FACTORS AFFECTING AFFORESTATION PROGRAMMES IN CHULUNI DIVISION IN KITUI COUNTY: KENYA

BY

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A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN PROJECT PLANNING AND MANAGEMENT OF THE UNIVERSITY OF NAIROBI

2012
DECLARATION

This research project report is my original work and has not been presented for a degree in any university or any other institution of higher learning.

Signed________________________________        Date ___________________________

ISAAC M. TITUS
L50/66733/2010

This research project report has been submitted for examination with my approval as the university supervisor

Signed_______________________________          Date ___________________________

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LECTURER, DEPARTMENT OF EXTRA-MURAL STUDIES

UNIVERSITY OF NAIROBI.
DEDICATION

This research project is dedicated to my family and the people of Kitui County.
ACKNOWLEDGEMENT

I wish to express my sincere appreciation to several people without whom this research work would not have succeeded. My deep appreciation goes to the entire administration of Nairobi University for granting me a chance to study with them.

My profound gratitude goes to my supervisor Dr. Moses Otieno for his support, guidance and patience which have brought this research project to completion. Most importantly also I wish to express my thanks to all my lecturers who took me through the course work and initiated a spirit of research development in me.

I appreciate the support of all my colleagues in the masters’ class during the time of developing this proposal. I also thank the forest and provincial administration office in Kitui County for permitting me to collect data from the locations in Chuluni division in the month of April, 2012.

My heartfelt appreciation and sincere gratitude goes to my wife, Lydia Mwendwa for her encouragement, patience, and support in typing the work. She has always been there for me together with our children Brian, Benjamin and Henry.
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### ABBREVIATIONS AND ACRONYMS

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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ASAL</td>
<td>Arid and Semi-Arid Lands</td>
</tr>
<tr>
<td>CAP</td>
<td>Chapter</td>
</tr>
<tr>
<td>CDM</td>
<td>Clean Development Mechanism.</td>
</tr>
<tr>
<td>CFA’s</td>
<td>Community Forest Associations.</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization.</td>
</tr>
<tr>
<td>KEFRI</td>
<td>Kenya Forest Research Institute</td>
</tr>
<tr>
<td>KFS</td>
<td>Kenya forest services.</td>
</tr>
<tr>
<td>MDG’s</td>
<td>Millennium Development Goals.</td>
</tr>
<tr>
<td>NGO’s</td>
<td>Non-Governmental Organizations.</td>
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ABSTRACT

Forests are crucial for maintaining and improving the productivity of agricultural lands as well as sustaining the ecological balance. The Kenya Government has put in place the forest Act Cap 385 in an attempt to increase forest cover and cut down on massive deforestation. Although many studies have been done on afforestation, very little has been done on factors affecting afforestation programmes. Afforestation programmes have faced many difficulties that have to be solved before reforestation can be successful. The main purpose of the study was to find factors influencing afforestation programmes in Kitui County. The study used a descriptive survey study that involved the use of qualitative and quantitative methods in data collection and drawing of inferences and conclusions. The target population comprised of 17 provincial administration officers, 15 farmers groups and one forest officer. The researcher used complete census in data collection. Questionnaires and interview schedules were the main research instruments that had both closed and open ended questions. A pilot test was carried out to determine validity and reliability of the research instruments. Data Analysis was done using the Statistical Package for Social Sciences based on the data collected from provincial administration officers, women groups and forest officer. The findings of the study were presented using frequency distribution tables. The study found out that majority of the people in Chuluni division had received formal education up to primary level, and that most household had over 5 members. The afforestation programmes were affected by high population densities and human settlements, and wood fuel was the common form of energy in the area. The study concluded that there was a relationship between afforestation programmes and human settlements. Deforestation involved cutting down trees for construction, charcoal burning and firewood. The study has recommended that the government, through the three sister ministries; Forestry and wildlife, environment and natural resources and water irrigation comes up with sound policies and strategies aimed at protecting the existing forest cover and achieving the 20% forest cover. Legal action need to be taken against those who cut down trees indiscriminately.
CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Forest cover is a critical requirement for the development of any country. The global standards recommend at least 10% of the territorial area of any country to be under forest cover. In Europe, the provision of forest services is an important underlying purpose of new forests, and that this function has been growing in importance relative to the timber production function (Alexander Matter, 2000).

Goal number seven (7) of the United Nations Millenium Development Goals (MDG’s), aims to ensure environmental sustainability. Target 7a specifically seeks to integrate the principles of sustainable development into Country policies and programmes; thus making a contribution to reversing the loss of environmental resources. Target 7b further seeks to reduce biodiversity loss, achieving, by 2010 a significant reduction in the rate of loss. This concurs with Kenya’s vision 2030 on environment which seeks clean environment, secure and sustainable environment by increasing forest cover. One way of reversing or reducing the impacts of deforestation and thus striving towards achieving MDG’s 7, as described above is through afforestation programmes and agro forestry. Agro forestry combines the use of livestock to create sustainable land use systems.

Daniel and Jeff (1999) in the proceedings of the 6th conference on agro forestry in North America argue that afforestation using agro forestry practices as a transitional management strategy will provide more rapid and ecological based forests. This is particularly true when fast-growing, early successional trees are integrated into the agro forestry system. Hence planting of tree species compatible with on-site edaphic and hydrologic conditions is essential to ensure success of any bottom land hardwood afforestation. The proceedings of the AFFORNORD conference on effects of afforestation on ecosystems, landscape and rural development in Iceland in June, 18-22, 2005 put emphasis on the role forest and forest exploitation in the economy and ecology of the Nordic countries play. Afforestation is thus seen as an important activity in restoring biodiversity.
The forest area in Africa is estimated at 635 million hectares equivalent to 21% of the total land area or about 0.7 hectares per person (Kelatwang, S. and Garzuglia, M., 2006). The global forest resources assessment 2005 provides a detailed picture of the current status and trends related to forests in Africa. In their report on changes in forest area in Africa 1990-2005, Kelatwang and Garzuglia show that the rate of afforestation is increasing as is the area of forest designated for the conservation of biological diversity. Africa forests remain under threat from population growth, unsustainable forestry and agricultural practices. African countries are reluctant in clean development mechanism (CDM) participation because there is lack of private investors for afforestation and re-afforestation, since these activities have typically been carried out through Government or donor supported development projects (Desanker, 2005).

The Kenya economy and the livelihoods of her population are largely dependent on natural resources which include plants and animals among others. These resources are increasingly under pressure from human activities and over exploitation resulting to environmental degradation and depletion. The total area under woodland in Kenya is estimated at 48.6 million hectares (1.3 million hectares are under natural forests, 0.7 million are forest plantations, 9.5 million are farmlands and settlements while 37.6 million are woodlands, bush-lands and wooded grasslands (NEMA, state of environment report 2006/007, Kenya).

According to National environment management authority (NEMA), illegal logging, excision clearing for human settlements and agriculture as well as charcoal burning for energy resources and livelihoods have collectively reduced forest cover in the country to a mere 2% of territorial area falling way below international standards. The report emphasis that tree planting is the most effective way of enhancing forest cover and reducing environmental degradation. The forest policy of 2005 calls for concerted efforts in increasing forest cover and save biodiversity. The NEMA report of 2010 recommends the urgent need to encourage the formation of community forest associations (CFAs) by explaining the legal and policy framework as well as the attendant benefits and responsibilities to forest adjacent communities.

Kitui County is faced with environmental problems such as wood fuel shortage, soil erosion and reduced tree based products. Ekisa (2009), in his study of community participation in afforestation and agro forestry programmes in Kenya argues that all these problems could be
solved through afforestation and agroforestry activities. This study therefore intends to determine the factors affecting afforestation programmes in Kitui County specifically in Chuluni division.

1.2 Statement of the problem

The Kenya government recently unveiled vision 2030, its vehicle for accelerating transformation of the country into a rapidly industrializing middle-income nation by the year 2030. The vision is anchored on three key pillars; economic, social and political governance. The economic pillar aims to achieve an economic growth rate of 10% per annum and sustaining the same till 2030 in order to generate more resources to address the MDGs. Managing forests for multiple uses can significantly contribute to the realization of the vision.

Afforestation involves improving natural resources and promoting the valuation of the services and products provided by the ecosystem. It is the act of planting trees so as to increase the vegetation cover. Many people participate in afforestation activities if they are able to get important livelihood sustaining product from the forests.

Clowdhury (2004) observes that majority of farmers participate in afforestation projects because of anticipated economic benefits and environment benefits of social status. He also observes that people’s level of education influences their participation in afforestation projects.

Kitui County is faced with environmental problems such as drought, soil erosion and reduced tree based products. Ekisa (2009) argues that all these problems could be solved through afforestation and agroforestry activities. The county is faced with unsustainable destruction of vegetation cover. It can be observed that studies done on afforestation programmes centres on energy sector, social (poverty reduction strategies) sector and agricultural sector. However there is an academic gap on research done and the study to be done on factors affecting afforestation programmes is going to close that gap- in knowledge. The relevance of this research is that, it will enable governments and non- governmental organizations to take into account environmental planning and management which are an integral part of project planning, implementation and operation. In view of the aforementioned this study was concerned with a focus on Kitui County to establish the factors affecting afforestation programmes.
1.3 Purpose of the study

The purpose of the study was to look into the factors affecting afforestation in Kitui County with specific reference to Chuluni Division.

1.4 Objectives of the study

The study was guided by the following objectives:

1. To determine how household size affects afforestation programmes in Kitui County.
2. To establish how demand for human settlement needs affect afforestation programmes in Kitui County.
3. To determine how population growth rate has affected afforestation programmes in Kitui County.
4. To determine how demand for wood fuel has influenced afforestation programmes in Kitui County.

1.5 Research questions

The research study was based on the following questions?

1. What is the effect of household size on afforestation programmes?
2. What is the effect of demand for human settlement on afforestation programmes?
3. How does population growth rate affect afforestation programmes?
4. What is the effect of wood fuel on afforestation programmes?

