

Deforestation in Tanzania: A Development Crisis?

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1. Introduction

Background

Deforestation has recently become a major concern for many countries in the world. It is one of the most pressing land use problems. Deforestation is occurring around the world on a scale never known before. More than 30 per cent of the world's forest is believed to have been deforested (Litvinoff 1990). Most of the damage is believed to have taken place during the last 45 years. By the early 1990s, almost 40% of the earth's land surface had been converted into cropland and permanent pasture (World Resources Institute [WRI] et al. 1996).

Deforestation is mainly a tragedy of the developing countries where high rates have been experienced. These countries are estimated to be losing about 11 million ha of tropical forest annually, and it is projected that about 225 million ha will be cleared by the year 2000 (FAO 1982; WRI et al. 1985; WRI and IIED 1988). Over half of today's deforestation occurs in Latin America, where roughly 10% of the Amazon has gone (Litvinoff 1990). Africa is the most severely deforested continent. Forests in Africa are believed to have been cleared 29 times faster than they were being planted in the early 1980s compared to 10.5 in Tropical America and 4.5 in Tropical Asia (Holmberg, Bass and Timberlake, Bass and Timberlake 1991).

Variations in the rate of deforestation, however, exist from one country to another. In Ivory Coast and Nigeria, for example, the rate has been as high as 5-6% a year (Gradwohl and Greenberg 1988; WRI 1990). Ivory Coast alone is believed to have lost over 56% of its forest cover since 1965 (WRI et al. 1988). Burkina Faso loses about 85,000 ha a year to make way for cash crops. In Tanzania, about 10,000 ha of closed forest was being deforested annually between 1981 and 1985, representing an average annual deforestation rate of 0.4% (WRI and IIED 1986). Between 1976 and 1980, deforestation is estimated to have proceeded at an average annual rate of 0.5% (Allen and Barnes 1985). This rate seems low compared to other African countries but it is substantial in relation to the forest resources available in Tanzania.

The depletion of forests is of great concern for environment and development in many developing countries, Africa in particular. Unsustainable use of forests has resulted in severe environmental problems, especially land degradation which is manifested by soil erosion, desertification and general loss of productive potential in rural areas. Soil degradation has been the cause of stagnating or declining yields in parts of many countries especially on fragile lands from which the poorest farmers attempt to wrest a living (World Bank 1992). Deforestation has also affected water catchment areas and destroyed watersheds, affecting the quantity and quality of the water supplies they contain. In some cases, deforestation has resulted in unprecedented floods and loss of life.

Scarcity of fuelwood caused by deforestation has also been a major problem to the majority of people, who, poor as they are, cannot afford to use alternative sources of fuel. African women have been forced to walk farther for fuelwood, reducing the amount of time they would spend on other productive activities.

All these problems are eroding the potential for sustainable development. Thus most developing countries are caught up in a vicious cycle of poverty and underdevelopment. Their efforts to disentangle themselves from this cyclic phenomenon are thwarted by the international world order with imbalances of trade and the debt crisis which forces developing countries to over-exploit their natural resources to meet their obligations at the expense of their own development.

Tanzania, like many African countries has been experiencing rapid rates of deforestation. However, estimates of the magnitude and rate have varied widely. The Ministry of Tourism, Natural Resources and Environment (MTNRE 1989a), for example, estimates that Tanzania has been losing between 300,000 and 400,000 ha of forest per annum. The FAO and World Bank estimates give an average annual rate of 130,000 ha or 0.3% (WRI 1990; World Bank 1992). Ahlback (1988), on the other hand, believes that the annual rate of deforestation has already exceeded 700,000 ha. Such disparities of data have made it difficult to assess the magnitude of the problem and to come up with strategies aimed at minimising it and dealing with its impacts.

Although generalisations have been made on the rates, magnitude and causes of deforestation in Tanzania, differences exist in different areas because of local variations in the types of land use and economic activities, nature of the vegetation and demands for various forest products including fuelwood. Therefore, any attempt to deal with the problem of deforestation must address these variations in order to avoid making blanket statements about it.

Of particular importance is the need to understand the contribution of the various factors such as settlement and expansion of agriculture, tree cutting for timber, charcoal production and mining to the deforestation problem in different areas. Such factors may be considered as proximate factors. The question is: what could be the underlying forces behind the problem of deforestation? Is population growth the only underlying factor as many people have always thought and believed? If not, what other factors could explain the process of deforestation? Is there any link between the process of deforestation and the development process within and outside the country? These and many other questions need to be addressed in order to understand the problem of deforestation and to devise appropriate strategies to deal with it.

This study was undertaken in Kahama District which, until only recently (about two decade ago), was still full covered with rich natural forests. However, the current large-scale deforestation that is taking place is now a threat to the existence of these forests. Indiscriminate tree felling is fast driving the landscape into bare land. There is even encroachment on forest reserves causing extensive deforestation.

Objectives of the Study

The main objective of this study is to provide an understanding of the principal processes underlying deforestation in Kahama District. In particular, 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 change which characterise a particular style of development-centred on agricultural production. It also sought to analyse first the role played by government policies in deforestation and secondly policies and strategies to deal with deforestation processes and their impacts at local and national levels.

In order to address the above issues, the study attempted to answer the following questions:

- (i) What is the extent of deforestation?
- (ii) How and why is deforestation occurring?
- (iii) How are the people living in and around forests affected by deforestation?
- (iv) How are they reacting individually and collectively to the problem?
- (v) What role is played by government policies in the whole process of deforestation?

The underlying assumption behind this study was that the development process in Tanzania has been largely responsible for the deforestation that has and continues to take place in the country. Such factors as expansion of tobacco cultivation, charcoal production and settlement, which seem to be important factors in Kahama District, are all linked to this process. Although population growth is seen as an important factor, its role can mostly be associated with the settlement of the migrant population and subsequent clearing for agriculture and grazing land. But even this is deeply rooted in the development process that took place in the whole country since the late 19th Century.

Significance of the Study

At present, one of the challenges facing Tanzania has been the alarming rate of deforestation being experienced in many parts of the country. Yet the rates and extent of the problem are still debatable due to paucity of reliable data and the processes involved are not clearly understood. This study is considered to be an important step towards bridging this information gap. The findings of the study are expected to contribute towards an understanding of the dynamics of deforestation in Tanzania.

As far as Kahama District is concerned, not many people are even aware that deforestation has become and continues to be a serious threat to the existence of the once rich forests. No studies have been undertaken in the district to highlight this problem which seems to be of a more recent creation. It is hoped that this study will highlight the extent of the problem so that appropriate steps could be taken before Kahama also becomes a barren land like the other parts of Shinyanga Region.

Theoretical Framework

There has been much concern about the pressures that population exerts on world resources and the environment. Many people blame the serious problems of deforestation in the developing countries on the growth of population (Anderson and Fishwick 1984; Allen and Barnes 1985; Holmberg, Bass and Timberlake 1991; Green 1992). The fact that population growth increases pressures on forest resources cannot be ignored. Population pressure, particularly in the closely-settled areas, has forced the extension of agriculture into forest and even fragile and marginal

lands and increased the demand for fuelwood, setting in motion a downward spiral of forest destruction. However, deforestation is a complex problem, and rapid population growth alone may not explain the rapid rate of deforestation experienced in Tanzania and in many other developing countries.

Myers (1986) identified poverty, unequal land distribution, low agricultural productivity, rapid population growth and various inappropriate and counter-productive government/public policies as underlying causes of deforestation. This view is also supported by Repetto (1985), Repetto and Holmes (1983), WRI et al. (1985), Barbir, Burgess and Makandya (1990), Litvinoff (1999) and Holmberg, Bass and Timberlake (1991). They argue that the rural poor, being themselves victims of the development process, are often caught in a vicious cycle of poverty that forces them into destructive patterns of land use to meet the basic needs for food and fuel. Other factors such as a breakdown of traditional common property management and commercialisation of the forest resources have also led to increasingly severe pressure on forests in most developing countries (Repetto 1985). Therefore, to regard the problem of deforestation as a consequence of population growth alone and the subsequent increase in the demand for food, fuel and other forest products is to oversimplify the problem, creating a danger of mistakenly formulating inappropriate policies and strategies to solve it.

The problem of deforestation in general needs to be looked at in a broader perspective. While single causes of deforestation may be identified and analysed, local interactions are inevitably far more complex than a simplistic overview suggests. According to Palmer (1992), the process of deforestation is derived from the entire pattern of world development since the colonial era, and the economies of most developing countries demonstrate a number of parallels that contribute to a greater or less extent to the deforestation process. Tanzania, like many other developing countries, has been caught up in a serious development crisis in which she is forced to use its natural resources not for development but to meet the financial requirements of the international creditors (IIED 1987).

As argued by Utting (1991), deforestation may be seen to reflect a specific type of development model which began in the late 1800s and early 1900s when national economies were drawn into the world market for primary goods such as cotton, coffee, tobacco, etc. Many countries had to rely on these primary goods to generate the foreign exchange needed to bring about economic growth and development. This situation prevails until today and is reinforced by government policies such as the Tanzania Agricultural Policy of 1983 which emphasises production of the primary export crops in order to generate foreign exchange. A crop like tobacco is a stable and profitable crop in the short-term. In the long-term, however, its environmental costs are high because of the large-scale deforestation associated with it.

As national economies were drawn into the world market, peasant producers were increasingly drawn into national markets (Utting 1991). This meant intensifying agricultural production to produce the food required and a marketable surplus in order to obtain the income necessary to purchase production inputs and consumer goods. The intensification of agriculture led to accelerated conversion of forest areas to crop and pastureland.

Coupled with the above, the modernisation process that was initiated introduced cultural attitudes which saw the forest as a resource to be cut down and used (Utting 1991). Lumber industries were started with the introduction of new technologies in order to meet foreign demands for tropical timber. This led to the opening up of forest areas for commercial logging, which played a key role in the conversion of forests in most developing countries. Deforestation caused by commercial logging is thus believed to be, by and large, a result of economic expansion that fails to take account of the value of the environment (WRI 1990).

In the process of integrating the peasant producers and national economies into the world market, highly skewed patterns of resource distribution emerged, which left many people living in extreme poverty with limited access to land, credit and other essential goods and services. Their desperate need for survival forced them to overtax their land and extend cultivation into forest and even fragile and marginal lands, causing a lot of destruction of forests and severe land degradation. To date, the situation has not changed much. Many people are still poor, and being themselves victims of forest destruction, they have often been caught in a chain of events that has forced them to overtax their land and natural resources, especially forests. Their efforts to escape from poverty by cutting fuelwood and producing charcoal for sale in towns and cities, and growing cash crops like tobacco have damaged the forests even further. They have scoured the countryside felling live trees wantonly. "Even forest reserves have not been immune to their depredations." (Grainger 1990:100).

From the preceding discussion, it is evident that the so-called causes of deforestation such as the spread of agriculture, the expansion of certain commercial crops, commercial logging activities, wood-cutting for fuelwood, and cattle raising which involves conversion of forest to pasture, are, in effect, sub-processes of the broader model or style of development outlined above. The rapid population growth and related pressures on the land may be seen as a survival strategy given that having many children is a cushion against poverty (Utting 1991). This study was, therefore, undertaken within the framework of this development model as presented above.

Methodology

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 three main sources, namely, field survey, informal discussions with district, divisional ward and village leaders and officials of the Tobacco Board of Tanzania, and household survey.

Data Collection

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 the type of vegetation, dominant species, type of land use in the surrounding areas and any evidence for deforestation. This was done along a series of transects. These were:

- (i) Kahama town to Ulowa in the south

- (ii) Kahama town to Bulungwa in the southwest
- (iii) Bulungwa to Busulusanguku in the west
- (iv) Kahama to Ngogwa in the west and to Ntobo in the north
- (v) Ntobo to Ngaya in the north via Nyanghwale-Busangi
- (vi) Ngaya to Kahama town.

It was the intention of this study to use Landsat imagery as one of the primary data sources to determine the extent and rate of deforestation that has taken place since 1973. However, in the absence of funds to purchase the imagery, it was not possible to use this source for the purpose. However, data generated from satellite imagery by Hunting Technical Services for the Forest Resources Management Project based at the Institute of Resource Assessment were used to describe the present vegetation of the district, and to provide a qualitative indication of deforestation in different parts of the district.

Discussions were also held with district, ward and village leaders, and officials of HASHI and the Tanzania Tobacco. These discussions were expected to provide information on an overall picture of the problem of deforestation and efforts that have been made to minimise it. They centred mainly on such aspects as changes in land uses, extent of migration and its social and ecological impacts, tobacco farming and its impact on woodlands, extent and causes of deforestation, areas mostly affected and afforestation and forest management programmes.

Detailed information for the study was collected during the household survey. Interviews were conducted with subsistence farmers in tobacco growing areas using a structured questionnaire to obtain the following information:

- socio-economic characteristics of the households; e.g., age, sex, size of household, and history of settlement in the areas;
- land use characteristics such as types and changes over time;
- farm characteristics; e.g., land ownership, types of crops grown, sizes, number and location of plots, systems of cultivation, production trends, changes in farm sizes and availability of farm land;
- tobacco cultivation; e.g., when one started growing tobacco and why, farming system used;
- fuelwood supply; e.g., source of fuelwood, distance to source and whether it has increased or decreased, preferred species;

- charcoal production; e.g., amount of charcoal produced, number and size of trees used per kiln, types of species used, source of trees, and changes in distance to source over time and reasons;
- perceptions on deforestation, especially problems currently being experienced, future supplies of fuelwood and conservation efforts.

Secondary data were obtained from census reports for demographic data of the villages in the district, ward and village records to obtain information on population and village characteristics, and published and unpublished books, research reports, government and Tobacco Authority/board records. Maps were also used to supplement information obtained from the field survey, particularly on land use and extent of deforestation.

Sampling Procedure and Sample Size

Initially, the study sought to uncover the interplay of various factors responsible for deforestation. However, due to financial limitations, it was decided to focus more on tobacco cultivation which is causing a great loss of woodlands in the district. The sample area chosen was Bulungwa Ward in Mweli Division which is one of the areas most affected by deforestation due to tobacco cultivation. Other affected areas are Ushetu and Bukomela Wards also in Mweli Division.

Sample villages were selected in such a way as to reflect the intensity of the deforestation process. Three sample villages were selected. These were Shaka, Makongolo and Nyabusalu (figure 1), which are the leading tobacco producing villages in the ward and also the most affected by deforestation. However, because of difficulties of getting interviewees from Nyabusalu village, only a few people were interviewed. Apparently, the people in Nyabusalu thought that a new tobacco buying firm was trying to win them from another firm. Thus they were reluctant to come forward and be interviewed. Each of the villages comprised several sub-villages, 10 in Saka, 6 in Makongolo and 5 in Nyabusalu. The basic unit of study in these villages was the household and questions were directed to the heads of households.

A total of 98 households were interviewed, 40 from Shaka, 9 from Nyabusalu and 49 from Makongolgo villages. These represented 4.5%, 1.8% and 13% of the total households in each village, respectively. The households were randomly selected with the help of the chairmen of the sub-villages. A structured, closed and open-ended questionnaire was used for the interview.

Data Analysis

The data collected from the household survey was processed and analysed using SPSS computer package. The results have been summarised and are presented both qualitatively and quantitatively using frequency tables and cross tabulations.

Figure 1. Kahama District: Location of Study Villages

2. Deforestation: An Overview

Defining Deforestation

The problem of deforestation has been widely documented in many parts of the world. Most of the studies and literature have attempted to analyse the extent and cause of the problem. However, there has been controversy world-wide over the data presented. This is a result of disparities in the definition of the term (see for example, FAO 1987, 1980; Myers 1980; FAO/UNEP 1982; WRI and IIED 1986).

Deforestation means different things to different people. For some it means the total clearing of trees; for others it is any activity which disrupts the natural ecology of the virgin forest (Timberlake 1985). In this regard, change can range from patchy slash and burn cultivation followed by partial regeneration, to complete clear-felling over large areas. Basically, this confusion is a matter of terminology, but it has created a lot of problems in trying to compare different estimates on the extent and rates of deforestation. In addition, lumping together all the activities which disrupt the forest ecosystem and regarding them as deforestation obscures the real issues.

FAO (1978) defined deforestation as simply the loss of forestland. Such a definition encompasses the full range of forest types and uses. It covers not only closed forests (those with dense canopies, such as rain forests), but also open woodland, wooded savanna and degraded forests. Deforestation has also been defined by FAO as the clearing of forest and its conversion to non-forest uses such as cropland and shifting cultivation (WRI and IIED 1986; WRI et al. 1996). This does not take into account the effects of fuelwood collection and other influences. Forests that have been logged and left to regenerate are also not included. Other definitions which have been put forward are: "the loss of original forest", i.e., not including clearing of dry scrub savannah or re-clearing of secondary forest (Fearnside 1993); "temporary or permanent clearance of forest for agriculture or other purposes" (Grainger 1993).

From the above definitions, it is clear that deforestation results when forest is replaced by another land use, including different types of shifting and permanent agriculture as well as non-agricultural uses such as mining and settlements. Deforestation in this context does not include disturbances such as selective logging or selective cutting of trees for charcoal that leave the forest canopy intact. Selective logging usually involves removal of a few trees in such a way that it only results in the deterioration in the density or structure of vegetation cover or its species composition. That deterioration can be temporary or permanent. Such disturbances have been termed by Grainger (1993) as "degradation". From this perspective, deforestation then would represent one extreme of degradation, which is easy to monitor by satellite sensors in comparison with selective logging.

