EXPLORING ENVIRONMENTAL EDUCATION DIMENSIONS OF THE INTERACTION BETWEEN ZEMBA FARMING BLOCK VIRGINIA TOBACCO FARMERS AND THEIR FORESTS

BY

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Acknowledgement

This manuscript is a product of the thought and works of the many people with whom I worked, as well as my lecturers in environmental education at the University of Zambia. My deepest gratitude go to the late Dr. Tembo Ackim who, in a most generous gesture, offered me his materials to read through and for having taken us as a class to a field using his own resources so that we could practically carry out tree census. This experience gave me an insight into issues of deforestation. (M.H.S.R.I.P)

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My sincere thanks go to the college administration for awarding me a sponsorship to pursue this degree with the University of Zambia. The pieces of advice I got from the Vice Principal Mr. Vincent Chiyongo is highly appreciated.

My gratitude also go to others, whom I know only through their written books, too numerous to mention, whose books nonetheless I referred to.

I wish to thank my fellow post graduate students (Inonge, Pumulo, Darius, Mutinta and Adrian) with whom I shared a lot of insights in this field.

Lastly, I wish to thank my family, especially my husband whose special touch made this document what it is.

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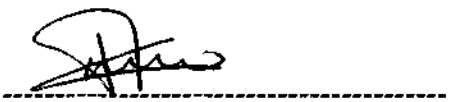
DEDICATION

To my four loving children – Esther, Vositele, Daliso and Lazarous junior who, I am sure, missed the motherly care during the course of this study.

DECLARATION

I, Kasaro Joyce, hereby declare that this dissertation represents my own work and that it has not been previously submitted for a degree at this or any other University.



Signature

19-06-09

Date

APPROVAL

This dissertation of Kasaro Joyce is approved as fulfilling part of the requirements for the award of the degree of Master of Education in Environmental Education of the University of Zambia.

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Abstract

Forests can help in regulating local climate which, in turn, can contribute to the global climate situation. The many environmental problems that the world is faced with have reached alarming proportions. Deforestation is one of these environmental problems. Deforestation refers simply to the loss of forestland or, as defined by FAO (1978), as the permanent destruction of indigenous forests and woodlands excluding exotic forests such as plantations. The major effects of deforestation include deterioration of ecological systems that result in negative effects on production and development.

This research reports on a study conducted in a rural farming community in Zambia called Zemba farming scheme. It aims to explore the relationships between the community and their forests as well as to articulate environmental education dimensions that can influence community participation in forest resource management among Virginia tobacco farmers.

The study established specific estimates of forest-wood depletion in Zemba farming block as a result of tobacco growing. The aim of the estimate was to investigate the extent and causes of deforestation in Zemba farming block. Once these data was generated, the study proceeded to use the data to design an environmental education programme for the study community.

In this study the following two questions were explored, firstly, what is the extent of deforestation in Zemba farming block? Secondly, why did deforestation occur and how did it affect the people living in the area? In order to address the aim of this study, the following specific objectives guided the study;

- to generate baseline data on the relationship between rural tobacco farmers and the forest in their vicinity
- to provide an understanding of the principal processes underlying deforestation in Zemba farming block.

At the time of this study in 2008, it had been discovered that Zambia was losing about 444 000 ha of forest each year and that in the period 2000 – 2005, it increased by 10% per year.

This was a serious contribution towards deforestation. Such an estimate of wood harvest was a challenge that this study wished to address at a general level.

Tree census conducted in the area revealed that the forest was a 'young forest' which means that most of the big trees had been harvested for tobacco use or other uses. The largest tree of the endangered species, *Jubernardia paniculata,* only measured about 46cm in circumference; most of them measured less than 30cm.

It was also clear from the findings that the farmers in the study community were not willing to stop growing Virginia tobacco for other less destructive types of tobacco such as barley for reasons that Virginia tobacco was quite profitable even when grown on a small portion. They also earned early cash and in foreign currency as Virginia tobacco was quoted in foreign currency on the stock market.

The respondents in this study only focused on short term benefits and ignored the long term effects that this kind of tobacco farming brings and how these effects would, in turn, affect their future living. Reafforestation had been tried in the past by some tobacco companies in the area but had not been supported by the local community. In a situation like this, environmental education would be helpful in changing the attitudes of these people.

What is important to note is that there are solutions to environmental problems. Human needs never end and, therefore, it is important to find a lasting solution that would be helpful to the community while sustaining the environment. In this regard, this study recommends intervention measures such as bee keeping and environmental education to make conservation of the endangered forest successful. Bee keeping in itself is a job creation activity, which in the end empowers the community economically.

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List of Acronyms

CFC	Chlorofluoro Carbon
ECZ	Environmental Council of Zambia
EIA	Environmental Impact Assessment
EPPCA	Environmental Protection and Pollution Control Act
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
ha	Hectare
ICRAFT	International Centre for Research in Agro Forest
IUCN	World Conservation Union
MACCO	Ministry of Agriculture and Cooperatives
MOE	Ministry of Education
MTENR	Ministry of Tourism, Environment and Natural Resources
PAGE	Pilot Analysis of Global Ecosystem
PRSP	Poverty Reduction Strategy Paper
SADC	Southern Africa Development Community
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNO	United Nations Organization
W.H.O	World Health Organization
WWF	Wild Wide Fund for Nature

Chapter 1

Introduction

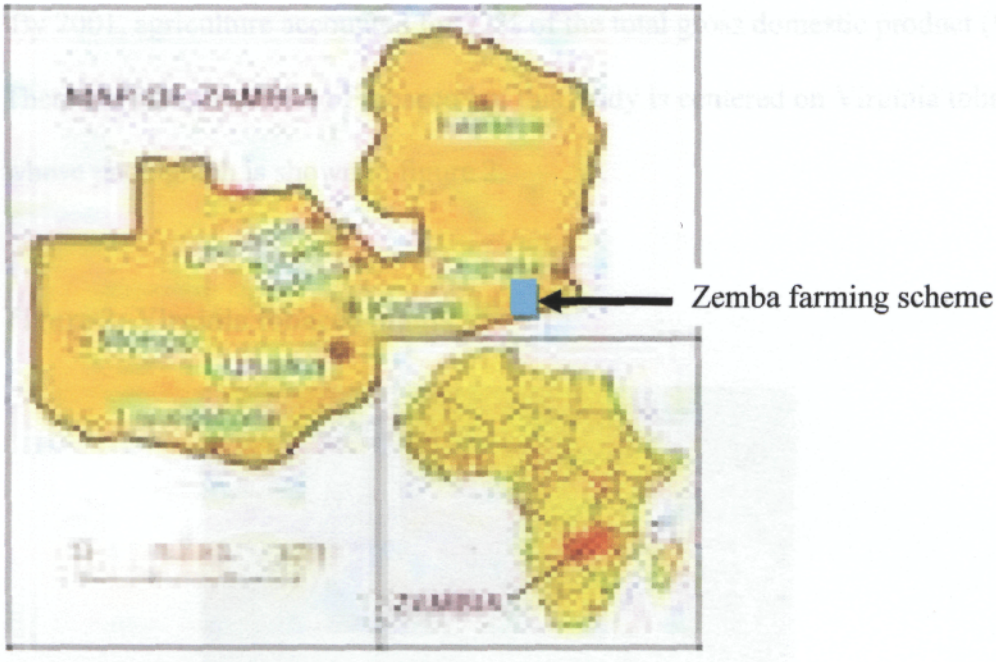
1.1 Background to the study

This chapter introduces a brief history of Virginia tobacco as an agricultural crop among the people of Zemba farming block located 60km from Chipata town and15km south of the Great East Road in Eastern province of Zambia.

It also includes some uses of tobacco as found in the study site. The chapter further discusses the relevance of Zambia's education in general. The discussion on the relevance of education is linked to the problem of deforestation because education is a recognized means of addressing environmental problems such as that of tree cutting for various uses. Later parts of the chapter focus on tobaccos' share in contributing to deforestation.

Zemba is one example of a settlement scheme. Though surrounded by some villages and some traditional land, the scheme houses a number of retired workers who have engaged themselves into farming. Many of the settlers here are single household families. They don't own much land, on average most of them have up to about five hectares of land. These farmers are mostly subsistence farmers because most of their produce is used for consumption. The only crop they grow for sale is tobacco. This location is placed at a place where three districts meet or share boundaries, these are Chipata, Chadiza and Katete, such that the farming community does not belong to a particular district, they are simply considered as the Zemba farming block.

Figure 1: location of the Zemba farming scheme on the map of Zambia



Source: website www.google (modified)

1.2 Tobacco Growing in Zambia

Tobacco is an agricultural product that is processed from leaves of plants that belong to the nightshade family, consisting of crop plants, perennial flowering plants, poisonous weeds, various herbs, shrubs, and trees.

In Zambia, the development of commercial farming including that of tobacco followed the line of rail during the 20th century. The main stimulus was World War II (1939-1945). Most of Zambia's population is engaged in subsistence farming involving a few cash crops, which include tobacco. In 1999, tobacco, the most important export crop, was estimated at 3000 tons.

By 2001, agriculture accounted for 22% of the total gross domestic product (GDP). There are many varieties of tobacco but this study is centered on Virginia tobacco whose photograph is shown in figure 2.

Figure 2: Virginia tobacco plants

Source: (Field data, 2008)

Tobacco is not indigenous to Zambia; it has been growing on the American continent since 6000 BC. It is commercially available in dried, cured, and natural forms. (www.tobaccocontrol.bmj.com/cgi/content/full/8/11)

John Rolfle is credited as the first man to have successfully raised tobacco for commercial use at Jamestown in Virginia. The Virginia settlers also used tobacco as currency for many years.

Growing tobacco is a 12 month- job. It is mostly grown for sale. Research has shown that tobacco is profitable even when grown on a small scale. Tobacco seeds are scattered onto the surface of the soil as their germination is activated by light. This is done around the month of October. This is referred to as a nursery bed. After the plants have reached a certain height, they are transplanted into fields from the nursery beds and planted in rows for easy inspection of diseases, weeding and harvesting of the tobacco as shown in figure 3.

Figure 3: Transplanted tobacco being inspected for diseases

Source: (Field data, 2008)

Tobacco is harvested when the leaves ripen. The leaves ripen from the ground upwards. In figure 4, the bottom leaves of the Virginia tobacco plant are ripe and ready for picking, they have turned yellow.

Figure 4: Ripe tobacco ready for picking

Source: (field data, 2008)

Pulled leaves are immediately transferred to tobacco barns (kiln houses), where they are cured. This activity of picking leaves begins as early as February and goes on up to April. The process of curing also begins immediately through to about the month of June. Figure 5 is an example of a kiln used in the curing of tobacco among the Virginia tobacco farmers in the study community.

Figure 5: Kiln for fire cured tobacco

Source :(field data 2008)

The picture depicts an example of a kiln used by Zemba farmers in the curing of Virginia tobacco. The people of Zemba convert the kilns into small huts or kitchens after use. Most of them use burnt bricks for construction and corrugated iron sheets for roofing, although this one in figure five was grass thatched.

Curing of Virginia tobacco in Zambia is mostly done by using wood fuel. The farmers in the study area are not an exception. This kind of tobacco is known as fire cured Tobacco. It is hanged in barns where fires of wood are kept continuously for weeks. Day and night, wood has to be added to keep fire burning. This activity requires huge quantities of forest wood such that by the end of a farming season many trees are cut. It is for this reason that this study was conducted so that specific estimates of forest

wood depletion because of Virginia tobacco farming in Zemba farming block are established so that the information could be used as evidence of deforestation. Reports show that the area cultivated for tobacco farming in Zambia is increasing. *(State of the Environment annual report, 2000)*

Growing this kind of tobacco is also labor intensive. Such labor has discouraged many women, especially those that are not married, from growing Virginia tobacco.

Selling of tobacco begins as soon as it is treated, that is, from March. This is to the advantage of tobacco farmers. They get early cash as compared to maize, whose market season and buyer is unpredictable. Tobacco market is readily available as it has sponsors. The sponsors of tobacco are the companies that provide inputs such as seeds and fertilizers for tobacco farming in form of loans. The loans are deducted from the proceeds then the farmer gets the balance.

The photograph in figure 6 shows how treated Virginia tobacco looks when ready for to be smoked. It is, however, not possible to tell the grade of this tobacco from the picture, but it is graded and sold according to quality.