1.6 Research hypothesis

H$_{11}$: There is a significant relationship between household size and afforestation programmes
H$_{12}$: There is a significant relationship between human settlement and afforestation Programmes
H$_{13}$: There is a significant relationship between population and afforestation programmes
H$_{14}$: There is a significant relationship between wood fuel and afforestation programmes
1.7 Basic assumptions of the study
The study was based on the following assumptions;

1. All respondents would be cooperative and give responses to the questions posed with being biased.
2. The information given by the respondents would assist the researcher in the investigation of the factors affecting afforestation
3. All respondents would be knowledgeable about the environment Act.
4. All questionnaires send to the respondents would be filled and returned promptly.

1.8 Significance of the study
The study would help the ministry of Agriculture through starting projects in agro forestry farming which helps to conserve biodiversity and also increment of forage important in livestock production. It will also help the ministry of environment and natural resources through the establishment of conservation projects on gazette lands which serve as water towers and natural resources. The study is significant to the ministry of Forestry and Wildlife by highlighting areas where relevant projects can be initiated aimed at increasing land use and biodiversity since wildlife biodiversity is an important resource in the Country for tourism industry, research and education.

1.9 Delimitations of the study
The research was conducted in Chuluni division of Kitui County. Although fifteen farmers groups were involved, they were only represented by their group leaders who sometimes were not well versed with afforestation programmes. The study was set to find out the factors affecting afforestation programmes. The study did not however look at all other aspects that impact on afforestation programmes.

The study mainly used questionnaires on forester and provincial administrators. This was despite the many strengths of interview method which would have provided in-depth data and chance to ask probing questions which was not possible with questionnaires.
1.10 Limitations of the study

Some respondents especially farmers groups were not well versed with Forest Act 2006. This might have affected the exhaustiveness of research instruments in gathering all inclusive information on factors affecting afforestation programmes. The actual field study was costly and time consuming hence the researcher utilized the resources within his budget to obtain information.

Some reluctance was noted in responding to the items in the questionnaire mainly because chiefs thought that the researcher was out to expose specific forest issues in their areas of jurisdiction. However, the researcher assured the respondents that confidentiality was to be ensured.
1.11 Definition of significant terms

**Ecosystem:** A system involving the interactions between a community of living organisms in a particular area and its non-living environment.

**Agro forestry:** An integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock.

**Afforestation:** Refers to planting of trees.

**Participation:** It is the involvement of all stakeholders in whatever activity or project is intended for them. Participation is about sharing responsibilities e.g. in planting.

**Wood fuel:** The construction of wood for charcoal. It is the use of wood as a source of energy.

**Deforestation:** The conversion from forest (closed, open or fragmented forests; plantation and forest regrowth) to non-forest lands.

**Re-afforestation:** The establishment of forest in an area where there was forest during the last 50 years. The previous crop is either replaced by different or same species as before.

1.12 Organization of the study

The study is organized into five chapters. Chapter one deals with the background of the study, problem statement, purpose of the study, objectives of the study, research questions, research hypothesis, significance and limitations of the study, definition of significant terms and organization of the study. Chapter two deals with review of related literature including afforestation programmes in Kenya, poverty in the forest related intergovernmental dialogue, impact of population growth and size on the environment., logging and wood fuel as a source of energy. Chapter three deals with research methodology including research design, target population, sample size and sampling procedures, reliability and validity of research instruments, data collection methods and data analysis techniques. Chapter four involved data analysis and interpretation. Chapter five contains summary findings, discussions, conclusion and recommendations.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature with particular focus on factors affecting afforestation programmes in Kitui County, Kenya. It presents an in depth analysis of poverty, demand for human settlement, agriculture, charcoal as a source of energy and timber and its effects on afforestation programmes. It also explains the rationale for afforestation programmes in Kenya.

2.2 Afforestation activities

Despite the growth of protected land biodiversity including forest resources continue to decline across the globe. Many governments and Non-governmental organizations directly engage in programmes of afforestation to create forests, increase carbon capture and sequestration and help to anthropogenically improve biodiversity.

Europe has deforested the majority of its historical forests. The European union has paid farmers for afforestation since 1990, offering grants to turn farmlands back into forests and payments for the management of forests in Poland, the National programme of afforestation was introduced by the government after world war 11 when total area of forests shrank to 20% of Country’s territory.

Iran is considered a low forest cover region of the world with present cover approximately seven percent of the land area. Due to soil substrates, it is difficult to achieve afforestation on a large scale compared to other temperate areas endowed with more fertile and less rocky and arid soil conditions. Consequently most of afforestation programmes are conducted with non- nature species leading to habitat destruction for native fauna and flora and resulting in an accelerated loss of biodiversity.

The great loss of bottomland forests in North America and the highly fragmented forest remnants make forest restoration a priority wildlife conservation goal (King and Keeland, 1999). This necessitates afforestation programmes in these areas.
Afforestation in South America has been practiced for many decades as a means to address diminishing timber resources. Currently the industry contributes 4.4% to the Country’s gross domestic product. South Africa is estimated to use 1.5 million hectares of land for commercial forestry and it is believed that 1 million acres of land will be needed by 2020 inorder to meet the growing and projected timber demands.

2.3 Afforestation programmes in Kenya

The Sessional paper No. 1 of 1986 entitled ‘A forest policy for Kenya’ recognized the need to carry out afforestation in the rural areas outside the Government gazetted forests as a strategy to conserve the meager forest resources which amounted to less than three percent and continue to dwindle at an alarming rate due to population pressure among other factors (Muita And Mutie, 1997). These meager resources were also expected to provide this increasing population with their basic wood related needs, some of which are very basic to their very survival like firewood. Because of harsh and fragile ecosystem, arid and semi-arid lands (ASALS) have presented unique challenges to forestry extension.

Current approaches have mainly concentrated on conserving and managing the existing natural resources for sustainable use while at the same time promoting the status and use of non-wood forest products in order to broaden the economic base of the ASAL inhabitants which at present centres around livestock and unreliable fragile practices (Muita and Mutie, 1997). In their paper entitled ‘Current forest department extension strategies and experiences in semi-arid lands, they identify the following special problems for social forestry in semi-arid lands: Semi-arid lands have harsh climatic conditions characterized by unreliable rainfall making tree planting difficult due to poor seedling survival, termites pose a serious threat to both seedlings and trees, the large population of animals that tend to roam freely and do destroy trees, land tenure is uncertain and hence trees ownership is not clear, with attendant problems in protecting the same from animals and people.

Hence afforestation programmes in semi-arid lands has to be approached in community approach to vegetation protection and joint ownership and management of bush, trees and forest resources. This paper presented at the conference on social forestry and tree planting technology in semi-arid lands Mugaga in 1997 does not address the factors affecting the afforestation
programmes and specifically deals with strategies and experiences in forest extension in ASAL areas.

The agenda 21 of Rio declaration on forest principles (UNEP, 3-14 June, 1992) called for environmentally sound management of biotechnology. This could significantly contribute in enabling the development of more efficient industrial processes for transforming raw materials, support for sustainable methods of afforestation and re-afforestation and detoxification of hazardous waste. The Governments, at the appropriate level, with assistance of international and regional organizations were called to identify more productive strains of fast-growing trees especially for fuel wood and develop rapid propagation methods to aid wider dissemination and use. It also stressed the need to develop processes to increase the availability of materials derived from biotechnology for use in food and renewable raw materials production.

2.4 Poverty in the forest related intergovernmental dialogue

The linkages between poverty, forests and forestry have received considerable attention in recent years in global forest related policy processes and by international organizations and donor agencies involved in the forest sector (World Bank, 2002). In the 1980’s, this ‘people centred approach’ led to increasing integration of forest issues into rural development efforts, resulting in a shift from industrial timber production towards concepts such as community wood-lots, agro-forestry, buffer zone management around forest reserves. It has also led to increasing importance being given to non-wood forest products.

The World Bank forest strategy (World Bank group, June 2002) acknowledges the need to work increasingly in partnerships with stakeholders and to look at forests in terms of how they can reduce poverty. The strategy is founded in three pillars; harnessing the potential of forests to reduce poverty, integrating forests in sustainable economic development, protecting vital local and global forest environmental services and values.

The bank lists the priority areas in the revised strategy as promoting institutional and legal frameworks that ensure the rights of indigenous and other forest dependant peoples and communities are protected, empowering women, the poor and the marginalized to make a more active role in formulating and implementing rural forest policies and programmes, supporting the scaling up of collaborative forest management so that local communities can manage their own
resources, rehabilitate and protect forests, market forest products and benefit from security of tenure, working with local groups NGO’s, the private sector and other partners to integrate forest and agro-forestry farming systems into rural development strategies.

Rural poverty in sub-Saharan Africa often presents a striking similar set of symptoms, while in the causes can vary considerably. Work on rural poverty and domestic energy in Kenya suggests that rapid privatization of land resources is the basic cause of both poverty and domestic energy problems (Weisner B, 2002). The nexus between poverty and the environment cannot be explained in terms of people’s lack of income alone. People’s livelihoods and human development depends on a number of factors including ownership of natural resources (World Bank, June 2002). Poverty leads to over-use and destruction of natural resources where short term needs are pursued at the expense of long-term environmental sustainability.

2.5 Impact of population growth and size on the environment

Population increase over the years has exerted considerable pressure on land and related natural resources. The consequences include decline in forest cover over the years due to excisions done to settle the poor and landless lacking shelter and means of subsistence. Other impacts include deforestation, loss of indigenous plant and animal species and destruction of water catchment areas (NEMA, 2004).