Forest degradation in the tropics, however, is a significant concern because of the substantial losses of biomass and habitat fragmentation not reflected in estimates of deforestation (WRI et al. 1996). Not only are individual species' survival endangered, but also fragmentation can leave patches of forest that are too small to support population of plants and animals dependent on forest ecosystems. Thus, for example, while 7% of the 1980 forest area in tropical forest

underwent change during 1980-90, only less than half were converted to other uses (WRI et al.1996). More than half represented changes in forest conditions ranging from loss of forest density to severe forms of degradation, e.g., reduction to shrub-like formations. The latter represent the most common degradation pattern and are considered by FAO as deforestation to other wooded land.

For the purpose of this study, the more comprehensive FAO definition has been adopted and it includes the severe forms of degradation discussed above. Some modifications have been made to this definition to include the nature of that loss, whether it is temporary or permanent. In this regard, deforestation is defined by the author as the temporary or permanent loss of forest land. Forest land here encompasses a full range of forest types and uses as contained in the FAO definition.

Extent of Deforestation in the Tropics

Although the magnitude of deforestation in the tropics, particularly in developing countries varies substantially, available data suggest that deforestation is a real trend. FAO (1982) estimated that tropical forests were vanishing at a rate of some 7.3 million ha per annum, while 4 million ha were cleared in the semi-arid areas. According to Burgess (1993) the extent of tropical deforestation reached 16.9 million ha per annum, at an annual deforestation rate of 0.9% throughout the 1980s. Projections by FAO (1982) indicated that 150 million ha or 12% of the remaining closed tropical forests and roughly 76 million ha of open tropical woodlands would be deforested by the year 2000. Most of this deforestation is likely to occur in developing countries where forests are projected to decline at 3-6% annually in some countries and even faster in others (Allen and Barnes 1985). Recent estimates indicate that the annual deforestation rates of tropical forests amount to some 17 million ha world-wide (Sitarz 1994). According to a recent FAO study, the world lost 450 million ha of its tropical forest cover between 1960 and 1990 (WRI et al. 1996).

Although developing countries such as Europe and North America also suffered severe deforestation in the past (WRI et al.1985) their concern now is centred more on other environmental problems such pollution than anything else. Deforestation is mainly a tragedy of the developing countries. Those were estimated to be losing about 11.4 million ha each year in the early 1980s (World Bank 1992). Subsequent country studies and the increasing use of satellite imagery have pushed the estimates for the late 1980s to 17-20 million ha a year. WRI et al.(1996) estimates that in just three decades, 1960-1990, one-fifth of natural tropical forest cover was lost in developing countries.

High rates of deforestation have been reported in various countries (see for example, Bajracharya, 1983; Repetto and Holmes 1983; Repetto 1985; Myers 1989; WRI et al.1990; Timberlake 1991; Fearnside 1993). Available estimates indicate that deforestation is concentrated in Latin America and Africa, where 8.3 million ha and 5 million ha, respectively, are deforested annually (Burgess 1993). Asia has experienced the lowest extent of tropical deforestation (3.6 million ha per annum) but the highest rate of deforestation at 1.2%. A recent FAO study shows that between 1960 and 1990, Asia lost one-third of its forest cover while Africa and Latin America each lost about 18% (WRI et al.1996).

Burgess (1993) further reveals that Brazil and Indonesia incur the highest extent of annual forest loss. However, because of the vast extent of their forest stocks, the annual rate of deforestation has remained relatively low: 0.9% in Brazil and 1.21% in Indonesia. The highest rates of deforestation have, according to Burgess, been experienced in those countries that have high annual losses of tropical forests, combined with relatively small forest resources. These include Ivory Coast (6.5%), Nigeria (5%), Costa Rica (4%) and Paraguay (4.7%).

Estimates of the extent of deforestation in Brazil, however, have been a subject of frequent controversy. The percentages given by different sources vary tremendously, obscuring the true picture of the problem. Official estimates by the government indicate that only 5% of the Legal Amazon was deforested through 1988 (Fearnside 1993) while the World Bank claims that 11% of the region was cleared during the same period (Mahar 1989). Fearnside (1993), on the other hand, believes that the best estimate for deforestation loss through 1988 is 9.3%. Despite this controversy, the fact that deforestation is a serious problem in Brazil cannot be denied. Brazil alone is believed to account for almost 40% of tropical deforestation (Pearce et al. 1991).

Central America is believed to have experienced one of the highest rates of deforestation in the world throughout the 1960s and 1970s. The extent of forest cover is estimated to have been reduced from approximately 60% to a third of the total land area since the mid-1960s (Utting 1991). The countries which seem to have been mostly affected are Guatemala, Honduras and Nicaragua.

In Asia, Litvinoff (1990) estimates that 42% of the original tropical forest has gone. Much of the deforestation is concentrated in the south and southeast, where annual losses, through forest clearing, amounting to over 15 million ha were recorded in the 1970s (Manshard 1974). In Nepal, it is believed that forest cover decreased from 60% to 19% during 1960-80 (Metz 1991).

Compared to Latin America, Africa is the most severely deforested continent. With the world's fastest population growth rate, Africa has also experienced high rates of deforestation. It is estimated that between 1930 and 1970 alone, about 25 to 30% of the African rainforest was destroyed (Manshard 1974). By 1970s the African rainforests had shrunk to 60% of its original size. Recent estimates show that 5 million ha were being deforested annually (Burgess 1993), while a decrease in forest and woodland cover of 3.1% has been recorded over a ten-year period from 1981-83 to 1991-93 (WRI et al. 1996). Over half of Central Africa's rainforest has already been cleared (Litvinoff 1990). North Africa, which used to be described as a land of continuous shade, has also lost considerable areas of forest. According to Zaimeche (1994a), Moroccan forests have decreased by about 5 million ha since the Roman period. Algeria is losing about 40,000 ha of forest annually, while Morocco is losing about an average of 13,000 ha annually, and Tunisia 5,000 ha.

The highest rates of deforestation have been experienced in West Africa. Ivory Coast, the biggest timber exporter in Africa, lost about two-thirds (over 56% of its closed forest in 20 years from 12 million ha in 1956 to 4 million in 1977 (Timberlake 1991). The annual rate of deforestation is 6.5% while in Nigeria it is 5% (Burgess 1993; Gradwohl and Greenberg 1988). A recent FAO study recorded a percentage decrease of 24.4% in forest and woodland cover in Ivory Coast from

1981-83 to 1991-93, the highest in Africa (WRI et al. 1996). In Nigeria, a 20.3% decrease has been recorded.

Within the Eastern African region, extensive areas of land have also been deforested. In Kenya, for example, only 3% of the nation was still under natural forest by 1985 (Timberlake 1991). In Ethiopia, the forested area has shrunk from 16% of the land area in the 1950s to only 4% in the 1970s (WRI and IIED 1986). In 1980, only 4.5 million ha of closed forest remained, accounting for some 3.6% of the land surface (Stiles 1991). Uganda is also experiencing rapid depletion of forest resources. Deforestation in Uganda is believed to have become a problem since the early 1970s. Over a ten-year period, the forest was diminishing at a rate of about 20% per annum (Hamilton 1987 cited in Mupada 1993).

In the SADC region, it is estimated that about 600,000 ha of the indigenous forests were cleared every year for other land uses (Shaba 1993). Extensive deforestation has occurred in Zambia where the rising demand for fuelwood in Lusaka had resulted in the clearance of 64% of the reserve lands within 50 km of the city (Kalapula 1989). Accordingly, clearance was taking place at a rate of 1150 ha per year. Other estimates of deforestation in Zambia are provided by Chidumayo (1983, 1987, 1989). In Mozambique, WRI (1990) estimated a deforestation rate of 120,000 ha per year for the 1980s.

From the preceding discussion, it is evident that deforestation is a very widespread problem, and is threatening the future of the forest resources particularly in developing countries. Although there is still some controversy over the reliability of the various estimates of deforestation in the various countries, they nevertheless give an indication of the extent of the problem and how fast the forests are disappearing. The availability of satellite data should be able to resolve the controversy. However, there is still need to have a standard definition of deforestation that would facilitate the determination and comparison of the magnitude and rate of deforestation.

Causes of Deforestation

What causes deforestation? Studies have shown that no single factor can account for the high rates of deforestation that have been experienced world-wide especially in developing countries. Rather, the problem is a result of a multiplicity of factors. These include inappropriate land tenure systems, pressure to expand agricultural areas and increasing demand for forest products (Sitarz 1994). The more direct causes are agriculture, logging for timber and industry and large-scale development projects (Cooper and Palmer 1992). These have been interlinked with a range of more indirect causes, including human population growth, ever-increasing demands for forest products, unequal distribution of land, national policies and the world economic situation where the developing countries have great debts to pay.

Various approaches or models have been developed to analyse the complex causes of deforestation. Population growth has, often, been singled out as the underlying cause in developing countries. The former Prime Minister of the UK, Margaret Thatcher, told the UN General Assembly in November 1989 that

The main threat to our environment is more and more people, and their activities; the land they cultivate even more intensively; the forests they cut down and burn; the mountain sides they lay bare. (*The Guardian*, 9.9.1989, quoted by Litvinoff 1990: 152).

A linear relationship between population growth and deforestation is often postulated. Thus countries with high rates of population growth are also believed to have higher than average rates of deforestation (Allen and Barnes 1985). Such an orthodox way of thinking has led to the conclusion that high population numbers exponentially increase consumption of fuelwood, thereby causing severe deforestation (Anderson and Fishwick 1984; Anderson 1986; 1987). It is also believed that because of rapid population growth and the rising subsistence demands, there has been expansion of cultivation causing outright clearance of forests. Moreover, there has been wholesale cutting of trees to meet the increasing demand for fuelwood. About 90% of the people in developing countries depend upon wood or charcoal as their main source of household fuel (Grainger 1990).

Critics of the above approach, however, feel that there are other factors at work and deeper underlying causes than just population growth. Questions have been asked, for example, whether the poor farmers were to blame for causing deforestation when actually they were victims of the development process. Utting (1991:3), for example, asks:

Are peasants at fault because they are cutting down the forest or are they the victims of a particular socio-economic system which has made access to land and other resources in areas of greater agricultural potential increasingly difficult? Do government policies which encourage colonisation, cattle raising and logging in rainforest areas, help or hinder the development process?

Other factors which have been mentioned include skewed land distribution, plantation agriculture, official policies encouraging unsustainable forest exploitation and rich countries' greed for cheap tropical timber (Repetto 1985; Litvinoff 1990; Holmberg, Bass and Timberlake, Bass and Timberlake 1991; Kohlhepp 1991; Utting 1991; Fearnside 1993). Domestic policies may determine how individuals will use or abuse natural resources. In Sudan, Larson and Bromley (1991) attributed the deforestation of *Acacia senegal* to domestic policies under colonial and independent governments. Studies by Kohlhepp (1991), Fearnside (1993) and Eden (1994) have also shown that the present situation in the Amazon rainforests of Brazil came about as a result of the Brazilian government's decision of the mid- 1960s to include the northern part of the country in the overall development programme. This led to construction of numerous long distance highways which encouraged migration, establishment of large cattle farms, agrarian colonisation by small-scale farmers, and establishment of industrial mega-projects, all of which led to the destruction of the Amazon forest. Accordingly, little deforestation is due to subsistence agriculture while ranches continue to account for most deforestation (Fearnside 1993). These views are supported by Michael (1992); Binswanger (1991); Anderson (1990); and Fearnside (1986).

In Central America, Utting (1991) links the problem of deforestation to the development process which began in the 800s. He believes that modernisation processes and survival strategies have all contributed to extensive deforestation. He also identifies agrarian structures, land tenure

systems and government policies and legislation concerned with agrarian development and land use to be determinants of deforestation. This view is also supported by Cooper and Palmer (1992) and Barraclough and Ghimire (1994?).

The destruction of forests in Africa is mainly attributed to clearance for agriculture (Deweese 1989; O'Keefe 1983). Manshard (1974) identifies the practice of slash and burn cultivation as the main cause of deforestation. Almost 70% of the forest changes in Africa in the 1980s occurred through the degradation of closed forest to open and fragmented forest areas marked by shifting cultivation with short fallow periods (WRI et al. 1996). However, both traditional techniques of slash and burn agriculture and permanent cultivation are taking their toll. In Mozambique, for example, the government estimates the rate of deforestation of approximately 45,000 to 100,000 ha per year caused by shifting cultivation and 15,000 ha per year by intensive agriculture (Bila 1993). In Rwanda, there has been tremendous pressure to clear Virunga Mountains National Park for agricultural land. Timberlake (1985) reports that in 1969, about 40% of the country's national parks were cleared for farming. He reports further that an estimated five million ha of forest were converted to agriculture in the Ivory Coast between 1966 and 1980.

The increasing demand for fuelwood especially in urban areas has also taken its toll on the forests. In Africa south of the Sahara, dependence on fuelwood is almost total; wood provides over 90% of the total national energy consumption in countries like Tanzania, Mali, Upper Volta and Ethiopia (Eckholm et al. 1984). With the increasing demand for fuelwood by the growing populations, the rate of deforestation has also increased especially where market forces have come to play.

In the rural areas, women usually gather fuelwood, preferably dead wood, from trees and shrubs. Even where cutting of trees is done, it is selective, and sometimes only the lower branches of isolated individual trees are cut. "The subsistence farmer does not cut down a tree to obtain firewood" (Bhagavan 1984:26). Therefore, rural fuelwood gathering is not a cause of deforestation. Rather it is urban demand for energy that produces deforestation because it involves cutting of whole trees for charcoal production (Anderson 1986; Bhagavan 1984; O'Keefe 1983).

Charcoal making, a commercial activity, is in most countries largely unregulated and outside government controls. The results of tree cutting for charcoal are most easily seen near cities. However, as nearby sources are depleted, charcoal dealers travel further for hundreds of kilometres to get charcoal, thereby spreading deforestation. Much of the 10,000 tonnes of charcoal used annually in Dakar, Senegal, for example, now comes from a distance of over 300 km (Timberlake 1991). It is, therefore, common to observe a decline, in tree stocks for a radius of between 40 and 200 km or more from cities.

Studies in Zambia (Chidumayo 1987, 1983; Kalapula 1989) have shown that the rate of fuelwood-related deforestation is closely related to urban population growth. Further, the rising demand for fuelwood in Lusaka resulted in the clearance of 64% of the reserve lands within 50 km of the city by the end of 1982. The average annual rate of deforestation between 1971 and 1982 was 1,158 ha (Chidumayo 1983). In the copper-belt region, a total of 391,400 ha of

woodland (51% of the total woodland cover of the region) had been deforested for industrial and household fuelwood between 1937 and 1983 (Chidumayo 1987).

Rural industries, which are also large consumers of fuelwood, are a significant cause of deforestation. Such industries include tobacco curing, tea processing, brick-making, brewing, and fish-smoking. Tobacco, which is an important export crop in the Miobo woodland zone in Southern Africa is having far reaching consequences on the woodlands. Woodland losses have been reported in Malawi and Zimbabwe because of expansion of the crop and the increasing demand for wood for curing purposes (Eschweiler 1993; Forest Sector Review n.d.; Katerere, Moyo and Mujakachi 1993).

Although both agricultural expansion and increased fuelwood demand are a result of population pressure, they are also a manifestation of the vicious circle of poverty and low productivity of the land (Bajracharya 1983; WRI et al.1985; Cline-Cole et al. 1990; Holmberg, Bass and Timberlake 1991). For example, because of widespread poverty, many people cannot afford to use alternative fuels. Thus wood remains the main fuel even in areas where forests are rapidly disappearing. However, even domestic policies, particularly those related to export of primary products to meet foreign exchange requirements in many developing countries have led to expansion of agriculture causing significant deforestation.

Repetto and Holmes (1983) and Reppeto (1985) identified commercial exploitation of forests as an important factor in the destruction of forests. In Ivory Coast, Nigeria and Indonesia, for example, the main force behind deforestation has been logging of hardwoods for the export market (Repetto and Holmes 1983; Whitlow 1987; Timberlake 1991). Although logging is often not included in the definition of deforestation because of its selective nature (see, for example, Grainger 1993), studies have shown that where it has been commercialised, it has become a significant cause of deforestation (Zaimeche 1994b; Timberlake 1985). Commercial logging operations, whether selective or mechanised, have been particularly destructive to forests because they have often not been controlled.

Timberlake (1985) observed that in Liberia, about 80,000 ha of forest was being logged annually out of its remaining 900,000 hectares of primary forest. In Nigeria, most of the exploitable forests have already been logged, and they have now banned exports of timber. Ivory Coast, the biggest timber exporter in Africa, lost two-thirds of the closed forest in 20 years by 1980. Algeria has also suffered from the ravages of commercial timber exploitation, where French companies over-exploited the forests to near total exhaustion (Zaimeche 1994b).

The World Resources Institute et al.(1985) blames the developed countries whose demand for tropical timber has been rising steadily. In view of the much needed foreign exchange, some developing countries like Nigeria and Ivory Coast have gone their way to deplete their forest resources through exports of mahogany and other hardwoods (Whitlow 1987; Timberlake 1991). The logging pressure created on the forests, however, has not been a result of rapid population growth or increased demand in the respective countries. Rather it is a response to foreign market demands. Even the sparsely populated Amazon Basin has recently experienced rapid deforestation caused by commercial logging (Repetto 1985).