Figure 6: Cured tobacco ready for use

Source: (Field data, 2008)

Zemba farmers have many uses of this tobacco, such as Insecticide. Tobacco leaves are boiled in water, and then the water is used as an insecticide in gardens, in homes or against mosquitoes. Tobacco dust is also used in the same way. Tobacco is also used for the treatment of bee or wasp stings as well as the deadly scorpions.

Each tobacco plant yields only about 18 leaves. According to the scheme supervisor, to cure 1 kg of tobacco, on average 7.8 kg of wood is required! Such wood usage is alarming.

1.3 Relevance of Zambia's education in general

Like many other countries, Zambia's formal education system did not fully satisfy many of the crucial needs of rural people at the time of conducting this study in the

year 2007. The education provided was more appropriate for the urban population than the rural. One such area of need where rural peoples' education was inadequately catered for was agriculture. Most of the rural farmers may not have received adequate rural agricultural education to help them with their farming occupation. This was because -

> *Education helped in the development of rational powers of man, so that he could fully understand the physical and the social environment in a scientific sense. This education has made a number of people to have modern and rational attitudes as compared to the less educated persons with an exception of the villagers close to urban centers those were likely to change in attitudes more easily than those far off (Bhatnagar*, 1972: 38).

Lengrand (1975) notes that the education that people receive in childhood and adolescence no longer suffices to enable them lead a satisfactory life. Therefore, rural farmers who could have received some form of education during their childhood days may require refresher courses or programmes for them to keep up with changing times. It may no longer be possible nowadays to speak of cultural or intellectual qualifications because the knowledge and knowhow acquired at any one period of life quickly becomes outdated and loses its value. This suggests that adults can not avoid going on training to acquire new skills particularly those skills that have some relevance to their present work and life.

Environmental problems may seem to vary from nation to nation, but the majority of these problems are similar. To pretend that environmental problems of other countries could be ignored is, in other words, like telling a fellow passenger in the boat that where he is sitting, the boat was sinking. We are, therefore, all passengers on a

crowded planet Earth and whatever happens to the global environment might affect us. Therefore, the concern for human environment has to be a concern for every one. The commonest global environmental problem that has been identified at global level is deforestation. This has contributed to global warming probably arising from atmospheric changes.

1.4 Problem of Deforestation

According to Sargent and Bass (1992), human impacts on the forest are not a function of numbers alone. They are also a function of the political and social signals that cause individuals to move into and within forests. Sargent and Bass (1992) also reports that the forests of Brazil with their enormous biodiversity and valuable woods are rapidly disappearing. The rate of deforestation reported is particularly severe in Asia and the Pacific region. In 1993, FAO estimated the rates of deforestation of up to 3.9 million ha per year in the tropical region.

The problem of deforestation has been widely documented in many parts of the world. Although deforestation means a different thing to different people, it has an element of tree cutting or clearing for whatever purposes. FAO (1978) defines deforestation as simply the loss of forestland. Yet others have defined it simply as the loss of original land and as clearance of forest for agriculture or other purposes. Deforestation has also been defined as the permanent destruction of indigenous forests and woodlands excluding industrial forests such as plantations. Whatever the case, the key thing is that an original forest has been tampered with in one way or another. For the purpose

of this discussion, deforestation has been understood as any form of alteration to the forest, whether temporal or permanent, as long as it affects the forest ecosystem in someway.

Although the magnitude of deforestation in the tropics varies from one country to another, available data suggests that deforestation is real. The problem is that the trees can not be replanted and re grown at the rate at which they are being cut. Some countries have reported some relatively high rates. Some recent study by FAO shows that between 1960 and 1990, Asia lost one third of its forest cover while Africa lost about eighteen percent (18%). Burgess (1993) reveals that Brazil and Indonesia incurred the highest extent of annual forest loss. However, according to Burgess, high rates are experienced by those countries that have relatively small forest resources.

Africa has actually been rated the most severely deforested continent. It is estimated that between 1930 and 1970 alone, about 25% to 30% of the African forest was destroyed. It shrunk to 60% of its original size. This is as noted by Burgess (1993). It is also reported that Kenya had only 3% of the nation under natural forest by 1985. Even though the extent of deforestation raised some controversy due to variations in figures given by different sources, the fact is that deforestation is a serious problem in Zambia.

Shaba (1993), estimates that about 600,000 ha of indigenous forests are cleared every year for other land uses in the SADC region where Zambia is. Indeed, extensive

deforestation has occurred in Zambia where the rising demand of fuel wood has resulted into the clearance of 64% of the reserve lands from the city of Lusaka. Chidumayo (1983, 1987, and 1989) provides other estimates of deforestation in Zambia.

With the influx of tobacco farmers from the neighboring Zimbabwe at the time of this research in 2007, the rates could even be higher than before. By 2004, Zambia Investment Centre (ZIC) had already registered about 40 commercial farmers from Zimbabwe, most of who were engaged in growing tobacco. It was evident that deforestation was a widely spread problem and was threatening the future of forests in Zambia.

Deforestation has become a major concern in many countries in the world. Over thirty percent of the world's forest is believed to have been cleared and that most of the damage has been done in the last 45years. The problem is said to be worse in developing countries where the rates are quite high. In 1982, Food and Agriculture Organization (FAO) projected that about 225 million hectares would be cleared by the year 2000.

Variations of deforestation rates however exist from one country to another. In Nigeria and Ivory Coast for example, it has been 5-6 % per year. Where as in Zambia, it has been 10% per year and was projected at 13.6% by 2005. The depletion of forests is of much concern for the environment and development in developing countries.

Unsustainable use of forests has resulted in severe environmental problems such as land degradation, soil erosion, desertification and loss of productive potential in rural areas.

According to World Bank (1992), this has led to poor yield among the poor farmers whose livelihood depends on the soil. In some areas, deforestation has resulted in unprecedented floods and loss of life. Wood fuel has also become scarce due to deforestation especially among the poor. As a result, women spend more time fetching firewood than doing other productive activities. These affect development. Although generalizations have been made for deforestation rates, there exist differences in different areas depending on the usage of land in a particular area such as demand for forest products, which included fuel wood. Therefore, there is need to consider this in addressing the problems of deforestation.

It is for this reason that this study focuses on Virginia tobacco farmers in particular, rather than taking a general approach. Of particular importance is the need to understand different situations in different areas. The researcher needed to understand the underlying forces behind the problem of deforestation in the area under study. This was necessary in devising appropriate strategies in dealing with the problem.

The study was taken in a Virginia tobacco farming block of Chipata district. Until recently, the rural area has had many natural forests. However, the large scale deforestation that is taking place has not spared these forests. Indiscriminate cutting of

trees for wood fuel to cure tobacco has left the land bare. There is even encroachment on forest reserves, causing extensive deforestation.

1.5 Effects of deforestation

Deforestation has many devastating effects. It affects climate significantly, because the forest plays a major role in the water cycle, recycling rain back into the clouds as it receives rainfall. Effects may range from a barren landscape to a higher carbon dioxide level in the air. As a result, when the land is cleared, flooding and drought become serious problems, as rainwater travels quickly through the ground without the forest to regulate it.

The impact of deforestation and desertification is that the world will be faced with large tracks of unproductive land while at the same time facing sharp increase in demand for food due to population growth. Population growth is a problem because more ground has to be cleared in order to feed the ever growing populations. As the population grows, there is a need for more food. People take the initiative and buy large pieces of land that they cultivate with single crops. They have to cut down trees and bush. When they harvest their crop, they leave the ground open to erosion. Some farmers even sell some wood by the roadside. Others do not cut trees they burn using logs as fuel to fell trees- thereby increasing carbon output.

One of the major causes of deforestation in Africa is population growth. The other causes are agriculture, bush fires, logging, growth of cities, road construction and highways and shifting cultivation.

This study is focused on Virginia tobacco farmers because of the significance of wood fuel in this form of farming for curing the tobacco. Woodland losses because of this form of agriculture have been reported in Malawi and Zimbabwe. Since reports show that Zambia is trailing second to the two countries in Virginia tobacco production, it means therefore, that there is increased forest clearing for wood fuel as there is no alternative yet to heat source in this industry. Many rural people can not afford to use the alternative fuels. Thus, wood remains the main fuel in areas such as Zemba farming scheme where forests are rapidly disappearing.

The major effects of deforestation have been deterioration of ecological systems with resulting negative effects on soil fertility, water flows and biodiversity. Soil erosion has rendered most of the land unproductive. There is evidence of reduced dry season river flows and drying up of springs and rivers. Floods have occurred in some areas and this has been attributed to deforestation by most environmentalists and metrological stations. Deforestation has also led to acute shortages of wood fuel in many parts of this country.

The many environmental problems that the world is faced with have reached alarming proportions and can not be ignored. It is against this background that there are

international efforts at global level such as the enactment of relevant legislation such as the *Environmental Protection and Pollution Control Act (EPPCA)*

In 1985, the Zambian government adopted the National Conservation Strategy (1985) as the principle policy that would guide sustainable use of the country's natural resources. Following this, the Ministry of Environment and Natural Resources was created in 1991 and a number of statutory instruments aimed at safe guarding the environment were enacted. These were the *Zambia Wildlife Authority Act No. 12 of 1998,* the *Forestry Act No. 7 of 1999* and *the fisheries Act Cap 2000.* Central to these was the idea of community participation.

1.6 Environmental Policy formulation

The international community realized the global environmental problems as early as 1972, and through the United Nations Organization, the first conference was held on human environment in Sweden. In 1992, another conference was held in Brazil. The theme was *"the last chance to save the earth"* and agenda 21 was adopted as a world programme for conserving the environment or simply an action plan for the 21st century.

Agenda 21 stipulates 27 environmental and forestry principles, which the entire member states of the United Nations Organization (UNO) should observe. Emphasis is placed on the importance of human life in the conservation of the environment. Agenda 21 is important to all nations since all nations depend on natural resources like

water, land, forest, the soil and minerals. Human beings too depend on these natural resources for survival. Zambia is not an exception. It is for this reason that an environmental policy was drafted to guide the country in promoting environmental protection, conservation and sustainable development.

Following the earth summit in Rio de Janeiro in June, 1992, Zambia endorsed the agenda 21 plan of action and other Rio agreements. The Zambian government with assistance from UNDP, World Bank and the Norwegian Agency for development cooperation (NORAD) developed the National Environment Action Plan (NEAP) that was adopted in 1994. (MENR 1994)

The NEAP identifies the following environmental concerns in Zambia:-

- Deforestation
- Air pollution
- Wildlife depletion
- Land degradation and
- Water pollution

In 1990, the Environmental Act and Pollution control Act (EPPCA) was enacted and it led to the establishment of the Environmental council of Zambia (ECZ) in 1992

1.7 International Conventions on Environment in Zambia

Legislation included international conventions. These were frameworks for international understanding on issues of common concern for humankind habitat- the

biosphere. Zambia was part to some of them. By 2006, Zambia had ratified 12 of these conventions. Those ratified included:-

- **Convention on climate change**

  Countries were required to take an inventory of greenhouse emissions and prepare communications, which would be the framework for controlling the greenhouse gasses such as carbon dioxide, methane, nitrous oxide that cause global warming. The Environmental Council of Zambia was the focal point for the convention. In 1997, a conference was held on climate change in Japan. At this conference, developed countries agreed to specific targets for cutting their emissions of greenhouse gases. It became known as the Kyoto Protocol.

- **Vienna Convention for the protection of the Ozone layer**

  The main objective was to protect human health and environment against adverse effects of ozone layer depletion. The Ozone layer protects the earth from ultra violet rays from the sun. Fumes from chlorofluoro- carbons (CFs) which are gasses that emanate from some refrigerators affect it. When the ozone layer is depleted, the suns rays cannot be deflected, they come directly to the earth.

- **Convention for biological diversity**

  The broad objective was to conserve species, genetic and ecosystem diversity.

- **Convention on the International Trade and Endangered Species of Wild fauna and flora (CITES)**

  Its broad objective was to control the trade in endangered species of animals and plants by way of classifying them and listing them.

- **United Nations Convention to Combat Desertification in those countries experiencing serious drought particularly in Africa**

  This convention was intended to combat desertification and mitigate the effects of drought. By 1999, Zambia had signed and ratified a number of international conventions. Table 1 is a summary of the international conventions signed by Zambia and those that she ratified.

