

UTILIZATION AND MANAGEMENT PATTERNS OF FOREST  
RESOURCES: A CASE STUDY OF WOKHA DISTRICT, NAGALAND.



BY

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IN FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY IN GEOGRAPHY  
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NOVEMBER, 2013

*Dedicated to my Parents*

*(For the sacrifices they have made to make me what I am today)*

# **NAGALAND UNIVERSITY**

November 2013

## **DECLARATION**

I, N. Renthungo Jungio, hereby declare that the subject matter of this thesis entitled “Utilization and Management patterns of forest resources: A case study of Wokha district, Nagaland” is the record of work done by me, that the contents of this thesis did not form any basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Nagaland University for award of the degree of Doctor of Philosophy in Geography.

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### **CERTIFICATE**

The thesis presented by Mr. N. Renthungo Jungio, M.Sc., bearing Registration No. 280/2007 (24<sup>th</sup> November 2006) embodies the results of investigations carried out by him under my supervision and guidance.

I certify that this work has not been presented for any degree elsewhere and that the candidate has fulfilled all conditions laid down by the University.

(WANGSHIMENLA JAMIR)

Supervisor

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(N. Renthungo Jungio)

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**UTILIZATION AND MANAGEMENT PATTERNS OF FOREST  
RESOURCES: A CASE STUDY OF WOKHA DISTRICT,  
NAGALAND.**

**Ph. D. THESIS ABSTRACT**



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The Research study was carried out with the main objectives to study the status of forest cover, to classify the types of forest resources and to study the utilization and management patterns of forest resources in Wokha district of Nagaland. The impacts of modernization and human activities on forest leading to problems of forest resources management were also examined so as to suggest suitable and improved management plans.

The Wokha district is the home of the Lotha Nagas and is located between 26°01' to 26°8' North latitude and 94°18' to 94 ° 27' East longitudes covering a geographical area of 1628 Sq.Km. The topography of the district is characterized by hill ranges and ridges dissected by seasonal streams with some valleys.

Purposive sampling method was adapted for the selection of eighteen sample villages to carry out the research study. Interviews and focused group discussions were conducted based on structured questionnaires which were complemented by observations made in the field.

The forest resources utilized in the study area were of two types, namely Timber and non-timber forest products (NTFPs). Apart from the use of wood for construction, making furniture and other household items, wood was mostly used as fuel for making fire because of the fact that the use of other sources as fuel for making fire was very less. The non-timber forest products consisted of leafy vegetables, meat of wild animals and birds, aquatic life forms, shoots, stems, flowers, fruits, insects, fungi, bamboo, rock, sand and mineral resources.

The traditional and socio-economic life of the people in the study area was also studied as these factors also influence the utilization of forest resources in many ways. The study showed that the pattern of utilization of forest resources varied depending on the location and proximity from the main commercial centre, i.e.,

Wokha town. It was observed that forest resources were mostly utilized for commercial purposes in the sample villages located near the main commercial centre which were facilitated by access to markets and good transportation and communication facilities whereas the absence of the same had led to the utilization of the forest resources mostly for domestic purpose in the villages located far from the main town.

It was observed that the traditional management practices are gradually declining as they are being replaced by modern management practices in the study area. Despite the prevalence of these management practices various factors such as increase in population, development in human resources and infrastructures, dominant practice of jhum cultivation, absence of markets, poor transportation and communication facilities, ineffective implementation of alternative livelihood schemes and ineffective implementation of various forest Rules and Acts have become a problem for effectively managing the forest resources and these have also contributed to the decrease in forest cover to a great extent in the recent times.

Since no study of this kind have been done before, the present study have brought to light the prevailing conditions with regard to the utilization and management of forest resources in Wokha district and thus this study can be the base for various researchers, academicians, students, NGOs, Administrators and policy makers.

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# CHAPTER-I

## Introduction

From the beginning of the human race, man has carried out certain economic activities utilizing the available substances and materials around him for his survival. Prior to their utilization of these substances and materials by man they were not considered as resources as they did not possess any functions and utility. According to Zimmermann, a 'resource' does not refer to a thing or a substance. Rather, it refers to the function which a thing or a substance may perform or to an operation in which it may take part. This function or operation is for attaining a given end, the end is only to satisfy the fundamental needs of a man or society (Ghosh, 2000). That is to say, a thing becomes resource by its function in relation to man. The development of civilizations and coming of the age of great discoveries and inventions man required better control over nature in order to meet the increasing needs of resources for development and exploration. With the passage of time the population increased triggering the need for tapping more resources for the ever increasing population and this was made possible with the development and advancement in science and technology which also helped in diversifying the types of resources with the findings of their functions and utility. The functionability of a thing differs from time to time and from place to place.

There are various opinions about the types of resources. Ghosh (2000) classified resources into three groups on the basis of control and utilization by individual, group or organization. They are (a) Individual resources that includes money, house, etc., and knowledge, power, culture, etc. possessed by an individual. (b) National resources that are utilized and controlled by an organization. These are forest, mines, industries, railways, air-ways, Government, etc., and (c) World

resources, which is the sum total of the resources of different countries. Among the various types of resources, forest resource is one among the important resources that give great service to the economic life of mankind. Forests have been useful to all classes of society and the more civilization advances the greater is the service they render.

Forests, which predominantly consist of plant community, form an integral part of the environment and are important for the conservation of biodiversity, water generation and prevention of Global warming. It also plays a vital role in providing great service to the economic life of mankind. Forests give us lumber for housing, biomass for fuel wood, pulp for paper, medicines and many other products that are utilized by the people to fulfill their daily needs throughout the world. Many forest lands are also used for mining, grazing, livestock and recreation purposes. Thus, forest is often termed as multi-purpose resource. Forest and forest products have profound impact on the socio-economic life of the people, particularly in areas where people have to depend greatly on forest and forest products for their livelihood. A. F. Hill has rightly observed that man obtains three great necessities of life from forests- food, shelter and clothing. Forest has different uses and functions and they are utilized accordingly by different sets of interest groups. Forests are crucial for the well-being of humanity. They provide foundations for life on earth through ecological functions, by regulating the climate and water resources and serving as habitats for plants and animals (Antonio, 2005).

Forests are also home to some of the World's poorest people. Almost 70 million people, many of whom are indigenous, live inside the forests. Another 735 million rural people live in or near forests and Savannas, relying on them for their fuel (Chomitz et al., 2007; World Bank, 2008). Man's dependence on forest and its

resources for his existence dates back to the beginning of the human race. Throughout evolution human species has had a close relationship with forest. Wood and other forest products have been important elements in the evolution of human culture (Oniandia, 2000). Use of Forest resources is concentrated on products such as fuel-wood, leafy vegetables, meat, honey, wild fruits, fishes, fodder, medicines, house building materials, etc. Human beings are heavily dependent on the forest resources for their survival and economic growth. It does not matter whether a man is rich or poor; he is dependent on the forest resources in one way or the other which plays a very important role in his way of life. The basic needs for man's survival such as food, shelter, water, good quality air, etc. are obtained from the forest and its resources. Forest is one of the most accessible productive resources available to the rural people which provides a source of income and subsistence living.

Products derived from the forest can be differentiated into two broad categories i.e. timber and non-timber forest products (NTFPs). These non-timber forest products include all biological materials other than wood which are extracted from natural forests for human use as well as services derived from forests and allied land use, they play a significant role in the livelihood of forest dwellers, communities living in the vicinity of the forest, as well as people at large in the immediate surrounding areas (Dattagupta et al., 2010). The non-timber forest products (NTFPs) serve a wide range of subsistence needs as well as providing opportunity for earning cash incomes. Used primarily for home consumption, but are also for sale and exchange, forest foods constitute the major proportion of the large number of NTFPs harvested, in terms of both species and values.

Forests do not only provide resources to human beings for their needs and survival but it is also the home of many species of fauna and flora who are a part of

the forest ecosystem and are equally important for maintenance of ecological balance. These varieties of fauna and flora species are collectively known as ‘biological diversity’ or ‘biodiversity’ in short. Biodiversity plays a vital role in maintaining natural balance in the ecosystem, it is important from the economic and cultural point of view and also for preservation and propagation of fauna and flora species. Biodiversity is an extremely important part of life on Earth. In evolutionary theory, it has become clear that the greater the diversity that exists within a family or genus, the more likely it is to survive environmental change. Thus, evolution depends on biodiversity<sup>1</sup>.

Climate change and forests are intrinsically linked. On the one hand, changes in global climate are already stressing forests through higher mean annual temperatures, altered precipitation patterns and more frequent and extreme weather events. At the same time, forests and the wood they produce trap and store carbon dioxide, playing a major role in mitigating climate change (Yiangou, 2009).

In spite of the multiple and significant roles that forest resources play, it has been observed that the forest resources are exploited randomly leading to various socio-economic and environmental problems regionally and globally. With the expanding human population pressure coupled with the requirement of resources for development, survival and livelihood, most of the forest lands are being converted into agricultural lands, settlement areas and degraded lands. The uncontrolled land conversion and unsustainable land-use practices of forest areas poses a potentially volatile environmental situation. Forest resource, which is considered renewable, has become a waning resource due to wanton destruction and unsustainable use. A satellite-based survey released by the UN Food and Agriculture Organization (FAO)

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<sup>1</sup> (<http://serendip.brynmawr.edu/exchange/node/1692>).

provides a more comprehensive picture of changes in the world's forests, showing forest area continued to decline between 1990 and 2005. The study showed that the rate of world deforestation, mainly the conversion of tropical forests to agricultural land, averaged 14.5 million hectares per year between 1990 and 2005. The net loss of forest area - in which losses of forest cover are partially offset by afforestation or natural expansion - totalled 72.9 million hectares between 1990 and 2005. The data also show that the net loss of forests accelerated, increasing from 4.1 million hectares per year between 1990 and 2000 to 6.4 million hectares between 2000 and 2005 (UN-REDD, 2012).

Taking into consideration the rate at which the forest covers are declining, formulation and implementation of certain sustainable approaches for the proper utilization and management of forest resources has become the need of the hour. The mistaken belief that trees have infinite capacity to regenerate themselves and forest resources are inexhaustible has resulted in the unregulated and extensive exploitation of forest resources. Consequence of this belief is the rapid depletion of forest resources and various environmental problems, which in the long run will ultimately threaten the existence of not only mankind but also all the living organisms whose needs mostly depend on forests. Thus, the study of forest resources based on accurate and updated information for effective and sustainable management has become important so as to secure the survival of forest ecosystem and enhance their environmental, socio-cultural and economic functions and facilitate a sustainable co-existence between the two entities i.e., man and forest.

### **1.1 Literature review**

In the vast area of literature a good number of scholars from various branches of subjects have studied and written about the forest and its importance. The scholars

studied the various aspects of forest and its resources and have recommended different management strategies to conserve the forest because of its multi-purpose role. Accordingly, study materials from various sources such as research journals, Government publications and documents, books, websites, etc. have been reviewed for carrying out the research.

Forest is a complex ecological system in which trees are dominant life forms. The word 'Forest' is derived from the Latin word 'Foris', meaning 'outside', the reference apparently being to a village boundary of fence. Thus, originally a forest must have included all uncultivated and uninhabited land. Today, there are more than 250 definitions of the term "forest." These definitions differ based on the emphasis or concerns of different people. A legal definition is different from an ecological definition. The perspective of the economist differs from that of a geographer. All definitions stress the importance of trees in the system and include places where tree cover ranges from 5% to as high as 100%<sup>2</sup>. Allen and Sharp, in their book 'An introduction to American Forestry', forest has been defined as 'a community of trees and associated organisms covering a considerable area, utilizing air, water and minerals to attain maturity and to produce itself, and capable of furnishing mankind with indispensable products and services (Roy, 1997). Forest is also defined as any land managed for diverse purpose of forestry, whether or not covered with trees, shrubs, climbers, or such other vegetations (Agarwala, 1990). According to the CDM of the Kyoto Protocol, a "forest" is an area of more than 0.5–1.0 hectares with a minimum "tree" crown cover of 10–30%, with "tree" defined as a plant with the capability of growing to be more than 2–5 m tall (Neeff et al., 2006). The FAO (Food and Agriculture Organization, 2010) has defined forest as land with tree crown cover

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<sup>2</sup> ([http://www.museum.state.il.us/muslink/forest/htmls/intro\\_def.html](http://www.museum.state.il.us/muslink/forest/htmls/intro_def.html)).



(or equivalent stocking level) of more than 10% and area of more than 0.5 hectare. The trees should be able to reach a minimum height of 5 m at maturity in situ.