The preceding discussion clearly shows that no single factor can explain the process of deforestation. So many factors are involved and are interlinked that the whole problem becomes a complex one requiring a deeper and thorough analysis. Factors often singled out as causes of deforestation, including agricultural expansion, demand for fuelwood, and logging, are only a manifestation of a much deeper crisis. These can only be considered as the proximate factors. The most fundamental underlying factors are population growth and official government policies which are linked to the development process and poverty.

Deforestation in Tanzania

There are no reliable estimates of the extent and rate of deforestation in Tanzania because of paucity of data. Not many studies on deforestation have been undertaken. Consequently estimates of deforestation have varied considerably. Government estimates quote a rate of deforestation of 300,000 to 400,000 ha per annum (Ministry of Lands, Natural Resources and Tourism [MLNRT] 1989a). These same figures are reported by Mnzava (1988) as loss due solely to clearing for agricultural purposes. Mnzava (1988) further estimates that the country's forest area had declined from 44,300,000 ha or 50% of total land area in 1938 to 38,096,000 ha or 43% of total land area in 1987. This implies a loss of 1.5 million ha per annum. Temu and Mbwana (1984) further estimate that over 60% of the area covered by forests in 1920 has already been deforested. Recent estimates show that in 1989 deforestation was proceeding at a rate of 3,000 sq. km., i.e., 0.3% or 300,000 ha (World Bank 1992). This, however, does not include the loss of forests resulting from fuelwood supply, logging and building materials. Reed (1996) believes that about 2 per cent of the forest area is being lost each year.

Deforestation in Tanzania is a widespread problem. In eastern Usambara, for example, the Amani forest has been reduced by about 50% while in western Usambara, an estimated average of about 7,000 ha of forest has been cleared annually between 1960 and 1980 (Temu and Mbawana 1984). Recent estimates suggest that well over 70% of the Usambara forests have been cleared since 1905 (NEMC 1995). In Shinyanga region, about 1.9 million ha of forest is estimated to have been lost between 1900 and 1984 (Mnzava 1988). There is encroachment on forest reserves for agriculture and other uses. In 1980, about 200 ha of Kilimanjaro Forest Reserve, a water catchment forest, were encroached by farmers (Kaale 1981).

The factors that cause deforestation are many and include expansion and clearance for small-scale and commercial agriculture; felling for domestic and agricultural fuelwood, charcoal, building poles, and exports, indiscriminate bush clearing and bush fires for various reasons and overgrazing (Reed 1996; Ministry of Tourism, Natural Resources and Environment (MTNRE) 1994a; MLNRT 1989a; Misana and Nyaki 1993).

Expansion of agriculture, especially the massive clearance of land for cultivation of cash crops such as cotton and tobacco to boost export earnings has been mentioned as one of the leading causes of deforestation in Tanzania. Agriculture alone seems to account for an annual deforestation rate of about 300,000 to 400,000 ha of forest and bushland (Mnzava 1988). The regions most affected are Coast, Mbeya, Dodoma, Singida, Shinyanga, Tabora, Kigoma and Tanga. The expansion of agriculture has often taken the form of shifting cultivation. This has had

a marked impact in the tobacco growing areas of Tabora, Urambo, Iringa, Chunya and Songea Districts (Misana and Nyaki 1993).

In Tanzania, some 6,000 villages containing 260,000 people relied on tobacco as a cash crop while the nation relied on it as a key export (Timberlake 1985). Because of build-up of pests in the soil and fuelwood demand, the cultivated areas must be abandoned after only one to two years. This practice is believed to be causing an annual deforestation rate of 2% in the affected areas. In Tabora Region, tobacco caused the decimation of at least 240,000 hectares of woodland over a 20-year period since the early 1960s (Madeley 1983). It is estimated that about 400,000 m³ of fuelwood is consumed annually for curing the tobacco (MTNRE 1994b). This figure does not include the amount destroyed during clearing of the land for the crop.

The increasing demand for fuel and the scarcity of alternative sources is also a major factor. Urban growth has created a great demand for charcoal resulting in a loss of some 575,000 ha annually through fuelwood extraction (Bagachwa et al. 1995; Kulindwa and Shechambo 1995). Fuelwood supply to Dar es Salaam city alone had been depleting forests in the surrounding areas at a rate of 75,000 ha per annum (Hagman 1984). Consequently, today charcoal is brought from distances of up to 200 km inland (MTNRE 1994a; Misana and Nyaki 1993; Monela, O'Kting'ati and Kiwele 1993). Piles of charcoal bags awaiting collection are a common sight along major roads leading to the city (Plate 1). The gradual disappearance of woodland in circular areas around towns has also been observed in Dodoma (Allen 1985).

Other factors which have contributed to deforestation are indiscriminate burning of woodland for easy farmland clearance, inadequate management of existing forest resources, including inadequate enforcement of laws and regulations, and mining. Mining is causing deforestation by tree felling and land stripping in preparation for mining. This is evident in the small-scale gold mining areas in Kahama and Geita Districts and in Morogoro Region where there is intensive mining of ruby (NEMC 1995).

The effects of the various factors mentioned above have been augmented by government policies since the colonial period including the villagisation programme and recently by the structural adjustment programme (McCall 1985; Bagachwa et al. 1995; Barraclough and Ghimire 1994?). The tsetse eradication campaign initiated in 1920 resulted in extensive areas of vegetation being cleared for tsetse control in order to make land available for settlement and to relieve congestion. Thus much of the deforestation that occurred in Shinyanga and Dodoma Regions during the early twentieth century is attributed to this. More recently, the influx of refugees from neighbouring Rwanda and Burundi has had devastating a effect on some of the forested areas in Kagera, Kigoma, Rukwa and Tabora Regions (MTNRE 1994b). About 4000 ha of forests have been cleared in Kagera, Kigoma and Rukwa Regions.

Plate 1. Piles of charcoal bags along the Dar es Salaam-Morogoro highway awaiting to be transported to Dar es Salaam (Photo by S. Misana, November 1989).

Social, Economic and Environmental Impacts of Deforestation in Tanzania

The major effects of deforestation in Tanzania have been deterioration of ecological systems with resulting negative impacts on soil fertility, water flows and biological diversity (NEMC 1995; Misana and Nyaki 1993). Soil erosion has become a serious problem in many parts of the country, particularly in the central region. Sheet and gully erosion were widespread, rendering most of the land unproductive.

Deforestation has also affected water catchment areas and the quantity and quality of water supplies they contain. There is extensive evidence of reduced dry season river flows and drying up of springs and seepages. There is also increased sedimentation of rivers and dams and frequency of flash floods. Major floods and landslides occurred in Lushoto in 1993 and they have been attributed to deforestation in the Western Usambara following the degazettement of forest reserves around Mlalo in the 1960s (NEMC 1995). Ground water supplies have also been depleted because of reduced infiltration of rainfall into the soil caused by deforestation. The lack of and poor quality water have, in most cases, been associated with incidences of many water-borne diseases such as typhoid, diarrhoea and cholera.

Deforestation has also led to acute shortages of fuelwood in many parts of the country. Women in rural areas are forced to walk long distances up to 7 km or more with heavy burden of wood. Until the late 1970s women were able to collect firewood within a radius of one to two kilometres from their villages (Kilahama 1988). By the 1980s, however, women particularly in semi-arid areas were walking ten kilometres or more looking for firewood. Regions which are experiencing fuelwood deficits include Mwanza, Shinyanga, Mbeya, Mara and Arusha. Furthermore, there has been loss of wildlife habitat and biodiversity as a result of fragmentation and loss of critical ecosystem linkages and over-exploitation of the natural habitats.

The depletion of forest resources in Tanzania is of great concern for environment and development. It is affecting not only the economy of the country, through negative effects on agriculture but also the health of the people. It is undermining the potential for sustainable development. Therefore, efforts need to be made to reverse the trend.

3. Kahama District - Geographical Setting

Location and Administrative Setting

Kahama District is one of the six districts and, before its split, was the largest district in Shinyanga Region. It is located in the northwest central region of Tanzania and lies along the central plateau between latitude 3°S and 4° 30'S and longitude 32°E and 33°E (see figure 1). It is bordered in the north by Geita and Shinyanga Rural Districts, in the east by Nzega District, in the south by Tabora and Urambo Districts and in the west by the newly formed Bukombe District. Until July 1995, the new Kahama and Bukombe Districts formed one big district, Kahama District.

The district has an area of 9461 km². This represents 19% of the total regional landscape, which is 50,052 km². Before the split, it had a total area of 19,943 km² representing 40% of the total area of Shinyanga Region. The district is made up of five divisions, namely, Isagehe, Msalala, Dakawa, Mweli and Kahama Mjini. Before the split, it had six divisions including Siloka, which is now in Bukombe District. There is a total of 34 wards, with Dakawa and Msalala Divisions having the highest numbers, 10 and nine, respectively. Others have (with numbers in brackets): Kahama urban (6), Isagehe (5), and Mweli (4). There is a total of 205 villages out of which 191 are registered and 24 are not registered villages.

Relief and Drainage

The landscape is characterised by many plateaus and hills that are separated by extensive valleys and plains. Much of the area, however, particularly in the east, is mostly plain (Mbuga). The average altitude ranges from 300m to 900m above sea level. The district is drained by Manonga river in the east. Many other small rivers, most of which are intermittent, also characterise the drainage network.

Climate

Kahama District has a good tropical climate. The average daily temperature is 22⁰ C. Rainfall is unimodal, falling from October to May (table 1). The months of January and February sometimes experience a dry spell while very heavy rains fall from March to May. The dry season extends from June to September.

The annual rainfall is on the average 1000mm and is fairly and adequately distributed in the whole district except in the eastern part in Isagehe Division, where rainfall amounts average 600mm. Yet, rainfall increases towards the west. However, over the recent years, especially since 1991, below average annual rainfall amounts have been experienced as evident in Table 1. This could be attributed to the progressive reduction of forest cover which has been experienced in the district during the last decade.

Table 1. Average Monthly Rainfall (mm) at Kahama Town Meteorological Station

Month	1990	1991	1992	1993	1994	1995	1996
January	37.3	145.2	115.2	227.0	41.7	130.7	121.6
February	122.9	77.0	145.6	59.1	86.0	172.7	135.6
March	352.5	126.6	N.A	184.1	149.7	117.1	107.1
April	147.0	149.7	N.A	43.4	133.0	156.0	65.2
May	44.7	59.0	N.A	114.8	59.2	53.0	14.3
June	-	-	N.A	-	-	1.2	-
July	-	-	-	-	-	-	N.A
August	-	-	-	-	9.5	-	N.A
September	-	15.7	-	-	-	2.7	N.A
October	75.0	196.5	20.9	13.0	24.2	6.5	N.A

November	58.8	92.7	86.7	36.9	79.0	54.5	N.A
December	181.4	50.9	150.7	59.0	201.9	136.4	N.A
Total	1,019.6	913.3		737.3	784.2	830.8	N.A

Soils and Vegetation

The soils in the lowlands, such as in Mpera and Isaka plains, are alluvial and very fertile. They contain a lot of silt. Elsewhere, the soils range from sandy to sandy-loams and clay-loams. The latter two types are found mainly in tobacco growing areas.

There is a range of vegetation types covering Kahama District. In the north and east of the district, the area is characterised by thorny shrubs of *Acacia - Commiphora* type and scanty grass due to the dry nature of the area. Acacia bushland is found in areas which are not cultivated (Plate 2). In the south and west of the district, patches of Miombo woodlands dominate on the hills and relatively undisturbed areas. These are dominated by various species of *Brachystegia*, *Pterocarpus angolensis*, Mpogolo, Migondo, Mibanga and others. Much of these Miombo woodlands have, however, been cleared for cultivation. Only remnant trees remain in some farmlands (Plate 3). Elsewhere the woodlands have been opened and transformed into wooded grassland as a result of tree cutting.

Plate 2. Acacia bushland/bushed grassland which dominates in the northern and eastern part of the district (Photo by S. Misana, August 1996).

Plate 3. Scattered remnant trees standing in a maize farm. The rest of the trees have been cleared for cultivation (Photo by S. Misana, August 1996).

The Mbuga (Plains) area in the south and west are characterised by wooded grassland dominated by *Borassus aethiopum*, *Terminalia* sp and *Combretum* sp. in some parts. Bushland and bushed grassland dominated by *Combretum* and *Terminalia* are also found. Other species include *Brachystegia spiciformis*, Mikurungu, Mlandalanda, Midati, Mipande and Mhoja. Regenerating bushland and bushed grassland is common in areas which were previously cultivated or where trees have been cut for various reasons.

Population

The population of Kahama District is estimated at 425,619 (1993 projections). This is almost 68% of the total population of the old Kahama District before it was split into the new Kahama and Bukombe Districts. Before the split, the district had an estimated population of 629,436 (according to 1993 projections). Compared to other districts in the region, the old Kahama District had the highest population during the 1988 population census (503,204 or 28% of the regional population) and it was projected to increase to 709,134 by the year 2000 (table 2). The annual average growth rate was estimated at 5.9%. This rate is almost three times the rate of the whole region of 2.3%. The high rate of population growth is attributed to the favourable climatic conditions for both crops and livestock, and the presence of minerals, mainly gold, which attract a lot of immigrants from within and outside the region. Over 90% of the population consist of

Sumbwa, Nyamwezi and Sukuma tribes. The rest are a composition of various immigrating ethnic groups from different parts of the country.

Table 2. Population Projections in Shinyanga Region

Year	Bariadi	Maswa	Shinyanga(R)	Kahama*	Shinyanga(U)	Meatu
1988	382,383	221,194	405,605	503,204	100,724	159,439
1991	416,624	241,001	441,926	548,264	109,744	173,716
1993	-	-	-	629,436	-	-
2000	538,869	311,715	571,594	709,134	141,944	224,687
2020	954,532	568,173	1,012,500	1,256,134	254,434	398,002

*Includes New Kahama and Bukombe Districts

Population in the Study Villages

There is variation of population from one village to another. Of the three study villages, Shaka has the highest population of 4,817 with 889 households. These are distributed within sub-villages or sub-localities as follows, with the number of households in brackets: Shaka 2,232 (372), Bukale 1275 (255) and Mulungu 1310 (262). Makongolo village, on the other hand, has 360 households with a total population of 1200 while Nyabusalu has 490 households in total. There is a lot of migration of Sukuma people into Bulungwa Ward mainly for cotton cultivation.

Land Use

Given the amount of rainfall, nature of the soils and presence of forests, Kahama District has a good potential for agriculture, livestock and forestry activities. The types of land-use vary from one area to another. However, agriculture is the most important economic activity. Other economic activities include livestock keeping, timber and charcoal production, bee-keeping and mining, particularly gold mining. Figure 2 shows the economic potential of Kahama District.

The most important types of land use emanating from the above economic activities are agriculture, agro-pastoralism, forestry and mining.

Agriculture

Agriculture is the main type of land-use in the district. Over 80% of the total population depend on agriculture. Livestock and bee-keeping only supplement farming. Out of a total area of 9,461 km², 8,610 km² or 91% of the total land area is suitable for agriculture and livestock grazing. The rest is forest, shrubs, hills and rocks. The main subsistence crops include maize, rice, millet, sorghum, cassava, groundnuts, beans and sweet potatoes. Recently, paddy has been used as a cash crop. Other important cash crops are mainly tobacco and cotton. Small amounts of simsim and sunflower are also grown in some areas as cash crops.

Agricultural production is high because of favourable climatic conditions. In actual fact, Kahama and Bukombe Districts are a source of food for most parts of Shinyanga Region. Table 3 shows the agricultural production performance of the various crops during the year 1992/93 to 1995/96.

Production performance of the various crops as shown in table 3 has, however, been fluctuating from one season to another. The 1994/95 season seems to have been a bad year compared to the previous season 1993/94, with yields of most crops, except rice and groundnuts, having gone down. For example, while the acreage of maize increased by 25% from 110,046 ha in 1993/94 to 137,383.7 ha in 1994/95, the yield declined by 8.2% from 157,074 tons to 145,202.05 tons, respectively. This could be attributed to rainfall fluctuations or decline which has been characteristic of the district over the last few years. Available rainfall data suggest that rainfall was well below the normal average of 1000mm in 1994/95 season (October-May), amounting to only 578.5mm. The acreage, however, also seems to have been fluctuating from one season to another as evidenced in table 3, although it is generally on the increase for most crops.