Table 1: international conventions signed by Zambia

Convention title	date signed	Date ratified
Convention on biological diversity	11- 06 – 1992	28- 05- 1993
Convention on wetlands of international importance (RAMSAR)	1971	28 - 12 – 1991
Convention on International Trade in Endangered Species of wild flora and fauna (CITES)	1980	1981
The united Nations framework convention on climate change	11- 06 – 1992	1993
United Nations Convention to combat desertification	11 – 06 – 1992	19 -09 – 1996
The convention on plant protection		
Convention on the protection of world cultural and heritage sites		04 - 06 – 1984
Convention on the law of the sea		07 – 03- 1983
Convection on the protection of the ozone layer	1990	
Convention of the protection of migratory species of wild animals		1979
The Basel convention on the control of trans-boundary movement of hazardous waste	1999	

Source: Module 2 Theoretical Aspects of Environmental Management 2006

It should be noted that any international law could only be applicable to any given country when it was ratified. Therefore, if Zambia was part to many international conventions that did not bind her till the same laws were ratified and domesticated. At the time of this research, Zambia was adequately covered with legislation relating to the protection of the environment.

1.8 Relevance of Zambia's Environmental Education in particular

With increased awareness of the impacts of environmental problems, issues of environmental education were introduced in the school curriculum. The curriculum framework in Zambia had given a mandate to schools on the way forward on issues of the environment in basic schools. It had been considered of vital importance to introduce environmental issues in basic schools in order to curb the on- going environmental degradation. It aimed at providing basic facts and understanding of the processes that lead to environmental problems. It was also designed to bring about change in pupils' attitudes and behavior towards nature. Every pupil was to be made to understand that the environment needed protection and that when carefully exploited; all could enjoy its benefits, (*Curriculum framework* 2004).

Porritt (1990:1) states that,

> *Whatever the nature of change required, education is of paramount importance. The well-being of all future generations depends on the skill and effectiveness with which we inform and inspire the knowledge base and values of those currently in our schools and colleges. The challenge is daunting, in as much as each and every delay in bringing about the necessary transformation will cost us dearly in the future.*

However, the problem that was found is lack of education on environmental issues among the out- of- school populations of tobacco farmers.

It was against this background that this study hoped to design an Environmental Education Programme in order to update rural Virginia tobacco farmers of Zemba farming block, in Chipata district, so that they could keep up with the changing times. This study intended to design an educational programme that could help to meet the needs of the rural tobacco farmers while sustaining the environment. The study had targeted the rural Virginia tobacco farmers whose livelihood depended on agriculture. According to the State of the Environment (2000) in Zambia, the area cultivated for Virginia tobacco had been increasing and that Virginia tobacco methods of production were destructive to the forest. The State of the Environment (2000), noted that one hectare of tobacco required an equivalent of one hectare of forest wood for curing it. The rate at which forest was cleared raised a lot of concern and called for environmental education.

Tobacco growing had in the last few years doubled in Zambia. It was making the country's significant earning second to copper mining. In the year 2006, for example, the produce raised from 14 million to 50 million tones per year. The number of farmers had also risen sharply especially with the influx of tobacco farmers from Zimbabwe.

Tobacco leaves are normally ready for curing in May. It is labor intensive. The curing process requires that fire is kept at a given intensity to ensure a 'perfect crop'. The whole night fire has to be rekindled to bake the leaf and this goes on for ten days or more.

Since most Virginia tobacco farmers used wood fuel, a lot of it was required. Many indigenous trees were felled for use. Notable endangered trees were Julbernardia paniculata, which were almost extinct at the time of this research in 2007. These normally produce hard wood. They were preferred because they produce more fire and take a little longer to finish. It was also true that they took longer to grow to maturity as compared to those that produced soft wood. Eucalyptus for example grows quite fast but has its own disadvantages, such as demand on nutrients and water. It also reduces soil fertility.

1.9 Justification of environmental education for tobacco farmers

Educational guiding principles that were used in determining what was to be taught in schools included the National Environmental Action Plan of 1994, (Ministry of Environment and Natural Resources). All other policies from other ministries and agencies that influenced education in Zambia were also referred to, to come up with an education policy that was inclusive. These included the National Constitution of Zambia Act no. 1 of 1991, the amendment Act no. 18 of 1996 and the new 2000 Education Act; however, all these were silent on Virginia tobacco farmers, especially on the issue of environment and the forest in particular.

Official directives and circulars issued by the Ministry of Education are mostly for formal education. According to the Curriculum framework, environmental issues are mandatory in Schools and have been considered as a cross cutting issue. These are not regular subjects per se but they are learning areas that appear in the curriculum linked and embedded in all subjects. This was after a realization that these areas were as important in life as the other areas of learning. They are known as "cross cutting issues."

The main purpose for including environmental issues into the School Curriculum was to curb the ongoing environmental degradation. The aim was to bring about a positive change in pupils' attitudes and behavior in protecting nature and conserving the environment. However, the pupils were not the only users of the environment. Educational programmes for other users of the environment especially Virginia tobacco farmers had not been designed. Any efforts that have been made to change the practices have not been fruitful. It is hoped that the approach suggested by this research will work.

1.10 Statement of the problem

Rural tobacco farmers were among many others less privileged people in society in as far as educational provision was concerned. Considering that the area cultivated for Virginia tobacco was increasing and that the methods used were destructive on the forest, it meant that the area used for wood fuel when curing tobacco was increasing

too. This form of forest destruction called for environmental education, which this study was interested in designing.

1.11 Purpose of the study

The aim of the study was:-

(a) to generate baseline data that was to be useful in designing an environmental Education programme aimed at sustaining the life of the Zemba tobacco farmers and their environment.

(b) to provide an understanding of the principal processes underlying deforestation in Zemba farming block.

1.12 Objectives of the study

In order to address the purpose of the study as stated above, this study was guided by the following specific objectives:-

- to generate baseline environmental data on the relationship between rural tobacco farmers and the forest
- arising from the baseline data to be generated, to design a proposed environmental education programme for Zemba farming block farmers of Virginia tobacco in Chipata district.

In general, the study investigated the extent and causes of deforestation, focusing more on tobacco cultivation and tried to link this to broader processes of social, economic,

and technological changes, which characterize a particular style of development centered on tobacco production.

In this study, the following questions were crucial:

- What is the extent of deforestation?
- How and why is deforestation occurring?
- How are the people living around the forests affected by deforestation?

1.13 Research questions

For practical purposes in the field, the following questions were very instrumental in generating the data that was required:-

- What type of knowledge does one require to be a successful tobacco farmer while promoting environmental sustainability of forests?
- What kind of methods does one require to disseminate knowledge on the value of the forests to rural adults of Virginia tobacco farming?

1.14 Significance of the study

At the time of the research, one of the challenges facing Zemba was the alarming rate of deforestation experienced in the area. Yet because the rates of deforestation were still debatable, this study considered conducting a tree census to generate evidence of deforestation in the area. The findings of the study were expected to contribute towards an understanding of the dynamics of deforestation in Zemba.

As far as Zemba farming block was concerned, not many people were even aware that deforestation had become and continued to be a serious threat to the existence of the

once rich forests. No studies had been done in the area in the remote past to highlight the problem. It was hoped that this study would highlight the extent of the problem so that appropriate action could be taken before Zemba became a barren land like some parts of the African region.

1.15.1 Limitations of the study

Due to inadequate time and resources, the study was only confined to Zemba rural farming block. The choice of the scheme was purely based on the researchers' familiarity of the place and language knowledge used in the area.

Chapter 2

Literature review

Different sources of information were used to highlight the problem of deforestation, among others; the *Post newspaper* and its *website* were the mostly used. Other government documents like *Acts and Environmental Bulletins* had also been referred to. Information had also been sourced to establish tobacco's share in deforestation. The chapter also highlights the effects of deforestation on weather patterns as experienced in Zambia in the recent past (2006-2008) seasons in particular.

According to the *Post Newspaper* of 4th February, 2007, humanity is to blame for global warming. The *Post* has cited activities such as tree cutting for charcoal burning and land clearing for cultivation as some of the human activities. The United Nations panel, which groups 2,500 top climate scientists from more than 130 nations, predicted more droughts, heat waves and a slow gain in sea levels that could last for more than 1,000 years even if greenhouse gas emissions were capped. Humanity was to blame for this global warming.

The scientists predicted a rise in temperature of between 1.8 and 4.0 degrees by 21st century. Research that had been undertaken in order to gain some understanding of the nature and magnitude of future climatic changes indicated:-

- a doubling in atmospheric carbon dioxide levels by 2100
- a rise in global annual mean temperature of 2 degrees by 2100
- an increase in sea level of 50cm by 2100
- a more vigorous hydrological cycle, meaning the potential for more severe droughts and or floods in some areas
- frequency of extreme weather events such as hurricanes, typhoons, tornadoes and floods.

Deforestation is a major global problem with serious consequences to the planet. These consequences have negative effects on climate, biodiversity, the atmosphere and threaten the survival of humanity. There are many causes of deforestation but this discussion is only focused on deforestation due to land clearing for wood fuel used in tobacco curing.

2.1 The contribution of tobacco to deforestation

Tobacco is a crop whose origin is in the United States of America. It grows to about 1.2 - 1.8 meters high and each plant produces approximately 18 leaves of about 60 – 75 cm long. The width is about 38- 46cm. It takes about 100- 130 days to mature. The type of soil and climate determines the characteristics of the tobacco produced. (http://www.tobaccocontrol.bmj.com/cgi/content/full/8/11)

There are many varieties of tobacco but this study was centered on Virginia tobacco. Nicotine in tobacco does exist naturally, but the content differs

depending on the species of the plant, growing conditions and methods of curing. There is flue cured, air cured and fire cured. Virginia tobacco is fire cured and wood is used as fuel.

Agriculture had become an increasingly important sector in the Zambian economy since the mineral sector declined. In 2004, Gama Hobbs, an author, a reporter, a publisher and an advocate for libraries and library patrons, reporting on African business, reported the fall in the world price of copper and urged the Zambian government to rethink its economic policies. Copper was once Zambia's main source of foreign currency earnings. Virginia tobacco was then bringing more foreign currency into the country.

With the assistance from donors, the government had been trying to formulate revival measures to make agriculture a priority. President Levy Mwanawasa, who was in office at the time, in the years 2001 to 2008, also insisted that agriculture would be his government's priority.

However, former Vice President, Enock Kavindele and a farmer, said "it was easy to make policy statements that sounded good on paper but implementing them was always a problem." Lawrence Clark, former World Bank representative to the Zambian government, also observed that the Zambian government did not make tangible efforts in implementing the agricultural

policies as money, which was put in the bank for diversification from copper, was lying idle. www.postnewspaper, 2007.

Although some policies are not being implemented as observed by these few individuals, there is evidence that Zambia's tobacco industry is growing. There were rumors of the British American Tobacco Plc board trying to fold up its manufacturing business in Zambia in 2006. This had been ruled out, and it would not pull out of Zambia.

Tobacco is mainly grown as a cash crop in Zambia. In 2007, the minister of agriculture, Mr. Ben Kapita, was quoted as saying the cash crop was contributing immensely to the economic growth, www.postnewspaper, 2007.

Agriculture provides livelihood to 60% of the population in Zambia. This was according to policy Note No. 27, 0f 2006. The sector also employed 2/3 of the labor force. In 1999, 3000 tons of tobacco was produced in Zambia. In 2005-2006 season, 13000 tons were produced. This was attributed to the improved planting methods and the influx of tobacco famers from the neighboring Zimbabwe.

2.2 Effects of human activities on the environment

Human activities alter their environment in many ways. These include land cover, landscapes, climatic changes and changes in plant and animal species. The ability of the planet to support life is not finite. This means that the increasing

demand would lead to the depletion of natural resources and shortage of food, fuel and fodder.

Ninety percent of the human activities led by burning fossil fuels contributed to most of the warming in the past 50 years, (Pannerselvam, 2005). Deforestation is one of the current environmental issues that have rocked most discussions world wide. According to Pannerselvam (2005:54), the most significant way in which man has distorted the environment is through burning and cutting of trees. About 22 hectares of forest were cut down every minute all over the world, leading to soil erosion, droughts and floods.

Some of the signs that were cited include drought in Australia, high winter temperatures in Europe, dwindling fish catches in Lake Chad, which is shrinking after years of poor rainfall. In Zambia, several bridges had been submerged while other areas had less rainfall.

Figure 7 shows a photograph of flood victims and how it affected mobility in some parts of Chipata district. Bridges had been washed away in other areas.

Figure 7: floods due to abnormal rainfall 2006- 2007 season

THE IRONY: A charcoal trader wades across a flooded stream in Chipata early this year. Most parts of Zambia experienced above normal rainfall, resulting in floods

Source: post website www.postzambia

Jennipher Sakala, Christian Aid's country manager based in Lusaka sounded a warning that severe flooding due to heavy rains would lead to serious food shortage during the 2007 – 2008 season.