Since time immemorial forests have met the needs of all living beings in one way or the other. People began life on this planet as forest dwellers. They were food gatherers and depended on the forest for all their needs: food, clothing, and shelter. They gradually became food growers, clearing a small patch in the forest to grow food. But they continued to depend on forests to meet a lot of their needs. Even today people depend on the forest for paper, timber, fuelwood, medicine, fodder, food, etc. Forests are also important for conservation of biodiversity, water generation and prevention of global warming (Kumar, 2001). Poulsen (1982) stated that forest have traditionally yielded a great variety of useful products. The production of fodder, food and typical of many African forests in the recent times also characterized forest in many other parts of the world in the past. The usefulness of forests is spread to commercial exploitation of forest for timber and other products, maintenance of birds and wildlife, maintenance of ecological balance, prevention of soil erosion, etc. Forests have been a source of raw material for buildings, transportation and communication; a source of food, and the fuel for cooking it; and – when forests are cleared – a source of land for farms and cities (FAO, 2012). Biologically-rich forest ecosystems provide shelter, food, jobs, water, medicine and security to more than 1 billion people, as well as regulate our global climate (UNEP, 2011). Forest resources also play important role from the economic point of view, the Food and Agriculture Organization of the United Nations (FAO) estimated that the forest industry contributed approximately US\$ 468 billion or 1 per cent of global gross value added to global GDP in 2006 (FAO, 2009). More than 2 billion people depend on wood energy for cooking, heating and food preservation (UNDP, 2000). Wood or timber is an important forest resource; it is used by all for various purposes such as fuel wood,

building materials, paper, plywood, etc. Njoroge and Muli (2011) studied the Economic and Social Significance of forests for Rwanda's sustainable development and stated that Wood is the principal source of energy in Rwanda, where forests accounts for approximately 84% of current primary energy use. 96.2% of all households use wood as a source of energy. The sale of wood products other than fuel wood also generated significant incomes to those involved. Forest products accounted for 1.1% of GDP in Rwanda in 1998.

Apart from timber the other important forest resources are the non-timber forest products (NTFPs). The NTFPs refer to the natural resources collected from the forest apart from timber of other industrial wood products that are used at household level for domestic, social, cultural or economic purposes (CIRUM 2012). FAO (1992) defined NTFPs as "non-wood forest products which include all goods of biological origin, as well as services derived from forest or any land under similar use, and exclude wood in all its forms. Non - timber forest products (NTFPs) are a very important aspect of the tropical forestry that cannot be overlooked. Medicinal plants – that cater for the health of over 80% of the human population in developing countries and about 25% of human population in developed nations, an estimate of over 4 billion people – are classified as part of the non-timber forest products (NTFPs), and are repositories of phytochemicals, which are useful for the development of pharmaceutical drugs and other therapeutic products (Lawal et al. 2010). The ministry of environment and forest Ministry of Environment and Forest, Government of India report (1999) estimated that about 400 million people in India are dependent on NTFPs in one way or the other, generating ` 20 billion as Government revenue. Of these, about 50 million of forest dwellers, most of the tribal, harvest substantial quantities of NTFPs for their subsistence and low volume trade (Dattagupta et al., 2010). Bhavannarayana et al., (2012) stated that Non- timber

forest product (NTFP) plays a significant role in the lifestyle of the forest dwellers of Sudikonda Range of East Godavari District. As per the obtained data, 38 different plant species were mostly extracted as NTFPs for food, fodder, fuel, medicine, household and commercial purposes. Of the widely exploited 38 species, 5 (13.5%) are food products, 4 (10.5%) are used as fodder, 13 (34.2%) are commercial, about 8 (21.05%) are used for household purpose, 2 (5.26%) are plants having medicinal properties and the rest are used as fuel.

Forest ecosystems capture and store carbon dioxide (Co<sub>2</sub>), making a major contribution to the mitigation of climate change. When forests are destroyed, over-harvested or burned, however, they can become a source of Co<sub>2</sub> emissions (Bodegom et al., 2009). Forests and forestry contribute to climate change mitigation by preserving and expanding carbon stocks in the forests (including above- and below-ground biomass, deadwood, litter, and soil), by producing renewable materials in order to substitute fossil fuel and materials for which production cost much fossil energy, and by storing carbon in harvested wood products (EUROPA, 2010). Forest sector is important in the context of climate change due to three reasons namely, i) deforestation, forest degradation and land-use change contributes to about 20% of global CO<sub>2</sub> emissions, ii) forest sector provides a large and low-cost opportunity to mitigate climate change, and iii) forest ecosystems are projected to be adversely impacted by climate change, affecting biodiversity, biomass production and forest regeneration. Climate is one of the most important determinants of forest vegetation patterns and it is likely that changes in climate would alter the configuration of forest ecosystems in India (PCI, 2011).

Forests are complex biotic communities, characterized by trees and encompassing much of the life on earth. They constitute the world's largest and most

important terrestrial ecosystem, and have the largest reservoir of plants and animals on land. Forests are one of the most biodiversity-rich habitats on Earth. According to Barrow (2005), Biodiversity is the diversity of different species together with the genetic variation within each species in a given area or ecosystem. Another definition given by Castri (1996) states that biodiversity is the ensemble and interaction of genes, species, and ecological diversity of a given place and time (Singh, 2008). UNEP (2001) defined Biodiversity as ‘the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems’ (Keating et al., 2009). Biodiversity exists at three main levels: (a) genetic diversity—the variety of genetic information that is contained in all living things and that varies within and between the populations of organisms making up single species or wider groups (b) species diversity—the variety of species on earth (c) ecosystem diversity—the variety of the earth’s habitats, ecosystems and ecological processes (Commonwealth of Australia, 2009). Biological diversity is essential not only for maintaining the ecological balance in the nature but also to meet a variety of human needs. A rich biologically diverse resource base expands the choice for a range of sustainable economic activity and hence increases the human welfare (Keating et al. in, 2009). Biodiversity supports economies and cultures. It forms the basis of our primary production industries, such as agriculture, forestry and fisheries, and provides services to those industries, for example by pollinating plants, contributing to soil health and recycling nutrients. Biodiversity is also the basis for the production of many other important human services such as medicines, and is fundamental to the culture of Indigenous peoples (Commonwealth of Australia, 2009).

In spite of the importance and services provided by the forests to man, over

exploitation of forest resources and unsustainable practices of Landuse has led to destruction of vast forest areas. Forests currently cover about 4 billion hectares, about 31 percent of the earth's land surface (FAO, 2010). A key message from the Global Forest Resource Assessment 2010 stated that, while the rate of deforestation and loss of forest from natural causes was still alarmingly high, it was slowing down. At the global level, it decreased from an estimated 16 million hectares per year in the 1990s to around 13 million hectares per year in the last decade. At the same time, afforestation and natural expansion of forests in some countries and areas reduced the net loss of forest area significantly at the global level. The net change in forest area in the period 2000–2010 was estimated at -5.2 million hectares per year (an area about the size of Costa Rica), down from - 8.3 million hectares per year in the period 1990–2000. However, most of the loss of forest continued to take place in countries and areas in the tropical regions, while most of the gain took place in the temperate and boreal zones, and in some emerging economies (FAO, 2011). As human population and economic activity have increased, so too has humans' ability to manipulate the natural world. This manipulation is most evident in the clearing of forests. Deforestation – the clearing of forests to use the land for other purposes or to leave it as unused wasteland – is one of the most widespread and important changes that people have made to the surface of the earth. Over a period of 5 000 years, the cumulative loss of forest land worldwide is estimated at 1.8 billion hectares – an average net loss of 360 000 hectares per year (Williams, 2002). Population growth and the burgeoning demand for food, fibre and fuel have accelerated the pace of forest clearance, and the average annual net loss of forest has reached about 5.2 million hectares in the past ten years (FAO, 2010). Forest loss has significant negative effects on soil quality, biodiversity, local livelihoods, and indigenous communities. It destabilizes local climate and weather by disrupting historical

hydrological cycles, albedo, and large-scale circulation patterns (Conservation International, 2009). Kissinger et al., (2012) in their study 'Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers' stated that Proximate or direct drivers of deforestation and forest degradation are human activities and actions that directly impact forest cover and result in loss of carbon stocks. Agriculture is estimated to be the proximate driver for around 80% of deforestation worldwide. Commercial agriculture is the most important driver of deforestation in Latin America (around 2/3 of total deforested area). In Africa and sub-tropical Asia it accounts for around 1/3 of deforestation and is of similar importance to subsistence agriculture. Mining, infrastructure and urban expansion are important but less prominent. Findings on global patterns of degradation indicate that (commercial) timber extraction and logging activities account for more than 70% of total degradation in Latin America and sub-tropical Asia. The report of National Remote Sensing Agency indicates that India is losing about 1.3 million hectares of forest cover every year (Kumar, 2001).

The negative influence of past use of forest resources, as well as the needs for continued use of these resources for future generations was already noted as early as the 17<sup>th</sup> century (Glacken, 1976 as cited in Wiersum, 1995). With the passage of time, the realization of the fact that forest and its resources are being randomly abused at a large scale leading to various environmental and socio-economic problems worldwide has in the past few decades led to the formulation and implementation of various management and conservation strategies of forest at the local, regional and world levels. In 1804 the German forestry lecturer Hartig described sustainability as follows: 'Every wise forest director has to have evaluated the forest stands without losing time, to utilize them to the greatest possible extent, but still in a way that future generations will have at least as much benefit as the living generation'

(Schmutzenhofer, 1992 as cited in Wiersum ,1995). This first definition was based on the principle of sustainable forest yield, with the main goal being sustained timber production, and it was assumed that if stands that are suitable for timber production are sustained, then non wood forest products will also be sustained (Peng, 2000 as cited in García and Diez ,2012 ).Though the concept of sustainability existed since the 18<sup>th</sup> century it was only in the 1980s and at the beginning of the 1990s with the Brundtland report (1987) and the Conference on Environment and Development held in Rio de Janeiro, Brazil, in 1992 (the so-called Earth Summit), respectively that the concept of sustainability began to increase in importance (García and Diez, 2012). The UN Brundtland Commission defines sustainable development as ‘Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs’ (UNCED: 41 in CIRUM, 2012). A recent definition of sustainable forest management was developed by ministerial conference on the protection of forest in Europe and adapted by FAO 1999, it states ‘Sustainable forest management is the stewardship and use of forest and forest land in a way, and at a rate, that maintains their Biodiversity, productivity generation capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local national and global levels, and that does not cause damage to other ecosystems’. Central to this definition is the aim to reach a balance between socio-economic demand for forest products and the conservation of forest and biodiversity (CIRUM, 2012).

Efforts and initiatives for conservation and restoration of forest from all corners of the world are being taken up and implemented. Various organizations, conventions and departments at the international, national and local levels have been instituted and laws and policies passed to check the random destruction and protection of forest ecosystem. The Convention on International Trade in

Endangered Species of Wild Fauna and Flora (CITES) is currently the only World-wide legal agreement that could be concretely used to control a part of the trade of illegally sourced timber. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The Convention on Biological Diversity is an International treaty that was adapted at the Earth Summit in Rio de Janeiro in 1992. The Convention has three main goals: conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising from genetic resources (Pettenella and Santi, 2004). The 1997 G8 Summit established an Action Programme on Forests to accelerate the implementation of the proposals for action of the Intergovernmental Panel on Forests (IPF). The Ministerial Conference on the Protection of Forests in Europe (MCPFE) is a high-level political initiative involving 40 European countries and the European Community, launched in 1990 to promote sustainable forest management in Europe<sup>3</sup>. The run-up to the 2002 World Summit on Sustainable Development in Johannesburg saw the formation of two international partnerships bringing together national governments, international institutions and civil society groups. They are the Asia Forest Partnership<sup>4</sup> and the Congo Basin Forest Partnership<sup>5</sup>, their objectives included tackling illegal logging. The 2003 United States President's Initiative against Illegal Logging aims to assist developing countries in combating illegal logging, illegal timber trade and corruption in the forest sector. It focuses on the Congo Basin, the Amazon Basin and Central America as well as South and Southeast Asia<sup>6</sup>. International agencies can also assist governments in rationalizing their national forest policy and legislative framework and in providing capacity building for better law enforcement. The Collaborative Partnership on Forests (CPF) is an

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<sup>3</sup> ([www.mcpfe.org](http://www.mcpfe.org))

<sup>4</sup> ([www.asiaforests.org](http://www.asiaforests.org))

<sup>5</sup> ([www.cbfp.org](http://www.cbfp.org))

<sup>6</sup> ([www.usaid.gov](http://www.usaid.gov)).



interagency partnership of 14 major forest-related international organizations, institutions and convention secretariats, which was established in April 2001 to enhance cooperation and coordination on forest issues<sup>7</sup>. Illegal forest activities were prominently exposed in FAO's State of the World's Forests 2001 report. Subsequently, the Organization has been carrying out various activities in support of countries' efforts to promote better forest sector governance<sup>8</sup>. International Tropical Timber Organization (ITTO) has a membership of 59 countries representing 80 percent of the world's tropical forests and accounting for 95 percent of the global trade in tropical timber. ITTO acts as a forum for debates on forest trade and sustainable forest management and also funds projects, some of which focus on forest governance and illegal trade<sup>9</sup>. Programme on Forests (PROFOR), a World Bank-hosted multi-donor initiative established in 1997 to implement some of the recommendations of the Intergovernmental Panel on Forests, aims at enhancing the contribution of forests to poverty reduction, sustainable development and protection of environmental services. Forest governance - and within it, forest policy and law enforcement - is on PROFOR's agenda<sup>10</sup>. The World Bank/WWF Alliance for Forest Conservation and Sustainable Use is a global partnership including governments, the private sector, and civil society. The Alliance's focus is on conservation and sustainable management of forest protected areas and forest certification<sup>11</sup>. In India, The Ministry of Environment & Forests (MoEF) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, coordination and overseeing the implementation of India's environmental and forestry policies and programmes. The broad objectives of the Ministry are: (a) Conservation

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<sup>7</sup> ([www.fao.org/forestry/cpf](http://www.fao.org/forestry/cpf))

<sup>8</sup> ([www.fao.org](http://www.fao.org))

<sup>9</sup> ([www.itto.or.jp](http://www.itto.or.jp)).