Figure 2. Economic Potential of Kahama District

Table 3. Production Performance of the Main Crops in Kahama District, 1992/93 - 1995/96

Crop	1992/93		1993/94		1994/95		1995/96*	
	Ha	Tons	Ha	Tons	Ha	Tons	Ha	Tons
Maize	122,408	123,020	110,046	157,074	137,383.7	145,202.05	67,659.2	101,489
Rice	34,632	135,800	25,440	89,827	53,382.4	209,365.7	38,257.5	150,046
Groundnuts	35,059	28,040	40,993	37,371.5	54,562.7	81,844.05	24,679.5	37,019.25
Cassava	41,718	83,430	58,417	123,168	38,290.9	76,521.8	22,794.5	45,589
Beans	41,625	29,140	30,858	33,677	34,489.4	24,142.58	10,004.9	7,003.43
Sweet potatoes	20,688	88,960	25,870	59,658	29,468.9	58,937.8	14,710.0	29,420
Sorghum	5,530	10,280	20,656	49,853.3	18,729	20,695.5	4,689	5,181.3
Finger millet	2,313	4,160	4,672	12,201	7,139	7,877.5	2,319	2,562.5
Cotton	37,887	26,500	30,067	43,383.2	56,763	39,734.1	23,290.7	16,303.5
Tobacco	1,589.1	1,600	1,529.4	2,978.25	2,031.4	1,523.55	1,916.3	1,437.2

*Excludes the new Bukombe District

Source: District Agricultural Development Office, Annual Reports 1992/93-1995/96.

Agro-pastoralism

Pastoralism in Kahama supplements agriculture as an economic activity. The local inhabitants (the Sumbwa) are not livestock keepers traditionally. However, with the increasing migration of the Sukuma people from within and outside Shinyanga Region, livestock have become important in the district, and have increased substantially over the last 10 to 15 years.

The current livestock population in the district is high (table 4) and it includes cattle (417,403), goats (198,653) and sheep (85,580). The livestock population has been increasing at a very high rate, estimated at 4.1% during the 1984 livestock census. The cattle population is currently estimated to be growing at 5% while the rate for sheep and goats is 4%.

Table 4. Livestock Population in Kahama District, 1984-1985*

Livestock unit	1984	1995
Cattle	327,374	417,403
Goats	159,470	198,653
Sheep	70,249	85,580
Donkeys	35,443	-

*Includes the new Bukombe District before the split

Source: District Livestock Office.

The distribution of livestock population within the district is shown in table 5. It will be noted that Msalala Division has the highest livestock population compared to other divisions in the district, despite its being relatively dry. The division borders with Geita District in Mwanza Region and, therefore, harbours many Sukuma agropastoralists. Siloka Division, which is presently in the new Bukombe District has also a relatively high livestock population and the numbers have ever been increasing. Although Dakama, Mweli and Kahama Divisions have low livestock numbers, the population is increasing at a rapid rate due to migration.

Most of the immigrants have settled in the south and west of the district in Dakama and Mweli Divisions and in the new Bukombe District. They have even invaded forest reserves with their livestock. Reserves which have been mostly affected include Mpunze (3,600 ha) and Ukamba (2,000 ha) forest reserves all in Kahama District and Biharamulo (44,000 ha) and Mbogwe (9,000 ha) in Bukombe District. The high rate of immigration has led to a concentration of livestock in the west and south of the district. This has caused serious erosion problems in these areas.

The agropastoralists practice a nomadic way of life. As they settle in a particular area, they clear the forests for cultivation and pasture. After a few years, they move to other areas with good pasture. During the dry season, most livestock keepers move with their livestock to distant forests, sometimes up to Urambo and Tabora Districts and only come back when the situation has improved. In one of the study villages (Shaka), however, it was evident that livestock

keepers, mainly Sukuma, from Ukune, Kahama and Chambo Wards were bringing their livestock into the village for pasture and water during the dry season and would then go back during the rainy season.

Table 5. Livestock Population by Division in Kahama District, 1984 - 1995

Division	1980			1995		
	Cattle	Sheep	Goats	Cattle	Sheep	Goats
Kahama	10,461	3,131	6,753	13,338	3,820	8,239
Isagehe	71,763	16,353	27,196	91,498	19,950	33,179
Siloka*	81,195	11,504	44,991	103,524	14,034	54,889
Mweli	12,237	1,676	5,969	15,602	2,045	7,283
Msalala	116,647	21,484	42,265	148,725	26,210	53,887
Dakama	35,071	16,001	32,296	44,716	19,521	41,177

*The division now belongs to the new Bukombe Division.

Source: District Livestock Office.

Forestry

Kahama District is one of the few areas still covered by relatively large natural forests in the whole of Shinyanga Region. The other area in Bukombe District. Before the split in 1996, the district had 12 forest reserves with a total area of 728,600 ha. These included Biharamulo (44,000 ha), Ngogwa (28,000 ha), Uyovu (16,000 ha), Mpunze (3,600 ha), and Runzewe (32,000 ha). After the split, however, the new Kahama District has been left with only six forest reserves, namely, Usumbwa, part of Ngogwa, Ukamba, Ushetu, Mpunze, and Ukune. The latter, however, has almost disappeared because of overexploitation while Mpunze and Ngogwa have been severely degraded. Forests also exist outside the reserve areas, although some have already been depleted. The forests are mainly utilised for lumbering, charcoal production and honey and beeswax collection.

Kahama and Bukombe Districts remain the only core suppliers of charcoal in the region. Between 1989 and 1992, the two districts produced 89,183 bags of charcoal worth Tshs. 30,238,600/=. In 1995, only 11,640 bags were recorded. However, this figure may be an underestimation because there is a lot of unlicensed charcoal produced which goes unrecorded by the forestry department. Firewood is also an important product and available records show that 53 m³ of firewood was harvested in 1995. This figure excludes the firewood collected by rural women for household cooking and that which is used for tobacco curing.

Timber production is an important economic activity which generates revenue for the district. In 1995, about 80.5 m³ of timber worth Tshs. 1,278,000/= was produced. The main species used for

timer are *Pterocarpus angolensis*, *Brachystegia sp.*, and *Azelia quanzensis*. *Pterocarpus angolensis*, however, is the most preferred species and is mainly obtained in forest reserves. The species has already been depleted in unprotected areas.

Figure 3. Agro-ecological Zones in Kahama District

Mining

Mining is mainly done in Msalala Division, and it involves mainly gold mining. The largest gold mining activity is in Kakola in the northern part of the district where the Bulyanhulu gold mines are found. Other popular gold deposits are Ushirombo (Bukombe District), Nyakafuru, Mwangimagi and Nyanghwale. The latter has both gold and diamonds nearby. These deposits have attracted a lot of migrants from both within and outside the district and Shinyanga Region as a whole.

Agro-ecological Zones

Kahama District is conveniently divided into three agro-ecological zones (figure 3). These are the north and east agro-ecological zone, which encompasses Msalala and Isagehe Divisions, the southwest zone encompassing Dakama, Kahama and Mveli Divisions and the western zone encompassing part of Msalala Division in the north-west. The zones depict variations in terms of rainfall, topography, soils, vegetation and potential for livestock. The descriptions of each ecological zone are presented below.

The north and east agro-ecological zone is relatively dry with rainfall ranging from 500mm - 700mm. The soils are degraded with little potential for increased farm output. Soil erosion is common particularly in Isagehe Division. The zone is also characterised by poor vegetation cover, with only shrubs, mainly of *Acacia type*, and scanty grass cover. This has been a result of expanded arable agriculture and overgrazing. There is a high density of human and livestock population which are exerting a lot of pressure on land.

The southwest agro-ecological zone is fairly wet, with rainfall ranging from 800mm - 1000 mm. The soils are fairly good with patches of degraded lands. Soil erosion features only in some places such as in Bulungwa. However, there is good potential for increased farm output. The vegetation cover is good and is characterised by patches of Miombo woodlands and abundant grass cover. There is an increasing number of both human and livestock population due to migration. Compared to the other zone, however, this zone is considered as a moderate density area for livestock.

The western zone which also incorporates the new Bukombe District has a higher rainfall (1000mm - 1200mm) than the two zones. This zone is dominated by Miombo woodlands, with three forest reserves and a game controlled area found in Bukombe District. The soils are still fertile and virgin in some places with very high

potential for increased farm output. There is a high concentration of livestock, particularly in Mbogwe Division.

4. Deforestation in Kahama District

Extent of Deforestation

Deforestation is the most serious environmental problem in Kahama District. A decade ago, the district was full, covered with rich natural *Brachystegia* woodland. But the relentless pressure put on forests by population explosion is threatening the existence of these woodlands. Indiscriminate tree felling is fast driving the landscape into bare land. Extensive areas of woodlands, including forest, have been deforested.

The rate and extent of deforestation in the district are yet to be determined. However, from available records and field visits, it is evident that deforestation is very widespread and is proceeding at an alarming rate. The process involves the shrinking of woodlands through selective cutting of tree species (Plate 4) to complete clear-felling leaving only stumps (Plate 5). With the incidences of annual fires, the trees are not given a chance to regenerate. Thus, eventually, an area becomes devoid of trees.

The areas which have been mostly affected by deforestation are Ushetu, Bulungwa and Idahina Wards in Mweli Division. Woodlands extending from Bulungwa to Mbika have completely disappeared. Other areas are Bukomela Ward, which until 1973 was still forested, but now almost all of it has been cultivated. In Idahina Ward, the most affected areas are around Busulwanguku and Nyamtengera villages. In Bukombe district, the areas most affected by deforestation are in Runzewe and Mbogwe Wards.

Plate 4. Thinning of Miombo woodland in Ngogwa Forest Reserve. The foreground is completely devoid of trees (Photo by S. Misana, August 1996).

Plate 5. Clear-felling of trees (foreground) in a Miombo woodland in Nyamtengera. Note the dense woodland cover at the background which is also under threat (Photo by S. Misana, August 1996).

A traverse through the district along various transects revealed extensive areas which have been converted into cultivated land. In other places, only a few scattered trees dot the landscape in an otherwise extensive grassland or fallow land. Around Mpunze area, the former vegetation in the plains has been converted into pure stands of *Borassus aethiopum*. Formerly the vegetation was mixed with other species including various species of *Brachystegia*. The *Borassus aethiopum* species were left standing during the process of clearing because they could not be used for anything. Remnants of woodlands are only found on hills, in forest reserves and a few public forests which have not yet been invaded. Asked if woodland cover had declined in their villages and surrounding areas, most of the respondents (97.9%) said yes and only 2.1% said that no changes had occurred in woodland cover.

Deforestation is not confined only to public lands. Even forest reserves have been equally affected. Forest reserves which have been completely deforested in the district are Isaka, Ukune, and Ukamba forest reserves. Other reserves which have been seriously affected include Mpunze

(Plate 6). The rest of the reserves, that is, Biharamulo, Ngogwa, Uyovu and Mbogwe, which have also been seriously affected, are now in Bukombe District.

Causes of Deforestation

Several factors are responsible for the massive deforestation that is currently being experienced in Kahama. These include land clearing and expansion for agriculture, firewood and charcoal production, population increase, tobacco cultivation and curing, settlement and house construction (table 6). Other factors are fire, cutting trees without replacement and timber and poles. From the household interviews, it was evident that fuelwood and charcoal production were the leading causes of deforestation in Bulungwa Ward. Almost 40% of the respondents (39.8%) identified them as causes of deforestation, followed by tobacco cultivation and curing (31.6%), house construction (23.5%) and land clearing and expansion for agriculture (21.4%). Fire burning did not seem to be an important factor. Only 3.1% mentioned it while only 4.1% mentioned timber and poles.

Plate 6. Part of Mpunze Forest Reserve which has been degraded. A few scattered trees including *Borassus aethiopum* (tall tree in the background) and some regenerating shrubs of *Combretum sp.* and *Terminalia* species remain in this area (Photo by S. Misana, August 1996).

Table 6. Reasons for the Decline of Woodlands in Bulungwa Ward

Reason	Frequency	Percent
Land clearing and expansion for agriculture	21	21.4
Tobacco cultivation and curing	31	31.6
Settlement	6	6.1
House construction	23	23.5
Population increase	18	18.4
Firewood and charcoal	39	39.8
Fire burning	3	3.1
Cutting trees without replacement	20	20.4
Timber and poles	4	4.1
Other	1	1.0

Discussions with various officials in the district also revealed that the leading causes of deforestation in Kahama District were charcoal burning, tobacco cultivation and curing and settlement. From the District Forest Officer's point of view, settlement was the leading cause followed by charcoal and lastly tobacco production. This view may be explained by the fact that many forest reserves have been invaded for settlement, and some are on the verge of being completely depleted. Other factors which have also played a role in deforestation, though minor, are mining and the breakdown of traditional forest management system.

It is difficult to determine the extent of deforestation caused by each individual factor because they do not act in isolation. Rather, they interplay in the process of degrading the forest resources and/or converting them into non-forest lands. This makes the problem of deforestation a complex one requiring integrated efforts in curbing it and reversing the trend. However, as a matter of convenience, the various factors will be separately discussed to highlight their role in the process of deforestation.

For the purpose of analysis and clarity in this report, the individual factors have been conveniently grouped into population growth and settlements, land clearance and expansion for agriculture, tobacco cultivation and curing, commercialisation of forest products inducing charcoal and timber, fire and lack of tree planting, mining and breakdown of traditional forest management system. Settlement, house construction and population increase have been grouped into one factor, population growth and settlement. The impact of tobacco cultivation is further discussed in detail in Chapter 5. The order in which the factors are discussed portrays their relative importance as perceived by both the district officials and the villagers in Bulungwa Ward.

Population Growth and Settlement

As has been observed in Chapter 2, Kahama District, even before the split, was attracting a lot of people because of its favourable climatic conditions. The population almost doubled from 291,622 in 1978 to 503,203 in 1988, at a growth rate of 5.9%, almost three times the rate of growth for the whole region (2.3%). Pastoralists and agro-pastoralists have moved in from other parts of Shinyanga region and even Mwanza and settled in the southwest extending to Bukombe District and to Kibondo. Areas which have been mostly affected by migration include Bulungwa Ward and the former Ushimbo, Runzewe and Bukombe Wards which now belong to the new Bukombe District.

Most of the migrants are Sukuma people from other parts of Shinyanga Region which have been badly affected by land degradation. Thus they have moved to Kahama in search for a better living, and have settled on the periphery of villages and closer to the woodlands. Some have even started new villages in the middle of woodlands, both protected and unprotected. In the process, they have indiscriminately cleared forests not only for settlement (Plate 7) but also for agricultural land and grazing purposes. They also clear all trees around the homestead to get rid of owls which are often associated with witchcraft.

In Bulungwa Ward, most of the people have come from within the district. This is illustrated by the responses from the three study villages (table 7). The respondents were asked whether they were born in the villages in which they resided, in the district, in other districts within the region or outside the region. The results as presented in the table show that most of the respondents (63.3%) were born somewhere else, though within the district. 29.6% of the respondents, however, were born outside the district, 16.3% of whom were born in other districts within Shinyanga Region. 13.3% of the respondents were born outside the region, and only 7.1% were born in the study villages.

Plate 7. A new settlement being established in a woodland in Nyamtengera village, Idahina Ward. Trees are being felled for house construction and to make room for cultivation (Photo by S. Misana, August 1996).

Table 7. Place of Birth of the Respondents

Place of birth	Frequency	Percentage
In the village	7	7.1
Within the district	62	63.3
Within the region	16	16.3
Outside the region	13	13.3
Total	98	100

From the data in the table, it is also evident that most of the people in Bulungwa Ward are migrants, the majority having moved into the area during the villagisation programme in the 1970s. When asked where they came from, 60.2% of the respondents said that they came from distant villages within the district (table 8.). Only 13.3% and 14.3% came from other districts within the region and outside the region, respectively.

Table 8. Origin of Respondents in the Study Villages

Place of origin	Frequency	Percent
Nearby village	8	8.2
Distant village	59	60.2
Another district within the region	13	13.3
Outside the region	14	14.3
No response	4	4.1
Total	98	100

About 65.3% of the respondents said that they started living in their respective villages (Shaka, Makongolo and Nyabusalu) between 1970 and 1980, 12.6% between 1981 and 1985, 7.4% after 1990. The period between 1970 and 1980 coincides with the implementation of the villagisation programme which involved resettlement of people into nucleated villages. It also coincides with the introduction of tobacco cultivation in the district. When asked why they migrated into Bulungwa, the majority (31.6%) said that they were moved by the government during the villagisation. 22.4% said it was due to scarcity of land for agriculture and 26.5% gave other reasons (table 9). The category "other" includes those who moved to follow their parents and relatives, opportunity for agriculture, particularly tobacco cultivation, and those born within the study villages.

Yuovu, all of which now belong to Bukombe District, have been mostly affected by settlement of migrants and cultivation. Recently, the Minister for Tourism and Natural Resources was heard ordering the people who had invaded Biharamulo Forest Reserve to move out immediately

before stern measures were taken against them. Three other forest reserves, namely, Mpunze, Ukamba in new Kahama District and Mbogwe in Bukombe District have been invaded mostly for cattle grazing by surrounding villages.

Table 9. Reasons for Moving into the Study Villages

Reason	Frequency	Percent
Scarcity of agricultural land	22	22.4
Land degradation	14	14.3
Scarcity of grazing land	3	3.1
Moved by the government	31	31.6
Other	26	26.5
No response	2	2.0
Total	98	100

Ngogwa Forest Reserve, part of which is in the new Kahama District, has almost been depleted especially within the last eight years. Four villages, Maguta (Plate 8), Kabanga, Homolwa and Nyanhwiga have been established in the middle of the reserve. By 1989, there were 600 families with a total of about 6,500 people. Each of the villages has even started a primary school.