Pressure exerted by population growth and agricultural expansion has led to sub-division of land into small uneconomic sizes, encroachment into forests, increased migration into ASALS and subsequent introduction of poor land use practices (NEMA, 2005). Demand for land to expand agriculture and human settlements are the main driving forces behind declining forest cover. These have led to excision of forests, illegal cultivation and human settlements in forest areas. This problem has been experienced in most forests in the country ranging from the large forest blocks to very small isolated hilltop forests (NEMA, 2005).
Table 2.1. Population distribution by administrative units in Chuluni division in 1999

<table>
<thead>
<tr>
<th>Location</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Households</th>
<th>km²</th>
<th>Density</th>
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<td>Nzambani</td>
<td>1100</td>
<td>12,079</td>
<td>23,079</td>
<td>4229</td>
<td>1569</td>
<td>147</td>
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<tr>
<td>Nzangathi</td>
<td>3748</td>
<td>4133</td>
<td>7881</td>
<td>1497</td>
<td>86</td>
<td>92</td>
</tr>
<tr>
<td>Mbitini</td>
<td>8360</td>
<td>9332</td>
<td>17,692</td>
<td>3,231</td>
<td>116.9</td>
<td>151</td>
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<tr>
<td>Kisasi</td>
<td>5812</td>
<td>6,306</td>
<td>12,118</td>
<td>2149</td>
<td>59.7</td>
<td>203</td>
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<tr>
<td>Mbusyani</td>
<td>5378</td>
<td>6,193</td>
<td>11,571</td>
<td>1,871</td>
<td>10.2</td>
<td>113</td>
</tr>
</tbody>
</table>

Source: CBS; 1999 population and housing census book volume 1 page 53

The increase in population in Chuluni division has exerted pressure on environment leading to clearing of forest cover for agricultural activities. Table 2.1 above shows the population figures in the division in 1999 and table 2.2 below shows the population statistics in 2009.

Table 2.2. Population statistics in Chuluni division in 2009

<table>
<thead>
<tr>
<th>Location</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Households</th>
<th>km²</th>
<th>Density</th>
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<tbody>
<tr>
<td>Kisasi</td>
<td>6,786</td>
<td>7,112</td>
<td>13,898</td>
<td>2,910</td>
<td>73.5</td>
<td>189.08</td>
</tr>
<tr>
<td>Mbitini</td>
<td>9,151</td>
<td>10,197</td>
<td>19,348</td>
<td>3,787</td>
<td>114.5</td>
<td>168.97</td>
</tr>
<tr>
<td>Mbusyani</td>
<td>4,805</td>
<td>5,537</td>
<td>10,342</td>
<td>2,125</td>
<td>86.3</td>
<td>119.83</td>
</tr>
<tr>
<td>Thua</td>
<td>3,953</td>
<td>4,286</td>
<td>8,239</td>
<td>1,619</td>
<td>125.2</td>
<td>65.80</td>
</tr>
<tr>
<td>Nzangathi</td>
<td>4,848</td>
<td>5,149</td>
<td>9,997</td>
<td>1,968</td>
<td>88.0</td>
<td>113.60</td>
</tr>
<tr>
<td>Nzambani</td>
<td>10,618</td>
<td>11,318</td>
<td>21,936</td>
<td>4,734</td>
<td>86.0</td>
<td>255.06</td>
</tr>
</tbody>
</table>

Source: KNBS 2009 Kenya population and housing census vol. 11 volume 1A page 82

The demand for wood fuel caused by the growing population is expected to continue increasing steadily posing a major threat to existing forest resources and biodiversity (NEMA, 2004, State of environment report 2003, Kenya).

2.6 Forestry and Logging

Reforestation projects have faced many difficulties that have to be solved before the reforestation can be successful. In dry areas of Kenya, the supply of forest products is getting scarce due to
overexploitation coupled with low regenerative capacity due to adverse weather conditions. It is in these situations that most foresters are operating to try to solve people problems which also include supply of timber and building poles.

Chavangi, (1983) argues that the application of suitable agro forestry systems to different land use situation has been suggested as one of the solutions to the problem of provision of fuel wood, timber and poles. Indigenous trees planted properly are the best assurance of success in afforestation according to FAO 1955. The implication of the progressive depletion of the vegetation resources leads to the unavailability of wood for other essential needs such as timber for house construction. The scarcity of wood for household domestic need imposes an arduous burden on the wood collectors who are mostly women. Ongugo and Njuguna (2004), argues that the harvesting of poles and posts have reduced forest cover probably because of the frequent bans on harvesting and sell of forest produce in the markets.

2.7 Wood fuel as a source of energy

Energy exploitation contributes to deforestation and land degradation. The continued high dependence on biomass resource to provide energy to majority of Kenyans means its demand will undoubtedly continue to raise leading to the felling of more trees for fuel wood and charcoal production. The rapid urbanization phenomenon compounds the biomass supply problem, particularly charcoal to meet the soaring demand against a background of declining biomass cover. Most charcoal production involves selective harvesting. Commercial charcoal production in some areas has led to deforestation of large tracts of wooded savannah (Ecoforum, 2002).

Kamweti (1984), in a paper entitled ‘Fuel wood in Eastern Africa , present situation and prospects’ presented to FAO of united states in 1984 carried out the study of fuel wood as a source of energy and an analysis was carried out in the fuel wood situation in the Eastern African sub-region using 1980 as the base year and assessing developments to the year 2000. The main conclusions were that there is at present a wood fuel deficit estimated at around 53 percent of needs in the sub-region and this will worsen to 56 percent of much larger needs by the year 2000 even if the current rate of tree planting is maintained. Deficits are worst in the densely populated highlands in all the countries where these exist, natural forests and wood lands, in spite of their unmanaged or poorly managed state currently account for about 60 percent of the sustainable
fuel wood supply potential. They could provide around 80 percent if all the sustainable supply potential were accessible. It appears that affective management of this resource is the key feasible solutions of Eastern Africa’s fuel wood crisis. The analysis suggests that no planting efforts can be large enough to fully substitute for natural wood land so the current nearly exclusive emphasis on plantations is unfortunate, with regard to the importance of fuel wood resource accessibility, the study shows that this factor is at present the largest single determinant of supply, trees growing on agricultural land, although currently occupies less than 10 percent of land area, provide nearly a quarter of all fuel wood and are particularly important The study shows that although their productivity may be high, the currently limited areas of fuel wood plantations which exist or whose creation can be financed places such plantations into only third priority among solutions to the crisis except as a response to concentrated urban or industrial demand or to urgent situations.

The United Nations conference on environment and development, Agenda 21 of Rio Declaration of 3rd – 14th June, 1992 called for rural energy transition to enhance productivity. It emphasized the need for more intensive energy inputs for increased productivity of human labour and for income generation. To this end, rural energy policies and technologies should promote a mix of cost effective fossil and renewable energy sources that is itself sustainable and ensures sustainable agricultural development.

Forest resources in ASAL areas are dwindling fast due to increasing population, expanding agricultural fields and energy generation. The processes that are depleting forests in ASALS are those related to domestic energy production and consumption such as charcoal burning. Socio-economic surveys done in Kitui County indicate that over 90 percent of the rural dwellers use fuel wood for cooking and other cultural activities. A number of households in the County use fuel wood as a source of lighting as shown in the table below:

Table 2.3: Rural households by main type of lighting fuel in Kitui County

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Pressure lamp</th>
<th>Lantern lamp</th>
<th>Gas lamp</th>
<th>Fuel wood</th>
<th>Solar</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1049</td>
<td>442</td>
<td>35,834</td>
<td>492</td>
<td>2,653</td>
<td>2160</td>
<td>281</td>
<td>67,254</td>
</tr>
</tbody>
</table>

Source; KNBS 2009 Kenya population and housing census volume 2 page 378
The expanding agricultural lands and overstocking of livestock has progressively degraded the forest cover creating ecological imbalance thus leading to shortages in fuel wood demands both in rural and urban areas (Kyenze, Kitheka, Kimiti and Shimada., 2001) in their paper entitled ‘Energy conservation for sustainable wood fuel utilization’ the following factors were identified as contributing to scarcity of fuel wood in ASALS of Kitui; overcutting of woody vegetation, especially the acacia species whose growth is slow due to poor management and browsing by tree grazing animals, the demand for acacia species is high due to their high quality charcoal, the demand for wood fuel for cooking and heating has also increased due to population growth, more land for cultivation is increasingly being cleared, inefficient use of forest resources which provide most of energy for fuel wood supplies. Brick making contributes to degradation of environment and depletion of forest resources especially during the brick firing stage and tobacco curing, though an economic activity also plays a major role in depleting forest resources.

The challenge is how to reduce reliance on wood fuel sources in order to reduce associated adverse impacts on environment, especially our dwindling forest resources and general vegetation cover. Wamukonya (2002) in her paper entitled ‘A critical look at gender and energy mainstreaming in Africa avers that a significant proportion of the African population live in rural and peri-urban areas where access to modern energy is lowest and its improvement most costly. Most of these people rely predominantly on traditional biomass fuels. Projects and programmes on tree planting were launched to address energy problems. Women were regarded as a special target group, to which donors and NGO’s directed aid in various ways. They were the main target group for wood-saving store programmes and eventually also of rural afforestation programmes.

The writer of this script paper focuses on inequality along gender lines which has been one of the main factors driving the establishment of women-focused, and more recently gender-focused afforestation programmes. Hence it is prudent to clearly look into the factors that influence afforestation programmes which are not highlighted by the writer.
2.8 Conceptual framework

Several afforestation projects have been undertaken in the County over time, including planting of trees on the soil and water conservation structures. Many people participate in afforestation activities if they are able to get important livelihood sustaining products from the forests. The framework of this study is based on the system approach which relates the variables essential for successful afforestation programmes in Kenya.

The millennium development goal number seven calls for the integration of the principles of sustainable development into County policies and programmes to reserve the loss of environmental resources.
Figure 1 Conceptual framework

**Independent Variables**

- **Household size**
  - Number of households
  - Number of individuals

- **Demand for Human Settlement**
  - Land
  - Timber

- **Human population**
  - Population density
  - Environmental degradation

- **Wood fuel**
  - Charcoal burning
  - Firewood

**Intervening Variables**

- Agriculture

**Dependent variable**

- Afforestation

**Government policy**

- Gazettlement of forests
- Legislation on logging
2.9 Summary of the literature review

The chapter dealt with summary of related literature as pertains to factors affecting afforestation programmes. The review indicates that the Government of Kenya through Sessional Paper No. 1 of 1986, ‘A Forest Policy for Kenya’ that recognises the need for carrying out afforestation programmes in rural areas outside the Gazetted forests as a strategy towards conserving the meager forest resources. The World Bank (2002) acknowledges that poverty is a hindrance to effective afforestation programmes and thus the need to increasingly work in partnership with all stakeholders and look at forests in terms of how they can reduce poverty.