<sup>10</sup> ([www.profor.info](http://www.profor.info)).

<sup>11</sup> ([www.forest-alliance.org](http://www.forest-alliance.org)).

and survey of flora, fauna, forests and wildlife (b) Prevention and control of pollution (c) Afforestation and regeneration of degraded areas (d) Protection of the environment and (e) Ensuring the welfare of animals. These objectives are well supported by a set of legislative and regulatory measures, aimed at the preservation, conservation and protection of the environment. Besides the legislative measures, the National Conservation Strategy and Policy Statement on Environment and Development, 1992; National Forest Policy, 1988; Policy Statement on Abatement of Pollution, 1992; and the National Environment Policy, 2006 also guide the Ministry's work<sup>12</sup>. The Forest Survey of India (FSI) was created in June, 1981 with the objective of monitoring periodically (10 years cycle) the changing situation of land and forest resources and presents the data for national planning; conservation and management of environmental preservation and implementation of social forestry projects<sup>13</sup>. The National Biodiversity Authority (NBA) was established in 2003 to implement India's Biological Diversity Act (2002). The NBA is a Statutory, Autonomous Body and it performs facilitative, regulatory and advisory function for the Government of India on issues of conservation, sustainable use of biological resources and fair and equitable sharing of benefits arising out of the use of biological resources<sup>14</sup>.

## **1.2. Statement of the problem**

In spite of the role that the forest resources play in the socio- economic life of the people of Wokha district, sustainable utilization and management of the forest resources are rarely understood and practiced. For an agrarian economy like Wokha district, forest plays an important role in meeting the needs of the people, particularly

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<sup>12</sup> (<http://envfor.nic.in/modules/about-the-ministry/introduction/>).

<sup>13</sup> (<http://envfor.nic.in/fsi/fsi.html>).

<sup>14</sup> (<http://nbaindia.org/content/22/2/2/aboutnba.html>).

the rural population which accounts for about 78.95 percent (2011 census) of the total population. Practice of jhum cultivation has been the main economic activity apart from hunting, fishing and gathering of non timber forest products for use since time immemorial for the people of this region. Though forest areas were cleared for jhum cultivation and other land use purposes yet the impact on the natural environment was negligible as plenty of forest areas were available compared to the population and the rate of development during the forefathers' days. With the passage of time, population increased rapidly and modernization started to set in leading to demand for more land for development and settlement purposes which has resulted in the decrease in availability of arable land leading to the shortening of fallow period and ultimately resulting in the declination of forest cover. The random cutting down of trees and clearing of forest areas without any effective policies for conservation and management is the main factor for loss of forest cover in the district. Paving the way for the development of the region and trying to accommodate the needs of the ever growing population have taken its toll and have had adverse effect on the natural environment which not only threatens the ecological balance of the forest ecosystem but also can affect the survival and existence of men in the near future. Various environmental problems such as climate change, reduction in availability of water, accelerated soil erosion, increased landslide hazard, extinction of endemic species of flora and fauna, etc. have been reported from the study area which are all in one way or the other related to the ways in which the forest and its resources are utilized and managed in the region.

### **1.3. The study area**

The research study has been conducted in Wokha district of Nagaland which covers a geographical area of 1628 sq.km representing 9.82 percent of the total geographical

area of Nagaland. It is situated in the mid western part of Nagaland, bounded by Mokokchung district in the north, Kohima district in the south, Zunheboto district in the east and the state of Assam in the west. The Wokha District is situated between 26°01' to 26°8' North latitude and 94°18' to 94 ° 27' East longitudes. The topography of the district is characterized by hill ranges and ridges dissected by seasonal streams with some valleys.

#### **1.4. Objectives**

1. To study the status of forest cover.
2. To classify the types of forest resources in the study area.
3. To study the utilization patterns of forest resources by the people.
4. To study the impact of human activities on the forest leading to problems of forest resources management.
5. To propose improved management strategies for sustainable use and conservation of forest resources and restoration of ecological balance.

#### **1.5. Hypothesis**

1. Forest resources play vital role in human life. They are renewable but not inexhaustible.
2. Unethical utilization of forest resources poses a threat to depletion of forest, environment and human life.
3. Sustainable use of forest resources leads to conservation of resources and restoration of human-environment relationship.

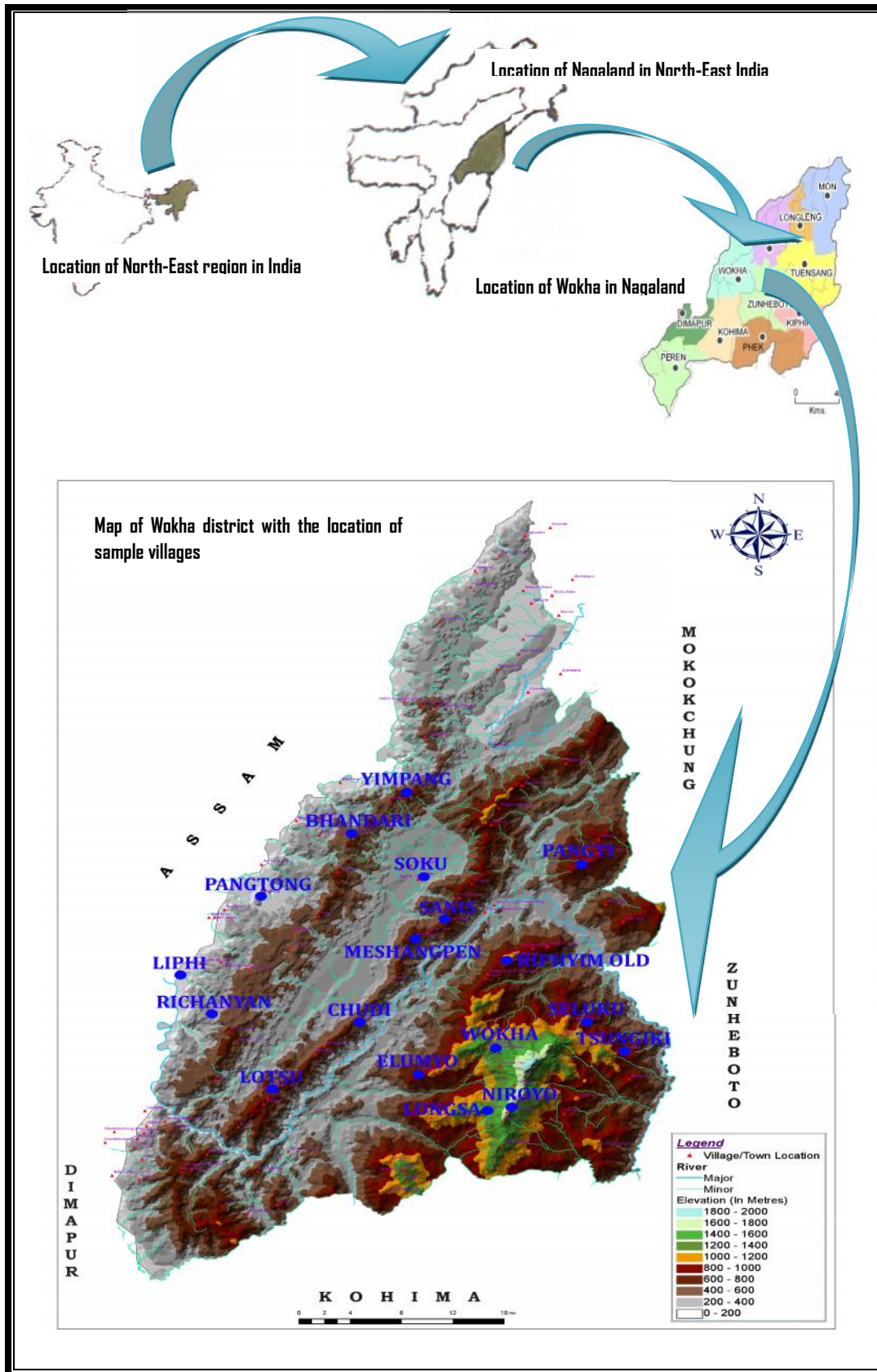


Fig. 1.1. Location map of the study area showing the sample villages (Source: Nagaland GIS & Remote Sensing Centre, Govt. of Nagaland).

## **1.6. Significance of the study**

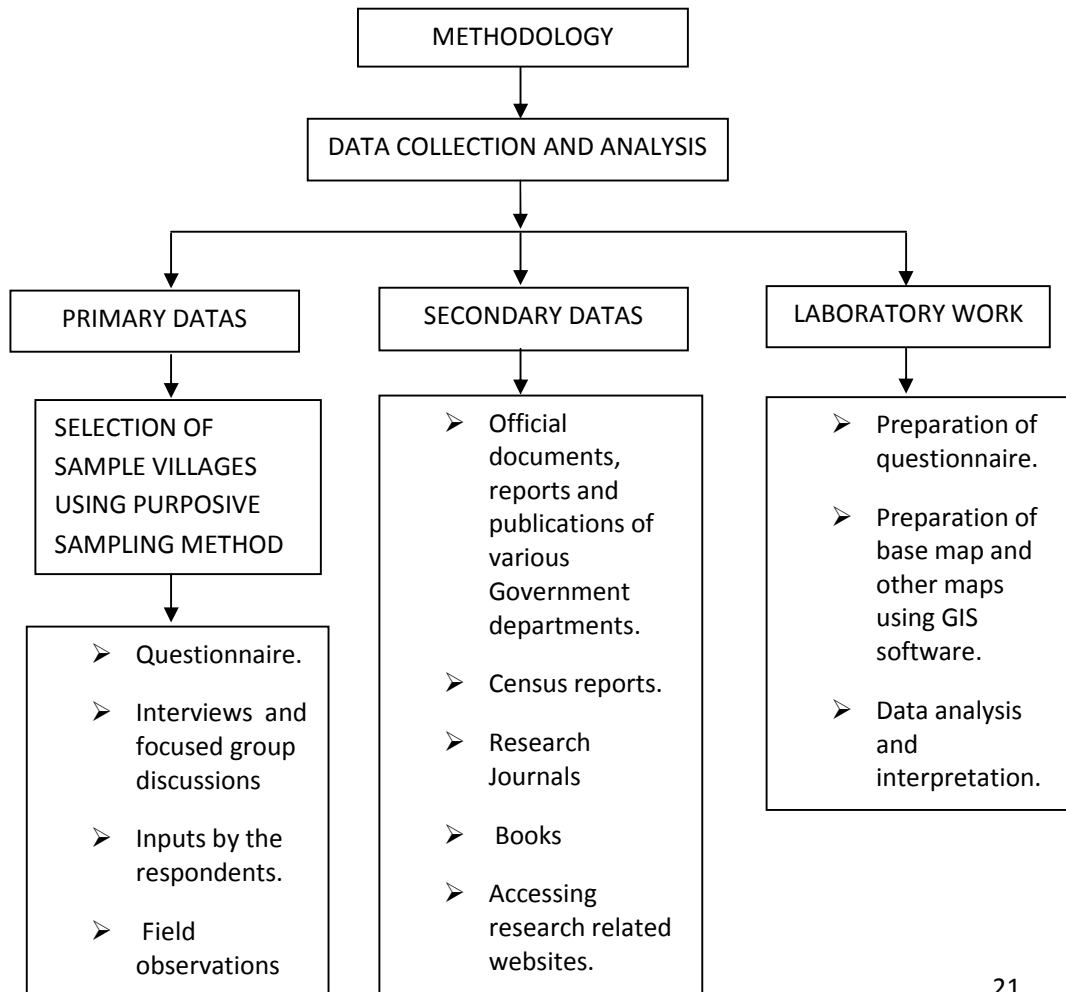
Forest is a primary activity and depends to a great extent upon the physical environmental condition for its development. The research study has been undertaken with an attempt to assess and understand the utilization and management of forest resources in Wokha district of Nagaland state. The forest in the region has the potential to meet the needs of the people, however, in the recent years due to various factors such as population pressure, infrastructural development and practice of primitive agricultural method such as jhum cultivation, the areas under forest have shown declining trends and many areas which supported luxuriant forests in the past are treeless today. Proper and effective management of forest sustainability has become a global challenge in the present scenario. There also has aroused the need for increasing amount of scientific information so as to support the emerging practical, ongoing goals and objectives in managing forest resources. Thus, firstly the present study will provide some general information about the study area such as the location, area, people, physiography, drainage, soil, geology, vegetation, etc. Secondly, this study will identify the types of forest resources utilized in the study area and bring to light the patterns of the utilization of these resources and help in assessing the dependence of the people on the available forest resources and the role that they play in the socio-economic life of the local people. Thirdly, the research study will unearth the traditional forest management practices and identify the various modern forest management practices which will help in formulating improved integrated management techniques for sustainable utilization of forest resources so that benefits continue and future generations are not compromised. Fourthly, through this study we can acquire knowledge of current state of forest and impact of the advent of modernization on forest and its resources leading to the problems of forest resource management in the district. Lastly, since no research

study of this kind has ever been conducted in the district except for the present study, the outcome of the study can be the base for various researchers, academicians, students, NGO s, Administrators and policy makers. Apart from what have been mentioned this study can pave the way in identifying the comprehensive potentials of forest resources and their utilization through proper management strategies.