Illegal settlement in Ngogwa forest reserve is believed to have started way back in 1968. Although the CCMN Party and government leaders visited the area in 1989 and decided that the people should be moved to other places, implementation of the directive was very difficult. Actually the lives of the forest officers who patrolled the forest were threatened, as the people (with backing from some politicians) were reluctant to move out of the reserve. The whole issue later turned to be political, and it was eventually decided to let the people stay. Thus currently, all the four villages are fully registered, and there is further extension of the settlement areas as more people move into the reserve. The consequence has been that the reserve has been almost depleted, and it should actually be struck out of the books as a reserve because it is non-existent. Only small portions remain in the hilly areas and in the east, and perhaps efforts should be made to protect these remaining portions against further encroachment.

Apart from permanent villages, there are also temporary residences for pastoral communities in Ngogwa and Mkwani Hills Forest Reserves which are adjacent to each other. The pastoralists construct temporary houses particularly in the dry season when they bring their cattle for watering and pasture. The ponds and earth dams that they use as watering points were dug for sand during the construction of the road to Rusumo. Some pastoralists, however, have dug their own watering points or expanded the ones which already exist.

The encroachment in forest reserves is a clear indication that management and control of the forest reserves, whether by the central or local government has either been inadequate or lacking. The phenomenon is becoming widespread in the country and a lot of forest reserves are being depleted. In Mpwapwa District, for example, a similar situation was encountered recently where people had invaded Rudi Game Controlled Area and established 8 sub-villages (*vitongoji*) belonging to Kimusi, Singonhali, Idodoma, Malolo, Mtera, Kisima, Winza and Chilendu village

(Misana, Forthcoming). As is the case with Ngogwa Forest Reserve, people from within and outside the district, including Barabaig, Gogo and Hehe, have moved into this area, and their stay is being politically backed. The quest for cheap popularity by some politicians is putting the future of the reserves at stake.

Commercialisation of Forest Products

The increased demand for forest products, particularly charcoal, within and outside the district has been a significant cause of deforestation in Kahama District. The majority of the people depend on fuelwood as a source of energy. In the rural areas, most of the people use firewood which is collected in the form of dry wood. This does not, therefore, contribute to deforestation. However, over the recent years, firewood has become commercialised as its demand has increased particularly in those areas which are devoid of trees and in the urban areas.

Kahama District, including the new Bukombe District remains the only core supplier of charcoal in the region. It supplies charcoal to both Kahama township and Shinaynga town. Some charcoal is even transported all the way to Mwanza town. Charcoal makers/dealers are supposed to obtain licences and pay fees to the Forestry Department for the wood they use. However, only a few people comply. Much of the charcoal business is illegally conducted. Thus the charcoal production figures available in the district natural resources office are actually an underestimation because there is a lot of unlicensed charcoal production which goes unrecorded by the Forest Department.

Plate 8. Maguta village in Ngogwa Forest Reserve. The village has been established in the middle of the forest reserve. The centre of the village (foreground) is completely devoid of trees (Photo by S. Misana, August 1996).

Charcoal burning is a commercial activity and it is largely unregulated by the government. The business is believed to have expanded rapidly since 1988. Trees of all species and sizes, but especially big trees have been felled for charcoal production (Plate 9). The most affected species are, however, *Brachystegia spiciformis*, *Burkea africana*, *Pericopsis angolensis*, Msima and Mkulungu.

Massive deforestation has occurred in both public and protected forest areas due to charcoal production. In Idahina Ward, for example, particularly in Busulwanguku village where charcoal production has become a lucrative business, all land is owned by individuals who invite charcoal burners to clear their land so that they can grow crops, mainly cotton. The charcoal burners thus indiscriminately clear all the trees (total felling) irrespective of species (Plate 10). The village only receives Tshs. 1000/= in the form of tax, the rest of the income goes to the charcoal burner. The owner of the land only benefits from the fact that farmlands have been cleared for maize and cotton cultivation. This practice is slowly spreading to Nyamtengera, which is also currently affected.

Plate 9. Logs of trees which have been felled for charcoal production in Busulwanguku village area. Note the size of logs in the foreground (Photo by S. Misana, August 1996).

Plate 10. Total felling of trees in Busulwanguku village for purposes of clearing the farmlands. The trees felled are used for charcoal production. Here the felled trees have been chopped into logs ready for charcoal making (Photo by S. Misana, August 1996).

Among the forest reserves which have been affected by charcoal burning is Ngogwa Forest Reserve. The activity, though illegally done, began in 1990 when the reserve was invaded by charcoal makers from Shinyanga who came specifically for the business. Trees of all sizes were indiscriminately being felled (Plate 11), thereby destroying the woodland. They had even constructed temporary huts in the reserve. In 1992, however, all the charcoal burners were evicted by the government, their huts burnt down and 19 culprits who were caught were taken to court and charged. 18 of them were fined 2,000/= while one was jailed for four months. Definitely the kind of punishment which was delivered seems a joke given the extent of destruction of the woodland that the culprits had inflicted on the reserve. The scars of deforestation left behind already paint a grim picture to the future of the forest. Discussions with the District Natural Resources Officer revealed that currently, no charcoal business is being conducted in the forest reserves. Only public forests are being exploited for the purpose.

Charcoal is made from traditional kilns or earth mounds (Plate 12). There are different sizes of these kilns, some as big as a small hut. The amount of wood used varies with the size of the kiln. It was difficult to determine the number of trees used in one kiln because none of the respondents interviewed was engaged in charcoal production. Timberlake (1991), however, estimated that about five to six tonnes of wood were normally used to make one tonne of charcoal.

Plate 11. Indiscriminate felling of trees for charcoal production in the western end of Ngogwa Forest Reserve (Photo by S. Misana, August 1996).

Plate 12. A traditional charcoal kiln made of earth material in Busulwanguku area. This is one of the largest charcoal kilns observed during the field visits (Photo by S. Misana, August 1996).

The way the trees are felled, however, leaves a lot to be desired. While some trees are felled directly by an axe or machete, others are first ring-barked (Plate 13). When they dry, then fire is set by burning logs at their base so that they can easily fall down without cutting. Thus where trees have been felled, one can easily see ashes and scars of burning in the woodland. Perhaps this method of tree felling is commonly used because of the big size of the trees which makes cutting by simple tools like a hand axe difficult. The method, however, is destructive to the vegetation because the fires easily spread to unintended areas.

Timber production in the district is not as devastating as charcoal production, and is not considered as a major cause of deforestation. For example, only 4.1% of the respondents thought that deforestation was caused by timber and building poles as against 39.8% for firewood and charcoal or 31.6% for tobacco cultivation and curing. The main reason is that timber production is licensed and only selected species are felled. Thus its effect may not be easily felt because the preferred species are widely spaced. *Pterocarpus angolensis*, *Azelia quanzensis*, and *Brachystegia spiciformis* are the preferred species. These are obtained mainly from protected forest reserves as they have almost been depleted in unprotected areas.

Tobacco Cultivation and Curing

Tobacco cultivation in Kahama District is concentrated mainly in the south and southwest part in Ushetu, Bulungwa and UKune Wards in Mweli Division. In Bukombe District, tobacco is mainly grown in Runzewe area. The crop is grown on a shifting cultivation basis which involves clearing of new farmland annually. A plot is cultivated for one year only after which the farmer shifts to another area. The former plot is then used for maize cultivation for 3-4 years after which it can be used for tobacco again. 97.8% of the respondents were involved in tobacco cultivation on a shifting cultivation basis.

Plate 13. Tree debarking for easy felling in Homolwa village in Ngogwa Forest Reserve. This practice of tree felling is common in the woodland areas in the district (Photo by S. Misana, August 1996).

The practice of shifting cultivation in tobacco growing is normally a result of nematode disease which attacks the crop. However, in Kahama District, nematode is more serious in the seedbeds than in the farmlands. Thus here, some people shift to new areas mainly due to fuelwood availability rather than nematode disease. The majority of the people, however, shift because of declining fertility. This has led to opening up of tobacco farms in the middle of woodlands (Plate 14), causing extensive deforestation.

Plate 14. A tobacco farm with two barns in the middle of a woodland in Namatutu area, Bulungwa. There are no trees left standing in the farm. At the background is an uncleared part of formerly extensive woodland (Photo by S. Misana, August 1996).

Normally, when a new farm is opened, all the trees are clear-felled and used as fuelwood for tobacco curing. As fuelwood diminishes in nearby areas, a tobacco farmer is forced to move further into the woodland where a new farm is opened. Therefore, extensive treeless landscapes are a common feature in the tobacco growing areas.

Many tobacco farms are located some distance from the village centre. Each farmer in Bulungwa as elsewhere in the tobacco growing areas has claimed a portion of the woodland where he grows the crop and obtains firewood for curing the tobacco leaves. 58.9% of the respondents who grew tobacco said that they obtained fuelwood from their own farms while 35.6% said that they obtained it from a village forest. Since these woodland areas are now some distance from the village centres, the farmers shift to the farmlands and construct temporary homes where they stay during the growing season and only come back to the village after harvesting and curing the tobacco. The tobacco barns are also built in the farm area.

The size of the farms vary from one farmer to another depending on the economic well being. In the study villages, tobacco farms vary in size from 0.3 to 6 ha with a mean of 1.4 ha. Out of the 98 respondents interviewed in the three villages, 87 of them or 88.8% was growing tobacco. Assuming that each year a farmer was cultivating one hectare of tobacco on the average, it means that 87 ha of woodland was being clear-felled annually for the purpose because of shifting cultivation. This has caused extensive deforestation not only in Bulungwa Ward but also in all tobacco growing areas.

In addition to clear-felling of trees for cultivation the fuelwood requirement for curing tobacco leaves further exacerbates the deforestation problem. Tobacco consumes a lot of fuelwood for leaf curing. As farms are cleared for cultivation, the trees cut are then stored for tobacco curing after harvesting. If the fuelwood from the cleared farm is not adequate, then more trees are cut from the nearby woodland area (Plate 15). However, because of woodland depletion in many parts, some farmers are forced to buy fuelwood from others who still have tree stocks in their woodland plots. One cubic meter of fuelwood is sold at Tshs. 6,000/=, and this is only enough for one barn with a size of 4.8 meters by 4.8 meters. A barn of that size can cure between 700-900 kg of tobacco at a time, equivalent to between 0.8 - 1 hectare of tobacco. However, some farmers use three cubic meters for curing 900 kg of tobacco. The average yield of tobacco per hectare is 900 kg. Therefore, the amount of fuelwood required and the number of trees cut will depend on the size of the trees, size of the farm and barn and the yield per hectare. Whatever the case, the amount of fuelwood used for tobacco curing is quite substantial. This together with the system of cultivation used which is largely associated with fuelwood requirements is a major cause of deforestation in Kahama. It ranked second to firewood and charcoal (see table 6).

Areas which have been mostly affected by deforestation caused by tobacco growing are all the tobacco growing areas in Ushetu, Bulungwa and Ukune Wards. The villages mostly affected are Ulowa and Kangeme in Ushetu Ward, Makongolo, Shaka and Nyabusalu in Bulungwa Ward and Bukomela and Ngokolo in Ukune Ward. The former woodland extending from Bulungwa to Mibika (Ushetu) has completely disappeared. Bukomela area, which was still forested in 1973, is now devoid of trees. The whole area is cultivated. Similarly Kangeme, which in 1973 was covered with a big woodland area full of lions, is now open with only a few trees standing as wind breaks. As a result of deforestation, fuelwood for tobacco curing has become scarce in many areas. The species which have been mostly affected are *Brachystegia spiciformis*, *Pericopsis angolensis* and Mikulungu.

Plate 15. Tree-felling for tobacco curing in Namatutu, Bulungwa Ward (Photo by S. Misana, August (1996)).

Land Clearance and Expansion for Agriculture

As discussed in the preceding sections, the environmental conditions in Kahama are favourable for agriculture. It has also been noted that agriculture is the main economic activity of the people. Over 80% of the population depend on agriculture. Crops grown are mainly maize, groundnuts, beans, sweet potatoes, cassava, rice, sorghum, cotton and tobacco. The last two are the major cash crops in the district. Rice is both a cash and a food crop while the rest are grown as food crops.

There has been expansion of agriculture in the district over the years as evidenced by the increase in area under cultivation of various crops (table 10). Although the acreage has been fluctuating from one season to another, the general trend shows an increase in the area under cultivation. While the area under maize cultivation does not seem to have changed much between 1989/90 and 1994/95 seasons (it has actually remained almost constant), that under sorghum and groundnuts has increased by more than 100%. The area under rice, tobacco and cotton has also increased substantially by 94.9%, 49.4% and 29.9% respectively. When tobacco

was introduced into the district in 1971/72, only 28 families grew the crop and only 2.5 ha was cultivated. Ten years later, however, the number had increased to 1,506 families with an area of 453 ha cultivated. By 1994/95, 3,413 families were engaged in tobacco growing, the area having increased to 2031.4 ha.

Table 10. Area under Crop cultivation, 1989/90 - 1994/95*

Crop	Area under cultivation						Increase %
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	
Cotton	43,690	53,200	82,017	37,887	30,067	56,763	29.9
Tobacco	1,360	1,108	1,099.8	1,589.1	1,529.4	2,031.4	49.4
Maize	137,500	103,270	116,220	122,408	110,046	137,383.7	-0.08
Paddy	27,395	37,350	24,500	34,632	25,440	53,382.4	94.9
Groundnuts	26,680	67,020	32,880	35,059	40,993	54,562.7	104.5
Cassava	28,132	24,980	42,600	41,718	58,417	38,290.9	36.1
Sorghum	2,700	6,000	2,900	2,313	4,672	7,139	164.4
Beans	30,316	7,540	24,800	41,625	30,858	34,489.4	13.8

*Includes the new Bukombe District before the split.

Source: District Agricultural and Livestock Development Office Annual Reports.

The increase in the area under cultivation has partly been a result of immigration and partly due to market incentives including easy availability of markets and favourable prices. The migrants have settled and opened farms by clearing the woodlands causing massive deforestation. In Bulungwa, for example, a lot of Sukuma people have moved into the area specifically for cotton cultivation. They have settled in a former woodland area and established their own settlements in Bukale and Mulungu, which are sub-villages of Shaka village. Because they are agro-pastoralists, they have brought a lot of cattle with them. Previously, cotton was not allowed in Bulungwa and in the southwest part of the district. The area was demarcated for tobacco production only together with other food crops. Cotton was confined to the south and southeastern part of the district in Dakama Division and in the western part in Siloka, Mobogwe, Masumbwe and Ushirombo, which now belong to Bukombe District. Cotton was only introduced in Bulungwa two years ago.

The implication of increased acreage under crop cultivation means more woodland is being cleared to open new farmland (Plate 16). Since the areas around the villages have all been cultivated, expansion of cropland has meant extending cultivation into the woodland areas where the soils are still virgin and fertile. In clearing farms for cotton cultivation, all trees have been completely felled to remove shading. Meanwhile, trees around rice farms are felled to get rid of

quelea quelea birds. This has depleted woodlands in many parts. Even forest reserves have been affected by such an expansion. In Ukune Forest Reserve, for example, some of the remaining parts have been cleared for the cultivation of maize and cotton. There are even settlements in the reserve.

The situation has been exacerbated by the system of shifting cultivation used especially for tobacco cultivation as earlier discussed. The agro-pastoralists also practice this system. They move mainly to seek for pasture. They settle, cultivate and then move again to other areas. Busulwanguku and Nyamtengera villages in Idahina Ward have been seriously affected by deforestation caused by Sukuma immigrants who have settled in these areas and invited charcoal burners to help them clear the woodland for establishing farmlands.

Fire and Lack of Tree Planting

Fires have been ravaging through the woodlands killing trees and preventing their regeneration. Hunters normally set fires during the dry season to encourage fresh grass growth in order to attract wild animals. This is mainly done in Siloka (Bukombe District) and Mweli Division. Pastoralists, on the other hand, cause fires to destroy tsetse flies and to encourage new grass growth for pasture. Honey collectors are also believed to be the main cause of accidental fires. Some fires are, however, a result of the method used in felling trees, where a tree is debarked, and fire is set at its base when dry. Such fires easily spread into the woodlands damaging trees and other small plants.

Plate 16. Clearing a new farm for cotton cultivation in Mseki A village, Bulungwa. The shrubs are cut, piled and then burnt (Photo by S. Misana, August 1996).

Incidences of fire are very common in Kahama District. Although only 3.1% of the respondents mentioned fire as a cause of deforestation, discussions with the Bulungwa Ward Executive Officer revealed that it was a problem particularly in the plains where fires started by pastoralists sometimes spread to areas demarcated for conservation purposes. Evidence of burning was also visible in the hilly and woodland areas in Nyabusalu and Busulwanguku villages, respectively. Other areas where there was evidence of burning include Kabanga village in Ngogwa Forest Reserve (Plate 17), Mbika area in the south, Ulowa and Kabanga (in Mpunze). Most of these areas, with the exception of Ngogwa Forest Reserve, are in Mweli Division. This confirms the observation made earlier that fire was a big problem in the division. However, there are reports that fire incidences have now gone down in the village areas, mainly because of village by-laws which are very strict.

The nature and extent of the damage caused by fire is yet to be determined. However, evidence from the field and available literature suggests that fire has been responsible for opening up of the woodland, aggravating the effects of tree cutting. Fire not only prevents the re-establishment of the trees that have been cut for various purposes, but also kills some of the trees and small plants. Plate 17 is a clear illustration of such an effect. Fire is also known to hinder the regeneration of such species as *Pterocarpus angolensis* (Misana 1985; Trapnell 1959; Kikula 1986). Fire is also believed to be a setback to tree planting in Kahama District.