NEMA (2004) concurs with the World Bank (2002) that population increase over the years has exerted a lot of pressure on land and related natural resources leading to reduced forest land, loss of indigenous trees and subsequent decline in forest cover. One challenge facing afforestation programmes is logging and cutting down trees for wood fuel, timber and poles. This its worth noting that the forest cover is dwindling very fast due to increasing population, expanding agricultural fields and energy generation. This calls for prudent environmental practices that can ensure successful implementation of afforestation programmes. Afforestation programmes dealing with rural energy crisis or any specific manifestations of rural poverty must be fitted in all projects geared in improving environment and its bio diversity.
3.1 Introduction

This chapter discusses research methodology under the sub-headings research design, target population, sampling and sampling procedure, data collection instruments, data collection procedures, reliability of instruments, validity of instruments, data analysis and presentation techniques and operational definition of variables.

3.2 Research design

The study used a descriptive survey research design that involved measurement, classification, analysis, comparison and interpretation of data. Descriptive research helps in describing the characteristics of variables under investigation appropriately. This design is not restricted to fact finding but may often result in the formulation of important principles of knowledge and solutions to significant problems (Kerlinger, 1973). Thus the researcher was able to explain and explore the existing status of afforestation programme and make inferences about relations among the variables under investigation.

3.3 Target population

The study targeted to collect data from different clusters of stakeholders who are directly involved in afforestation programmes in Kitui County. These include forest officers, administrators (chiefs) and farmers/ charcoal burners. The stakeholders are knowledgeable on the factors affecting afforestation programmes and they were expected to respond to the instrument questions appropriately based on their experience.

The target population was all foresters, chiefs and farming groups engaged in afforestation programmes in Chuluni division. The division has six locations with 19 provincial administrators, 1 forester and 15 farmers groups as shown in table 3.1.
Table 3.1: The target population

<table>
<thead>
<tr>
<th>Category of target population</th>
<th>Size of population(n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foresters/ Technical assistant</td>
<td>1</td>
</tr>
<tr>
<td>Chiefs/ assistants</td>
<td>19</td>
</tr>
<tr>
<td>Farmers groups</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

**Source:** District Forestry office, Kitui-2012

3.4 Sample size

The researcher used census to get information from target population. The census comprised all the 17 administration officers, 15 farmers groups and one forester.

3.5 Data collection instruments

The study used questionnaires for the forester/technical assistant and provincial administrators as the main tool for collecting data. The selection of this tool has been guided by the nature of data to be collected, the time available as well as by the objective of the study. Questionnaires were used since the study was concerned with variables that cannot be directly observed such as views, opinions, perceptions and feelings of the respondents. The target population was also largely literate and unlikely to have difficulties responding to questionnaire items.

All the questionnaires were divided into parts A and B. Part A of the foresters and provincial administration officials questionnaires sought demographic data, academic and professional qualifications as well as work experience. Part B consisted of questions made to test the research questions. The questionnaires had both structured and unstructured questions.

The researcher used interview method for the fifteen farming groups as a convenient tool for collecting data. Interview surveys typically attain higher response rate than mail surveys do. The interviewer was guided by an interview guide. The interviewer asked the questions properly, recorded responses accurately and probed meaningfully.
3.6 Data collection procedure

A research permit was obtained from the forest and provincial administration offices in Kitui County before collecting data from the respondents. Assistant chiefs and chairpersons of farmers groups were contacted prior to the actual exercise of data collection for familiarization and authority to collect data.

The researcher wrote an introduction letter to the respondents stating clearly that the data collected was for academic purposes only and that it would be treated with confidence. The data was collected by the researcher alone and the exercise carried out over a period of three weeks in the month of April.

3.7 Reliability and validity.

Reliability of measurement instruments contributes to validity of research findings. If an instrument measures what is not designated to measure, then the instrument fails to be valid and would yield unreliable results.

3.7.1 Reliability of the instruments

Reliability refers to the degree to which a measure supplies consistent results (Mugenda and Mugenda, 1999). Reliability was tested through a pilot test on 5 farmers groups after which amendments were effected before the actual data collection was done.

3.7.2 Validity of the instruments

To ascertain research validity of the research instruments, the researcher intensively consulted his supervisor on items analysis and accuracy of the questionnaire and the observation guide items in relation to the variables of the study. The researcher also widely made consultations with colleagues on questionnaire development. This led to the development of a scale which logically reflected what it purported to measure, enabling the researcher to obtain sufficient information on the factors affecting afforestation programmes in Kitui County.
3.8 Data analysis and presentation techniques

The raw data was appropriately edited by checking the questionnaires for completeness and accuracy. Descriptive statistics such as frequencies and percentages were used to analyze data. The analyzed data was presented in form of tables. This data formed the basis for conclusion and recommendations for the study.

3.9 Operationalization of variables

Indicators were derived from the main variables under the study in order to render them measurable.
### Table 3.2 Operationalization of variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>indicators</th>
<th>Measure</th>
<th>Scale</th>
<th>Data collection method</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Size</td>
<td>Households. Individuals.</td>
<td>Number of households. Number of individuals.</td>
<td>Nominal</td>
<td>Questionnaire Interview</td>
<td>Frequencies Tabulation Chi square statistic</td>
</tr>
<tr>
<td>Population</td>
<td>Population density. Environmental degradation</td>
<td>Level</td>
<td>Level</td>
<td>Nominal</td>
<td>Questionnaire Interview</td>
</tr>
<tr>
<td>Demand for human settlement</td>
<td>Land. Timber.</td>
<td>Level</td>
<td>Level</td>
<td>Nominal</td>
<td>Questionnaire Interview</td>
</tr>
<tr>
<td>Wood fuel</td>
<td>Charcoal burning. Firewood.</td>
<td>Level</td>
<td>Level</td>
<td>Nominal</td>
<td>Questionnaire Interview</td>
</tr>
</tbody>
</table>
CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

The chapter analyses and presents the findings of the study based on the data collected through the use of a questionnaire and an interview guide. The respondents were provincial administration officers, women groups and the forest officer in Chuluni division in Kitui County. The provincial administration officers and women groups were asked to fill the questionnaires while the forest officer from the division was interviewed by the researcher. The statistical Package for Social Sciences was used to code, tabulate and analyze data, while frequency tables were used to present the data. Presentation, interpretation and discussion of the findings was done based on the objectives and research questionnaires.

4.2 Response rate

The study sought to find out the response rate of the provincial administration officers, Farmers groups and forest officer who participated in the study. The response rate was 94.3 percent as presented in Table 4.1 below.

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Expected n</th>
<th>Expected Percentage</th>
<th>Actual n</th>
<th>Actual Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provincial administrators</td>
<td>19</td>
<td>100.0</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td>Women groups</td>
<td>15</td>
<td>100.0</td>
<td>15</td>
<td>100.0</td>
</tr>
<tr>
<td>Forest officers</td>
<td>1</td>
<td>100.0</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>100.0</strong></td>
<td><strong>33</strong></td>
<td><strong>94.3</strong></td>
</tr>
</tbody>
</table>

The forest officer and all the 15 farmers groups took part in the study, while 17 (89.5%) provincial administration officers out of expected 19 officers participated in the study. It was necessary to find out the response rate in order to ensure that the sample size was representative of the
initial target population, provide quality results and adhere to rules and regulations governing research procedures. On average, the overall response rate was 33 (94.3%). The questionnaire return rate was acceptable since it was over and above the 75.0% as Mugenda and Mugenda (2003) notes that a response rate of 75% and above is acceptable.

4.3 Demographic characteristics of the respondents

The socio-demographic characteristics of the respondents included gender, age, academic/professional qualification the officers, work experience, and access to formal education by the women groups.

4.3.1 Gender and age of the provincial administrators

Findings of the study on age and gender of the provincial administration officers are presented in Table 4.2 as per the various age brackets.

Table 4.2 Gender and age of provincial administrators

<table>
<thead>
<tr>
<th>Gender by age</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Percentage</td>
<td>n</td>
</tr>
<tr>
<td>30-39</td>
<td>5</td>
<td>100.0</td>
<td>5</td>
</tr>
<tr>
<td>40-49</td>
<td>8</td>
<td>72.7</td>
<td>3</td>
</tr>
<tr>
<td>50 years and above</td>
<td>1</td>
<td>100.0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>82.4</td>
<td>3</td>
</tr>
</tbody>
</table>

As indicated in table 4.2, 11 of the administrators were in the 40-49 year age bracket, 8(72.7%) males and 3(27.3%) females. One male administrator was in the 50 and above age bracket with 5(100.0%) males in the 30-39 year age bracket. This finding shows that majority of the officers who participated in the study were mature individuals with the capacity to provide information on the factors that affect afforestation programmes in Kitui County. The Forest officer who took part in the study was a male in the 30-39 year age bracket. Maturity of the officers and
experience was crucial in helping to obtain knowledge on the various factors that influence afforestation programmes in the area.

4.3.2 Highest academic level by gender of the officers

The study sought to find out the highest academic level of the 17 provincial administration officers and the forest officer. The findings are presented in Table 4.3 based on the highest level of education attained by each officer as per their gender. Using the closest ended question type, the officers chose their levels of education from the options provided.