### 1.7. Methodology

The research study has been carried out based on the available secondary datas obtained from various sources while the primary datas were acquired through field studies by way of conducting interviews and focused group discussions based on prepared structured questionnaires.

Figure 1.2: Research methodology flow chart.



**Acquiring Primary datas:** According to the 2001 census the number of villages recorded in Wokha district was 130 out of which 129 are inhabited and 1 uninhabited. Taking into account the high number of villages in the study area, complete enumeration is not possible for an individual researcher due to limitation of money, time and energy. At the same time, the survey of that kind is not required in the context of a universe characterized by homogenous conditions. In this a part of the universe can explain the reality and as such sampling becomes an indispensable tool for a researcher (Kothari, 1990). Due to the fact that the study area is homogenous in almost all aspects such as the ethnic composition, socio-economic activities, the traditions and culture, etc., purposive sampling method was adapted and accordingly sample villages were selected for the study based on the location and distance from the main commercial centre i.e., Wokha town so as to study the utilization patterns of forest resources. Pre-survey field trips were conducted in some selected villages to get some insights relating to the study and accordingly structured questionnaires were prepared for acquiring the datas. Initially the prepared questionnaires were sent to some selected villages as a pilot attempt to check the feasibility for effective implementation but it was not successful hence, field trips were extensively undertaken in all the sample villages where focused group interviews were conducted basing on the previously prepared structured questionnaires so as to acquire the datas required for the study. The respondents for the interviews included the village Gaon Buras, village council chairmen and secretaries, and representative from at least 20 to 30 households consisting of mostly the head/father in the family depending on the population and size of the village who also provided additional insights apart from the questions asked to them. During the study period in the field, observations were also made which complemented the datas obtained during the interviews.



**Acquiring of secondary datas:** The research undertaken is also dependent on the secondary datas obtained from various sources. These datas have infact paved the way and supplemented to the research study in many ways. The secondary sources included books and research journals published by academicians, scholars and various research organizations and institutions. Various websites related to the study were also accessed for obtaining informations and datas apart from going through official document, reports and relevant publications of various State Government and Government of India departments. The preparation of maps used in the research study was done in the laboratory using GIS software Arc GIS 9.2.

### **1.8. Chapterization**

1. Introduction, literature review, statement of the problem, study area, objectives, hypothesis, significance of the study, methodology and Chapterization.
2. Wokha district: A Geographical overview.
3. The forest cover and its types.
4. Utilization of Forest resources.
5. Management of forest resources.
6. Conclusion.

## **CHAPTER II**

### **WOKHA DISTRICT: A GEOGRAPHICAL OVERVIEW**

An understanding of the geography of the study area is of tremendous value while studying the utilization and management of forest resources. The various geographical aspects covering physical and human geography are of utmost importance as they are inter-related and influence each other in various ways. The physical aspects such as the topography, soil, climate, vegetation, drainage, etc. of a place or a region determine the activities and ways of life of the people living within that area on one hand and on the other hand the human geographical aspects such as population, economy, social and cultural on the other hand. This helps us to understand how the people adapt and adjust to their physical environment. Thus it becomes imperative to give importance to these aspects while studying the relationship between men and forest as they influence the types of vegetation in one way or the other and the activities of men whether it is socio-economic or cultural.

#### **2.1. Brief History and Administrative Division**

In 1876 the British Government occupied Wokha as the district headquarters of the Naga Hills under Assam. By the year 1878 the headquarters was shifted to Kohima, but Wokha remained a sub-division. Later in 1889 the sub-division was shifted to Mokokchung. Wokha became a sub-division again in 1957 and subsequently was created as a district in 1973. It is the homeland of the Lotha Naga tribe with mongoloid features as it is with the rest of the Naga tribes. The early history of the Lothas is obscure, so is the early history of the other Naga tribes. The early period, however, can be reconstructed mainly on the basis of the traditions collected from different villages which throw light on important incidents of the past. According to

traditional story the Lotha, Angami, Rengma and Sema were brothers of the same parents and they had dispersed from Khezakhenoma to their present respective settlements. The Lothas during the span of migration did not settle permanently till the occupation of the present Wokha district area. The present area where the Lothas settled permanently was not yet named as Wokha, but was named so later. 'Wo or Owe' in Lotha means number of People. 'Kha' means the counting. Thus 'Wokha' means 'counting the number of people'. So the place in which the Lotha ancestors had assembled and counted themselves of their number was named as 'Wokha'.

For administrative convenience the Wokha district has been divided into eleven revenue circles, five R.D Blocks and one town during the census of 2001. The district is administered by a Deputy Commissioner under whom there are administrative circles each headed by either Additional Deputy Commissioner, Sub-Divisional Officer (Civil) or Extra Assistant Commissioner. The Administrative circles are Changpang, Aitepyong, Bhandari, Baghty, Sungro, Sanis, Lotsu, Ralan, Wozhuro, Wokha Sadar and Chukidong. The five R.D Blocks are Bhandari, Sanis, Wozhuro/Ralan, Wokha and Chukidong. According to the 2001 census the district has 130 villages out of which 129 are inhabited and one is uninhabited. Wokha is the only town of the district and came into existence only in 1981. Majority of the villages are located at the hill tops, mostly in speculation and isolation of one another (Census, 2001).

## **2.2. The Physiography**

Wokha is one among the eleven districts of Nagaland and is located between 26° 01' and 26° 08' North Latitudes and between 94°18' and 94°27' East Longitudes covering an area of 1628 square kilometer. It represents about 9.82 percent of the total area of the state of Nagaland and is bounded by Mokokchung district on the north,

Zunheboto district on the east, Kohima district on the south and the plains of Assam state on the west. The topography of the district is characterized by lofty hill ranges with steep slopes, intermontane valleys, and limited alluvial plains which are dissected by perennial and seasonal rivers and streams. The Doyang River which is the largest river in the district flows into Wokha from the south-east and moves to the north meandering the lofty hills and flows to the south until it enters Assam, taking a south west direction. It cuts the district into almost two equal halves. Wokha district can be divided into three ranges based on the topography; namely The Wokha or upper range, Sanis or middle range and Bhandari or lower range (Fig 2.1). As per the ground water resources estimation of the state, out of a total area of 1,62,800 hectare, about 8,710 hectare is considered hilly area and about 1,500 hectare is earmarked as valley area like Baghty (CGWBNER,2008).

The Wokha or upper range lies in the eastern part of the district. It is dominated and characterized by hilly terrains and rugged topography. Major portion of this range is composed of landforms with high elevation varying from 200 to 1970 meters above mean sea level. With an elevation of 1970 meters the Tiyi Elung is the highest mountain peak in the district and on its foot lies Wokha town, the district headquarters. There are not many valleys and other low lying under this range because of the steep character of the hills, only a few low lying areas and valleys and are found along the Doyang River. The Sanis or the middle range is separated distinctly from the upper range by the Doyang River. The middle range appears to have merged with the Changkikong range emerging out of Mokokchung District in the north. It is a long and continuous stretch of hilly range starting with Mekokla in the north to Phyochu in the south. Had the Doyang river not changed its direction to south-west cutting this range from Phyochu, it would have extended upto Ralan area in a continuous stretch and merged with the Lower or the Bhandari range. The area is

Fig.2.1: Digital elevation map of Wokha district showing the three different ranges

mostly hilly with rugged terrain throughout the stretch of land. On both sides of the middle range lie the intermontane valleys or low lying areas. In the east the range dips steeply into the Doyang River and is marked by steep slopes. The west side of the range is characterized by gentle slopes which moves down and merges with the Baghty and Tsurang valleys.

The Bhandari or the lower range is the outer range of the district forming a border with Assam in the west. This range is a prolonged chain going north-wardly up to Japukong range in Mokokchung district and runs more or less parallel to the middle range which is separated by the Baghty and Tsurang valleys in the east. This valley area is a long stretch of fertile land and also the home of varieties of species of flora and fauna. These valleys are part of the lower range and possess the largest valley areas in the district. Of the two, the Baghty valley is the largest. The western part of the range gradually slopes down and merges with the plain of Assam.

### **2.3. The Geology**

The evolution of the various landforms that are seen on the surface of the earth are all in one way or the other the result of the various geologic activities and processes such as degradation and aggradation that have acted on the surface as well as beneath the earth's surface. These geologic activities and processes are in fact still active even today and the landforms that we see today will gradually get modified with the passing of time.

Nagaland state forms a part of the Himalayan Orogeny, where the Himalayan system terminated in sharp acute syntaxial (structure) bend along Myanmar area. Geologically the rock of Nagaland is comparatively young comprising tertiary sequences of rock belonging to fairly mobile belt of the earth. The rock formation in Nagaland is represented in ascending order by the Disang Group (Eocene), Barial

Group (Oligocene), Surma Group (Lower Miocene), Tipam Group (Upper Miocene), Namsang Formation (Mio/Pliocene) and Dihing Group (Pliocene). The Disang Group comprises two formations, the lower Disang and the upper Disang. The lithology of the lower Disang is composed of Epimetamorphosed sediments of slates and Phyllites with lenticular limestone beds while the upper Disang is composed of dark grey splintery shales with non-calcareous silt stones and thin beds of sandstones. The Disang formations are gradationally overlain by the Laisong, Jenum and Renji formations of the Barail Group and are composed of massive and bedded sandstones, shale, sandy shale with inter-bedded hard sandstone and well bedded compact shale with sandstone intercalations. Above the Barail Group lies the Surma Group comprising of two Formations namely Bokabil and Bhuban which are characterized by alteration of shales and sandstones with more thin conglomerates. The Tipam sandstone and Girujan clay formations comprise the Tipam Group which lies above the Surma Group, towards the base the Tipam is characterized by grey, greenish, coarse gritty, ferruginous sandstone, clay, shale and conglomerate. The top of the Tipam is made up of mottled and other varieties of clay and subordinate gritty sandstones. Overlaying the Girujan clay is the Namsang Formation which is a part of the Dupitila Group and is characterized by bands of gritty sandstone, mottled clay and conglomerates. The Dihing Group which is the youngest among the different Groups is characterized by b gritty pebble beds, soft sandy clay, conglomerate and gritty sandstone.

The Geology of Wokha district is not much different from that of the Geology of Nagaland because of the fact that they fall under the same Stratigraphic succession (Table 2.1). Geologically, Wokha district forms a part of the NE-SW trending Tertiary sedimentary formation of Nagaland, bounded on the west by Assam plains restricted within the Schuppen Belt, in the south by Ghasio Ru and Aghko nala and to

Table 2.1: Stratigraphic Succession of Wokha district (after DGM, 2008).

<u>GROUPS</u>	<u>FORMATIONS</u>	<u>LITHOLOGICAL DESCRIPTION</u>
Alluvium	Alluvum	Sand, clay, pebbles
..... <i>Unconformity</i> .....		
Tipam	Girujan clay	predominantly reddish, buff, grey, molted grey, coarse grained sandstone forming channel structures, occasionally with clay-clast conglomerates.
	Tipam sandstone	Massive, medium to coarse grained, gritty, friable, micaceous sandstone, shows alternation with thin horizon of siltstone/shale.
Surma	Surma (Bhuban)	Coarse grained, micaceous sandstone with clay and pellets, often conglomeratic horizon associated thinly bedded sandstone with bands of medium to fine grained laminated sandstone, ripple marks, planner trough, cross bedding are common. Base is marked by lateritised conglomerate band and a number of this conglomerates and bebbly bed occur above the base.
..... <i>Unconformity</i> .....		
Barial	Upper Barial	Medium to fine grained, well bedded sandstone with minor shale, thick units of shale/sandstone and thickly bedded sandstone, mega cross bedding common. Workable/mineable coal occurrences associated.
	Lower Barial	Thick bedded, massive, laminated fine to medium grained sandstone with alteranating sub-ordinates shale and thinly bedded sandstone.
	Upper Disang	Alternation of sandstone, siltstone and shales with thick bedded sandstone as compared to lower Disang.
	Lower Disang	Dark grey to black shale splintery shale interbedded with thinly bedded dark grey, compact and hard sandstone and siltstone.



the east confined by the Doyang river. The major rock types/lithounits comprised of sandstones, siltstones, splintery shales, shales, mottled clay, conglomerates and laterites belonging to Tertiary Era. These have been classified on the basis of lithological association and related sedimentary structures into the Girujan Formation, Tipam Formation, Surma Formation, Barail Formation and Disang Formation.