Plate 17. Fire burning in Homolowa village in Ngogwa Forest Reserve. The foreground is completely devoid of vegetation cover. Only scattered trees and shrubs with dense woodland on the hills are seen in the background (Photo by S. Misana, August 1996).

Tree planting is mainly done under the Forestry Department and the HASHI Project. However, HASHI's activities were initially concentrated in Isagehe and Kahama Divisions, but have now been expanded to Msalala and Dakama Divisions. Mveli Division, where there is a lot of tree cutting for tobacco cultivation, charcoal burning and recently cotton cultivation is yet to be included in the project.

Despite these activities, the rate of tree planting does not match with the rate of tree cutting. No wonder 20.4% of the respondents mentioned lack of tree planting as a cause of deforestation. Trees were being cut without any replacement. Further discussion on tree planting is presented in chapter 7.

Mining

Though not widespread, mining of gold is also a threat to the woodlands because of the open cast method which is used. The gold deposits at Kakola, Ushirombo, Nyakafuru, Mwagimagi and Nyanghwale have attracted migrants from both within and outside Kahama and Bukombe Districts and Shinyanga Region as a whole. Some gold is also found around Iponya village area.

The mining activity is done mostly on a small scale by unauthorised individuals. Trees are felled to allow for mineral extraction and stacks of wood are normally placed around the open pits which are up to 50 meters deep to protect the walls from collapsing. The demand for wood and clearing of woodland for digging the pits is depleting the woodlands surrounding the mining areas.

Breakdown of Traditional Forest Management System

The Sumbwa people are traditionally honey gatherers. Thus they would protect trees and forests for beehives and honey production. To them, clearing of forests is a foreign culture, having only started with the need to expand agriculture, particularly the growth of cotton and tobacco as cash crops. The migration of Sukumas into the district further eroded the culture of preserving trees and forests.

The Sukuma people generally do not like trees around their homesteads because they believe that they would attract owls which are a bad omen. Thus they would make sure that they clear all the trees around the settlement area. This has contributed to deforestation to some extent. The situation has been aggravated by the need for cash income from cotton and tobacco cultivation and also from charcoal production on one hand, and absence of effective community institutions and processes for management of woodlands on the other. All these have led to the depletion of woodlands in many areas. If efforts are not made to reverse the trend, then the rest of Shinyanga Region's experience with large expanses of open tree-less landscape may repeat itself in Kahama in the near future.

5. Tobacco Cultivation and its Impact on Miombo Woodlands

Discussions on how tobacco cultivation and curing are causing deforestation in Kahama District have been presented in chapter four. This chapter discusses in detail the extent of tobacco cultivation and how the demand for fuelwood and marketing strategies are exacerbating the problem of deforestation in the district.

Extent of Tobacco Cultivation in Kahama District

Tobacco cultivation in Kahama District (including the new Bukombe District) was initiated in 1971/72. Initially only a few villages cultivated the crop, but with time more and more villages have become involved. By 1992, there were 12 tobacco-growing villages, three of which were relatively new in the tobacco business. The villages included Ulowa, Kangeme, Ilomelo, Mbika and Uyogo in Ushetu Ward, Nampangwe and Bugege in Runzewe Ward (now in Bukombe District) and Bukomela and Ngokolo in Ukune Ward. Ushetu Ward was until 1990/91 the leading producer of tobacco in the district, with 498.8 ha of tobacco compared to 272.5 ha in Bulungwa and 204.4 ha in Runzewe.

The number of tobacco farmers has increased from 28 families in 1971/72 to 2,993 in 1995/96 season with a corresponding increase in acreage from 2.5 to 1,846.3 ha during the same period (table 11). This illustrates that tobacco is becoming an important cash crop in the district as more and more people are becoming involved in producing it. The increase in the number of tobacco farmers may be attributed to the incentive structure where competitive prices are offered to farmers together with inputs. Availability of land for tobacco growing has also favoured expansion of the crop in the district. Land does not seem to be a problem now because of low population density. But with increased migration and depletion of woodlands, this may not be the case in the near future.

Many of the tobacco growers are smallholder farmers whose average farm size is less than a hectare. In 1971/72, for example, the average farm size for tobacco per family was 0.09 ha. This has now increased to 0.6 ha in 1994/95. However, there are variations in farm sizes from one area to another and from one family to another. In Kangeme, for example, one of the old tobacco complexes in the district, the average farm size ranges between 1.5 to 2 ha of tobacco per family. In Bulungwa, the farm size ranges from 0.34 - 6 ha with an average of 1.5 ha per family.

The small size of the farms may be attributed to the nature of the work that is involved in tobacco production and the level of technology used. Normally, clearing of the farms requires uprooting of the trees if a tractor has to be used for ploughing the land. Such a task is normally done by hand because the majority of the farmers cannot afford to hire a bulldozer. However, if a hand hoe is to be used for tilling the land, then clearing would involve cutting of trees and leaving stumps 0.5 - 1 meter above the ground so that cultivation could easily be done. Many tobacco growers use hand hoe while some hire tractors at a cost of Tshs. 25,000/- per 0.4 ha.

Apart from preparation of the farms which is very laborious and tedious, the crop also needs maximum attention from the time the seeds germinate in the seedbeds to the time of packing the leaves into bales ready for sale in order to have quality assurance. The curing process is also very

laborious. Once started, it continues non-stop for three days, day and night. This is repeated until all the tobacco is cured. Under all these circumstances, an ordinary farmer would definitely only manage 0.5 - 2 ha, at most. This applies to almost all tobacco growing areas in the country. In Chunya., for example, Kasaka (1974) observed similar conditions and identified the strenuous nature of the work involved in tobacco production as a limiting factor to the expansion of farm sizes.

Table 11. Tobacco Production in Kahama District, 1971/72 - 1994/95

Year	No. of families	Area planted (ha)	Total production (kg)	Average price/kg (Tshs)
1971/72	28	2.5	1,709	7.79
1972/73	64	15.0	7,781	6.45
1973/74	183	54.9	32,972	6.54
1974/75	401	136.2	80,277	7.55
1975/76	731	230.1	164,314	8.09
1976/77	744	324	205,438	8.40
1977/78	1,055	474.6	356,159	7.60
1978/79	512	510.2	256,405	8.90
1979/80	1,465	679.4	447,389	8.09
1980/81	1,375	701.0	340,749	9.36
1981/82	1,506	453	213,135	15.92
1982/83	991	500.4	237,367	17.90
1983/84	1,160	754.3	400,907	19.40
1984/85	1,349	810	290,895	34.53
1985/86	1,370	706	586,219	43.45
1986/87	1,757	740	503,419	61.07
1987/88	2,163	756	492,400	75.10
1988/89	1,837	996	645,686	99.43
1989/90	2,518	1,100	745,837	124.11
1990/91	2,575	1,108.1	988,185	285.7
1991/92	2,710	1,550	1,455,519	459.25
1992/93	2,848	1,861.9	1,320,966	329.64
1993/94	3,051	1,556.6	1,316,137	527.98
1994/95	3,413	2,031.4	1,846,595	559.88

*Includes the new Bukombe District

Source: Tanzania Tobacco Board

Despite the above limitations, tobacco production has tremendously increased within the last 25 years. The data in table 11 show that while total production in 1971/72 was only 1,709 kg, this has increased to 1,846,595 kg in 1994/95. This assured farmers an average income of Tshs. 302,926.10 in 1994/95.

Fuelwood Requirements for Tobacco Curing

Tobacco production is highly dependent on the woodland resources available in a particular area. Where wood is scarce, the crop cannot flourish because of its wood requirements for curing the leaves. Firewood from the forests surrounding the tobacco growing areas is the only source of energy used for tobacco curing. It is also the source of energy for domestic purposes for all the families in those areas. But the continued expansion of farmlands into the woodlands and the continued use of firewood has pushed its source further and further away from the village centres, necessitating tobacco producers to establish temporary homes closer to their farms. According to Boesen and Mohele (1979), the villagisation programme in 1974/75 which assembled together a large number of people into concentrated villages further increased the distance between the tobacco household and the forests.

The amount of fuelwood required to produce flue-cured tobacco depends on the design of the barn and the furnace/heat exchange system, operator procedure, ambient conditions and characteristics of fuelwood (Wahid 1984). There are barns of different sizes, the most common sizes used by small holder farmers being 2.7m x 2.7m x 3.6m high, 4.6m x 4.8m x 4.35m high, and 4.8m x 4.8m x 4.35 - 4.8m high. Many people in Kahama on the average use the last two. These barns are constructed using poles firmly planted into the ground strapped together with tree bark and sealed with mud. They are thatched with reed grass (see Plate 14 for illustration). The furnaces are open-hearth type, with an opening at one end for inserting wood.

It is estimated that one hectare of tobacco would require 20m³ of fuelwood, which is equivalent to one hectare of woodland (Temu 1979). The national average is, however, estimated at 15m³ for 500 kg of tobacco (Wahid 1984). According to Boesen and Mohele (1979), this quantity is obtainable from 0.4 ha of woodland. In Kahama, the average tobacco production per hectare is 875 kg. Based on the average national fuelwood consumption figure of 15 m³, it means that on average 26.25m³ of fuelwood is required for one hectare of tobacco. Thus in 1994/95 Kahama consumed 55,397.85m³ of fuelwood for producing 1,846,595 kg of tobacco. This is equivalent to 2,769.9 ha of woodland, assuming that one hectare can produce 20m³ of solid wood on the average. Miombo woodlands generally have a low stocking rate and a low annual volume increment estimated at 0.5m³ of solid wood. The implications here are that each year extensive areas of woodland are felled to meet the fuelwood requirements for tobacco curing. As production increases, the area of woodland to be felled also increases, causing extensive deforestation.

Not all tree species found in Miombo woodlands are used for tobacco curing. People have preferences, and these may vary from one area to another. In Kahama generally, people prefer such species as *Brachystegia spiciformis*, *Pericopsis angolensis* and Mkulungu. Other species used are *Burkea africana*, Msima, and Mlandala. When asked what species have been affected most by tree cutting, the majority of the respondents mentioned the above species, 28.6% of the

respondents said that these species have been mostly affected by tobacco curing while 16.3% mentioned fuelwood (probably this would include fuelwood used for tobacco curing).

Because of the depletion of woodlands in the vicinity of the villages, the distance to the source of fuelwood from the village centre has increased tremendously. Reports from the Tanzania Tobacco Board indicate that in 1992, fuelwood was obtained within a distance of 5-8 km. Today, however, the distance has increased to more than 10km from the village centre. This indicates a high rate of woodland depletion.

In the study villages, many of the respondents (55.1%) agreed that the distance to the source of fuelwood had increased while 36.7% did not agree. When asked how far they had to go from the village to obtain their fuelwood requirements for tobacco curing, 40.8% said less than one kilometre, 22.4% between 1.1 and 2 km, 14.3% between 2.1 and 3 km and 14.3% over 3 km (table 12). However, looking at the actual situation in the villages, there may have been a misinterpretation of the question by the respondents. There are no woodlands left in the vicinity of the study villages, even tobacco farms are far from the village centres. Therefore, a distance of less than one kilometre from the village centre is not correct. The distances given in the table could be from the tobacco farms which are located near the woodlands where the farmers can easily obtain fuelwood.

**Table 12. Distance to the Source of Fuelwood
in the Study Villages in Bulungwa Ward**

Distance from village centre (Km)	Frequency of responses	Percent
Less than 1	40	40.8
1.1 - 2	22	22.4
2.1 - 3	14	14.3
Above 3	14	14.3
No response	8	8.2
Total	98	100

In Kangeme village, while some farmers obtained their fuelwood within a distance of less two kilometres, others had to walk a distance of almost 10 kilometres to obtain fuelwood. One farmer was travelling a distance of 0.6 km to Ubagwe village to buy fuelwood for curing his tobacco. There were no more trees left in his farm land, and because of fuelwood scarcity, he has decided since 1995/96 season not to grow any more tobacco. His plan is to rent out his two tobacco barns at the rate of Tshs. 50,000/= per barn per season.

A similar situation of fuelwood scarcity has been observed in other tobacco growing areas such as Ruvuma, Tabora and Chunya. In Ruvuma, for example, Barie (1979) observed that the distance to a source of fuelwood from the village centre was a problem for some farmers, while the majority of the farmers still obtained their fuelwood within one kilometre. In the late 1970s, the average distance was between 0.7 and 2.2 km. This distance must have increased substantially by now, given the nature of the farming system used and the high demand of fuelwood for tobacco curing. In Urambo District, not only has the distance increased but growing the crop has been abandoned in some areas due to lack of fuelwood (Kanga 1977).

Incentive Structure and Marketing Strategies

Flue-cured tobacco which is the type being produced in Kahama is an extremely input intensive crop. It demands many more inputs including seeds, fertilisers and pesticides than just land and fuel. Since the early days of African tobacco production in Tanzania, the government, in its efforts to encourage farmers to increase production, provided technical assistance and financial credit for mechanised operations, fertilisers and other equipment (Misana 1988; Boesen and Mohele 1979). In order to facilitate this, settlement schemes, which brought together small and medium-sized African farmers were established in all tobacco growing areas. From 1971, the government started tobacco complexes as a further move to increase the number of tobacco growers (Misana 1988). In Kahama District, such complexes were established in Ulowa, Kangeme and Ilmelo villages. The move came as a result of proposals during the second Five-Year Development Plan to expand small-holder tobacco production on a co-operative basis. Fertilisers and other inputs were until the 1990s subsidised by the government. This, together with other facilities provided served as incentives to the African tobacco growers who rapidly increased in number (Misana 1988).

With the removal of subsidies following the structural adjustment programme of the 1990s, many farmers now cannot afford to buy fertilisers because of the high prices. But in order to encourage farmers to expand production of the crop, the inputs are now provided to them on credit. The farmers pay for the inputs after selling their tobacco through deductions from the sales of the crop. In order to ensure easy availability of inputs to the farmers, the private companies which purchase the crop stock them at the primary societies registered in the tobacco growing villages. That way, the question of late delivery or distance does not arise. Previously, supply of inputs and crop purchases were being done by the tobacco authority of Tanzania, now known as the Tanzania Tobacco Board. But with the liberalisation of trade these tasks are now performed by the private companies such as Tobacco Leaf and the Kahama Co-operative Union (KACU). The Tobacco Board presently performs an advisory role only.

It has, however, been observed that many farmers do not use fertilisers for tobacco production. In the study villages, only 2.2% of the respondents used fertilisers, the rest (97.8%) practice shifting cultivation. Although the question of unaffordable prices may be a contributory factor, it does not arise here as a reason for the low usage of fertilisers because it has been learnt that many farmers purchase on credit fertiliser meant for tobacco production and use it for maize production. The only valid explanation could be the high risk of spoiling the quality of the harvest if more than the optimal amounts of fertilisers were applied. Boesen and Mohele (1979) observed that tobacco on virgin land gave the best results at a lower fertiliser application rate

than that which was optimal for tobacco grown after following. Since the risk of spoiling the quality of the harvest by using too much fertiliser (nitrogen) was bigger than the slightly reduced output resulting from less than the optimal amount, many tobacco growers have opted to use less or completely no fertilisers.

In Kahama District many people cultivate virgin land each year on a shifting cultivation basis rather than use fertilisers. Only 2.2% used fertiliser for tobacco cultivation while 97.8% practised shifting cultivation. This is further illustrated by the responses given by the interviewees in Makongolo, Shaka and Nyabusalu villages when asked why they practised shifting cultivation. The majority of the farmers (50.0%) said it was for fertility reasons while 19.3% said it was because of disease (table 13). 23.5% said it was because of insects and only 7.1% said that they followed advice given through extension. So long as land availability is not yet a problem in the district, this system of cultivation may continue to yield a good crop. However, this cannot continue for long given the high rate of migration into the district and the increasing number of people involved in tobacco production.

**Table 13. Reasons for Shifting Cultivation in Tobacco
Growing in Bulungwa Ward**

Reason	Frequency of responses	Percent
Disease	19	19.3
Fertility	49	50
Insects	23	23.5
Advice	7	7.1
No response	12	12.2

Prices have often been used in Tanzania as an incentive for farmers to increase production. Prices of tobacco have generally been favourable (see table 11), having increased from Tshs. 7.79 per kilogram in 1971/72 to Tshs. 559.88 per kilogram in 1994/95. Of course in real terms, this change may not be significant because of inflation and devaluation of the shilling. The fact that TAT did not buy farmers' crops on credit further encouraged more people to become involved in tobacco production. At present the various companies involved in purchasing tobacco offer competitive prices to the farmers. They even compete in the delivery of inputs and other facilities such as watering cans close to the people. This is done to boost the morale of the farmers so that they can increase production.

Implications of Tobacco Growing on the Environment

Tobacco is increasingly becoming important as a cash crop in Kahama District and in the rest of the Miombo zone. Growth in output has been recorded over the years, and many small-scale farmers appear to be turning to the crop in response to the incentive structure and marketing strategies that are in place. Production of the crop is expected to continue to be important in the

district in the foreseeable future, given the export drive of the nation. Tobacco is one of the leading export crops in the country.