Table 4.3 Highest academic level by gender of the officers

<table>
<thead>
<tr>
<th>Academic qualifications by gender</th>
<th>Provincial administrators</th>
<th>Forest officer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Secondary level</td>
<td>n</td>
<td>Percentage</td>
<td>N</td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>71.4</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>28.6</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>61.1</td>
<td>1</td>
</tr>
<tr>
<td>College</td>
<td>3</td>
<td>21.4</td>
<td>2</td>
</tr>
<tr>
<td>University level</td>
<td>1</td>
<td>7.1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>33.3</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100.0</td>
<td>18</td>
</tr>
</tbody>
</table>

Results of the study indicated that majority of the administrators had high school (secondary) level of education as expressed by 11(61.1%); that is 10(71.4%) males and 1(28.6%) female, 5 (27.8%) administrators and forest officer having college qualifications. The forest officer clearly stated that he had a diploma. Only 1(7.1%) had university qualifications.

However, the forest officer pointed out that he had attended several training programmes on forest conservation, thus he was in a better position to provide proper guidance the measures that would be undertaken to come with better afforestation programmes. Using the knowledge and skills acquired from the training, the officer would help to inculcate positive attitudes in the
Chuluni people on the benefits associated with active participation in the afforestation programmes.

### 4.3.3 Work experience by gender of the provincial administration officers

The researcher sought to find out the work experience of the provincial administration officers. The findings on the work experience are presented as per the gender of the provincial administration officers. The work experience was categorized into groups set at 5 years interval starting with below 5 years to 26 years and above as shown in Table 4.4.

**Table 4.4 Work experience by gender of the provincial administration officers**

<table>
<thead>
<tr>
<th>Work experience by gender</th>
<th>Male</th>
<th>Percentage</th>
<th>Female</th>
<th>Percentage</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 5 years</td>
<td>5</td>
<td>35.7</td>
<td>1</td>
<td>33.3</td>
<td>6</td>
<td>35.3</td>
</tr>
<tr>
<td>5-10 years</td>
<td>4</td>
<td>28.6</td>
<td>1</td>
<td>33.3</td>
<td>5</td>
<td>29.4</td>
</tr>
<tr>
<td>11-15 years</td>
<td>4</td>
<td>28.6</td>
<td>1</td>
<td>33.3</td>
<td>5</td>
<td>29.4</td>
</tr>
<tr>
<td>16-20 years</td>
<td>1</td>
<td>7.1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td>100.0</td>
<td>3</td>
<td>100.0</td>
<td>17</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Study findings indicates that 6(35.3%) administrators represented by 5(35.7%) males and 1(33.3%) female had a work experience below 5 years, an equal number of 5(29.4%) had a 5-10 year and 11-15 year work experience, in each case 4(28.6%) males and 1(33.3%) female respectively. One male provincial administration officer reported having 16-20 years work experience.

The provincial administration is critical in ensuring that government policies and legislations are effectively implemented in their areas of jurisdiction. Active participation of the two genders is also in line with the gender mainstreaming policy and report of the united nations of 2002 by which a people centred approach’ would help to increase integration of forest issues into rural
development efforts, resulting in a shift from industrial timber production towards concepts such as community wood-lots, agro-forestry, buffer zone management around forest reserves which can be handled by both gender.

4.3.4 Access to formal education

The study sought to find out from the 17 provincial administration officers whether the people of Chuluni Division in Kitui County had access to formal education. The information on access to formal education as reported by provincial administration officers is presented in Table 4.5.

<table>
<thead>
<tr>
<th>Access to formal education</th>
<th>Responses from provincial administration officers</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire primary education</td>
<td>8</td>
<td>8</td>
<td>57.1</td>
</tr>
<tr>
<td>Afford up to secondary level</td>
<td>3</td>
<td>3</td>
<td>21.4</td>
</tr>
<tr>
<td>Children go to primary schools and adults to adult centres</td>
<td>1</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td>Poverty is a limiting factor</td>
<td>1</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td>Officers are least concerned</td>
<td>1</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
Findings of the study from 15(88.2%) provincial administration officers indicated that people in their areas of jurisdiction have access to formal education, on the contrary 2(11.8%) said No. The officers argued that not all the people were able to access formal education due to the terrain and adverse weather conditions. Asked to explain, the issue of access to formal education; 8(57.1%) officers said that introduction of Free Primary Education, had led to increased enrolment, boasting access to primary education. It was noted that most people are able to acquire primary education. More so 3(21.4%) officers reported that the people are able to acquire formal education up to secondary or high school level.

The study observed that some officers in the areas were not very serious and never visited the villagers to ascertain the actual state of education. One provincial officer pointed out that children attend formal education, as adults attend adult literacy classes. Formal education in the area is facing a critical challenge of collapse. A view that one officer supported by saying that poverty is a limiting factor towards access to formal education.

Introduction of Free Primary Education in 2003 by the Kenya Government, led to an increase in enrolment in primary schools. Even the old were not spared as they got an opportunity to join formal primary schools or join adult education programmes, as reported by 1(7.1%) officer.

However 3(21.4%) administrators were of the opinion that majority of the people are able to acquire formal education up to secondary school. Some officers argued that due to laxity and reluctance of education officers in the area many people in the area are not able to access formal education, a view that was supported by 1(7.1%) officer, who was of the contrary opinion that poverty was a limiting factor to access to formal education. Factors that impact on the livelihood of people may have a direct or indirect influence on their ability to access formal education. One such factor is the economic viability of the individuals that has a direct influence on education.

4.4 Effects of household size on afforestation programmes

The Provincial administrators were of the opinion that poverty strongly affects afforestation programmes in Kitui County as reported by 10(58.8%) and supported by 6(35.3%) as 1(5.9%) disagreed. The World Bank (2002) underscores that poverty leads to over-use and destruction of natural resources where short term needs are pursued at the expense of long-term environmental sustainability. The World Bank forest strategy acknowledges the need to work increasingly in
partnerships with stakeholders and to look at forests in terms of how they can reduce poverty by harnessing the potential of forests to reduce poverty.

Weisner (2002) concurs with the finding by arguing that rural poverty in sub-Saharan Africa has often presented strikingly similar set of symptoms, which he associates with rapid privatization of land resources.

4.4.1 Average number of households

The study found out that most 12(70.6%) households had over 5 members, with 5(29.4%) reporting that the households had less than 5 members. The forest officer concurred with the provincial administration officers that the average number of household size in the area was over 5 citing 5-10 members. It was established from the forest officer that the main economic activity of the people of Chuluni area was agroforestry.

The women groups were of the contrary opinion that the main economic activity was 9(60.0%) was subsistence farming and horticultural crop production. Most farmers in the area grow cereal crops for home consumption and fruits for income generation. Through this programmes they are able to supplement the family income thus reducing the pressure on existing forests.

Members of women groups were in agreement with the provincial administration officers and the forest officer that the average sizes of their families were over 5, with 9 (60.0%) saying 5 members and 6(40.0%) saying that the households had 6 members.

4.4.2 Effect of household size on environment

The influence of the household size on afforestation programmes was sought from the provincial administration officers who took part in the study. The study findings on the effect of the household size are presented in Table 4.6. Only 14 of the provincial officers answered this particular item, while three remained silent.
Table 4.6 Effect of household size on environment

<table>
<thead>
<tr>
<th>Responses by Provincial administration officers</th>
<th>Effect of household size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deforestation to generate income</td>
<td>N 6</td>
</tr>
<tr>
<td>Trees are cut down for fuel</td>
<td>N 3</td>
</tr>
<tr>
<td>Environmental degradation</td>
<td>N 3</td>
</tr>
<tr>
<td>Lack of knowledge on conservation</td>
<td>N 1</td>
</tr>
<tr>
<td>Destruction of forest cover</td>
<td>N 1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

Findings of the study indicated that the size of the household had influence on the environment. It was reported by 6(12.8%) of the provincial administrators that household size leads to serious effects on the environment including deforestation. Trees are cut down without re-planting or reforestation. Most people cut down the trees to make firewood, charcoal or timber in order to raise income, which is required to sustain the families. Thus the higher the household size, the higher the pressure exerted on the existing forests leading to serious depletion of the forest cover.

It was reported by 3(21.4%) of the provincial administration officers that trees are cut down to obtain wood fuel which is widely used in the area as the main source of energy. An equal number of 3(21.4%) pointed out that household size contributed to environmental degradation. It was observed that majority of the people in the area cannot afford electricity or install solar power for energy generation, thus cut down trees for fuel and to generate income. This exposes the land to the agents of erosion, leading to massive destruction of the environment.

The finding indicates that an increase in the household size leads to depletion of the natural resources including water and the natural vegetation cover. Most officers associated the environmental problems experienced in the area to deforestation which is caused by increased population pressure on the available land. However, three of the officers did not respond to this item. It was the opinion of the forest officer that agroforestry as an economic activity had a
positive influence on the environment. Since, the practice of agroforestry leads to increased afforestation activities.

**4.5 Population density of Chuluni Division, Kitui County**

The study sought to find out the population density of Chuluni division by asking the provincial officers to rate it as very high, high, medium, low and very low. All the 17 provincial administration officers answered this particular question. The findings are presented in Table 4.7.

<table>
<thead>
<tr>
<th>Population density</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>High</td>
<td>7</td>
<td>41.2</td>
</tr>
<tr>
<td>Medium</td>
<td>8</td>
<td>47.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Most 8(47.1%) provincial administration officers were of the opinion that the area has a medium population density, with 7(41.2%) officers saying that the area has a high population density. Considering the average household size as per the Kenya Housing and Population Census of August 24-25 night, 2009, the average household size is 5-7 individuals per household. The findings of the study are in line with the Kenya Housing and Population Census results of 2009. Similarly, 2(11.8%) of the officers rated the area as having a very high population density. The results from all the 17 provincial administration officers are an indication that the region has a high density.