Upper range of Wokha district, stretching from N. Longitang to Phiro- Shaki south of Doyang river is occupied mostly by different rock types of Disang Formation and Barail Formation. Middle range which is located between Doyang (southern part) and Baghty nala (northern side) extending from Mekokla in the east to Pyochu towards the west also known as Sanis range, is mainly occupied by rocks of Upper Barail, Surma Formation and Tipam Formation and the Lower range areas located north of Baghty nala including Baghty valley, spreading from New Tssori in the east to Ralan area to the west is mostly occupied by rocks of Surma Formation, Tipam Formation and Girujan Formation (DGM/FS, 2008) (fig. 2.2) .

#### **2.4. The Drainage system and rivers**

The topography of the district, which is characterized by lofty mountains and hilly terrain are dissected by seasonal and perennial streams and rivers. Of the many streams and rivers found in this region the Doyang (locally called Pofu), chubi and Nzhu are the most important and are perennial in nature. There are no rivers navigable by large boats throughout the year. The Doyang river which forms the eastern boundary of the district originates at Mao Thana (Mao area) and is formed by two rivers that run parallel in the upper part of Doyang viz, the Dzuu and Sidzu rivers. The river flows between Kohima and Phek districts as Sidzu River and traverses through Pughoboto area where it is known as the Yeti river. As it enters Wokha district it changes its name to Doyang River which is also locally called Pofu and traverse through the whole district, collects almost all drainages and flows into the Dhansari

Figure 2.2. Geological map of Wokha district

Figure 2.3. Drainage map of Wokha district.

River in the plains of Assam which forms a tributary of the mighty Brahmaputra<sup>1</sup>. Its tributaries in the west bank are the Rengmapani or Zubra, the Zulu and the Siju. Doyang, the biggest and also the longest river is not only important for Wokha district alone but is also equally important for the whole state of Nagaland. In the valleys along the Doyang River the modern system of cultivation like terrace and horticulture are carried out successfully, especially in and around Pangti village. Pofu hayi and tentsu hayi are some of the important places where the modern system of cultivation is in practice.

Chubi is the second biggest river in the district; it flows south ward from Mokokchung district and joins Doyang south of Pangti area of the district. Nzhu which is a tributary of Doyang and covers the whole south-eastern portion of the district rises from the Nerhema area under Kohima district and flows through Miphong in the Rengma area. During the later stage, after it has advanced to the southwestern border of the district across the Phiro-Shaki area joins the Doyang River at Lotsu area of the District. Except for some small areas in the Doyang dam most of the rivers are not navigable. Both the seasonal as well as the perennial rivers and streams are home to varieties of aquatic species which have been a source of livelihood to the people of this region.

An important natural lake in the upper part of the district is the Totsu-Wozhu situated in the southern part of Phiro- Shaki area. The most important man-made Lake or artificial lake is the accumulation of water caused by the Doyang dam constructed for generation of hydro electric power. Of late this lake has become a place of attraction and leisure for many local and foreign tourists. Apart from becoming a tourist spot this artificial lake formed by the Doyang reservoir also serves as means of

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<sup>1</sup> (Sebu Soyhunlo, 2011 pp-41).

livelihood for a good number of families residing in the villages surrounding the Doyang catchment area.

## **2.5. The Climate: temperature, humidity and rainfall**

The importance of the climate of a region to its geographical environment, for human life and economic activities is very high. Climate encompasses the statistics of temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological elemental measurements in a given region over long periods. Climate influences plants, animals, man and soil directly. It influences rock through weathering while the external forces shaping the land surface are primarily controlled by climatic conditions. On the other hand, climate, particularly near the ground, is influenced by landscape features, vegetation and man through ecological processes and the forms they reference to the climate prevailing in the past<sup>2</sup>. According to the Indian Meteorological department, there are four seasons in India namely Northeast monsoon season (December to march), South-west monsoon season (June to September), the transitional hot weather (April to May) and the transitional period of retreating south-west monsoon (October to November). These four seasons are also felt in North East India<sup>3</sup> and includes the study area i.e. Wokha district. Being located in the sub-tropical region Wokha district enjoys warm rainy summer and cold dry winter. Because of the difference in the landscape of the region the areas adjoining the border of Assam i.e. the lower or the Bhandari range which is mostly dominated by low lying areas experiences a slight variation in the climatic variables/elements such as temperature, rainfall, relative humidity, etc. in other words the temperature is slightly warmer and rainfall is little lesser when compared to the areas in the middle or upper range based on the meteorological datas of one decade

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<sup>2</sup> (Ayoade 1983 in Furkumzuk. C, 2011).

<sup>3</sup> (Bhattachary, N.N., 2005 pp-21)

taken from the two stations in order to understand the type of climate prevailing in the region.

### **2.5.1. Temperature**

Temperature is undoubtedly one of the most important climatic elements. The temperature of an area is dependent upon the latitude or the distribution of incoming or outgoing radiation, the nature of surface (land or water), the altitude, the prevailing winds, etc. The air temperature normally used in climatology is that recorded at the surface. Moistures or lack of moistures modifies the temperature. The more moisture content in the atmospheric air in a region, the smaller the temperature range. Moisture is also influenced by temperature. Warmer air can hold more moisture than cooler air, resulting in increased evaporation and higher probability of clouds and precipitation. Moisture, when coupled with condensation and evaporation, is an extremely important climatic element. It ultimately determines the type of climate for a specific region. The winter season in this region starts setting in by the beginning of November and continues till February. December and January are the months during which maximum cold and chill are experienced as the temperature tends to drop down to about 4°C to 2°C during the coldest months of the year. Frost falls in Wokha Mountain and its adjoining areas like Wokha village and nearby villages in December and January. During these months mornings are bright, but almost every day by 11:00AM or 12:00 noon the sky becomes clouded and it continues till evening and the night sky is clear again. Towards the end of winter season, in the months of February and March, the sky is clear throughout the day with occasional cloudiness in afternoon but clear again at night. These are the windiest months in the year. Towards the end of March the wind dies out. Most of the winter months are dry and experiences very little rainfall. The gaiety spring can be felt only in the month of April. The temperature gradually starts rising from the month of May indicating the

setting in of summer season which lasts till the month of September. Actual hot day appears in July, August and September during sunny days only, and not during rainy or cloudy days. The average maximum and minimum temperature of Wokha district in July are recorded at 27.15° and 16.96° respectively<sup>4</sup> For studying and understanding the climate of the study area Meteorological datas (Rainfall, Temperature and Relative humidity) have been obtained from the Department of Soil and water conservation, Government of Nagaland. The datas of two Meteorological observatory stations namely Wokha and Bhandari have been taken into consideration basing on the variation of the physical landscape and accordingly a summary of the differences in temperature for one decade i.e., from the year 2001 to 2010 between the two stations have been presented in table 2.2, table 2.3 and figure 2.4.

Table 2.2. Decadal mean maximum and minimum temperature (2001-2010) in Bhandari meteorological station.

<b>Year</b>	<b>Mean maximum temperature (°c)</b>	<b>Mean minimum temperature (°c)</b>
2001	28.6	18.8
2002	26.5	17.4
2003	24.8	16.1
2004	24.3	16.7
2005	24.7	16.6
2006	25.9	26.5
2007	25.7	12.4
2008	25.3	16.1
2009	26.2	18.5
2010	26.9	20.2
<b>Decadal mean maximum &amp; minimum temperatures</b>	<b>25.9</b>	<b>16.9</b>

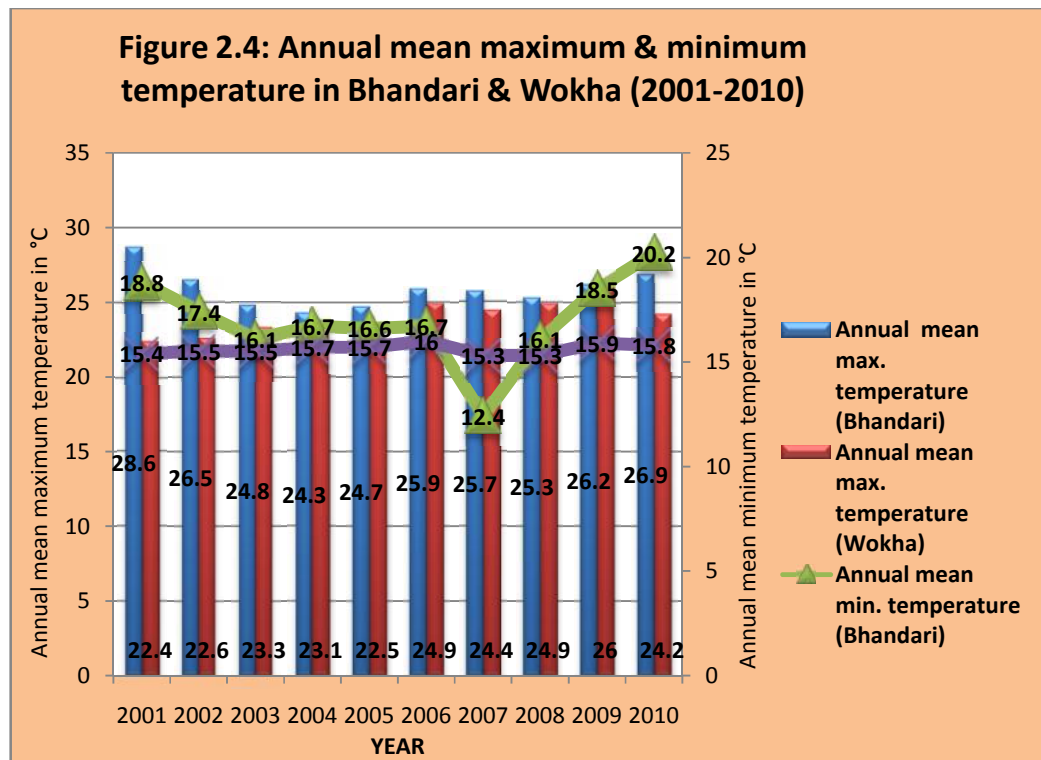
(Source: Department of Soil & Water Conservation, Nagaland)

<sup>4</sup> (Lotha, Y. Ben, 1996 pp-7&8).

Table 2.3. Decadal mean maximum and minimum temperature (2001-2010) in Wokha meteorological station.

Year	mean maximum temperature (°c)	mean minimum temperature (°c)
2001	22.4	15.4
2002	22.6	15.5
2003	23.3	15.5
2004	23.1	15.7
2005	22.5	15.7
2006	24.9	16
2007	24.4	15.3
2008	24.9	15.3
2009	26	15.9
2010	24.2	15.8
<b>Decadal mean maximum &amp; minimum temperatures</b>	<b>23.8</b>	<b>14</b>

(Source: Department of Soil & Water Conservation, Nagaland)



(Source: Department of Soil & Water Conservation, Nagaland)