Roads and bridges had been destroyed, cutting off whole communities, as well as damaging livestock, crops and forcing many Zambians to flee their homes. All provinces had been affected and Southern province was the worst hit. A similar scenario is shown in figure 8 where a maize field got flooded with water due to abnormal rainfall in southern province.

Figure 8: maize fields flooded

Source: Post Newspaper, 10th February, 2008

A report by the Family Health Trust (FHT) from Southern province said maize crops had been completely ruined by the rains. In addition, Jennipher said the 2007/2008 floods were unusual as they had come too early and predicted worse situations by the end of the season. The Christian Aid obtained the information from a press release in December 2007.

Figure 9 was yet another sad situation for the people of southern province. The photograph depicts a submerged bridge due to heavy rains experienced in some parts of the country during 2007-2008 season.

Figure 9: floods 2007- 2008 season

Source: Post Newspaper 10 February 2008 (Southern Province)

The above figures were scenarios from two consecutive seasons, of 2006 – 2007 and 2007 - 2008. According to the media reports, the situation was getting worse than it was in the previous years. The question one would ask is what was causing these floods; could it be attributed to deforestation?

Deforestation due to land clearing for agricultural purposes and other human activities had been reported to expand the Sahara desert and that many parts in the southern African region were beginning to show desert-like conditions due to fuel harvesting.

The problem of global warming was also reported during the official opening of the 116th inter- Parliamentary union conference, which was held in Bali, Indonesia in the year, 2007, that deforestation would cause drastic climate changes that were known to be catalysts to tropical diseases.

Another article on the same problem appeared in The Post news paper of 29 April 2007, entitled 'Earth is hotting up'..., and Zambia is beginning to feel the heat. In this article, it was reported in detail how environmental issues affected every life form on this planet including the human race. It was stated that global warming was an issue that was affecting the whole world.

Tourism Minister, Kabinga Pande, explained that Zambia was expected to bear the most severe brunt of climate change as it found it difficult to prepare for unpredictable extreme weather events and lacked technological knowledge to effectively mitigate their effects. Pande also attributed the high levels of poverty in the country to climate change and pointed out that consideration should be given to change effects of deforestation.

Trees help in the prevention of climate change as they act like carbon sinks which remove green house gas emissions from the atmosphere. However, that when cut, they increase carbon dioxide in the atmosphere as they decay - increasing the amount of carbon dioxide in the atmosphere. This is in addition

to other gas emissions such as those produced in burning. These emissions create a thick blanket, which eventually leads to rising temperature.

In comparison to transport sector, deforestation has been found to be a more serious problem for Zambia. This is because cars emit smoke that affects the ozone layer too but the effect of deforestation on this ozone layer outweighs that of vehicles in Zambia. The Minister was quick to state that deforestation has however, not received sufficient attention as there were a number of technical complications involved in quantifying the emissions from the forest. This is the more reason why this study had to consider carrying out a tree census in order to establish evidence of deforestation in the area.

In the same Post News paper article, Pande is also quoted as saying Zambia lost approximately 800,000- 900,000 hectares of forest annually, which ranks Zambia among the top ten countries with largest forest losses. European Union Studies attributed this to charcoal burning in some parts and wood fuel in other areas for either cooking or curing tobacco.

Figure 10, shows a photograph of an area whose trees have been cut indiscriminately.

Figure 10: Deforestation caused by tree cutting for land use

Source: The post website www.postzambia

The Minister acknowledges that there is no one easy answer to the problem of deforestation as there are many causes. He adds that there is no cure for deforestation as replanting does not really bring out the same species. He recommends a stop to destroying the forest all together. However, is it possible to stop it completely without finding solutions to the peoples' needs? Forests actually provide a canopy over the soils. They also absorb rain water and release it when needed by soil. In short, trees help in retaining ground water. Destruction of this forest leads to change in worlds' temperature in

harmful ways such as the land becoming sandy and dry as the sun can then penetrate deep into the forest, where before, the tree-cover blocked out the damaging rays. When this occurs, plants living near the cut down tree die and wither in the sun. It is believed that with every tree felled, another 40 are destroyed in the process. It is worse when the bull dozers knock the trees down.

The history of human impacts on nature is a long one. Some historical records from more than 4,000 years ago showed that water logging and salt building up in the arid soils of summer in ancient Mesopotamia gradually handicapped the kingdom's ability to feed itself and contributed to its fall.

In China's major cities, the residents faced severe water shortages in part because of over extraction of nearby rivers. In India, commercial cutting of the forests had left the traditional system of village management of local forests in shambles and brought shortages of fuel wood and building materials to millions of rural villagers.

In most cases the poor suffered when such problems occurred because they were usually the most directly dependent on them for survival. By 1980, the global economy had tripled in size, and the population had grown to about 6 billion people. Consumption had also increased, all at a cost to the ecosystems. These pressures were not likely to abate almost immediately.

- Economists predicted that the global economy would expand by a factor of five in the next 50 years
- Demographers expected the population to grow to 9 billion in the same period
- Demand for food was expected to grow to 40% by 2020
- By 2050, demand for wood could double.

Too often, these factors encouraged us to exploit ecosystems for short-term gain and discouraged long-term stewardship. We undervalued most produce from the environment and used more than we needed.

At the time of this research, many signs pointed to the decline of ecosystems. Some places had stopped producing certain products. For example in some areas where timber was obtained, scenic beauty of the forest was no longer there. It was clear that human activities had begun to significantly alter the earth's basic chemical cycles.

Our emissions of CO2 had brought the real threat of global climate change, and with it, potential changes in the distribution and productivity of ecosystems.

Deforestation was a contributing factor to the greenhouse effect. The trees were large carbon stores, and when the trees were burnt, they released this gas.

This led to an increase in the carbon dioxide levels in the air. Carbon dioxide was the major contributor in the greenhouse effect.

2.3 Description of Global warming

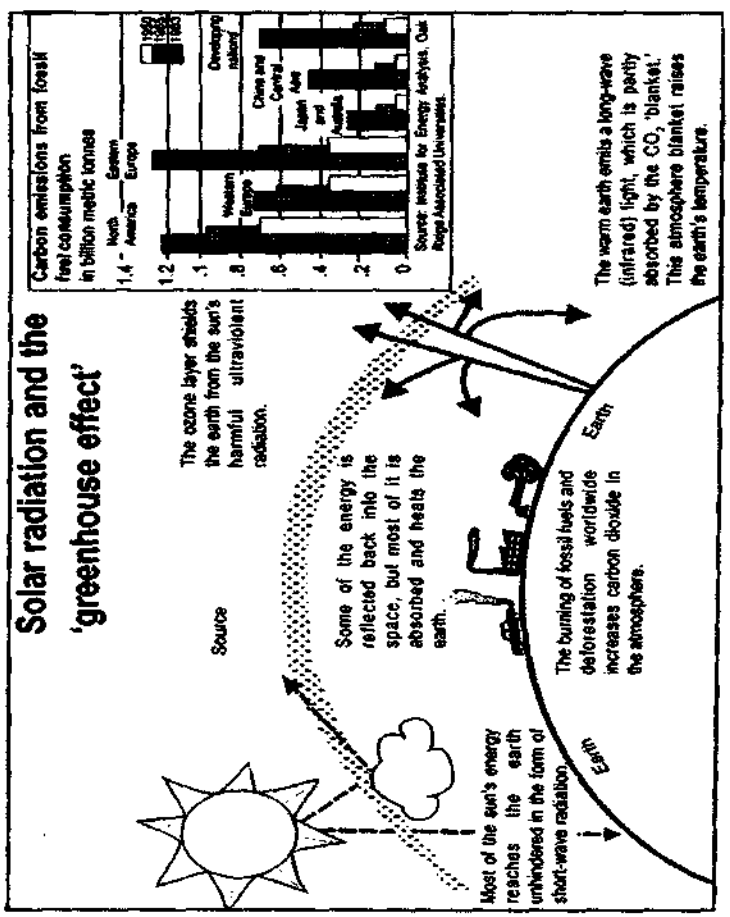
To simplify Global warming, Pannerselvam (2005) referred to it as the carbon dioxide problem. CO2 is considered the most dominant factor in causing global warming. This is because the gas has a characteristic of absorbing infrared radiation or heat energy from the earth. This property affects global temperatures. It has been recorded that the world at the time of this research in 2008 contained 25% more of this gas than it did in the 1960s.

Up in the atmosphere is the stratosphere within which is a very thin layer called the ozone layer. Although this layer is very thin, it has a very important role. It helps in absorbing most of the ultra violet rays from the sun. These rays are quite harmful; they can cause cancer of the skin and influence the immune system by suppressing the immune defense against tumors.

In 1985, scientists in Britain reported a depletion of this ozone layer in the atmosphere that more than 40% of the ozone had decreased. It was decreasing at a rate 0.3% per year. What was shocking was that at that rate, in 60 years, life on earth would end. This was why an agreement was made to eliminate ozone-depleting substances by 2000, which included carbon emission.

Figure 11 is an illustration of this complex activity. In industrial areas, the smoke can be from factories and cars, but the area under study was rather underdeveloped at the time of this research in 2008. Most of the smoke in the area of study emanated from burning wood fuel either in curing tobacco or clearing land. In the inserted picture, emissions of carbon dioxide had been rising over the years

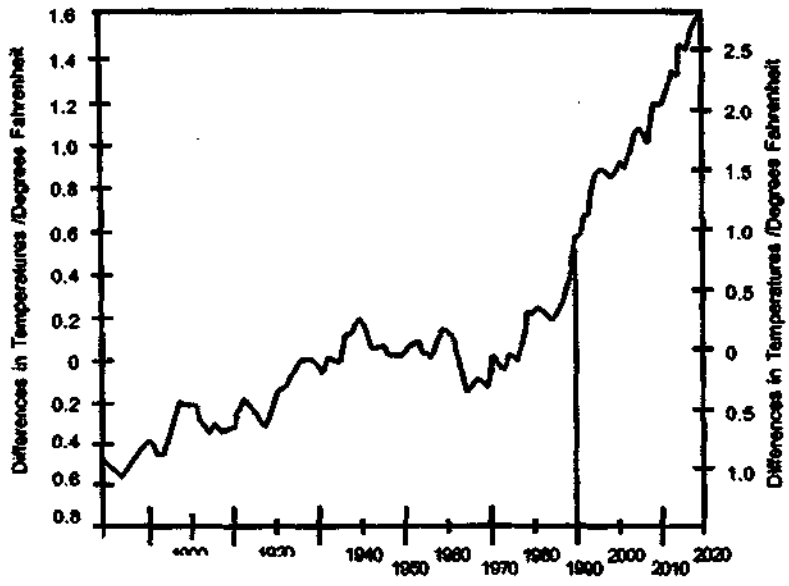
Figure 11: Greenhouse effect



Source: Panneerselvam, A. (2005)

There was an ozone layer above the earth, which acted like an umbrella and barred the violent rays of the sun from causing harm on humanity, but due to the many human activities, this layer was becoming thinner and thinner thereby allowing the harmful rays to reach the surface of the earth. Figure 12 illustrates the projected temperature rise as should be expected if nothing is done before 2020.

Figure 12: temperature rise between 1900 – 2020 projections



Source: Panneerselvam, A. (2005)

The graph shows how global temperatures have been changing over the years. If this trend continues at this rate, the world will face an average temperature rise of about 2 degrees centigrade by 2020.

Over the last two decades, the frequency of extreme climate events such as high surface temperatures, floods and droughts, has increased over the entire globe. These events affect subsistence farmers quite a lot. Southern province, for example, received less than 800mm of rain annually, yet it used to be a maize belt. For twenty years, it had been experiencing low unpredictable and poorly distributed rainfall. According to the metrological data, it was the driest and very prone to drought.

According to the 32 metrological stations around the country, the data for over thirty years, the temperatures indicated 0.6°C increases per decade in Zambia. This was said to be ten times higher than the global or southern African rate. To reverse this trend, the following were suggested at the earths' summit as activities that countries needed to adopt:

- use of energy sources that did not produce carbon dioxide such as the use of solar power and wind driven machines (windlass)
- replanting of forests
- Replacing fossil fuel.