All the women groups agreed that they had experienced population growth for the last 10 years and that this was impacting on the available land. NEMA (2004) posits that population increase over the years has exerted considerable pressure on land and related natural resources leading to a decline in forest cover over the years due to excisions done to settle the poor and landless lacking shelter and means of subsistence. It further notes that its impacts include deforestation, loss of indigenous plant and animal species and destruction of water catchment areas.
4.6 Effects of human settlement on afforestation

The provincial administrators were in agreement that high human population affects afforestation programmes as pointed 9(52.9%) officers who strongly agreed. This view was supported by 8(47.1%) officers who agreed that human population has an effect on afforestation programmes. The provincial administration officers were in agreement that there is a high demand for human settlement as reported by 16(94.1%) with 1(5.9%) saying No. The demand for human settlement and pressure exerted on existing forest cover manifests in various ways as expressed by the officers.

According to the Central Bureau of Statistics (2009) Housing and population census report the increase in population in Chuluni division has exerted pressure on environment leading to clearing of forest cover for agricultural activities.

Table 4.8 Effects of human settlement on afforestation

<table>
<thead>
<tr>
<th>Effect of population on afforestation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate space for afforestation</td>
<td>3</td>
<td>17.6</td>
</tr>
<tr>
<td>Extensive destruction of forests</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td>Clearing of forests for farming</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>Water shortages</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Encouragement to replace cut trees</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>No response</td>
<td>6</td>
<td>35.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

The provincial administration officers reported that human settlements had direct effect on afforestation programmes in Chuluni area. This was evident from the reports that forests are heavily depleted due to human encroachment. Some 3(17.6%) noted that increase in human population led to the demand for more space thus reducing available forest area. This was echoed by 3(17.6%) other officers who said that there was extensive destruction of the forests to create space for human settlement, while 2(11.8%) officers reported that forests are cleared to create farmland. All the women groups concurred that population expansion contributes to
environmental degradation through the practice of sand harvesting and population growth. An increase in population implies an increased demand for wood fuel, timber for construction and pressure on the available land.

Destruction of the forest cover leads to water shortages as reported by 1(5.9%) officer, considering the fact that forests act as water catchments. One officer was of the opinion that the people should be encouraged to plant more trees in the area. Efforts should be made to encourage the growing of trees in order to meet the demand for wood fuel caused by the growing population. The state of environment report of 2003 points out that with the expected increase it will continue to pose a major threat to existing forest resources and biodiversity.

4.7 Effects of the demand for human settlement

With the increase in human population the demand for land is increasing day by day. There was need to find out the effect of demand for human settlement from the provincial administrators. Findings from the 17 provincial administration officers are shown in Table 4.9.

<table>
<thead>
<tr>
<th>Effect of demand for human settlement</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate space for afforestation(planting trees)</td>
<td>8</td>
<td>47.1</td>
</tr>
<tr>
<td>Cutting down of trees for construction</td>
<td>3</td>
<td>17.6</td>
</tr>
<tr>
<td>Water shortages</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>High population leads to over exploitation</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

The study found out that the demand for space for human settlement leads to inadequate space for planting of trees as reported by 8(47.1%) provincial administration officers. However, 3(17.6%) of the officers were of the opinion that trees are cut down to create space for construction of human settlements. An equal number of 2(11.8%) provincial administrators were
of the opinion that high population leads to over exploitation of existing resources and serious water shortages. At least two (11.8%) officers did not response to the question.

4.7.1 Preferred materials for construction of dwellings

Information was sought from the 17 provincial administration officers on the preferred materials for construction of dwellings. Results of the findings are as shown in Table 4.10. The most commonly used building materials used are bricks, timber, thatching grass and iron sheets.

Table 4.10 Preferred materials for construction of dwellings

<table>
<thead>
<tr>
<th>Preferred materials for construction of dwelling</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricks</td>
<td>8</td>
<td>47.1</td>
</tr>
<tr>
<td>Timber</td>
<td>5</td>
<td>29.4</td>
</tr>
<tr>
<td>Thatching grass</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>Iron sheets</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Majority 8(47.1%) of the provincial administration officers reported that bricks were the preferred construction materials for dwellings, while 5(29.4%) said timber as 2(11.8%) officers noted that thatching grass with 1(5.9%) saying that iron sheets were the preferred materials for construction of dwellings. Reports from 10(66.7%) women groups showed that timber or wood was the main material used for construction of dwellings. It was reported by 5(33.3%) women groups that construction materials got from the nearby shopping centres are mainly timber or wood.

It should be noted that all the preferred materials require timber at one stage or the other. With the ever increasing demand for construction materials, destruction of forest areas continues. The forest officer agrees that there is a relationship between demands for construction of human settlements with afforestation, since more land is required for setting up the settlements. He
further noted that afforestation has increased especially in private farms due to the high demand for timber, which the government forests cannot withstand.

According to the forest officer there are no informal human settlements in the area, which is an indication that people in the area live in formal settlements. Similarly, the women groups indicated that they have no settlement problems. They also pointed out that there is a relationship between settlement and population. Increasing population demands for setting up new settlements. This has the implication that either the available forests are depleted to create space for construction or few trees are planted.

The forester further noted that drought and poverty were the main challenges facing afforestation programmes in the area, as most people are unable to afford purchase of seedlings and chemicals required initiate there own nurseries. Desertification is not a challenge for the area as the government forests are intact and more people are encouraged to plant trees. The finding is in line with Chavangi (1983) who concurs with Ongugo and Njuguna (2004) that harvesting of poles and posts has reduced forest cover in dry areas of Kenya; hence supply of forest products is getting scarce due to overexploitation coupled with low regenerative capacity due to adverse weather conditions.

4.7.2 Gazetted areas for afforestation

The study found out from 16(94.1%) provincial administration officers that there were no gazetted forest areas, except for one who reported that there were areas gazetted for forests. Thus it was not easy to ascertain the claim of human encroachment on the gazetted areas. Similarly, 16(94.1%) officers said that there were no settlement committees in the area. Only one officer reported that there were settlement committees which were mandated to control human settlement in the area. The forest officer concurred with the officer that there were gazetted forests in the area which are still intact that have not been affected by human settlement.

Study finding are in line with the sessional paper No. 1 of 1986 entitled ‘A forest policy for Kenya’ that recognized the need to carry out afforestation in the rural areas outside the Government Gazetted forests as a strategy to conserve the meager forest resources which amounted to less than three percent and continue to dwindle at an alarming rate due to population pressure among other factors (Muita And Mutie, 1997).
4.8 Effect of wood fuel on afforestation programmes

All the officers concurred that firewood was the main source of energy in the area. Asked the reasons as to why firewood was the main source of energy. The officers reported that poverty and poor living standards were the main factors that contribute towards use of firewood as the main source of energy as expressed by 5(29.4%) of the officers with another 5(29.4%) arguing that the other sources of energy were damn expensive, thus the people have no other choice but to use firewood and occasionally charcoal.

As Kamweti (1994) points out natural forests and wood lands, in spite of their unmanaged or poorly managed state currently account for about 60 percent of the sustainable fuel wood supply potential. This is a clear indication that the demand for wood fuel is high and there is need for the reforestation programmes to emphasize on the need for more intensive energy inputs for increased productivity of human labour and for income generation. To this end, suitable energy policies and technologies should be put in place to promote a mix of cost effective fossil and renewable energy sources that are sustainable and ensure sustainable agricultural development.

4.8.1 Factors that contribute to use of wood fuel

According to 2(11.8%) officers firewood was locally available and cheaper to use compared to the other sources of energy like electricity and solar energy. The increase in population growth of the area, contributes towards the use of firewood in the area. People spend time looking for firewood and save on the would-be costs of electricity and solar. No response to these question was given by 4(23.5%) of the officers. Wamukonya (2002) notes that majority of the people in rural and peri-urban Kenya continue to depend on the biofuels because the other forms of fuel are very costly.

Like the provincial administrators the forest officer pointed out that wood fuel was the most commonly used form of energy. However, the officer denied that charcoal was not an economic activity thus it had no influence on afforestation. Although, some provincial officers had pointed out that people in the area cut down trees for timber and charcoal burning for income generation. This contradiction can be attributed to the fact that the forest officers enforce laws and other legislations that hinder or prevent cutting of trees for charcoal burning.
Except for 1(6.7%) women group the rest 14(93.3%) were of the opinion that paraffin and wood fuel was the main types of energy. They all agreed that the use of this type fuel had an effect on afforestation programmes in the area. As many trees were being cut down without replacement. Due to the demand for wood fuel, the women groups reported that they often engaged in charcoal burning. This finding is in line with the Ecoforum (2002) report on energy exploitation that points that continued dependency on wood fuel contributes heavily to deforestation and land degradation. The demand will undoubtedly continue to raise leading to the felling of more trees for fuel wood and charcoal production. Therefore, necessary that all stakeholders take an active role in afforestation programmes.

4.9 Research hypothesis

The study findings are discussed and interpreted as per the research hypothesis, in an attempt to gain a more general perspective about the population using the sample information collected from 17 provincial administration officers on the factors that influence afforestation programmes in Chuluni division.

\[ H_0: \] There is no significant relationship between household size and afforestation programmes

\[ H_1: \] There is a significant relationship between household size and afforestation programmes

**Table 4.11 Effect of household size on afforestation programmes**

<table>
<thead>
<tr>
<th>Test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated value</td>
</tr>
<tr>
<td>Chi square value</td>
</tr>
<tr>
<td>Df</td>
</tr>
<tr>
<td>Asymptomatic significant</td>
</tr>
</tbody>
</table>

**Descriptive statistics**

<table>
<thead>
<tr>
<th>Mean</th>
<th>5.4118</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation</td>
<td>2.55095</td>
</tr>
</tbody>
</table>

(N=17)
There is no significant relationship between household size and afforestation programmes. The Chi square value calculated using the SPSS data processor presented in Table 4.10 clearly shows that the calculated value of 5.941 is less than the Chi square ($X^2$) value of 11.070 at 0.05 level of significance. Hence we accept the null hypothesis and conclude that there is a weak relationship between household size and afforestation programmes.

The mean for the results on the effect of household size on afforestation programmes was 5.4118 with a standard deviation of 2.55095. It is evident that higher household sizes have a direct influence on afforestation programmes through the demand for more space, construction materials and wood energy.