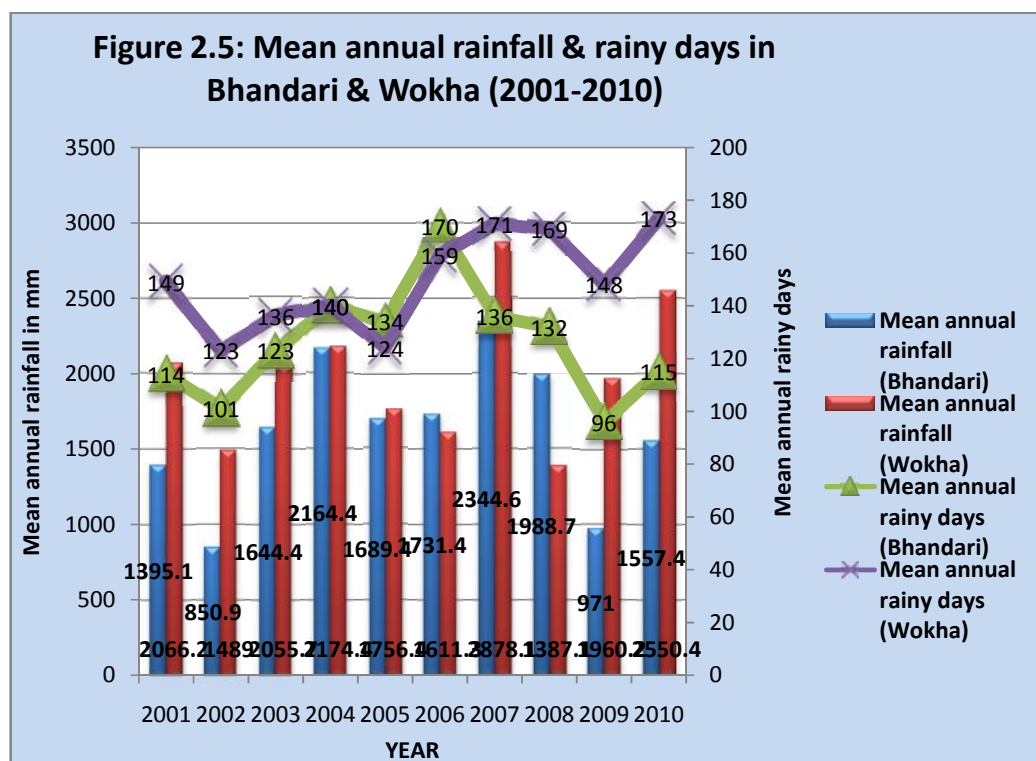
### **2.5.2. Rainfall**

Rainfall is the condensation of the atmospheric water vapour into the earth's surface which forms a major component of the water cycle and is responsible for depositing most of the fresh water on the earth. It also provides suitable conditions for many types of ecosystems, as well as water for hydro electric power plants and crop irrigation. For a district like Wokha where agriculture constitutes the main occupation for nearly 80 percent of the total population, it is without any doubt one can say that rainfall plays a very important role in determining the agricultural production on which the sustenance of the people of this region depends greatly. Before the setting in of the south-west monsoon, rainfall is scarce and only few drop of rainfall is received in February and March and a little more in April and may. The south-west monsoon normally sets in by the first week of June bringing along heavy rainfall and continues up to September. The average rainfall that the district receives is about 2000mm to 2500mm which falls for about five to six months of the year with greatest concentration in July and august. Sometimes hailstorms occur at this time and it suddenly becomes cold. Inorder to understand the variation of rainfall in the study area rainfall datas from 2001 to 2010 recorded in two meteorological stations namely Wokha and Bhandari have been obtained from the Department of Soil and Water Conservation, Government of Nagaland. On analysis of the datas it is observed that the numbers of mean rainy days from 2001 to 2010 are 164.2 days and 126.1 days in Wokha and Bhandari respectively. The average decadal rainfall from 2001 to 2010 stood at 2353.9 mm in Wokha station and 1633.7 mm in Bhandari. (Tables 2.4, 2.5 and figure 2.5).

Table 2.4. Decadal mean rainfall and number of rainy days (2001- 2010) in Bhandari station

Year	Mean annual rainfall (mm)	Mean annual rainy days
2001	1395.1	114
2002	850.9	101
2003	1644.4	123
2004	2164.4	140
2005	1689.4	134
2006	1731.4	170
2007	2344.6	136
2008	1988.7	132
2009	971.0	96
2010	1557.4	115
<b>Decadal mean rainfall &amp; Rainy days</b>	<b>1633.7</b>	<b>126.1</b>

(Source: Department of Soil & Water Conservation, Nagaland)



(Source: Department of Soil & Water Conservation, Nagaland)

Table 2.5. Decadal mean rainfall and number of rainy days (2001- 2010) in Wokha Station.

<b>Year</b>	<b>Mean annual rainfall(mm)</b>	<b>Mean annual rainy days</b>
2001	2066.2	149
2002	1489	123
2003	2055.7	136
2004	2174.4	140
2005	1756.4	124
2006	1611.3	159
2007	2878.1	171
2008	2387.7	169
2009	1960.2	148
2010	2550.4	173
<b>Decadal mean rainfall and rainy days</b>	<b>2353.8</b>	<b>164.2</b>

(Source: Department of Soil & Water Conservation, Nagaland)

### 2.5.3. Humidity

Humidity is a general term referring to the water vapour content of air at any one time and place. Of the various components of atmosphere, water vapour constitutes only a small fraction varying from nearly zero to about four percent by volume. However, the meteorological significance of this very small percentage of water cannot be ignored. Infact, in the heat budget as well as in the day-to-day weather changes that we observe atmospheric moisture plays a very important role (Lal, 1995). Without humidity, there would be no clouds, no precipitation, and no fog. Humidity is simply water vapor in the air, which is needed to form rain. Additionally, water vapor holds heat in the air. It is a greenhouse gas, which means it can absorb heat and warms the atmosphere. This is why humid air feels warmer. The air in the atmosphere has a saturation point beyond which it cannot hold any extra water vapour, the measurement of ratio of the actual water vapour content in the air at a

given temperature to the amount of water vapour that it can hold (its capacity) is termed as relative humidity and is expressed in percentage. As seen in the table 2.6 the average relative humidity in the two stations varies, Wokha station records an average decadal relative humidity of 79.4% from 2001 to 2010 and Bhandari records an average decadal relative humidity of 79.9% from 2001 to 2010. The percentage of relative humidity is maximum during the summer season i.e. from the month of May to September. In most of the year, the average relative humidity during the summer season is above 75% which sometimes goes up to 85% to 90%, and as such it is very damp in this district during the monsoon (fig. 2.6).

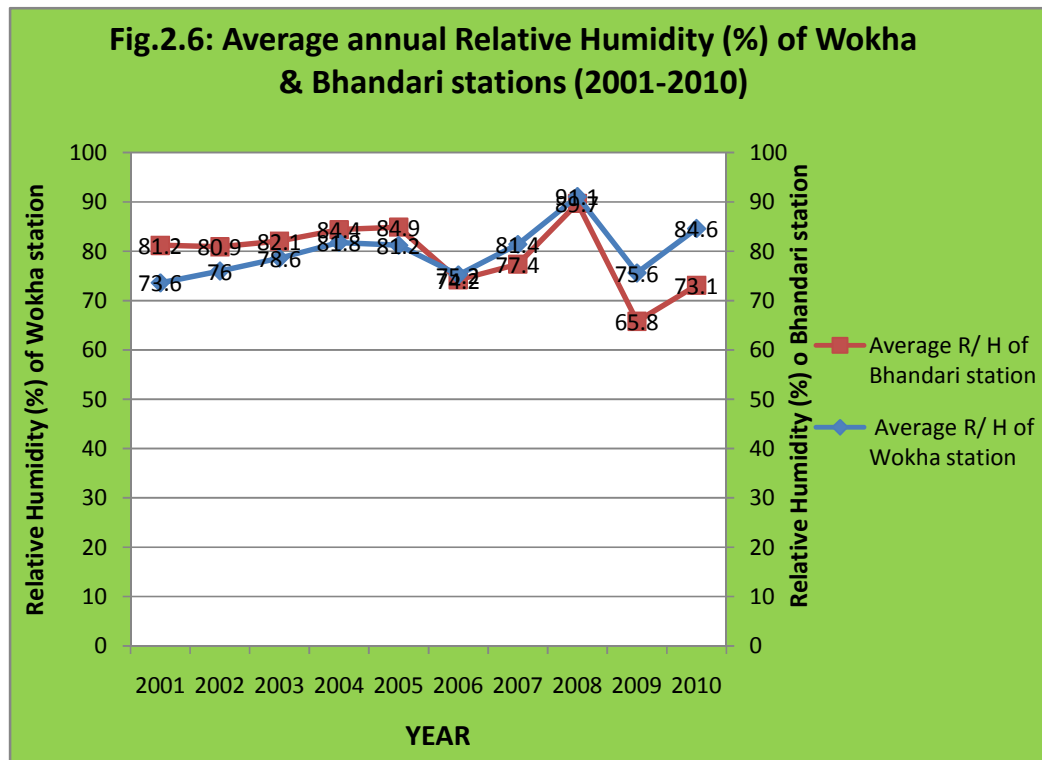
Table 2.6: Average decadal Relative Humidity in Wokha & Bhandari Meteorological stations (2001-2010).

<b>Year</b>	<b>Wokha Station</b>	<b>Bhandari Station</b>
2001	81.2	73.6
2002	80.9	76
2003	82.1	78.6
2004	84.4	81.8
2005	84.9	81.2
2006	74.2	75.2
2007	77.4	81.4
2008	89.7	91.1
2009	65.8	75.6
2010	73.1	84.6
<b>Average decadal Relative Humidity in %</b>	<b>79.4</b>	<b>79.9</b>

(Source: Department of Soil & Water Conservation, Nagaland)

Thus, the analysis of climate reveals that practically two seasons, winter and summer (monsoon), dominate the year. Spring and autumn are nominal and short-lived. Summer is generally hot, but inside the house the heat is not felt much in the

upper part of the district, unlike the lower parts of the district where the heat is felt more especially in Bhandari and Baghty areas.



(Source: Department of Soil & Water Conservation, Nagaland)

## 2.6. Soils

Soil is the thin surface layer on the earth, comprising mineral particles formed by breaking down of rocks, decayed organic materials, living organisms, water and air (Khullar, 2001). Soil is a very important and basic natural resource which supports living beings on the earth. Soil provides ecosystem services critical for life: soil acts as a water filter and a growing medium; provides habitat for billions of organisms, contributing to biodiversity; and supplies most of the antibiotics used to fight diseases. Humans use soil as a holding facility for solid waste, filter for wastewater, and foundation for our cities and towns. Finally, soil is the basis of our nation's agro-ecosystems which provide us with feed, fiber, food and fuel. The National Bureau of Soil Survey and Land Use Planning, Nagpur in co-ordination with the Department of Soil and Water Conservation, Government of Nagaland have investigated and

classified the soils of Nagaland into 4 orders, 7 sub-orders, 10 great groups, 14 sub-groups and 72 soil families (Maji et al., 2000). The 4 orders of soil in Nagaland are (i) Alfisols (ii) Entisols (iii) Inceptisols and (iv) Ultisols (Figure 2.8). Inceptisols dominate the soils of the State with 66% followed by Ultisols 23.8%, Entisols 7.3% and Alfisols 2.9% of the total 16.6 million Hactres of the State Geographical area.

(i) **Alfisols:**

Alfisols are base-rich mineral soils of sub-humid and humid region. They have light coloured surface horizon over a clay enriched sub –surface horizon that is rich in exchangeable cations with base saturation of more than 35%. This type of soil order is found on the western flank of the State bordering Assam. They are deep and well drained of fine to fine loamy texture. Common families of Alfisols which have been identified in Nagaland are:

- (1) Fine typic Kanhapludalfs
- (2) Fine loamy typic Paleudalfs

(ii) **Entisols:**

They are recently developed, mineral soils with no diagnostic horizon. This is because either of limiting time available for development or because of exceedingly unfavourable conditions. This soil order is found on the Western and North Western part of the State on the low hill slope and narrow river valleys. They are moderately deep, well drained, fine to fine loamy textured soils. Families which have been identified under this order are:-

- (1) Fine-loamy typic Udifluvents
- (2) Fine-loamy typic Udorthents
- (3) Coarse-loamy typic Udorthents

Fig.2.7. soil map of Wokha district

- (4) Fine-loamy Lithic Udorthents
- (5) Coarse loamy Lithic Udorthents

(iii) **Inceptisols :**

This soil order represents beginning stage of soil formation which is belong to that of Entisols but still short of the degree of development found in Alfisols. They may have some accumulation of clay in the sub-surface horizon, limiting in depth, organic matter content, and base saturation. This soil dominates the entire State having fine loamy, fine clay, clay loam etc. soil textures with moderately shallow to deep soils with moderately to excessively drained. The identified families under this order are:

- (1) Fine- loamy Umbric Dystrochrepts
- (2) Fine loamy typic Dystrochrepts
- (3) Fine Umbric Dystrochrepts
- (4) Loamy, skeletal Umbric Dystrochrepts
- (5) Fine typic Dystrochrepts
- (6) Loamy-skeletal typic Dystrochrepts
- (7) Clayey-skeletal Umbric Dystrochrepts
- (8) Loamy-skeletal Pachic Haplumbrepts
- (9) Fine Pachic Haplumbrepts
- (10) Fine-loamy typic Haplumbrepts
- (11) Clayey-skeletal Pachic Haplumbrepts
- (12) Fine loamy Pachic Haplumbrepts
- (13) Fine-loamy Dystric Eutrochrepts
- (14) Coarse loamy typic Dystrocrepts
- (15) Loamy skeletal typic Dystrocrepts
- (16) Loamy skeletal Dystric Eutrocrepts

(iv) **Ultisols:**



The Ultisols are similar with Alfisols, except for having low base saturation on the exchange complex due to advance stage at weathering. These are base-poor mineral soils of humid region developed under high rainfall and forest vegetation. They are characterized by low, less than 35% base saturation and clay enriched sub-surface horizon. This soil is sparsely scattered in all parts of the State having fine loam, clay loam and clayey texture. Well to excessively drained with moderate to deep soils. The families under this order which have been identified so far are:

- (1) Fine Humic Hapludults
- (2) Fine Typic Paleudults
- (3) Fine Typic Haplohumults
- (4) Fine loamy typic Hapludults
- (5) Fine typic Hapludults

The area wise distribution of different soils in Nagaland at order, suborder, great groups and subgroup is given in the table 2.7.

As seen in the Soil map of Wokha, all the 4 orders of soils are found in Wokha district with variation in their concentration. Of the 4 soil orders Inceptisols dominates and occupies more areas covering most parts of upper or Wokha range and extends to the middle or Sanis range including the Baghty and Tsurang valley areas. The second dominant soil order is the Entisols which are confined mostly in the Lower or Bhandari range along the Assam and Nagaland borders and extends towards the plains of Assam. Apart from occurring in the lower range, Entisols are also found in small batch in the upper range. The other two soil orders namely Alfisols and Ultisols are less dominant and occur only in small patches in the upper and middle ranges.