2.4 Zambia's level of commitment to solving the problem of deforestation

Unfortunately, Zambia did not seem to be making any positive steps towards these interventions. According to the *Daily News* from Harare, Zambia recorded an all time high bumper harvest in tobacco farming in the season 2005-2006. Jewette Masinja who was Zambia's executive director for tobacco association at the time reported this. He projected a harvest of 52 million kg as compared to 14.3m kg in the previous

harvest. This was because of the influx of tobacco farmers from the neighboring Zimbabwe. Records showed that tobacco farming had been rising in the past 3 years. What was sad was that nearly half of the 52 million kg was to be full flavor Virginia tobacco. This implied more land clearing for the curing of this tobacco.

Another unfortunate thing was that Zambia was not part of the 168 countries that signed the WHO framework convention on tobacco control, which was held in Geneva on 17 February 2007. The treaty was aimed at curbing tobacco use by requiring countries to impose restrictions on tobacco advertisements, sponsorship, and promotion. Muyunda Illilonga, who was Zambia's consumers' association executive secretary at the time of this report, noted that in Zambia people could freely produce, use, advertise and sponsor tobacco promotions without restrictions. He also reported that Zambia had become a leading producer of tobacco, other than copper mining, and tobacco was then the country's biggest exchange earner. Production was nearing the levels seen in Malawi and Zimbabwe, Africa's 2 top tobacco exporters in 2006. This was an indication that deforestation was on the increase.

As noted from the Post website, www.postzambia. , on the 4th of may 2008, Food and Agriculture Organization Assistant Director general, Alexander Muller, advised that agriculture could offer important solutions to many of the environmental problems. These problems included; poor fuel use, natural resource depletion and habitat exploitation. He suggested that agriculture be at the centre stage if we were to change the then problems, which were a threat to future food security. He added that issues of

climate change could not be resolved without involving the agriculture sector. He also called for political will.

From the same website, Richard Chizyuka, who at the time was permanent secretary for agriculture and cooperatives bemoaned budgetary allocation in Zambia as still below the recommended 10%. Also true was that the ministry was housing a lot of departments such as veterinary, fisheries and cooperatives such that the cake became even more depleted.

The US National Research Council (NRC) has developed an analytical framework for understanding the possible human responses to global environmental changes. It includes responses to experienced and anticipated changes. This is where people respond to the change as it is experienced or as it is anticipated. It is possible now to anticipate change due to increased scientific knowledge.
Some of these human responses are planned and coordinated while the others are not coordinated.

Mitigation describes an action that prevents delays or slows the rate of undesired impacts by acting on the environment or intervening in human activities. Human beings can simply introduce an activity that can prevent the effects from being destructive on them or on the environment. Good examples of this are the introduction of drought resistant crops, the Kuomboka ceremony where people simply migrate away from low- lying coastal areas to upper land.

The problems in developing agriculture in Zambia are similar to those of development such as lack of personnel trained in agricultural sciences, low prestige for agriculture and that agriculture is not rewarding. This has been seen in the pricing of maize, which has a very small marginal increase mostly during marketing seasons.

Truly, lack of skilled workforce impedes development. Until we recognize the need to educate adults, the affairs of the nation will remain in the hands of untrained adults.

According to Natural Resource Management, a source book on line, resource poor farmers are in risk prone environments and are not easily reached by modern technology through out the world. A new approach therefore, needs to be suggested to tackle the following areas so that the farmers can benefit. These include:

- Poverty alleviation
- Food security and self reliance
- Ecological management of productive resources
- Empowerment of rural communities
- Establishment of supportive policies

Innovations important to poor farmers suggested also include: - risk reducing, input saving, cost saving, nutrient, health and environment improving.

Another suggestion is that of a 'bottom - up' approach to be used, that is local people, their knowledge and their natural resources. Participatory approaches helps in getting the real needs of the people, their aspirations and circumstances, so that the

programme developed is received well. The people easily develop a sense of ownership.

It is true however; that there are many NGOs that are involved in promoting agricultural activities that have had an impact on the small farming communities such as the International Centre for Research in Agro Forestry (ICRAFT). Nevertheless, success largely depends on the use of a variety of approaches that favor a better use of local resources and emphasize human capital enhancement, community empowerment through training and participatory methods as well as higher access to markets and income generating activities. This is in line with the aim of the National Development Plan on the environment, which reads: - *to reverse environmental damage, maintain essential environmental and biological processes and ensure sustainable use of natural resources for the benefit of the people, (*MTENR).

There is need to adapt the needs of the lower level population in the Zambian Curriculum, or if this is not possible, a deliberate programme, which this study sought to design, should be adopted for the farmers.

In an effort to establish the relationship between education and social factors to economic growth, Adam (1963) defined development not just as economic, but social; and not just material but human, such as becoming creative. As such, he suggests a crash programme of educating, training, encouraging, helping and organizing enough people to carry weight in their contribution to both the economy and to the growth of a

viable and purposive society, (Adam 1963:5). It has been noted that inequality between the rich and the poor, if vast, can affect development. According to (1970) *adult education and nation building*, developing countries should treat adult education seriously. This would enable them to develop and promote national unity.

The other problem is lack of competent and uncorrupt administration in the majority of the backward countries. According to Adams (1963) *"as long as dishonest men existed, there would always remain a more vicious and personal form of corruption."* Other writers seem to agree with Adams (1963), that education should also change peoples' attitudes, values, motives, aspirations and standards of efficiency on which development depends. In Countries, which have developed well such as Norway, Sweden and Denmark, prosperity is wide spread.

In Kenya, agricultural education has residential farmers' training centers scattered throughout the districts. In Zambia, such centers are fewer and might not have been as effective. The centers offer short courses in basic agriculture, methods and techniques to subsistence farmers. A small fee is paid to enable them run small demonstrations but this is highly subsidized by the Kenyan government. Zambia too has co-operative colleges, but their role in tobacco farming is not clear.

Such education has proved helpful in upgrading the level of education among adults in some countries. Other benefits of such an education includes maintaining direction, developing interest, promoting social economic development, developing effective

neighborhood relations and helping out-of-school adults learning to use devices that have come with new technology. Besides, communities easily come up with workable action programmes.

Chapter 3

Methodology

This chapter describes the methodology that formed the research into the Zemba farming community. It explains the research methods, data collection techniques, data organization and analysis.

3.1 Location of the study area

The study area is called Zemba farming block and is located about 15km south of the Great East Road and about 60km from Chipata. It is on the left hand side of the great east road as one drives from Chipata just after Chiswa Basic School, (as shown in figure 1). The area houses farmers from Chipata, Chadiza and Katete districts, further away from the stream and mountains.

The area experiences 3 distinct seasons, hot, wet and dry. The winters can be extremely cold at times. Vegetation consists of trees of various species. The common ones include Brachystegia bussei *(Mkongolo* in Nyanja), Syzygium guineense (*Katope* in tumbuka and Nyanja), Monotes africanus (*Mzaza* in Nyanja), Julbernardia paniculata (*Mtondo* in Nyanja), Pericopsis angolensis (*Mubanga* in tumbuka or *muwanga* in Nyanja) and Diplorhychus condylocarpon (*Mtowa* in Nyanja).

The area was chosen because farmers can 'freely'cut wood fuel for curing their tobacco without much restriction as it is not in a reserve area. It is traditional land belonging to '*maso amambo*', meaning the eyes of the chief.

3.2 Research design

The study used a survey research design, which involved both qualitative, and the quantitative techniques

3.3 Population

The population was all the Virginia tobacco farmers in Zemba farming block. This farming block had been considered because of its distance from the nearest towns. It was quite rural, with little influence from urban farmers.

3.4 Sampling procedures and sample size

The study took place in a rural set up of Eastern province, assuming that there was little information pertaining to tobacco farming that reached these farmers. The choice of the scheme was purely based on the researcher's familiarity of the place and language knowledge used in the area. It was purposively selected. The purposive selection here was preferred in order to make sure the study was confined to Virginia tobacco farmers with or without any form of formal education and with little or no access to in-service education. Although farming blocks had scheme advisers, the area under study was in a tricky situation because of its location. It was located at a point where three districts meet, namely, Chipata, Katete and Chadiza.

A mini census was conducted to have a complete list of the Virginia tobacco farmers in the area, which was followed by simple random sampling getting every 3rd on list or 5th depending on the number. The sample consisted of only males. It was hoped that a

cross section of the population would be obtained. Research had shown that due to the labor involved most women avoided Virginia tobacco farming.

3.5 Limitations of the study

Initially, the study sought to cover many farmers. However, due to financial limitations and time, it was decided to focus more on only 30 Virginia tobacco farmers. This was because cultivation of this type of tobacco was causing a great loss of forest in the area. It was also discovered that Zemba farming block covered 3 districts, therefore it was not possible to involve the over three hundred farmers. Even using the K th sampling method, they were going to be scattered, thereby giving difficulty in bringing them to a central place for discussions. For this reason, the 30 included only those in the nearby catchment area to the center for the meeting.

Incidentally, each of the three districts was represented. The least represented district was Katete as it was difficult to get more farmers than those who came because the farming area is a bit further from the meeting place.

Many of those who came thought there was going to be input distribution, others could not come because word never reached them- notice was too short. Only two women came and they came late. Otherwise the invitation was open to all Virginia tobacco farmers although the earlier plan was to involve only men due to the assumption that due to the amount of labor involved, mostly men cultivate Virginia tobacco. As earlier stated only 30 farmers attended excluding the 2 women who came late, this was merely 10% of the total population of Virginia tobacco farmers in the block.

3.6 Research instruments and data collection

The study conducted group discussions and observations among Virginia tobacco farmers. In addition, interviews and questionnaires were administered to stakeholders involved in tobacco farming. A set of 15 questions were administered to stakeholders in Virginia tobacco farming. Questions covered areas like pollution in the area and the possibility of stopping it. They were asked if tobacco farming had any effect on the environment and what would be done to reduce the effect. The stakeholders were also asked to suggest the form that education should take if it were to be introduced in the area as a way of sustaining the environment. The stakeholders here refer to companies that provide loans to farmers in form of seed and chemicals for treating the crop and buy the yield at the end of the farming season. Others are union representatives of the farmers who from time to time are trained by the forestry department in agro-forestry.

Reasons have been given as to why the researcher chose to carry out the study among the population in question. To understand the dynamics of deforestation, both spatial and temporal data were required. These data were collected from both primary and secondary data sources. The primary data for the study were obtained from the field using informal discussions, questionnaires, and structured interviews. The researcher had to carry out oral interviews herself due to the absence of any effective statistical record on certain information about Virginia tobacco farmers. The only means of getting enough information from respondents was to use oral interviews as most of them could not read or write.

However, officials from Tobacco Board of Zambia (TBZ) provided some documents from which secondary data was obtained.

Six questionnaires were administered but only five were recovered, giving the researcher about 83% recovery. The following were the respondents to this set of questions:

- Tobacco inspector from Tobacco Board of Zambia (TBZ)
- A union representative
- A book keeper from Zambia leaf, a tobacco company
- A field officer from Africa leaf, another tobacco company
- A provincial forestry officer from the forestry department -Eastern province
- The last one was an agronomist from Alliance 1, a tobacco company

This was followed by in-depth interviews with the selected farmers. A structured open-ended questionnaire was used for the interview. A supplementary activity was carried out to determine tree density in the area namely; - The Point Centred-Quarter Method.

A field survey of the vegetation was undertaken in the study area. This involved traversing through the vegetation at randomly selected sample points and collecting relevant information such as tree types, distance apart and eventually dominant species. This was done along a more than half kilometer stretch into the natural forest. It was the intention of this study to use Point- Centered Quarter Method as one of the

primary data sources to determine the extent and the rate of deforestation that had taken place in the area and to provide a qualitative indication of deforestation in this area. To conduct this activity, permission had to be sought from the provincial forestry officer, who in turn facilitated access to the scheme supervisor, and later on to the headman in the area.

3.7 Description of the Point-Centred Quarter Method

This is a method of determining relative importance of the various tree species in the community under study. The factors used in determining tree value are **density, size** and **frequency.**

A large sample of 100 by 100 m squared, (a hectare) was used as a sample. This can be extraordinarily time consuming if the trees are very dense and where one has to count tree by tree. However, the Point – Centred Quarter method provided a quick way to make an estimate by using a series of measurements along a transect walk of 100m. It was difficult for the researcher to do this activity alone, she therefore asked two other people to help her do this activity. Using a 100m tape, a 5m tape, a note book, calculator and a table of random numbers (as shown under procedure in the next few pages), the activity was done. Random numbers were obtained from a statistical book. 10 or more random 2 digit numbers, which had a gap of 6- 10 m or more between digits, to avoid landing at the same sample were generated. The smallest random number became the starting point.