**Hypothesis 2**

$H_0$: There is no significant relationship between human settlement and afforestation programmes

$H_1$: There is a significant relationship between human settlement and afforestation programmes

**Table 4.12 Test statistics for relationship between human settlement and afforestation programmes**

<table>
<thead>
<tr>
<th>Test statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi square value (Calculated)</td>
<td>8.059</td>
</tr>
<tr>
<td>Actual Chi distribution table value at 0.05</td>
<td>12.592</td>
</tr>
<tr>
<td>Df</td>
<td>6</td>
</tr>
<tr>
<td>Asymptomatic significant</td>
<td>0.153</td>
</tr>
</tbody>
</table>

**Descriptive statistics**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.1765</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>2.62762</td>
</tr>
</tbody>
</table>

$\text{(N=17)}$

There is no significant relationship between demand for human settlement and afforestation programmes. The calculated Chi square value in Table 4.11 shows that the actual Chi square value of 12.592 at 0.05 significance level is greater than the calculated Chi square ($X^2$) value of 8.059. These implies that the null hypothesis which states that "there is no significant
relationship between demand for human settlement is accepted while the alternate hypothesis which states that “There is a significant relationship between demand for human settlement and afforestation programmes” is rejected. Similarly, results of the descriptive statistics indicate that the demand for human settlement has a mean of 3.1765 and a standard deviation of 2.62762. The area between the mean and the Z value is 0.4957. This implies that there is a greater chance of rejecting the alternate hypothesis. Hence the relationship between human settlement and afforestation programmes is not significant.

**Hypothesis 3**

- $H_0$: There is no significant relationship between population and afforestation programmes
- $H_1$: There is a significant relationship between population and afforestation programmes

**Table 4.13 Effect of high population on afforestation programmes**

<table>
<thead>
<tr>
<th>Test statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi square value (Calculated)</td>
<td>0.059</td>
</tr>
<tr>
<td>Actual Chi distribution table value at 0.05</td>
<td>3.841</td>
</tr>
<tr>
<td>Df</td>
<td>1</td>
</tr>
<tr>
<td>Asymptomatic significant</td>
<td>0.808</td>
</tr>
</tbody>
</table>

**Descriptive statistics**

- Mean: 1.4706
- Standard deviation: 0.51450

(N=17)

There is no significant relationship between high population and afforestation programmes in Chuluni area. The result in Table 4.13 reveals that the calculated $X^2$ (0.059) is less than $X^2$ table value of 3.841) at 0.005 level of significance. Hence we accept the null hypothesis and conclude that there is no significant relationship between population and afforestation programmes. The result shows that population increase has nothing to do with the afforestation programmes. Since a population may not necessarily increase with the demands of afforestation programmes could not be said to be more involved than younger administrators in decision making process.
The mean is 1.4706 with a low standard deviation of 0.51450, indicating that there is minimal relationship between high population density and afforestation programmes.

**Table 4.14 Test statistics for relationship between wood fuel and afforestation programmes**

- $H_0$: There is no significant relationship between wood fuel and afforestation programmes
- $H_1$: There is a significant relationship between wood fuel and afforestation programmes

<table>
<thead>
<tr>
<th>Test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi square value (Calculated)</td>
</tr>
<tr>
<td>Actual Chi distribution table value at 0.05</td>
</tr>
<tr>
<td>Df</td>
</tr>
<tr>
<td>Asymptomatic significant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Descriptive statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Standard deviation</td>
</tr>
</tbody>
</table>

(N=17)

The Chi square value could not be calculated because all the respondents said that they use wood fuel. The mean for the same test statistic is 2.00 with a zero standard deviation. This implies that there is a strong relationship between wood fuel and afforestation programmes. This is in line with the World Bank (2002) report that people in the rural areas cut down trees without replacement due to the high demand for charcoal, firewood. The more people cut down trees for charcoal and firewood, the more the forest cover is depleted.
CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This chapter presents a summary of the findings gathered from analysis of information collected from provincial administration officers, women groups and the forest officer. The chapter highlights various findings based on the research questions that may help alleviate challenges associated with afforestation programmes in Kitui County. Conclusions have been drawn from the study and recommendations put forward that may help to deal with the factors that influence afforestation programmes in Chuluni division, Kitui County.

5.2 Summary of findings
The findings of the study were summarized based on the objectives of the study as follows;
The study found out that most people in Chuluni division have access to formal education with majority having attained primary and secondary level of education. Most households have over 5 individuals per household as reported by 12(70.6%) provincial administration officers, 9(60.0%) women groups and the forest officer.
The main economic activity of the households is subsistence and horticultural crop production as reported by 9(60.0%) of the women groups contrary to agroforestry as reported by the forester. Household size has direct influence on the environment through cutting down trees for construction, wood fuel and creation of space for dwellings as reported by 6(42.9%) provincial administrators. Households in Chuluni division occupy less than 60% of the available land.
The provincial administration officers were in agreement that human settlement had an effect on afforestation programmes, with 16(94.1%) saying yes. Findings from the forest officer indicated that human settlement had no influence on afforestation programmes in the gazetted forests. The study found out that the demand for space for human settlement leads to inadequate space for planting of trees as reported by 8(47.1%) of the officers.
Majority 8(47.1%) of the officers reported that bricks were the preferred construction materials for the dwellings, however wood or timber was the most common construction material. The forest officer, provincial administration officers and the women groups agree that there is a relationship between demand for construction of human settlements with afforestation, since more land and timber are required for setting up the settlements. Thus the need for enhanced afforestation programmes.

The forester further noted that drought and poverty were the main challenges facing afforestation programmes in the area, as most people are unable to afford purchase of seedlings and chemicals required initiate there own nurseries. Similarly, 16(94.1%) officers said that there were no settlement committees in the area.

The study found out that from all officers who took part in the study and the women groups that firewood /wood fuel was the main source of energy in Chuluni division of Kitui County. Except for 1(6.7%) women group the rest 14(93.3%) were of the opinion that paraffin and wood fuel was the main types of energy.

5.3 Discussions

The study set out to find out factors affecting afforestation programmes in Chuluni Division of Kitui County, Kenya. This is in line with Alexander (2000) who points out that forests are critical to the development of the country. Countries like Kenya need to initiate appropriate measures that would ensure that available forests are maintained, sustained and improved upon as well as increase the existing cover up to 10%.

Despite the many benefits that accrue from the forests including being a natural habit of rich fauna (animals) and flora (plants) that are highly valued by man. The forest cover is being depleted at alarming rates thus the need to find out the factors that affect afforestation programmes. This includes the effect of household size on afforestation programmes. The finding from 12(70.6%) provincial administration officers that most households have 5-7 individuals is an indication that afforestation programmes are more likely to be affected. The increase in household size demands for space to construct dwellings, produce crops and set up
physical amenities. This increases pressure on the available land causing massive destruction of forests.

However every household should endeavour to initiate programmes that may increase the forest cover. Thus would help enhance soil and water conservation measures that would increase productivity of the land. Planting trees where they have been cut or have never been planted. Ekisa (2009) argues that all the environmental problems such as drought, soil erosion and reduced tree based products faced by Kitui County could be solved through afforestation and agroforestry activities.

According to all the provincial administration officers Chuluni area has a high population density, a view that 8(47.1%) women groups supported by arguing that the population density was medium. This finding is attributed to the fact that majority of the households have over 5 individuals. Compared to the 2009 census results, this is very high. Reports by the provincial administration officers and women groups indicated that people in the area had access to formal education. According to the provincial administration officers 57.1% of the people have attained primary education, with reporting university. This was an indication that very few children manage to go beyond primary and secondary school education levels. NEMA (2004) concurs that the consequences of a high population density include decline in forest cover due to excisions done to create settlements for the poor and landless people lacking shelter and means of subsistence. Other impacts include deforestation, loss of indigenous plant and animal species and destruction of water catchment areas.

The study indicated that human settlements have direct influence on afforestation programmes as pointed out by 16(94.1%) provincial administration officers. Depending on the approaches, the effects can be two fold. First, positive effects if those who settle in the respective areas initiative environmental conservation and afforestation programmes. For instance, some women groups reported setting up tree nurseries. By selling the trees, the women are able to generate income positive contributing to poverty alleviation and economic development. Planting of trees would help in overcoming the challenge of desertification, greenhouse effect, global warning and environmental degradation. Secondly, negative effects like massive destruction of forests to create space for construction of dwellings, charcoal burning, destruction of water catchments
leading to drying of rivers. The implication is inadequate supply of water and increased costs of living. In addition NEMA (2004) notes that other impacts include deforestation, loss of indigenous plant and animal species and destruction of water catchment areas, and that the demand for human settlements is the main driving force behind the depletion of the forest cover.

Reduction of the forest cover to levels below worldwide recommendations has numerous implications to the country’s participation in international environmental programmes. The challenge of poverty can easily be overcome if all the stakeholders including forest officers, environmentalists, natives and the Government of Kenya perform their roles efficiently to enhance afforestation programmes.

Wanton destruction of forests to obtain wood fuel remains a critical challenge to afforestation programmes. Due to the very high poverty index in the area, the provincial administrators and women groups 14(93.3%) reported that firewood was the main source of energy. Appropriate measures must be undertaken to ensure that the existing forests are not depleted, legislations on charcoal burning and cutting down of trees for timber should be reinforced. The finding is in line with Ecoforum (2002) that commercial charcoal production leads to deforestation of large tracts of wooded savannah.

Based on the study findings and World Bank forest strategy (World Bank, 2002) report there is need to work increasingly in partnerships with all stakeholders and look at forests in terms of how they can help reduce poverty. The people of Chuluni area must embrace the afforestation programmes and plan on how best they can harness the potential of forests to reduce poverty, integrate forests in sustainable economic development and seek to protect vital local forest environmental services and values.