It has been observed that the survival of the tobacco industry is very much dependent on fuelwood availability used for tobacco curing. Thus the Miombo woodlands have been a good source of fuelwood for the industry. The heavy demand for fuelwood for tobacco curing and the system of shifting cultivation used in growing the crop, however, have had devastating effects on the woodlands, with very heavy net losses of trees.

Although it has not been possible to determine in quantitative terms the rate and extent of deforestation caused by tobacco cultivation, available evidence suggests that large expanses of woodland have been depleted. The formerly dense Miombo woodland had been replaced by dry and open 'cultivation steppe' comprising mainly grain and tobacco cultivation and grasslands interlaced with Miombo woodland patches, shrubs and bushy thickets. Deforestation in tobacco growing areas has been proceeding at a very rapid rate, and this has consequently led to increased distance to sources of fuelwood and even high prices of fuelwood. As a result of the increased distance, availability of fuelwood has become a major constraint to tobacco production.

Although there are still extensive areas of woodland in some parts of Kahama District, increased tobacco production is posing a serious threat to their existence. The future of these woodlands looks grim given Tanzania's overall development strategies where agriculture is the backbone of the economy. The continued export dependency of the nation and the resulting exploitation of woodland resource through small holder production of tobacco as a primary export crop is likely to cause further devastation to the woodlands. This is so because the only fuel that is most abundant and cheaply available for curing tobacco in the country is wood. Other possible alternatives like coal are very costly and unaffordable by the farmers.

In the absence of other alternatives, the rate of woodland depletion implied in the pursuance of the present foreign exchange earnings from tobacco exports may be so great that one wonders whether it is worthwhile and sustainable to continue with the expansion of tobacco production under the present production system. The situation already prevailing in Kahama poses serious questions as to the validity of the continued expansion of the crop. For example, should Tanzania continue to concentrate on the expansion of tobacco production in the Miombo woodland areas as is presently the case given the high rate of deforestation? Or should the people continue to grow this environmentally unfriendly crop? If yes, then what alternative methods of curing are available in order to reduce its heavy reliance on fuelwood? These and several other questions need to be seriously considered in order to rescue the woodlands. Deforestation is a prelude to environmental degradation in the form of soil erosion and desertification (Misana 1988). Care should, therefore, be taken not to allow the district with such good economic potential to be turned into a complete waste. The experiences in Maswa, Meatu and Shinyanga Rural Districts should offer a good lesson to Kahama and the nation as a whole.

6. The Role of government Policies in the Deforestation Process In Tanzania

In Chapter 4, it has been shown how the various factors, including population growth, expansion of land for agriculture such as tobacco production, and commercialisation of forest products, have contributed to deforestation in Kahama District. The literature review given in Chapter 2 further alludes to these factors and many others as causes of deforestation, not only in Tanzania, but also in many other developing countries. While these may have played an important role in the deforestation process, they should not be blamed as the principal causes. There are more important underlying factors which, if not addressed properly, will continue depleting the nation's forest resources.

Barraclough and Ghimire (1994?) observe that deforestation in Tanzania is driven primarily by public policies that stimulate agro-export expansion, commercial logging for short-term profits and massive land alienation. Tanzania's desire to develop with a strong dependency on the agricultural sector, and the need to earn foreign exchange to meet her external debt obligations have led to over-exploitation of land and its resources causing massive deforestation. This chapter reviews some of the policies which have had a bearing on deforestation. It analyses both the colonial and post-independence policies related mainly to agriculture and the role of the structural adjustment programme in the deforestation process since the 1980s.

Review of Government Policies and their Implications on Forest Resources

Much of the contemporary policies in Tanzania is a reflection of the colonial period and has inherent weaknesses characteristic of the colonial policies. Misana, Mung'ong'o and Mukamuri (1996) observe that the agricultural sector in the Southern African region, including Tanzania, is still dominated by colonial agrarian structures and is highly cash crop oriented based on smallholder and large-scale farming. These colonial agrarian systems have been reinforced by post-independence agricultural policies which, like their predecessors, have emphasised cultivation of export crops of high incentives (in terms of producer prices) such as tea, coffee, tobacco, sisal and cotton in order to generate foreign exchange. All these have had a negative impact on forest cover, accounting for the large-scale deforestation and land degradation which has and continues to take place not only in Tanzania but in the whole Southern African region.

Colonial Policies

Analysis of the impact of colonial agricultural policies needs to be done within the context of the integration of national economies into the world market which led to intensification of agriculture and subsequent clearance of large expanses of forests and woodlands. When Tanganyika was annexed by the Germans in the late nineteenth century, their main focus was on increasing agricultural production in order to meet market demands of the expanding European industries. They thus promoted expansion of plantation crops such as coffee, tea and rubber in the highlands, which led to the clearing of the moist tropical forests. Other densely forested areas were also cleared for sisal production. White settlers alienated land in the highland areas which had a pleasant climate and established export crop plantations. At the same time, African peasants were coerced to produce for the market and especially for export.

When the British took over the country from the Germans after the First World War, the same processes continued. There was expansion of plantations producing export crops particularly in white settler areas, while the African peasants were increasingly being coerced to grow cash crops. In the drier areas, wooded areas were cleared for cotton and tobacco, and an ill-fated major groundnuts scheme was introduced in central Tanzania, then Tanganyika. While some peasants became involved in export crop production, many others expanded maize and food crop production for the market in order to pay taxes and purchase necessities (Barraclough and Ghimire 1994?). What emerged during the late nineteenth and early twentieth centuries was a dual economy comprising a relatively developed European sector and an underdeveloped African sector (Misana, Mung'ong'o and Mukamuri 1996).

The integration of the national economy into the world market led to the intensification of agriculture in both commercial and smallholder farms to meet market demands for export crops. Such intensification led to accelerated conversion of forests and woodland areas to crop and pasturelands. The increased demand for fuel for tobacco curing further aggravated the clearance of woodlands. Infrastructure development, including construction of roads and railways and provision of port facilities, took place to reinforce the export drive of colonial governments. Many changes also took place in the institutional arrangements for the control of land and natural resources. Land alienation policies were enforced, which led to much of the land, especially the more fertile land, being reserved for European settlers while the African peasants occupied the less fertile marginal lands. Thus by 1956, some 40% of total land under cultivation in Tanzania was alienated to settlers (Mbilinyi 1988).

The British colonial government also embarked on a land reclamation programme in the 1940s in the name of development. In the implementation of this programme, land that was previously infested by tsetse fly in the Miombo woodlands was reclaimed by the clearing of the woody biomass and used for resettlement and agriculture. By 1952 the tsetse flies had almost been eliminated in the cleared areas, and regenerating bush was slashed to ensure that the areas did not revert to woodland again.

The effects of all these policy drives and programmes were severe and very widespread. Extensive areas of forests and woodlands in such areas as Shinyanga, Dodoma, Morogoro and the southern highlands were deforested and reduced to open vegetation types or what Gillman (1949) termed as cultivation steppe. Thus generally, the pattern of deforestation that took place in Tanzania during the first half of the twentieth century can be explained by the German and British colonial policies which have left a landmark in regions like Shinyanga and Dodoma until today.

Post-independence Policies

Tanzania (then Tanganyika) got independence from the British colonial rule in 1961. With independence, she also inherited an agrarian structure that was highly cash-crop oriented, and an infrastructure that had been developed to support agricultural production for the world market. This agrarian system was reinforced by policies that followed later. In 1967, for example, Tanzania proclaimed a rural development policy "The Arusha Declaration" which laid the foundation for socialist development, with emphasis on self-reliance, agriculture and the

importance of the peasant farmer. The aim was to develop an efficient, socialist agricultural sector based on the production of food crops both for national consumption and export, as well as cane crops for export and internal use.

Tanzania's development strategy has, since 1967, put emphasis on increased agricultural production of crops with export potential by smallholder farmers in the villages. Tobacco, cotton, coffee, tea, among others, were chosen since the Second Five-Year Development Plan as priority crops whose production needed expansion because they were the country's foreign exchange earner. This was reinforced by the agricultural policy of 1983. While crops like coffee and tea, require more intensive methods of cultivation, tobacco is grown on a shifting cultivation system and is based on a heavy exploitation of the natural forest resource. Therefore, its effects on the environment are more pronounced than the other cash crops.

Until today, tobacco is becoming increasingly important as an export crop in the Mimbo zone in central and western Tanzania. More than 60% of the country's tobacco is produced in these areas and about 84% of the tobacco produced in the country is exported (Misana 1988). Only 16% is consumed locally. Growth in output has been recorded in all tobacco producing areas, including Kahama District (see table 11), while areas under cultivation have also increased. Between 1985/86 and 1991/92, for example, the area under tobacco cultivation increased from 228,000 ha to 1,374,000 ha, respectively (Shechambo and Kulindwa 1995). The largest increase was in 1990/91 season when a change of 112% was recorded. This shows how important the crop has become, but this has also been accompanied by heavy losses of woodlands for land and fuelwood.

During the 1970s, the government of Tanzania embarked on a villagisation programme which aimed at fostering the objectives of the Arusha Declaration. The programme was meant to provide rural people with amenities such as water, sanitation, schools and housing. It also aimed at facilitating the introduction of modern agricultural inputs, tools and practises along with better marketing and co-operative organisation. The programme involved resettling people in Ujamaa villages, which to some extent accelerated deforestation as the new settlements required construction materials and needed large amounts of fuelwood in concentrated areas that previously had been gathered by widely disposed smaller groups (Barraclough and Ghimire 1994?). Planning for the villages, however, was often inadequately done leading to establishment of some villages, cultivation and heavy grazing in marginally suitable areas. All these led to extensive loss of forest resources and contributed to the degradation of land in the form of soil erosion.

Since the late 1970s, Tanzania has been caught up in an economic crisis fuelled by deteriorating terms of trade and external shocks such as higher oil prices, fluctuating exchange rates and higher interest rates. The crisis was partly a result of the world economic downturn, partly the result of regional events such as break up of the East African community, a war with Uganda and two severe droughts, and partly the result of development policies pursued at that time (Reed 1996). It is argued by Reed that industrial development had been over-emphasised at the expense of agriculture, and government intervention in the economy had been excessive. At the international level, prices of major commodities such as timber, cotton, groundnuts and rubber fell significantly in the world market in the 1980s. This was accompanied by the rising costs of

debt repayments and interest charges. Squeezed between these two vices and being a predominantly agrarian country, Tanzania had no alternative but to strive to produce more agricultural output for the international market. 95% of the exports in 1990 were primary commodities, mostly agricultural, while debt service was estimated to be one-fourth the value of her export of goods and services (Barraclough and Ghimire 1994?).

The drive to break foreign exchange constraints on economic growth by using agricultural commodities as exports, and the need to meet the financial requirements of the industrialised country creditors has meant expansion of agriculture into even marginally suitable areas. This has led to overexploitation of the nation's natural resources, forcing the country to pay the hidden costs of increased environmental damage. Extensive rather than intensive agricultural practices which are common in rural Tanzania have caused a heavy toll on forest and woodland resources, resulting in their depletion in some parts. Forest reserves have also been equally affected as it has been shown in the preceding chapters. Price reforms brought about by the structural adjustment programme (SAP) have further encouraged increased land clearance as new land is opened up for cultivation. Thus as observed by Barraclough and Ghimire (1994?), the principal impetus to deforestation in Tanzania has come from public policies and world markets. This has further been aggravated by the current world economic order, with imbalance of payments and the heavy burden of debts that the country shoulders. This means that the problem of deforestation is a manifestation of a much larger development crisis than just a mere struggle for survival by the rural poor.

The Role of the Structural Adjustment Programme in Deforestation

Tanzania adopted the structural adjustment programme in 1986, which was a donor sponsored Economic Recovery Programme (ERP). Prior to that, she pursued her own recovery programmes, including the National Economic Survival Programme (NESP) in 1981 and the Structural Adjustment Programme (SAP) in 1983. The overall aim of the new programme was to achieve sustainable growth in real income and output. Specifically it aimed at rectifying severe macro-economic problems including worsening balance of payments, falling export earnings, mounting debts and declining economic growth (Reed 1996; Bagachwa et al. 1995). The ERP required the government to allow market forces take command of the economy. Attempts were made to encourage production of food and cash crops through better prices, improved product and input marketing, and in increased budget for agriculture (Reed 1996). The balance of payments deficit was to be reduced by devaluation, export incentive schemes and foreign exchange liberalisation.

Following the ERP, Tanzania has, since 1986, implemented market-oriented policies. These include pricing, privatisation of major sectors of the national economy, removal of state monopolies, restructuring of labour markets, and formation of domestic capital markets. The pricing policy has mainly concentrated on the removal of price controls on all consumer goods previously regulated by the government, and raising of producer prices for export crops in real terms. Subsidies on inputs like fertilisers have been removed while prices of export crops like cotton, tobacco, coffee and tea have increased. World Bank figures show that prices for coffee and cotton increased by 25% in real terms between 1990 and 1993 (Reed, 1996). According to

Bagachwa et al. (1995), producer prices of major agricultural exports generally increased by 200-400% between 1985 and 1992.

The liberalisation of markets and trade has seen the removal of trade and market restrictions, both internally and internationally. This has encouraged increased production and export of non-traditional crops in recent years, including flowers and even charcoal. Kulindwa and Shechambo (1995), making reference to statistics of the 1993 economic survey, report that exports of charcoal for 1992 were worth Tsh. 19,400. There has also been a dramatic increase in timber exports from 2500 tonnes in 1986 to 33,000 tonnes in 1989 (Bagachwa et al. 1995). Market reforms have in addition given rise to aggressive marketing and increased trade for tobacco and tea by private firms, resulting in expansion of production.

The effects of the liberalisation policy have been augmented by the exchange rate adjustments where devaluation of the shilling has tended to encourage exports and discourage imports. On budgetary, monetary and credit policies, moves have been made to reduce government expenditure and control inflation by limiting the growth of money supply. The latter has resulted in reduction in credits and high interest rates.

The net effects of these policy reforms under the ERP are many and diverse. Agricultural output and exports have increased significantly within the last 10 years. For example, the favourable prices for tobacco have led to a 13% increase in the area under this crop between 1985 and 1992 (Bagachwa et al. 1995). Shechambo and Kulindwa (1995) further show that fire-cured tobacco showed a consistent increase averaging 71% in area cultivated between 1995 and 1992. The largest increase of 112% was recorded in 1990/91. Areas under cotton cultivation have also increased significantly. Other records show increases in exports of forest products from 3,174 m³ in 1980 to 25,651 m³ in 1991 (Kulindwa and Shechambo 1995). Exports in hardwood timber increased from 76 tonnes in 1983 to 13,681 tonnes in 1985 and 127,263 tonnes in 1990 (URT 1994).

While agricultural outputs and exports have increased significantly over the years, the removal of subsidies on inputs and consumer goods has led to soaring prices of fertilisers. Between 1990 and 1992, prices of fertilisers increased by around 300% (Bagachwa et al. 1995), making them unaffordable to many small-scale farmers. In addition, the devaluation of the shilling has led to increased prices of petrol, diesel, kerosene, liquefied petroleum gas as well as electricity. Such price increases have heightened the dependency on fuelwood (both firewood and charcoal) which is readily available and affordable by the majority of the people in both rural and urban areas. At the same time, reduced government expenditure has meant falling expenditure on natural resource programmes including reforestation and extension.

All the above effects have had a negative bearing on the environment. Although no detailed studies of the processes have been undertaken, available evidence suggests an increase in deforestation overtime. This is mainly a result of clearance for small-scale and commercial agriculture; felling for domestic and agricultural fuelwood, charcoal, building poles, and exports; low rates of reforestation and a lack of monitoring and implementation capacity (Reed 1996). Higher crop prices are more likely to increase land clearance as new land is opened for cultivation. At the same time, increase in price of inputs relative to outputs may induce farmers

to put more land under cultivation to compensate for loss in returns. This would lead to more extensive systems of cultivation, further driving woodland clearance.

Extensification is necessary for small farmers because fertiliser for intensification was previously not available, but now it is too costly (Reed 1996). The farmers' purchasing power has been eroded by high consumer prices and lack of credit for agricultural inputs. But even for commercial farmers, land has become cheaper than the inputs such as fertilisers and machinery. Thus many have opted to increase the area cultivated rather than buy more fertilisers and machinery to intensify cultivation. Export crops that are more detrimental to the environment are cotton, sisal, and tobacco. These not only erode the fertility of the soil and require a lot of inputs but also deplete woodlands as a result of clearance of new farms and heavy fuelwood use in the case of tobacco.

The increases in energy prices and the lack of economical energy alternatives for both domestic energy and tobacco curing have led to increased demand for fuelwood. This, together with a dramatic increase in timber exports, has contributed to an increase in the rate of forest exploitation. Fuelwood use is likely to remain the dominant source of fuel for urban and rural people and for tobacco curing. Therefore, unless efforts are made to step-up reforestation, deforestation is likely to increase unabated.

Available statistics show that between 1986 and 1992, per capita income increased 6% in real terms (Reed 1996). However, despite such an increase, poverty is likely to increase, at least in the short-term. The concentration of economic power resulting from liberalisation and the removal of fertiliser subsidies are likely to increase rural poverty leading not only to over-expansion of cultivation but also to commercialisation of forest products, as households look for alternative income sources.