At each point a line was drawn across the transect to realize 4 equal parts or quarters, the nearest tree to the centre point in any of the quarters was sampled. The name of the tree species was then noted in the note book, its distance from the centre point recorded, and its size was taken at breast height or chest height of the same person. A standard measurement of 1.5cm from the ground could also be used in place of the breast height. This data was then processed using formulae to determine tree density. A species that was mostly sampled was the most frequent or dominant species in the area.

3.8 Materials used

Materials used included a 10m and 1.5m tapes, a stone and some random numbers obtained from statistics books. A stone was used to determine the starting point, the longer tape was for taking long length measurements on the ground and the shorter one was for taking tree circumferences.

3.9 Procedure

The following table of random numbers between 1 and 100 were used to obtain numbers that were used later to sample the trees.

37	**88**	**38**	**96**	**61**	**80**
79	70	20	85	21	
83	98	5o	10	39	
53	13	17	4	77	
8	24	90	51	2	
89	38	48	35	85	
33	20	28	75	100	
71	69	34	26	7	
43	80	75	29	68	
18	27	85	34	39	
13	72	**52**	**73**	**19**	
71	66	53	43	17	
24	55	45	46	23	
57	9	51	73	36	
34	54	34	50	24	
21	63	89	48	37	
20	51	39	56	73	
68	6	44	79	3	
41	7	55	88	27	
72	70	48	91	1	

Every tenth number was selected. The following numbers were obtained from the table of random numbers: 37, 13, 88, 72, 38, 52, 96, 73, 61, 19 and 80. The next step was to arrange the numbers in order as shown below:

13

19

37

38

52

61

72

73

80

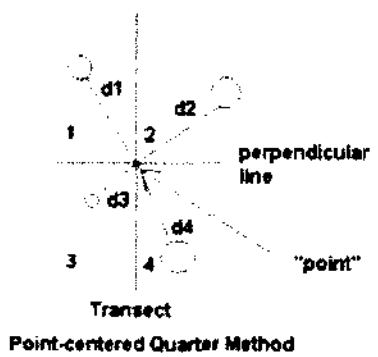
88

96

The next stage of the numbers that were close, one was eliminated to avoid having the same tree being sampled twice. The following were the final numbers that were used to determine the tree to be sampled: the first two digits were considered. These are: 13, 19, 37, 52, 61, 72, 80, 88 and 96. The tenth point was the one obtained at the beginning by stone throwing. Throwing a stone also determined the starting point.

Using the point centered quarter method where a straight line was drawn at the point where the measurement landed, and then a perpendicular line was drawn. The centre point was where the two lines crossed, creating 4 quarters. Any tree in any of the quarters provided the tree was more than 4cm wide and nearest to the centre point was sampled. Figure 13 shows what exactly was done.

Figure 13: Transect showing centre point with a perpendicular line drawn realizing the 4 quarters



Source: (field data 2008)

In the diagram, 3rd quarter had the nearest tree to the centre point (d3). This tree was sampled. Distance was then measured from the centre point to the nearest tree, which was then measured at 1.5m from the ground as standard chest height. The picture in figure 14 shows how the circumference of the trees was measured.

Figure: 14 taking measurement of tree diameter using a tape measure

Source: www.google

This was a substitute to a persons' actual chest height. It was not possible to use an actual chest height in this case because the three person data collection team could not manage. Either diameter at breast height (DBH) can be used or circumference at chest height (CCH). CCH was used as we did not have calipers used in measuring diameters. Table 2 shows the results of this activity.

Discussions were held with farmers of Virginia tobacco in the study area together with their village leader. These discussions were expected to provide information on an overall picture of the problem of deforestation and the efforts to reduce it in the

area. The main aspects discussed were their observation in rainfall patterns and other impacts of deforestation, and the kind of education that would help mitigate the effects of deforestation. Afforestation and forest management programmes were also discussed. Detailed information for the study was collected during the interviews conducted with subsistence farmers in tobacco growing using a structured questionnaire to obtain information on the history of the settlement, land use and characteristics such as types of changes in rainfall pattern over time.

Other areas included what was involved in tobacco farming, why the crop, the source of fuel and distance involved. This interview also helped to bring out information on challenges of Virginia tobacco farming, future supplies of fuel wood and conservation efforts that had been practiced.

Office reports helped in providing secondary data, which were obtained from TBZ office, Alliance 1 manager's records on tobacco farmers and their characteristics. Some government documents and newspapers were also used at this stage.

3.10 Data collection by the Point-Centred Quarter Method

The study was done on the 13th of August, 2008 with the help of a forestry officer provincial office in Chipata and another from Alliance 1, a company that provides loans to tobacco farmers and owns eucalyptus plantations for tobacco farming in areas where trees had become scarce.

The study was done to determine tree density, its carrying capacity and the value of the different tree species. The study was also to be used to get an insight of how future generations would survive in this area whose livelihood depended on forest. The investigation included total tree densities, frequencies, percent cover and value of the species in Zemba area. The study covered an area of over 500 square meters. The area was also open miombo woodlands.

A conclusion by the Pilot Analysis of Global Ecosystems (PAGE) suggested that as a country, there was lack of much of the baseline knowledge needed to properly determine ecosystem conditions on a global, regional or in many instances even at local scale. The dimensions of this information gap were large and growing, rather than shrinking, as it would be expected in the age of satellite and the internet. This was the reason why the Point -Centered Quarter method was conducted in this research to provide baseline data. The data developed was to be used in designing an integrated approach to systematically assess the ecosystem at all levels and get people informed. The goal of the point – centered quarter method was to determine the relative importance of various tree species in the study community. For the purpose of this study, **tree importance** referred to the value of a tree concerning its **size** and **distribution** throughout the community. This was so because the number of small trees does not have the same value as the same number but of large trees. Similarly, if the same number of a particular species was clumped together, they cannot have the same value as those that are fairly distributed throughout the community.

It was for this reason that in this study the **size, density** and **frequency** of tree species had been considered to determine tree value. As stated earlier, the area under discussion was about 500 meter squared, this was quiet a large piece of land, but with the Point – Centered Quarter Method, it was possible to make such an estimate by using a series of measurements along a particular direction.

3.11 Data analysis

Data analysis was done with the help of some statistical techniques such as correlations. For qualitative data, analysis went side by side with data collection. Data was then classified into themes so that a conclusion could be drawn from there. The data collected was analyzed and presented both qualitatively and quantitatively using graphs, tables and pie charts

Chapter 4

Presentation of Research findings

In this chapter, the findings of this study are presented in the context of the Zemba farming scheme, based on the themes designed in chapter 3, namely, value of trees, frequency, size and density of selected tree species. This chapter contains data as collected in the field. The following table presents results from the Point-Centred Quarter method.

Table 2: Results of the Point- Centred Quarter Method in meters

Serial no.	**Tree species**	**Distance from centre point**	**Circumference at 1.3m**
1	Brachystegia bussei	0.90m	35cm
2	Syzygium guineense	4.0m	26cm
3	Monotes africanus	1.9m	26cm
4	Julbernardia paniculata	2.6m	32cm
5	Julbernardia paniculata	5.4m	28cm
6	Pericopsis angolensis	2.8m	93cm
7	Julbernardia paniculata	2.2m	42cm
8	Julbernardia paniculata	5.3m	37cm
9	Julbernardia paniculata	4.2m	46cm
10	Diplorhychus condylocarpon	2.2m	56cm
TOTAL		**31.5m**	

Total distance was added to arrive at 31.5m. This figure is needed when calculating the density.

4.1 Frequency distribution

Brachystegia bussei - 1

Syzygium guineense- 1

Monotes africanus - 1

Julbernardia paniculata - 5

Pericopsis angolensis - 1

Diplorhchus condylocarpon – 1

To show the distribution as a pie chart, the data was converted into degrees.

Julbernardia paniculata – $\frac{5 \times 360}{10} = 180°$

Pericopsis angolensis - $\frac{1 \times 360}{10} = 36°$

Brachystegia bussei - $\frac{1 \times 360}{10} = 36°$

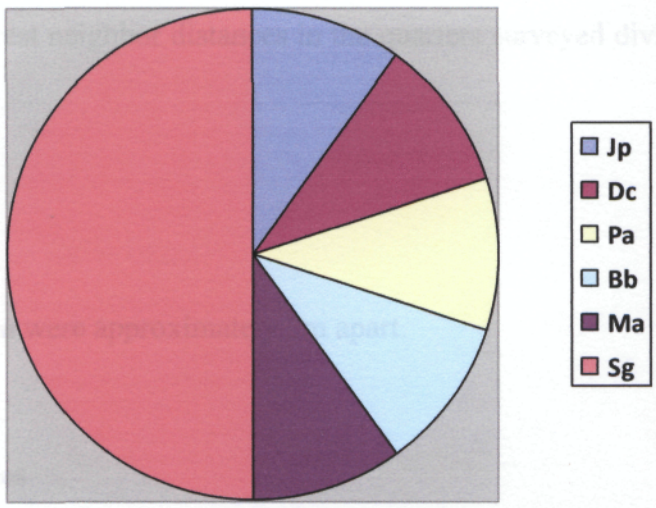
Monotes africanus $\frac{1 \times 360}{10} = 36°$

Syzygium guineense $\frac{1 \times 360}{10} = 36°$

Diplorhychus condylocarpon - $\frac{1 \times 360}{10} = 36°$

Figure 15 shows these results of the calculations of data to degrees expressed as a pie chart.

Figure 15: frequency distribution as a pie



Source: (field data 2008)

Legend

- Jp Julbernardia paniculata 180°
- Dc Diplorhychus condylocarpon 36 °
- Pa Pericopsis angolensis 36°
- Bb Brachystegia bussei 36 °
- Ma Monotes africanus 36°
- Sg Syzygium guineense 36°

4.2 Absolute density

For the purpose of this study, absolute density of trees was defined as the number of trees per unit area. It was expressed as the number of trees per hectare, where a hectare was 10,000m2. The point-centered quarter method allows estimation of value without having to count every tree within such a large area. From the transect information, the research team was able to estimate the mean distance between trees in the region. This was simply the sum of the nearest neighbor distances in the quarters surveyed divided by the number of quarters.

$\frac{31.5}{10} = 3.15\text{m}$

This meant that trees in this area were approximately 3m apart.

4.3 Relative density of a species

The relative density of each species was simply the proportion of observations of that species times 100 to make it a percentage. Thus, relative density was just the proportion of frequency over number of points times a hundred.

Brachystegia bussei $= \frac{1}{10} \times 100 = 10.0\%$

Syzygium guineense $= \frac{1}{10} \times 100 = 10.0\%$

Monotes africanus = $\frac{1}{10}$ x 100 = 10.0%

Julbernardia paniculata = $\frac{5}{10}$ x 100 = 50.0%

Pericopsis angolensis = $\frac{1}{10}$ x 100 = 10.0%

Diplorhchus condylocarpon = $\frac{1}{10}$ x 100 = 10.0%

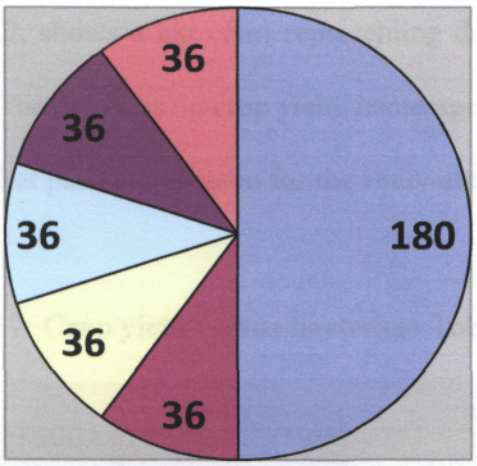
Note that the total should sum to 100%.

It was also important that the sample points were not too close to each other to avoid sampling the same species twice. To show this data on a pie chart, the percentage had to be converted to degrees by multiplying the fraction with 360.

As in $\frac{10}{100}$ x 360 = 36°

Figure 16 shows a pie chart on relative density.