The Soils in Wokha district are moderately deep, loamy skeletal, fine-loamy to fine in texture and moderately to severely eroded. The soils are moderately to strongly acidic in nature, moderate to high in organic matter and poor in exchangeable bases.

Table 2.7: Distribution of different soils at order, suborder, great group and subgroup levels in Nagaland (Source: NBSS&LUP, 2000).

<b>Order</b> Area('000 ha) % of TGA	<b>Suborder</b> Area('000 ha) % of TGA	<b>Great group</b> Area('000 ha) % of TGA	<b>Subgroup</b> Area ('000 ha) % of TGA
<b>ALFISOLS (A)</b> 47.8 (2.88)	Ad; Udalfs 47.8 (100)	AdN; Kanhapludalfs 33.4 (69.9)	AdNt; Typic Kanhapludalfs 33.4 (100)
		AdP; Paleudalfs 14.4 (30.1)	AdPt; Typic Paleudalfs 14.4 (100)
<b>ENTISOLS(E)</b> 121.3 (7.32)	Ef; Fluvents 60.4 (49.8)	EfD; Udifluvents 60.4 (100)	EfDt; Typic Udifluvents 60.4 (100)
	Eo; Orthents 60.9 (50.2)	EoD; Udorthents 60.9 (100)	EoDt; Typic Udorthents 44.9 (100)
			EoDl; Lithic udorthents 16.0 (26.3)
<b>INCEPTISOL S(I)</b>	Io; Ochrepts 850.9 (77.7)	IoE; Eutrochrepts 15.2 (1.8)	IoEd; Dystric Eutrochrepts 15.2 (100)
		IoD; Dystrochrepts 835.7 (98.2)	IoDt; Typic Dystrochrepts 467.2 (55.9)
			IoDum; Umbric Dystrochrepts 368.5 (44.1)
	Iu; Umbrepts 243.8 (22.3)	IuH; Haplumbrepts 243.8 (100)	IuHh; Pachic Haplumbrepts 240.5 (98.6)
		IuHt; Typic Haplumbrepts 3.3 (1.4)	
<b>ULTISOLS(U)</b>	Un; Humults 3.1 (0.8)	UnH; Haplumbrepts 3.1 (100)	UnHt; Typic Haplumbrepts 3.1 (100)
	Ud; Udults 391 (99.2)	Udp; Paleudults 124.7 (31.9)	Udpt; Typic Paleudults 124.7 (100)
		UdH; Hapludults 266.3 (68.1)	UdHhm; Humic Hapludults 21.4 (8.0)
			UdHt; Typic Hapludults 244.9 (92.0)

The different types of subgroups found in the district are Umbric Dystrochrepts, Phacic Haplumbrepts and Typic Dystrocherpts of the Inceptisols order, Typic Udorthents of Entisols order, Typic Paleudalfs of Alfisols order, and Humic Hapludults and Typic Paleudults of Ultisols order.

### **2.7. Flora and fauna**

The whole of Wokha district is endowed with rich vegetation of dense, mixed evergreen forest with thick undergrowth mainly of bamboos, bananas, various shrubs, reeds, creepers, elephant grass etc. Due to shifting jhum cultivation, most of the natural forest resources were already destroyed and very less virgin forest reserves are being seen preserved. Yet, Mt. Tiyi forest reserves of Wokha village, vast Baghty forest reserves, Akuk – Mekokla forest reserves, Totsu area forest reserves of Phiro-Shaki villages are still preserved with different varieties of forest trees includes Bonsum, Hollok, Jutili, Nahor, Badam, Champ, Simul, Bhelu, variety of Canes, variety of Lichen, Orchids, Rhododendron etc. Wokha district once considered haven of wild life have now become almost extinct due to rampant hunting by the inhabitants and disturbance of ecological system due to deforestation. Still, the district has numbers of different varieties of wild animals, which includes herds of elephant in Baghty valley and foot hill areas, mountain goats, barking deers, jungle cats, few tigers, wild boars, fowls, pheasant, quails, fishes etc. (Patton and Lea, 2008).

## CHAPTER III

### THE FOREST COVER AND TYPES

#### Introduction

Forest is a complex ecosystem composed of communities of plants, animals and micro-organisms interacting with each other and their environment which consists of abiotic components such as soil, water, air, etc. Since time immemorial man's life and his activities for survival and leisure have circled around forest and its resources. It is widely believed that early human species evolved in and around the African rainforests roughly 4 million years ago. The forest offered them food in the form of plants, animals and water. Throughout the history of mankind till the modern times the role played by forest and its resources has changed dramatically, initially forest provided man with just some basic amenities which were required by him for his survival but with the passing of time the human beings gained more knowledge and became very innovative. They started to implement and practice new ideas and techniques for development which required the utilization of the natural resources available around them, especially the resources from the forest which was easily accessible. With the passage of time their knowledge and skills became more refined and sophisticated resulting in the excessive use of natural resources for the purpose of nation building and advancement in all fields which gradually had adverse affect on the natural resources including the forest resources. Nonetheless, the importance of forest cannot be summed up in just a few words as their services towards the socio-economic and environmental benefits of the people are immense and because of which they are valued differently by different groups of people around the world.

The Wokha district is dominated by rural inhabitants which accounts for about

78.95% of the total population according to the 2011 provisional census. For a district with such a large composition of rural population, it is obvious that most of the people are engaged in agriculture and occupations associated with the forest in one way or the other such as hunting, fishing, logging, quarrying, etc. From the socio-economic and environmental perspective the forest and its resources have played important roles in the past which still persist and will continue to do so. Thus, Inorder to wisely utilize and manage the services provided by the forest resources for our benefit and development it is imperative to study, understand and acknowledge the importance of the forest that surrounds us.

### **3.1. Land holding and land use patterns in Nagaland**

The land ownership and management systems of the Nagas are unique and different from the rest of the country, where local customary laws had governed the land holding system throughout generations. These customary laws are usually not codified but have the constitutional sanction. The enforcement of these traditional laws and regulations rests on traditional village institutions such as village councils, tribal chiefs or headmen<sup>1</sup>. There are no laws or regulations governing ownership of land in the State excepting a small area of about 259 Sq. km. (the Dimapur Mauza) which was surveyed previously as part of the former State of Assam, where the Assam Land Revenue Regulations apply. The rest of the State has not been cadastrally surveyed and no systematic records or rights have been built<sup>2</sup>. As shown in table 3.1, out of the total geographical area of 16,57,900 ha. (16,579 Km<sup>2</sup>) the villagers consisting of individual, clan or family dominates the land holding system where the forest land of about 7,52,012 ha. is owned by them which is many times

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<sup>1</sup> [http://dolr.nic.in/dolr/downloads/spsp/Nagaland\\_SPSP.pdf](http://dolr.nic.in/dolr/downloads/spsp/Nagaland_SPSP.pdf)

<sup>2</sup> *Forest Development Agency in Nagaland, Department of Forest, Ecology, Environment and Wildlife, Govt. of Nagaland, pp-3.*

more when compared to the land owned by the State Government who possesses only 1,00,420 ha. of forest land. The traditional jhum/shifting cultivation which is the most dominant agricultural method practiced in the State covers an area of about 6,10,350 ha. As for the permanent/irrigated fields, they occupy only 58,000 ha. of land area. Settlement areas and infrastructures such as towns, villages, roads, etc. and areas under permanent orchards covers 1,12,118 ha. and 25,000 ha. of land respectively (fig. 3.1).

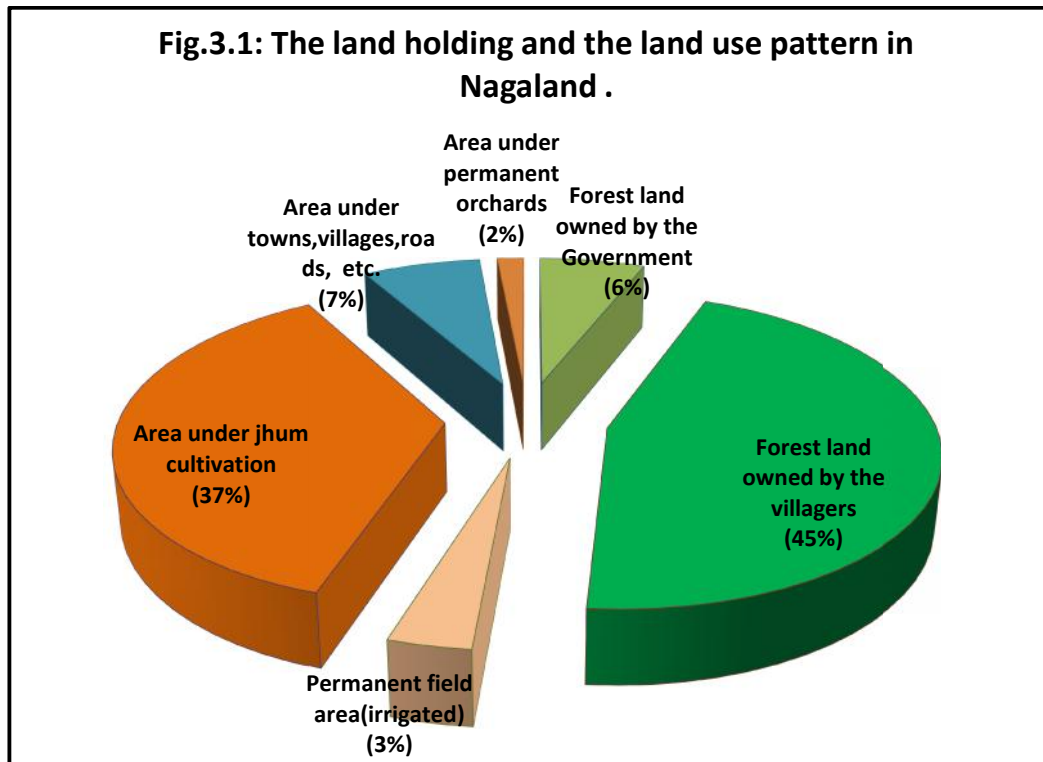
Table 3.1: The land holding and the land use pattern in Nagaland.

Sl. No.	Categories	Area (ha.)	Percent (%)
1	Forest land owned by the Government	1,00,420	6.05
2	Forest land owned by villagers	7,52,012	45.36
3	Permanent field area(Irrigated)	58,000	3.50
4	Area under jhum(Shifting cultivation)	6,10,350	36.81
5	Area under Town, Village, Roads, etc.	1,12,118	6.77
6	Area under permanent Orchards	25,000	1.51
Total Geographical Area of Nagaland		16,57,900	100.00

(Source: [http://tmnehs.gov.in/writereaddata/TR\\_Nagaland\\_26-09-12.pdf](http://tmnehs.gov.in/writereaddata/TR_Nagaland_26-09-12.pdf))

### 3.2. Status of forest in Nagaland

For a State like Nagaland whose rural population accounts for 71.03 % of the total population according to the 2011 census, forest plays a significant role in the Naga society as majority of the population are forest dwellers. According to State of Forest report 2011 published by Forest Survey of India the forest cover in the State based on the interpretation of satellite data of November 2008- February 2009 was 13,318 Sq. Km., which is 80.33% of the State's geographical area (FSI, 2011). But only about 8,629 Sq. Km. representing 52.04% of the total geographical area is under effective forest cover as the remaining areas are either jhum regrowth, degraded or fallow land, etc. The National Forest Policy, 1988 aims at achieving a target of minimum of one third or about 33% of the total land area of the country under forest or tree cover.

