4	5	6
maize			
beans			
Cassava			
Sweet potatoes			
Millet			
Sorghum			
Others (specify)			

g. What are the most frequent problems in your household?

- i. Financial
- ii. Food shortage
- iii. Disease
- iv. Drunkenness

h. What are the common diseases in your household?

- Malaria
- Typhoid
- Respiratory infections
- Other (specify)

i. Where do you go for treatment?

- Dispensary
- Herbalist
- Hospital
- Private clinic.

Why do you prefer either? .....

.....

**7. COMMUNITY PARTICIPATION**

- A. Do you belong to any community group?
- b. If yes which one?
- c. What activities do you engage in your groups
- d. If no why haven't you joined any? 1. Groups are not there
- 2. Not interested 3. a waste of time 4. Any other reason (Specify)
- e. If a group was to be formed would you be willing to be an active participant?
- f. What activities would you like the group to engage in?

**8. ECONOMIC ASPECTS**

- A. Do you own land? \_\_\_\_\_
  - b. If yes what is the size of the land? \_\_\_\_\_
  - c. Do you lease out part of the land?
  - d. If yes, What size? \_\_\_\_\_
  - e. What crops do you grow on your land in order of priority?(Rank them).  
( Sugar cane, maize, millet, coffee, bananas, cassava, sweet potatoes, tomatoes ).
- How much do you earn from each of the above?

	1	1	1
	9	9	9
	9	9	9
	4	5	6
Sugarcane			



Maize			
Millet			
Coffee			
Bananas			
Cassavas			
Sweet potatoes			
Tomatoes			

How do you spend each of the above earnings?

### **CONCLUSION**

Make any observations and general comments.  
Thankyou.