Figure 16: Relative density



Source: (field data 2008)

Legend

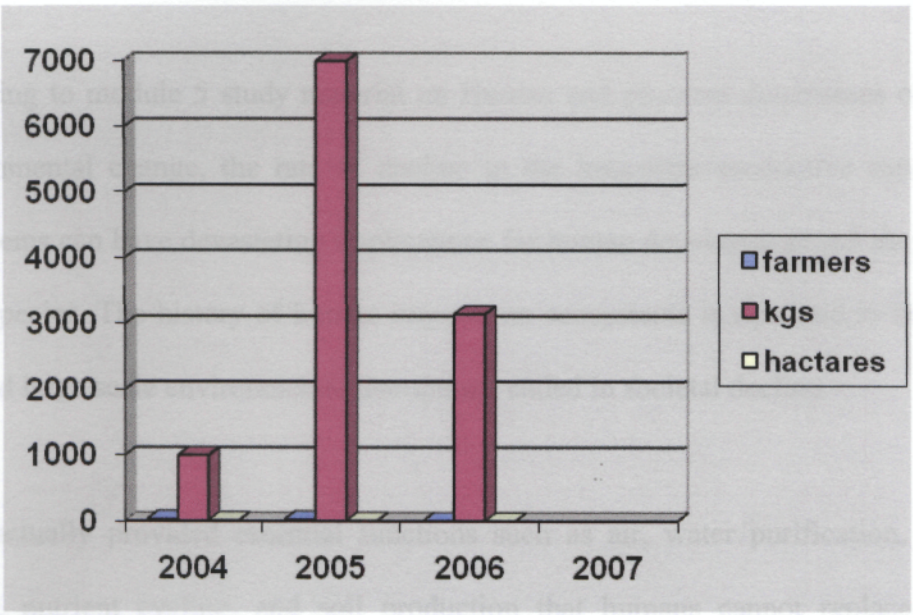
– Jp Julbernardia paniculata (**180°**)

- Dc Diplorhychus condylocarpon(**36°**)
- Bb Brachystegia bussei(**36°**)
- Sg Syzygium guineense(**36°**)
- Ma Monotes africanus(**36°**)
- Pa Pericopsis angolensis(**36°**)

4.4 Crop yield verses hacterage

Figure 17, shows a bar chart representing data obtained from records from the TBZ offices. The data was on crop yield, hacterage versus number of farmers growing the crop in that particular season for the study area.

Figure 17: Crop yield versus hacterage Tobacco farming as from 2004 season



Source: (TBZ Chipata office 2008)

4.5 Value of trees

Regarding the value of trees, respondents of this study community, especially the aged, were able to recognize the fact that trees were part of the large family known as nature. Trees are part of the family referred to as ecosystem. These are communities of interacting organisms. They include the wood lands, the lakes, rivers and streams, the range lands, the beaches, farmlands, urban parks and green spaces. In short, every

centimeter of the planet is part of an ecosystem, (Human and physical dimensions of global Environmental change module 5 study materials).

Besides providing medicines, headman *Maso Amambo,* was able to state that house construction in the village was heavily dependant on trees. In the past, they also avoided felling certain trees because of their value such as medicine. Unfortunately, with time and scarcity of trees, these trees are not spared anymore.

According to module 5 study material on Human and physical dimensions of global Environmental change, the rate of decline in the long-term productive capacity of ecosystems can have devastating implications for human development and the welfare of all species. The history of human impacts on ecosystems is also said to be a long one, and large scale environmental disruptions ended in societal decline.

Trees actually provided essential functions such as air, water purification, climate control, nutrient cycling, and soil production that humans cannot replace at any reasonable price. The young generation did not think that trees played such important roles. Ecosystems were the basis of peoples' economic development and provided employment particularly in low and middle-income areas.

Additionally, trees did provide aesthetic beauty and recreation. Forests in particular helped in the removal of air pollutants and they emitted oxygen people needed for breathing. Trees help in cycling nutrients and sequester of atmospheric carbon.

Certain weather extremes and impacts are moderated by the forest. In addition, forests provide habitat for human beings and other living organisms (Module 5).

4.6 Environmental issues in Zemba farming scheme as identified by the community members

In summary, the following issues came up from the discussions held by the researcher with the study community:- pollution, hunger, bush fires, poor housing, land degradation, vandalism, poor rainfall, artificial floods, high temperatures and deforestation. A detailed discussion and interpretation of these issues has been provided in chapter 5 on page 67.

Chapter 5

Discussion of findings

In this chapter the findings of the study are discussed. The discussion of the data herein is purely based on the findings obtained in line with the main purpose of the study.

5.1 Frequency distribution, size and density

Even at a glance, results of the frequency distribution showed that Julbernardia paniculata was the most frequent tree species in the study community making the forest *miombo* woodlands. This tree species is known as '*mtondo*' tree in the local language (Chewa). This information was presented in many ways and the results remained pointing to the same thing, that the forest had one tree species which was very common in the area. Such a forest is referred to as a miombo forest mainly because of the dominance of this particular species. The calculations done all pointed to the same results. It was the most frequent, which proves that this forest is indeed a miombo forest.

The data in table 2 also provided clear information regarding the tree size, frequency and density in the area. The distance from the centre point was a clear indication that trees in this forest were far apart. When it came to size, tree circumferences at breast height suggested that the trees in this location were generally small. As noted earlier, it was for this reason that this study suggested bee keeping allowing this young forest to

grow while farmers used proceeds from honey sales to buy logs from Alliance 1 to cure their tobacco.

Even though results showed small land used for actual tobacco cultivation, it must be noted that the effect on forest arose from tree cutting for curing the tobacco. It showed that few farmers were involved, small area was cultivated but the produce was quite high. This meant that tobacco farming was rewarding as one could still get a lot from a small portion cultivated. This in itself could encourage farmers to continue growing Virginia tobacco despite difficulties in fetching firewood for curing the yield.

Agriculture Minister at the time, Mr. Ben Kapita called for improved tobacco production because the cash crop contributed immensely to the economic growth of the country. He said this in Choma when he officiated at the 16th graduation ceremony at Popota Tobacco Training College in 2007. $22.5 million was raised from 11,571 tons at Lusaka floor and 15000 tons was expected in 2006. At this marketing floor 6 companies participated; TAZ (Tobacco Association of Zambia), Zambia Leaf Tobacco (ZLT), Tombwe, Alliance1, Association Central and T L Brokers.

The once rich forests were almost bare at the time of this research in 2008; trees had been cut down and used as fuel for curing tobacco and other uses. Tobacco farming has been proved to be a contributing factor to environmental degradation in this study location. It was clear from the responses that the area was already experiencing environmental degradation and effects that come with it such as soil erosion, poor

rainfall and poverty. The research that was conducted confirmed that in Zemba area, tobacco farming was actually the major cause of deforestation because the reports obtained showed that a lot of wood was actually required for the curing process.

Several ways of presenting data pointed to the same thing that the area actually favoured the growing of fire cured tobacco because of the popularity of the *miombo* trees that gave good fire according to the respondents. Whatever method used, Julbernardia paniculata remained the most frequent species in the area. The unfortunate thing was that most of this tree variety were small, the largest being about 46cm in circumference. What this means is that most of this tree species had been felled for various uses.

5.2 Community participation in Natural Resource Management

This study revealed that the livelihood of the people of Zemba farming block was dependant on the forest. All they needed was environmental education to help them develop skills and attitudes that were necessary in understanding and appreciating the interrelationships between them and their forest. If the people of Zemba were to make responsible decisions regarding their environment, they needed an education specially designed to bring about change in practices. To this effect, this study suggests an environmental education programme that emphasizes the conservation and sustainable utilization of natural resources and the total environment.

This type of education would create a strong awareness on the state of the environment of the Zemba community and the value of the renewable natural resources – the forest. It would also help in developing positive attitudes to the sustainable use of the forest.

The responses from the respondents generally pointed to the same issues. These included the need for an Environmental Education Programme to change peoples' attitudes and that it should be done in an integrated way where all stake holders such as MACCO, MTENR, MOE TBZ and the local community would be involved. They all felt this would enhance their efforts and as a result improve its effectiveness. They were also of the opinion that this education should be designed for all regardless of age, sex and education level so that the environment could save them better.

It was also generally emphasized in their responses that both educators and farmers needed some form of motivation. They suggested things like upgrading courses on issues of the environment for trainers, exchange visits and support projects to tobacco farming such as bee keeping. As for the exchange visits, places that were already in bee keeping and farms where advanced technology was used were suggested.

Stakeholders in tobacco farming also considered radio lessons as an effective way of reaching out to many farmers. They suggested putting farmers into listening groups as a way of increasing cooperation among them so that they could be mixing with each other from time to time. This way they would also help each other in areas of need.

As a monitoring tool, promotional quizzes where farmers would win some prizes such as seed were also emphasized to encourage listening skill and developing a culture among farmers to these radio lessons on environmental issues as well.

The dilemma was that the responses from respondents pointed to the fact that the area in question was already experiencing environmental degradation and effects that came with it such as soil erosion, poor rainfall, and poverty. Tobacco growing brought more profits than maize and this was the reason why it had been pursued even when there were not enough trees. Farmers also earned foreign exchange as tobacco was sold in foreign currency.

In the end, the ecological basis of all production was being permanently destroyed. As noted by John Revington (2006), in his article "the causes of tropical reforestation," that between 1.2 ha and 5.5 ha of forest were destroyed annually to grow and cure tobacco world wide.

It had been reported that tobacco farming was actually the major cause of deforestation in Brazil and Africa. This was reported in the WFPHA position paper no. 98-1.

It had also been reported that to cure tobacco grown on 200,000 ha of land, farmers needed another 200,000 ha of forest for wood. A 1986 industry commissioned report, reported that 7.8kg of wood on average was needed to cure 1kg of tobacco. Tobacco affected forests twice as much when clearing farmland as for curing it.

The depletion of forest resources in Zemba farming block was of great concern for environment and development. It was affecting not only the economy of the country through negative effects on agriculture but also the health of the people. The problem at hand was that farmers were not replanting and had no conscience about the damage they were doing, they had no regard for the future, yet they had children that grew and inherited the tobacco farms.

Cigarette smoke had also been identified as a significant contributor to environmental degradation; this was why some countries had put a ban on cigarette smoking as a way of preventing deforestation. In Michigan for instance, cigarettes were illegal. However, unless the Zambian government passed some law, it would not work because this is a global problem. It must also be understood that in solving environmental problems, you exacerbate another problem.

Tree planting activities as a strategy to restoring the forests had been done in Zemba before but had not been successful because of negative attitudes. The suggested education programme to ameliorate the situation includes problem solving, decision making and participation so that it would be acceptable and considered as part of the people's way of life. Palmer (1998) says that personal experiences, investigations and problem solving in the environment enable reflection and development of critical awareness and concern.

Tobacco companies were quite aware of the problems that Virginia tobacco brought about. It was just that they were beneficiaries in a way as they capitalized on the pricing of the tobacco. Mr. Ben Kapita, who was agriculture minister in 2007, was quoted by ZNBC, the National Broadcaster that pricing of the crop was usually a problem. He said Eastern province was likely to produce less tobacco in 2007 because farmers and buyers could not agree on the sale price for the season. What buyers got out of the sale of Virginia tobacco was better than if more of the farmers opted for Barley farming, which used fewer trees.

Respondents also felt that it was quite possible for the local community to be involved in resource management. They had worked with them before but the only difficulty was that they were not adequate to cover the area effectively. They needed reinforcement from other line ministries such as Education, Agriculture and Tourism, Environment and Natural Resources. The respondents also felt that there was need to strengthen the education of forestry officers in the field of environmental degradation for them to be effective. They also felt that contact farmers had been a let down because they were not motivated. Local leadership had also been ignored in the fight. Hence, they never supported these efforts.

Generally, respondents seemed to support the idea of developing radio programmes in the local language so that the information could go beyond contact farmers. The project was aimed at not only restoring forest cover but also improve forest function.

Chapter 6

Conclusions and Recommendations

6.1 Conclusions

In conclusion, the predictions that have been made in this study are quite scaring. If we are unable to prevent further global environmental changes and respond to those that are already underway, won't we all be 'losers'? We will surely perish. We cannot afford to ignore what is going on among Virginia tobacco farmers; it calls for environmental education so that gradually people can change. What is important to note is that there are solutions to environmental problems. Solutions like re-afforestation, finding an alternative source of heat like coal, awareness creation, and eradication of poverty through job creation, could make conservation successful. Another helpful suggestion is to use the young tree generation for bee keeping as a source of income for basic needs as well as purchasing of wood from Alliance 1, while giving chance to the young forest to mature. This is so because human needs never end. It can also be ideal to find an alternative source of fuel for curing tobacco.

There is need for education and training as desired in Agenda 21:-

> *Education, including formal education, public awareness, and training should be recognized as a process by which human beings and societies can reach their fullest potential. Education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues. (Agenda 21, 1992)*

Environmental Education should be a life long process. It should cater for people of all age groups, whether in school or out of school, if resources were to be sustainably used. The existence of humanity is deeply intertwined with the natural systems. If not careful, the future well-being of humanity is doomed. Environmental education could help in the preservation of the human race.