5.4 Conclusions

Most household have more than 5 individuals and that the size has influence on afforestation programmes in Chuluni Division of Kitui County. The higher the household size the greater is its impact on the afforestation programmes in the area. Suitable strategies need to be put in place to ensure that afforestation programmes are effectively carried out for the good of the people and the nation.
Majority of the households have received formal education and mainly engage in cereal and fruit crop production. Chuluni area is characterized by a high population density of more than 5 individuals per household. According to the Kenya population and housing census of 2009, most households have 5-7 individuals and Chuluni area is no exception. An indication that there is need for creation of awareness on the importance of afforestation programmes.

Increase in population growth over the last ten years has contributed to environmental degradation through deforestation and decreased afforestation programmes. Trees are cut down indiscriminately for timber, firewood and charcoal burning without an effective reforestation programme. This greatly contributes to the depletion of the forest cover.

Human settlements have a direct impact on the afforestation programmes in the area, and wood fuel is the main source of energy in the area as the people are unable to afford electricity and solar energy due to the initial capital costs. Tree planting initiatives must be encouraged and those who set up trees given incentives to plant more trees. The community needs to have a community mobilization team to foresee the afforestation programmes.

5.5 Recommendations.

Based on the study findings, the following recommendations were made:

1. The government through the Ministries of Forest and wildlife, Water and irrigation and the environment and natural resources needs to set out clear policies aimed at water and soil conservation.

2. Stringent measures should be taken against individuals or groups of people who destroy forests and other natural resources. Compensation and relocation of people from water catchment areas should be carried to reduce the effects of human settlement on afforestation.

3. The Government, community leaders, Non Governmental Organizations and other like minded groups should come up with suitable strategies including afforestation and reafforestation programmes aimed at achieving the 20% forest cover.
4. Alternative sources of fuel must be made available to the people at affordable rates in order to reduce the heavy reliance on wood fuel. The local community needs to be encouraged to use energy saving jikos and environmental friendly fuels like biogas.

5.6 Suggestions for further research

The study suggests that,

a) A study should be carried out to ascertain the net effect of human settlements on afforestation programmes and projects in conservation.

b) A study to be carried out to determine the effect of project planning and management in afforestation programmes.

c) A comparative study to be carried out in reference to project planning and management to determine the extent of afforestation programmes in Kitui County and other Counties in Kenya.

d) Initiation of projects to lock into alternative source of energy that should be made available for the common citizen.
REFERENCES


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Appendix A

Foresters Questionnaire

PART A: Bio-data

Please tick (✓) as appropriate

1. What is your gender?
   Male [ ]                Female [ ]

2. What is your age?
   i) Under 20 [ ]
   ii) 20-29 [ ]
   iii) 30-39 [ ]
   iv) 40-49 [ ]
   v) 50 and above [ ]

3. Indicate your academic level
   i) Primary level [ ]
   ii) Secondary level [ ]
   iii) University level [ ]
   iv) Any other, specify____________________

4. Have you ever attended any afforestation activity/training
   i) Yes [ ] No [ ]

PART B

Section 1- Household size and afforestation

5. Indicate the average number of household’s size in Chuluni division
   i) Under 5 [ ]
   ii) 5-10 [ ]
   iii) 10-15 [ ]
   iv) Over 15 [ ]

6. What is the economic activity of the residents of Chuluni division?
   i) Agriculture [ ]
ii) Mining [ ]  
iii) Commerce [ ]  
iv) Industry [ ]  
v) Any other, specify______________________

7. Does the activity stated in (5) above affect the environment 
   Yes [ ]  No [ ]

8. If yes, how?  
   i) Increased afforestation activities [ ]  
   ii) Land degradation [ ]  
   iii) Clearing vegetation cover [ ]  
   iv) Any other, specify______________________

Section 2: Population

Please tick (√) or write the answers as appropriate inside the boxes

9. In your opinion what percentage of available land is being brought under cultivation?  
   i) Below 20% [ ]  
   ii) Below 40% [ ]  
   iii) Below 60% [ ]  
   iv) Above 80% [ ]

10. Does the area experience high fertility rate?  
    i) Yes [ ]  No [ ]

11. In your opinion, does fertility rate influence afforestation programmes?  
    i) Yes [ ]  No [ ]

Explain your answer____________________________________________ ________________________

Is the population density in Chuluni division high

i) Yes [ ]  No [ ]
12. If yes what influence does it have on afforestation programmes?

____________________________________________________________________________
____________________________________________________________________________

____________________________________________________________________________

Section 3: Demand for settlement

Please tick (✓) as appropriate

13. Are Government or gazette forests intact?  
Yes [ ]  No [ ]

14. If No in 13 above what has led to encroachment in gazette forests?  
Explain____________________________________________________________________________
____________________________________________________________________________

15. In your opinion is there any relationship between demand for timber for construction and afforestation?  
Yes [ ]  No [ ]
Explain your answer____________________________________________________________________________
____________________________________________________________________________

Do you have informal settlement in Chuluni division?  
Yes [ ]  No [ ]
Explain their cause____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

16. What management challenges do you face as far as afforestation programmes are concerned?  
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

17. Do have desertification as a challenge in Chuluni division?  
Yes [ ]  No [ ]
18. If the answer is yes in (18) above how is it related to demand for human settlement?


Section 4: Wood fuel and afforestation

19. What is the most used source of energy
   i) Electricity [ ]
   ii) Wood fuel [ ]
   iii) Paraffin [ ]
   iv) Solar [ ]

20. Do you have charcoal burning as an economic activity?
   Yes [ ]  No [ ]

   21. If yes in (20) above explain how charcoal burning has influenced afforestation programmes


Thank you
Appendix B

Provincial administrators Questionnaire

This questionnaire is designed to gather data on the factors affecting afforestation programmes in Kitui County. The information you give will be treated with confidentiality and will be used purposely for this research. You are not required to write your name or any other form of identification. However the success of the research depends on the information you give. Be honest please.

PART A: Bio-data

Please tick (√) in the appropriate boxes.

1. What is your gender?
   Male [ ]                Female [ ]

2. What is your age?
   vi) 20- 29 [ ]
   vii) 30- 39 [ ]
   viii) 40- 49 [ ]
   ix) 50 and above [ ]

3. Please specify your academic level
   v) Elementary(primary) [ ]
   vi) High school(secondary) [ ]
   vii) College [ ]
   viii) University [ ]
   ix) Any other, specify____________________________

4. What is your employment experience?
   i) Below 5 [ ]
   ii) Between 5-10 [ ]
   iii) Between 11- 15 [ ]
   iv) Between 16- 20 [ ]
   v) Between 21- 25 [ ]
   vi) 30 years and above [ ]
PART B

Section 1: Household size and afforestation

5. Please indicate whether you agree with the statement that household size has affected afforestation programmes
   i) Strongly agree [ ]
   ii) Agree [ ]
   iii) Disagree [ ]
   iv) Strongly disagree [ ]

6. Do most people in your area of jurisdiction access formal education?
   Yes [ ] No [ ]
   Explain your answer
   __________________________________________________________
   __________________________________________________________

7. What is the average number of households?
   i) Below 5 [ ]
   ii) Above 5 [ ]

8. What effect if any does the answer in question 7 above has in the environment
   __________________________________________________________
   __________________________________________________________

Section 2: Population

9. What is the population density in your area of jurisdiction
   i) Very high [ ]
   ii) High [ ]
   iii) Medium [ ]
   iv) Low [ ]

10. What effect if any does the answer in question 9 above has in afforestation programmes?
   __________________________________________________________
   __________________________________________________________
11. Are you in agreement that high population growth has affected afforestation programmes?
   i) Strongly agree [ ]
   ii) Agree [ ]
   iii) Disagree [ ]
   iv) Strongly disagree [ ]

Section 3: Demand for human settlement

12. Is there high demand for human settlement in your administrative area?
   Yes [ ]  No [ ]

13. What effect if any does the answer in question 12 above has on afforestation programmes?

14. What is most preferred material for construction of dwelling houses?

15. Do you have gazette forests/lands in your area?
   Yes [ ]  No [ ]

16. If the answer in question 15 above is yes, explain if there has been any human encroachment

17. Do you have settlement committees in your area?
   Yes [ ]  No [ ]

18. If the answer in question 17 above is yes, explain the role of these committees in afforestation programmes

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

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**Section 4: Wood fuel and afforestation**

19. Specify the common source of energy used in your area.

   i) Electricity [ ]
   ii) Firewood [ ]
   iii) Solar [ ]
   iv) Others, specify ________________________________

20. In your opinion what factors have contributed to the use of energy in question 19 above?

    ____________________________________________
    ____________________________________________________________________
    ____________________________________________________________________

    Thank you.
Appendix C

Interview schedule

Section A: Poverty

i) Do you have titles for the land you own?
ii) Have you attended any formal education?
iii) What is the most common agricultural activity you engage in?

Section B: Population expansion

i) Have you experienced population growth for the last ten years?
ii) What is the impact of such growth if any?
iii) What are the average sizes of your families?
iv) Do you experience environmental degradation in your area?
v) In your opinion what is its cause?

Section C: Land for settlement

i) Do you face any settlement problems?
ii) Is there any relationship between settlement and population? Explain.
iii) Where do you get construction materials?

Section D: Biomass for energy

i) What source of energy for lighting and cooking do you use?
ii) Has the source of energy above has any bearing in afforestation programmes?
iii) Do you engage in charcoal burning? Why?
Appendix D

Letter of transmittal

Isaac Mwendwa Titus
University of Nairobi,
Mombasa branch.
10th March 2012.

Dear respondent,

Re: Factors affecting afforestation programmes in Kitui County.

I’m a post-graduate student in the University of Nairobi pursuing a Master of Arts in project planning and management. I am conducting a study on the factors affecting afforestation programmes in Chuluni division, Kitui County.

I hereby request you to respond to the questionnaire items as honestly as possible and to the best of your knowledge. The questionnaires have been designed for this research purpose only and the responses shall be treated with absolute confidence.

The respondent’s name(s) shall not be required.

Thanks in advance.

Yours sincerely

Isaac M. Titus