From the preceding discussion, it is evident that deforestation is likely to continue at unprecedented high rate under the structural adjustment programme. The macro-economic policies being implemented under SAP are putting enormous pressure on the use of land and extraction of natural resources, aggravating the deforestation process. Yet programmes designed to conserve the natural resources cannot be effectively implemented because of reduction in government expenditure on natural resource management, extension services and reforestation. Thus Tanzania has been caught up in a dilemma of trying to achieve higher economic growth rates translated into improved standards of living for individuals and the nation as a whole, and minimising damage to the environmental resource base supporting this growth. The hidden costs of increased environmental damage that Tanzania is likely to pay are so great that one wonders whether it is worthwhile to continue implementing SAP under the present conditions.

7. Policies and Strategies to Deal With Deforestation

The preceding discussions have shown that deforestation is a serious problem in Tanzania and that its pace is likely to be accelerated by current moves to improve the economy of the country and to bring about development. Definitely, the current trend of deforestation needs to be reversed in order to sustain both the present and future demands of forest products while at the same time preserving the natural heritage - the forest resources. This chapter reviews efforts that have been or are being made to protect the forest resources and slow down the pace of deforestation both nationally and in Kahama District.

National Policy on Forest Resource Conservation and Afforestation

Management and conservation of forest resources in Tanzania are guided by the National Forestry Policy, which is more inclined towards control and protection of forest resources than to sustainable utilisation. One of the provisions of the 1953 Forestry Policy is to demarcate and reserve in perpetuity, for the benefit of present and future inhabitants of the country, sufficient forested land or land capable of afforestation so as to preserve or improve local climates and water supplies, stabilise land which is liable to deterioration, and provide a sustained yield of forest produce of all kinds for internal use and also for export. The utilisation of forests under this provision is, however, limited to commercial exploitation.

The major weakness of this policy is that conservation efforts are directed to forest reserves. Forests outside the reserve areas have been neglected over the years causing significant deforestation and creating fuelwood scarcity. Even the draft Forestry Policy of 1994 does not seem to pay any attention to the public forests. Only species of economic value like *Pterocarpus angolensis* which are found in public forests are catered for by the two policies.

The forest reserves, have often been a source of conflict between the government and surrounding local communities who encroach on these resources due to pressure and depletion of resources in public lands. The Kahama case is a clear evidence for this. As observed in Chapter Four, some forest reserves have completely disappeared because of encroachment. The inadequate government control of the forest reserves has resulted in their encroachment for settlement, agriculture, grazing and charcoal production. With reduced government expenditure on natural resources management under SAP, the situation is not likely to improve in the near future.

Village Afforestation Programme

The national village afforestation programme was initiated in the early 1970s as a strategic approach for improving fuelwood supply in rural areas and reducing pressure on environmental degradation. It was meant to provide enough fuelwood to the rapidly growing population as well as maintain a sound environmental condition for sustained agricultural production. This came out of the realisation that sources of fuelwood supply were depleting faster than expected. Therefore, the need for tree growing to meet basic needs for fuelwood and poles, while at the same time saving the country from the threat of desertification, was seen as an urgent undertaking (Kilahama 1988). The main objectives of the programme were: to plant and grow as many trees

as possible by individuals, schools, institutions and villages as well as urban centres (urban forestry); to improve natural woodland productivity through proper management and conservation of the existing natural forests, woodlands and trees; and to ensure efficient utilisation of the available forest resources (MLNRT 1989a).

Although the idea of encouraging the people in the rural areas to plant trees was conceived as early as 1972, the actual performance was monitored only as of 1975. By then, a total of 3,300 hectares had been planted with trees. A national afforestation campaign was launched in 1980 through the mass media to solve the fuelwood crisis. Slogans such as "Misitu ni Mali" (Forests are wealth) and "Usikate Miti Ovyo" (Do not cut trees indiscriminately) were used in the campaigns. The agricultural policy of 1983 also incorporated aspects of tree planting, with the aim of expanding the afforestation programme especially in tobacco growing areas. Thus by 1983, over 68,000 hectares of woodlots had been established by villages, schools, government and NGOs (MLNRT 1989a). This means an average afforestation of about 6500 ha/year, which is relatively low. By 1989, about 80,000 hectares of scattered woodlots had been established (MLNRT 1989a). Annual seedling distribution was 15 to 20 million over a ten-year period, up to 1989. About 560 nurseries were in operation and more than 10,000 schools had planted trees.

Despite the establishment of woodlots at community level, the survival rate of the planted trees was very low, averaging between 40 to 50%. The programme had, since its launching, relied on the participation of villages and NGOs in tree planting. The villagers demonstrated a growing awareness of wood scarcity and were increasingly recognising the need to take action. However, in areas like Shinyanga, Mwanza, Dodoma and Arusha Regions, the situation was still critical or worsening, with the participation of the villagers being very low and discouraging. Very little noticeable success in the implementation of the programme has been achieved in communal woodlots (MLNRT 1989a). Some success, however, has been achieved by individual planting, schools and institutions. Thus, generally, despite the government's efforts, the overall impact of village woodlots on fuelwood supply has remained marginal, while forests and woodlands have continued to dwindle due to population pressure.

Tree planting in Kahama District has been rather low (table 14). On the average, about 69 hectares were being planted with trees annually. However, efforts to plant trees in recent years have been thwarted by lack of funds on the part of the Forestry Department to run the nurseries. At present, no more nurseries are being run by the Department. However, villagers, schools and NGOs are encouraged to establish their own nurseries.

Table 14. Tree Planting in Kahama District¹, 1987/88 - 1991/92

Year	No. of seedlings	Area planted (ha)
1987/88	180,000	85
1988/89	93,000	85
1989/90 ²	26,000	22
1990/91	103,000	95
1991/92	131,000	60

¹ Includes the new Bukombe District.

² Only small amount of money was allocated.

Source: District Forest Office

The HASHI Project in Kahama

The HASHI (Hifadhi Ardhi Shinyanga) project in Kahama was initiated in 1987, but actual activities started in 1988. Their activities were initially concentrated in two divisions, Isagehe and Kahama town. Dakama Division was only lightly covered, mainly through support to the youth economic group and women group. Since 1993, however, the activities have been expanded to Msalala and Dakama Division following IFAD's joining hands with HASHI. Mweli Division, which has been mostly affected by deforestation, however, is not covered by the project. In Dakama Division, HASHI works hand in hand with Kahama District Rural Development Programme (KDRDP) particularly in Ukune, Chambo, Idahina and Kisuke Wards, with a total of 16 villages covered, four in each ward. In 1994/95, the project covered a total of 38 villages.

The programme initially dealt with extension in relation to conservation - awareness raising, agroforestry and insitu conservation. At present, however, the project activities have been expanded to include afforestation, strengthening extension, range management, bee-keeping and land-use planning. Afforestation activities have concentrated on establishment of nurseries, tree planting, agroforestry and soil conservation through insitu conservation. Tree planting and agroforestry have been important activities undertaken by HASHI. They have mostly been raising seedlings and planting trees in project areas. Other seedlings are distributed to individuals and groups including institutions such as schools. The total number of seedlings raised up to 1992 were 1.165 million. Species raised include both exotic and indigenous such as *Lonchocarpus capassa* (Mipalapala), *Acacia polyacantha* (migu), and *Acacia nilotica* (mihale). Other species are *Albizia lebeck*, *Casuarina equisetifolia*, *Gmelina arborea* and *Pithecelobium dulce*.

In 1988/89 a total of 88 ha were planted with trees, 25 in Mondo, 60 in Mbulu, one in Isaka and two in Mpera. Mwendakulima village, though outside the project area, planted 10 ha with trees in 1989/90. Schools have also been involved in establishment of nurseries and tree planting. Igunda primary school, for example, have their own nursery, and they sell seedlings to individuals from nearby villages. In 1996, the school was number one in school competition on environmental conservation.

Insitu conservation and agroforestry have been concentrated in Isaka and Mbulu. Enrichment planting has also been introduced in these areas. Until 1992, 480 hectares had been conserved. Out of these, 120 hectares were agroforestry and enrichment planting. Some villages have also been conserving their own village forests. Penzi village, for example, is involved in traditional management of its own woodland area. Mpera village, on the other hand, demarcated a conservation area in 1991 after they had an animation seminar.

Range management activities include formation of village grazing associations and demonstration in the management of pasture areas and preparation of fire breaks. So far, there are 21 associations which have already been formed. Other activities include improvement of water sources for livestock. Bee-keeping activities focus more on encouraging people to use modern beehives.

Land-use planning activities have concentrated on survey of land and village boundaries, and soil survey classification. Other activities include soil and water conservation for soil erosion control. Both mechanical measures such as construction of contours in schools and villages, and biological measures are used for soil erosion control.

HASHI has also been involved in the formation of ward and village environmental committees. The formation of these committees has been necessitated by the problem of environmental degradation which is becoming widespread in the district and the need to protect and safeguard the environment. Already, ward and village committees have been established in Dakama Division under the programme of insitu conservation. The exercise is still on-going where the committees have not yet been formed.

Community/Individual Efforts in Woodland Management

Apart from activities being undertaken by the HASHI Project and the Forest Department, a number of villages and individuals have been involved in woodland management in order to preserve the environment. Makongolo village, for example, has demarcated all hilly areas for conservation since 1994. They have village by-laws which prohibit people from cutting trees in the conservation areas. Anyone caught is fined one goat or shs. 3,000/= . Traditional guards (Wasalama) patrol the areas during the day to ensure that there is no encroachment.

Some individuals have also set aside small areas for conservation purposes. Of particular interest is a farmer in Kawe-Kunelela village - Mr. Sayi Golani, who practices insitu conservation. He has stratified his land, which is approximately 121 hectares, into farm and conservation areas. 24 hectare of the farm area is used for rice cultivation. Previously the land was being used for grazing, while people from Kisuke village were coming to cut trees from the woodland area. Since 1988, when Mr. Golani bought this land, he demarcated the woodland area for conservation and prohibited tree cutting from the area. Today the area has a dense stand of trees (Plate 18), mostly of *Combretum sp.* and *Terminalia sp.* Other species include *Afzelia quanzensis*, Mikurungu, Mlandalanda, Mhoja Msana and Mdati. A few *Brachystegia spiciformis* and *Pterocarpus angolensis* are found on a hilly area behind the homestead.

The decision to set aside a conservation area was his. However, currently he receives advice from HASHI. The farmer also has plans to plant more trees in the area. Some of the major problems that he is encountering are encroachment for fuelwood by people from nearby villages and fire burning. People from nearby villages set fire to the woodland for hunting purposes and honey gathering. No fires were, however, experienced this year because of awareness raising, mainly by the HASHI Project.

Implications for the Future of Woodland Resources in Kahama District

Although efforts are being made at both district and community level to plant trees and conserve the woodland resources, the rate at which this is done is rather low. The rate of replacement of trees through tree planting is very low compared to the rate at which trees are being felled for various purposes. The situation is worse in the tobacco growing areas where no efforts are being made to plant trees for fuelwood for tobacco curing. The Tobacco Board has not taken any initiative to encourage tobacco farmers to plant trees despite the fact that tobacco growing is one of the leading factors for deforestation. Tree planting has only been done in Iringa, Tabora and Urambo Distircts.

Plate 18. Part of Mr. Sayi Golani's conservation area in Kawe-Kunelela village, Kisuke Ward. The Woodland is dominated by *Terminalia* and *Combretum* species (Photo by S. Misana, August 1996).

Kahama's experience in forest conservation is not an isolated case. At national level, URT (1989b) observed that there has been little systematic management of the natural forest resources for fuelwood which is the main forest product. Even forest reserves are marginally managed, if at all, due to lack of funding and sufficient staff. As a result, they are encroached upon due to high population pressure for shifting cultivation, grazing and logging, leading to their depletion in some parts. Already, Isaka, Unkune and Ukamba forest reserves in Kahama District have been depleted and more are on the way to being depleted. The overall impact of village tree planting on fuelwood supply has still remained marginal. Even individual tree planting is still scattered, with very little impact on fuelwood supply. Many people still depend on natural woodlands for their supplies.

Without concerted and integrated efforts to arrest deforestation, the future of the woodlands in Kahama is highly questionable. What will happen to these woodlands 10 years from now at the current rate of deforestation with very little intervention to stop or minimise it? Can the remaining resources sustain the present and future demands for forest products and at the same time conserve the environment? These and many other questions need to be considered in efforts to serve the woodlands in Kahama from total destruction.

8. CONCLUSION

Deforestation is a major environmental problem affecting many parts of the country. Available evidence indicates that it has been accelerating at a very rapid rate. Large tracts of land have been deforested, exposing the land to further environmental damage. There is encroachment on closed forests while woodlands are increasingly being converted into non-forested lands. Deforestation has not been on only non-reserved public forestlands. Forest reserves have equally suffered in the past thirty years. The growing demand on forest resources is a threat to the future existence of these forests.

The Kahama case study as presented in this report is a vivid example of how rapidly the forests are disappearing in Tanzania. The situation in Kahama shows that extensive areas of woodland have been completely deforested while in some areas, the woodland has been considerably degraded. Many of the woodland areas have been converted into cultivated land or grassland interspersed with a few scattered trees and shrubs. Some forest reserves have completely disappeared while others are being threatened. Areas which in the early 1970s were covered by dense woodlands are now completely devoid of trees. More data, however, is required to show the extent of the problem and the rate at which it has been occurring.

The causes of deforestation in Kahama District as elsewhere in Tanzania are multiple and complex, but all are a result of human development. The leading and more direct causes are settlement and expansion of agriculture, charcoal production, and tobacco cultivation and curing. Other factors though not very significant are uncontrolled bush fires, timber production, mining and breakdown of the traditional management system. These factors interplay in the process of degrading the woodland resources and/or converting them into non-forested lands.

A careful analysis of these factors, however, shows that they are a result of survival strategies by the local people. Poverty is fast driving the majority of the people into the woodlands in attempts to eke out a living. In so doing, they are clear-felling the woodland for agriculture through the shifting cultivation system. The people also see a chance to profit by selling wood or charcoal in a commercial market. So they fell live trees wantonly, not even sparing the forest reserves.

Seen from another angle, human population growth is also a major factor in the deforestation process. The rate of population growth in Kahama District is more than twice the national average, and is mainly a result of migration. Many people who have been displaced in other parts of Shinyanga Region due to land degradation and drought conditions have come to Kahama to secure a livelihood. They have not only settled on woodland margins, but have encroached deeper and deeper into the woodlands, causing vast tracts of virgin forest to be cleared and disturbed.

The results of this study have also shown that deforestation is intricately related to the world economy. The integration of peasant producers and the national economy into the world market, which began during the colonial period in the late 19th century, led to the expansion of agriculture in order to produce export crops for the world market. Tobacco cultivation in Kahama District is a result of this integration, and is causing extensive deforestation because of the shifting cultivation system used and the heavy demand for fuelwood for curing the leaves. Because of its destructive effects to the woodlands on which its continued production is heavily dependent, the crop is not sustainable. Thus, one wonders why the government should continue encouraging people to grow the crop. However, all this is because of the drive to earn the much-needed foreign exchange to service the nation's debts, which amount to billions of dollars.

The situation has been exacerbated by government policies, which have often encouraged unsustainable resource utilisation and management. A good example is the agricultural policy which emphasises cultivation of export crops, including tobacco, in order to generate foreign exchange. The policy reforms under the structural adjustment programme have further aggravated the problem of deforestation.

Taking into consideration all the arguments that have been put forward in relation to the causes of deforestation in Kahama the following observations may be made:

- 1) Population growth caused mainly by immigration is an important factor in relation to settlement of the immigrant population and the need for agricultural and grazing land.
- 2) Migration has led to the breakdown of the traditional management system of the Sumbwa people.
- 3) Market exploitation of forests particularly for charcoal has been done haphazardly and attempts by the government to regulate this activity through licensing and fees have failed to curb the illegal charcoal business.
- 4) The export drive and the need for income has led to the expansion of tobacco and cotton cultivation causing rapid depletion of woodlands.
- 5) Current efforts to address the problem of deforestation at national, district, community and individual levels are inadequate.
- 6) There has been inadequate government control of forest reserves resulting in their encroachment for settlement, agriculture and charcoal production.
- 7) Price incentives to encourage people to grow more tobacco and removal of subsidies on inputs caused by SAP have led to extensification rather than intensification of agriculture, further exacerbating woodland clearance.
- 8) The principal impetus to deforestation in Tanzania has come from world markets and public policies including SAP.
- 9) Deforestation in Kahama and in Tanzania generally is closely linked to the pattern of economic development both at national and international levels.

From the above observations, the general conclusion that may be derived is that deforestation in Tanzania is a complex process. It is a reflection of the entire pattern of world development where the less developed countries have to overexploit their natural resources to serve the interests of the developed industrialised countries. To blame the farming systems, expansion of agriculture, commercialisation of forest products, poverty and population growth as being the principal causes of deforestation is to do injustice to the people and the problem itself. These are only sub-processes of a much broader style of development that characterise most developing countries, and are reinforced by trends in the world market and public policies.

The challenge that is ahead of us is how to disentangle ourselves from this skewed pattern of development. Can the concept of sustainable development as detailed in the Brundtland Commission and AGENDA 21 be an answer to this formidable problem? What should be done to rehabilitate the deforested areas and restore their productivity and environmental contribution?

Can science and technology help to stop the process of deforestation and change the development scenario? These and many other questions need to be looked at more seriously in order to safeguard our finite resource base on which the development of the country depends.

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