The earth summit held in 2002 in South Africa re affirmed the need for education in reducing poverty through sustainable development. There is an urgent need for the protection of the environment in order to change the quality of life for the people. This study brought to light many devastating effects of deforestation.

Environmental protection starts by creating awareness among people so that it becomes part of their lifestyle. Probably the efforts made earlier to preserve forests in Zemba area failed because there was no awareness creation. This is the reason why this study put priority on environmental education to create awareness for the people of Zemba.

Environmental problems are not an individual problem, communities; nations and individuals should all have a commitment to the issues of the environment. The people of Zemba should not be left alone to solve the problems they are facing regarding the environment. All humans depend on one biosphere for survival regardless of where they live.

6.2 Recommendations

6.2.1 Proposed Educational programme

The proposed education programme for the people of Zemba is meant to create awareness and importance of trees particularly in preventing soil erosion and in preventing ozone layer depletion. To do this an approach known as institutional greening has been suggested. It involves the trainers carrying out a demonstration. This demonstration was to be done at Zemba Basic School, which was the only school in the area.

Panneerselvam (2005) described two approaches to institutional greening and that it was not mere planting of trees or teaching of environmental subjects in the school, but that the school would become a role model to the society by adopting eco friendly practices. At this school, the trainers would demonstrate an 'ideal' kind of situation so that in the end the community could copy from the school.

6.2.2 Trainer demonstration in institutional greening at Zemba Basic School

The whole purpose would be to make institutional greening a way of life. To achieve this Zemba Basic School should:

- exhibit their commitment to environmental protection
- ensure that the school area is covered with shady trees, parks and rare species of plants

- put in place proper waste management from classrooms, labs, workshops and offices
- Be free from smoking, drinking and use of drugs
- Put in place energy and water saving devices such as improved brazier for cooking and the use of solar power
- take interest in local environmental issues and problems
- try to create environmental awareness to the local public
- Identify polluting industries and suggest how to reduce it or eliminate it completely
- conduct tests on water, air and noise levels in the local community
- Take action to prevent cruelty to animals and birds
- Conduct environmental awareness through drama or evening classes or any other means
- Encourage waste recycling
- observe World Water day- 22nd March, Earth day -22 April and 5th June Environmental day.
- Avoid using plastic covers or use them to make other useful items such as toys or decorations

It is envisaged that the moment the school adopted these practices; the community would learn a lot even at a glance. It is also hoped that the school would then extend the ideas to the local community. This could be done through practical demonstrations as well as role plays and songs composed by teachers. The PTAs' involvement in school activities could also be an effective tool for information dissemination. The

local leadership could also be invited to attend some locally organized workshops by the school on environmental issues.

6.2.3 Radio programme

A radio programme that could run for thirty minutes in the local language preferably between 1800 and 1900 hours on the community radio station (Radio Breeze FM) so that farmers could meet in listening groups was suggested. The advantage of this approach according to the respondents was that those without radios could listen to the programme on friends' radios.

The farmers also suggested that there should be follow-up programmes before the next radio programme where the listening teams could share what was discussed on radio.

To encourage the farmers, some awards such as farming in puts, were also suggested by the village headman to be given to groups that were consistent and that the programme should be evaluated from time to time.

The other advantage of the radio programme is that it would disseminate information to a large target group within a shorter time and at a reasonably less cost than workshops.

Most farmers were not for the idea of workshops because those that had attended before in most cases never shared the knowledge with the others.

A few experts should be organized to give talks on various issues on the environment in the local language on the radio. It is the desire of the researcher that this radio programme would be adopted by Environmental Council of Zambia or WWF (Wild Wide Fund for Nature).

6.2.4 Bee keeping

In addition to these activities, bee keeping was also proposed by the provincial forestry officer, so that the young forest could be given a chance to grow while they used cash from honey sales to buy wood from Alliance 1, an organization that had some eucalyptus plantations for curing their tobacco but at a fee. The people of Zemba are actually privileged to have a *miombo* forest that supports bee keeping. This was as per tree census activity conducted by this study.

6.2.5 Sustainable farming

Diversification of farming is cardinal to sustainable farming. This is important in seasons like high or no rainfall at all. Such a season affects crop farming. Bee keeping is a good form of enterprise, which can support crop farming very well especially tobacco farming in Zemba. This can also help to prevent destitution. Continuous rains do not allow for weeding or applying fertilizers.

If applied, it is washed away. It is not safe for the Zemba farmers to rely on crop farming only. Spreading risks is better as one can always have something to fall back on.

Bee keeping is actually an enterprise that might not have any effect on farm operations. It also does not require a lot of money to start bee keeping. Honey is said to be good for people who perform heavy manual work like tobacco farmers. Honey also contains 80% sugar that is easily absorbed for use. It is also said to contain medicinal properties as stated in '*Back to Eden*', a book on herbal medicines. The bees themselves are useful to a farmer for pollinating crops.

Honey can be harvested twice a year giving farmers an opportunity to raise money for inputs as well as for buying wood for curing tobacco as they wait for the forest to mature.

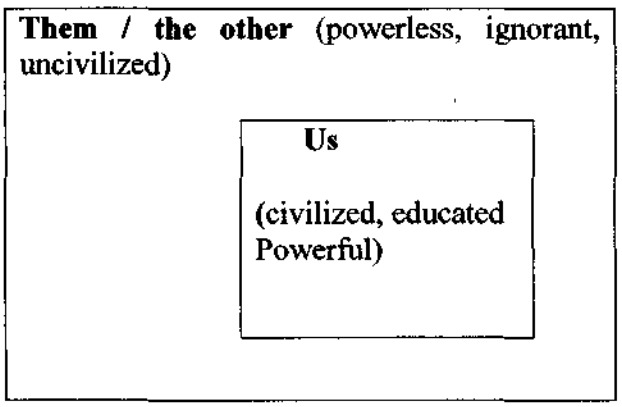
One reason farmers put forward for growing tobacco was that it gave them early cash as compared to maize; bee keeping then is quite a good option for early income.

6.2.6 Environmental Education for sustainable living

Environmental education should be aimed at sustainability. If this education is to be sustainable, it requires that the 'me', 'us' concept or one referred to as 'new age thinking' by Mellor (1992) or indeed the 'enemy concept' as termed in Namafe (2006) be done away with.

This is illustrated in fig. 18 below:

Figure 18: The source of enmity in people



Source: (modified from Namafe, 2006)

The thinking here is that environmental education should not be designed for 'them' while leaving out personal transformation. Sustainability requires communal change. An enemy concept is where some individuals look at themselves as a better people, civilized while considering others powerless and uncivilized, always thinking that that they were powerful while 'them' were powerless. The enemy concept is what Mellor 1992:46-47) referred to as new age thinking but puts it this way:-

> *The problem in new age thinking is the relationship between personal transformation and wider communal change... while I would not want to argue about the development of a spiritual dimension to our lives and a displacement of the emphasis on materialism... it risked diverting us into an inappropriate self-obsession. While this may help us individually to develop a wider spiritual awareness and 'bring together' parts of ourselves that had become divided in modern society, it would not necessarily lead to any wider social transformation. That must be done by transforming*

the materialism of our culture, not running away from it. In other ways, New Ageism could be seen as just another manifestation of the 'me' generation: a movement for the powerful, not the powerless,

According to O'Riordan (1987), environmental education should be radical if it has to be sustainable. It should aim at changing the attitudes and values of society not selected individuals. Out of this change, the worlds' resources could receive a careful treatment.

In short, this education programme should not just be for the Virginia tobacco farmers but for all Zambians, as they all depend on the environment in one way or the other. It is important that all take action if this change is to be sustainable. There are many users of forests targeted by this script; educators should not look at the Virginia tobacco farmers as the worst culprits and as the 'only' people who should take action.

Preventing deforestation is a personal undertaking; individuals need to try to conserve the wood they use. People should not buy excessive amounts of wooden items as this only encourages those who own timber mills and logging companies. The use of improved braziers at household level should be encouraged. Use improved heat sources; make the best use of the heat such as cooking many dishes at once when using a wood stove as the top surface becomes hot as well as the oven when lit.

6.3 Suggestions for Future Research

Interested researchers on the same subject matter of this research could investigate the following issues:-

- Tobacco growing and the Millennium Development Goals
- The changing economic environment for tobacco : Implications for Zemba farmers
- Environmental education impact on forest management in rural Zambia

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Appendices

Appendix 1

Questionnaire No: ☐☐

Interview Schedule for Virginia Tobacco Farmers

Dear respondent,

I am currently a postgraduate student of Environmental Education and I would like to conduct a survey of views and ideas on deforestation.

The data to be collected is purely for academic purposes only and may be useful for a better environment in future. You have been selected to provide this data because you grow Virginia tobacco, which requires the use of wood in the curing process. The views and ideas you give will be held in strict confidence. There is no wrong or correct answer. What I am looking for are your opinions on what is to be used to develop an environmental education programme for various people who use Virginia tobacco.

Personal Data

Province.....

District.....

Locality.....

Interviewer.....

Date.....

Occupation.....

Sex.....

Age.....

Environmental Education Dimensions of Growing Virginia Tobacco

1. What kind of advice do you receive from the scheme advisor in connection with how to best utilize the forest around your farm?

.....

.....

.....

2. Do you think as Virginia tobacco farmers you have adequate information on various aspects of your job?

☐ Yes

☐ No

3. If your answer is No, what do you think are the major hindrances to his information?

.....

.....

.....

4. Suggest what should be done to update tobacco farmers in this area.

.....

.....

.....

5. In your pinion, what **type of education** (i.e. topics and issues to be covered) should be provided in connection with Virginia tobacco farming in Zemba area?

.....

.....

.....

.....

6. **Who should provide** such education?

.....

.....

7. Who **should be taught** about such type of education?

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.....

.....

8. What **methods of teaching** would be best for such type of education?

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.....

.....

9. What would be the best way of **evaluating** the achievements of such type of education?

.....

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.....

10. What type of **teaching resources** does one need in order to make this type of education successful?

.....

.....

.....

11. What makes tobacco farming better than other jobs?

.....

.....

Thank you for your time

Appendix 2

Questionnaire No: ☐☐

Questionnaire for Stakeholders of Virginia Tobacco Farming

Dear respondent,

I am currently a postgraduate student of Environmental Education at the University of Zambia and would like to conduct a survey of views and ideas on deforestation. The data to be collected is purely for academic purposes only and may be useful for a better environment to improve peoples' lives in this area.

You have been selected to provide this data because of your involvement in tobacco farming or community works. The views and ideas you give will be held in strict confidence. There is no wrong or correct answer. What are being looked for are your opinions on what is to be used to develop an education programme for the various people who use Virginia tobacco.

Personal Data

Sex.....

Age.....

Occupation.....

Role in tobacco farming.....

Location.....

Environmental Education Dimensions of Growing Virginia Tobacco

1. Is there any activity in this area that you think is affecting the air we breath?

   If yes, state any.

   .....
   .....
   .....

2. What else do you think this activity affects apart from air?

   .....
   .....
   .....

3. In your opinion, do you think this activity can be stopped?

   If yes, give suggestions how.

   .....
   .....
   .....

   If your answer is no, give reasons why.

   .....
   .....
   .....

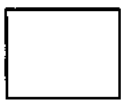
4. Given a chance, what type of tobacco would you prefer to grow?

   .....
   .....
   .....

   Give a reason for your answer in 4

   .....
   .....
   .....

5. Do you think the Zemba tobacco farming community can actively manage their own natural resources?



Yes

No

Not sure

6. What natural resources need to be effectively managed in this area?

.....
.....
.....

7. Are there any programmes in this community that aim at helping people to manage the natural resources? If your answer is yes, state them. If No, proceed to next question.

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.....

8. In your opinion, what **type of education** should be provided in connection with trees especially?

.....
.....

9. Who **should provide** such education?

.....
.....

10. Who **should be taught** about such type of education?

.....
.....

11. What do you think are the possible benefits of providing such education to this community?

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12. Given an opportunity to learn how to manage resources, what time would you suggest for these lessons?

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.....

Give a reason for your choice

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.....

13. What language do you think can be effective?

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14. If the programme is to run on radio, which station would you recommend and at what time?

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.....

15. In order to strengthen the effectiveness of the natural resource management, what do you recommend should be done?

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Thank you for time.