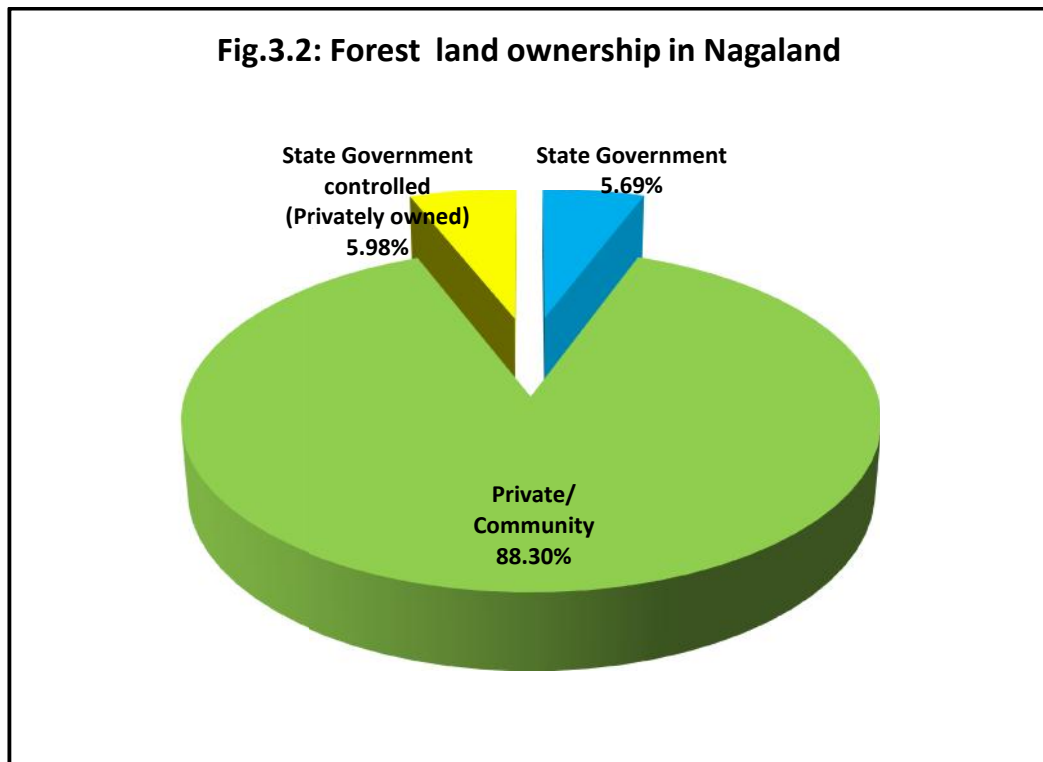


(Source: [http://tmnehs.gov.in/writereaddata/TR\\_Nagaland\\_26-09-12.pdf](http://tmnehs.gov.in/writereaddata/TR_Nagaland_26-09-12.pdf))

In the hills and in mountainous regions two third or about 66% of the areas under such cover needs to be maintained in order to prevent erosion and land degradation and to ensure the stability of fragile eco-system. With rapid modernization, development and increase in population taking place in the past few decades it has become difficult to maintain the 66% forest cover in the State, however, because of the increasing demands of the people the forest has become more dynamic than usual, resulting in the change in status over time.

Though the recorded forest cover in Nagaland is 13,318 Sq.Km., which is 80.33% of the State's geographical area but the effective forest cover is approximately 8,629 Sq.Km. which accounts for only 52.04 % of the total Geographical area of the State as the remaining areas are either jhum regrowth,

degraded or fallow land, etc<sup>3</sup>. The Per capita forest available in the State is 0.43 Ha per head taking into effective forest consideration the cover and 2011 population census. Out of the total forests area, 7,621.07 Sq.Km. i.e., 88.3% is under the control of private owners consisting of individuals, clans, families and villages. An area of about 516.79 Sq. Km is demarcated as protected forest which is controlled by the State Government though they are privately owned. The only forest land which are totally owned and are under the disposal and the control of the Government is about 491.44 Sq. Km which includes reserved forests (62.26 Sq. Km), Purchased forest 9192.47), Protected forest (34.69 Sq. Km) and Wildlife Sanctuary (202.02 Sq. Km) as shown in fig.3.2.



(Source: Annual Administrative report 2011-12, department of Forest, Ecology, Environment and Wildlife, Government of Nagaland)

<sup>3</sup> Annual Administrative report 2011-12, department of Forest, Ecology, Environment and Wildlife, Government of Nagaland pp 14-17



Table 3.2 shows the land areas that have been purchased from private owners in the nine districts by the department of Forest, Ecology, Environment and Wildlife, Government of Nagaland in order to take up plantations and biodiversity conservation which approximately covers an area of about 192.47 sq.kms and accounts for only about 1.16% of the total geographical area of Nagaland.

Table 3.2: District-wise area of land purchased by the department of Forest, Ecology, Environment and Wildlife, Government of Nagaland upto 2006-2007.

Sl. No.	DIVISION	TOTAL AREA (Sq.Km).
1	Dimapur	8.1238
<b>2</b>	<b>Wokha</b>	<b>6.9312</b>
3	Zunheboto	0.4000
4	Phek	7.6159
5	Peren	2.6700
6	Kohima	39.2601
7	Mon	73.4505
8	Mokokchung	45.4879
9	Tuensang	85.6969
TOTAL		192.4673

(Source: Annual Administrative report 2011-12, department of Forest, Ecology, Environment and Wildlife, Government of Nagaland)

The Forest survey of India has been instrumental in effectively conducting various studies on forests and its resources in India since its establishment in 1981. One such method is the classification scheme adapted for assessing the forest cover based on the canopy density as shown in table 3.3.

Table 3.3. Classification scheme for assessing forest cover by density

Sl. No	FOREST COVER	CRITERIA
1	Very dense forest	All lands with tree canopy density of 70% and above
2	Moderately dense forest	All lands with tree canopy density between 40% to 70%
3	Open forest	All lands with tree canopy density between 10% to 40%
4	Scrub	Degraded forest lands with canopy density less than 10%
5	Non-forest	Area not included in any of the above classes

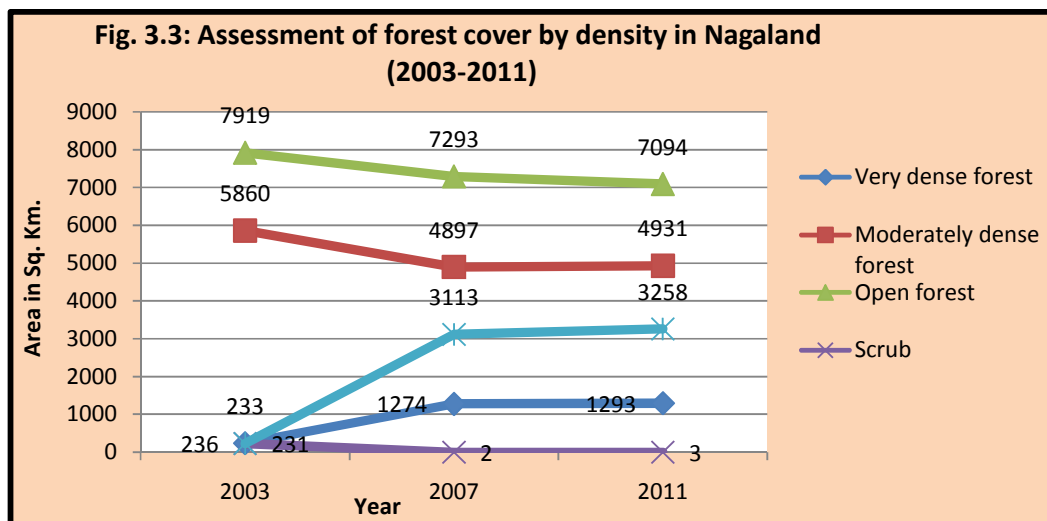
(Source: India State of Forest Report 2011, FSI, Dehradun)

Taking into consideration the classification scheme of forest cover by density the assessment for forest cover change in Nagaland for three different years i.e., 2003, 2007 and 2011 is as given in table 3.4. Analysis of the data reveals that the dense forest has increased many folds in 2011 compared to the assessment done in 2003. The reason for the increase can be attributed to the banning of logging and plantation of many tree species mainly taken up for afforestation and commercial purposes. The non forest areas also show an increasing trend in the three assessments and one reason for the increase is mainly because of the increase in settlement areas taking place in the State which has triggered occupation of more land areas so as to accommodate the ever increasing population. Areas of moderately dense forest, open forest and scrub have decreased mainly because of the extensive practice of jhum/shifting cultivation in the state and comparatively scrub area has decreased drastically (Fig 3.3).

Table 3.4: Change in Forest cover by density in Nagaland in Sq.Km (2003-2011)

Sl.No.	Year	Very dense forest	Moderately dense forest	Open forest	Scrub	Non forest area
1	2003	236	5860	7919	231	233
2	2007	1274	4897	7293	2	3113
3	2011	1293	4931	7094	3	3258

(Source: India State of Forest Report 2003, 2005, 2009 & 2011, Forest Survey of India)



(Source: India State of Forest Report 2003, 2005, 2009 & 2011, Forest Survey of India)

Because of its diverse properties for utility, forest is considered as dynamic resource and as a result over the years the forest cover has been changing depending on the intensity of utilization. As per the available data for the year 2003 and 2011 for eight districts of Nagaland (Table 3.5), it has been observed that the forest cover has reduced in six districts and only two districts show an increase in forest cover. The main reason for the decrease in forest covers in the five districts i.e., Wokha, Mokokchung, Tuensang, Mon and Zunheboto apart from Kohima is because of the extensive practice of jhum or shifting cultivation in these areas while in Kohima district the reduction in forest cover can be attributed to the rapid urbanization and occasional forest fires. The clearing of forest areas and burning of the dried plants for jhum cultivation including accidental occurrences of forest fires is yet another factor that leads to reduction of forest cover to a great extent. According to a study undertaken by the Forest Survey of India, it was estimated that an area of about 0.39 million hectare was effected by shifting cultivation during 1987-1997 in Nagaland<sup>4</sup>. The two districts i.e., Dimapur and Phek show an increase in forest cover because of the fact that terrace cultivation/wet rice cultivation dominates the agriculture practice in these two districts. In Dimapur apart from wet rice cultivation dry land farming is also extensively practiced. Except for occasional accidental occurrences of forest fires, loss of forest cover due to natural calamities especially in Dimapur district and cutting down of trees both legally and illegally for commercial and private use, the forests are mostly left undisturbed resulting in the increase in forest cover in these two districts (Fig.3.4).

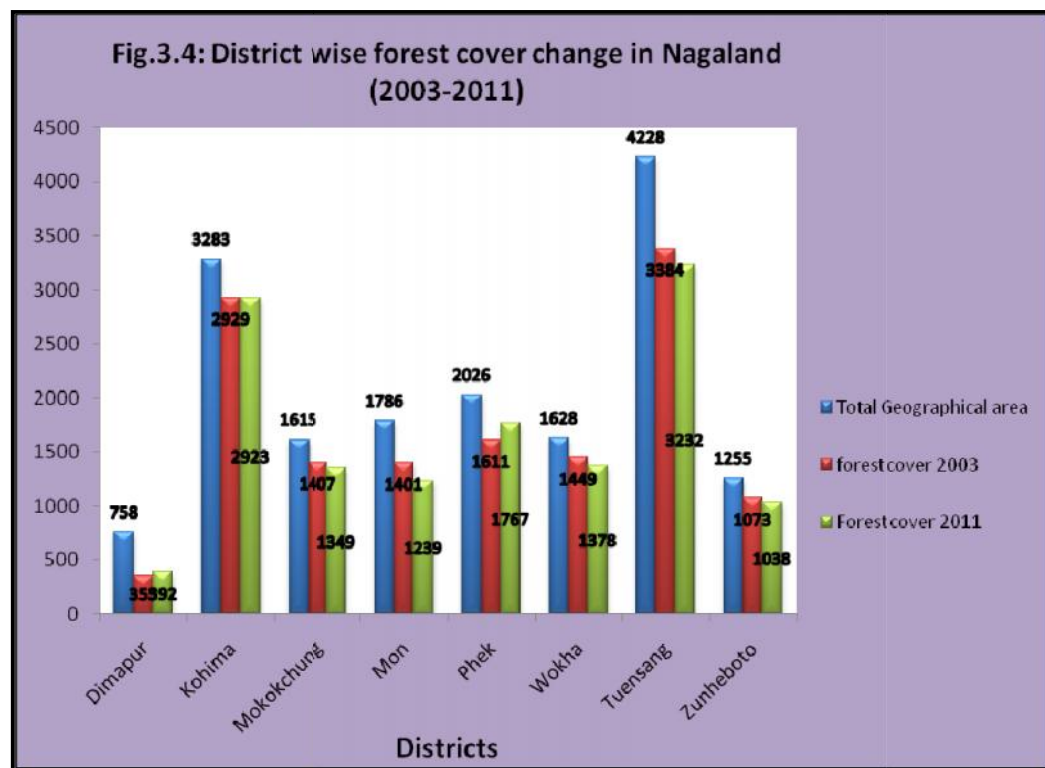
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<sup>4</sup> *India State of Forest Report 1999, Forest Survey Of India, pp 76-77*

Table3.5: District wise forest cover change in Nagaland (2003 & 2011) in Sq.Km

Sl. No.	Districts	Geographical area	Year		Change
			2003	2009	
1	Dimapur	758	355	392	+ 37
2	Kohima	3283	2929	2923	-6
3	Mokokchung	1615	1407	1401	-58
4	Mon	1786	1401	1239	-162
5	Phek	2026	1611	1767	+156
6	<b>Wokha</b>	<b>1628</b>	<b>1449</b>	<b>1378</b>	<b>-71</b>
7	Tuensang	4228	3384	3232	-15
8	Zunheboto	1255	1073	1038	-35

(Source: India State of Forest Report 2003, 2005, 2009 & 2011, FSI, Dehradun)



(Source: India State of Forest Report 2003, 2005, 2009 & 2011, FSI, Dehradun)

### 3.3. Factors determining the types of forest

A number of environmental factors combine to determine the type and variety of plants, which grow in an area. A change in these factors can result in different forest

types separated by short differences. As a matter of fact, no single factor is responsible, but rather a variety of factors combine to determine forest types. The types of vegetation in a given locality depend on the climate, the soil and past treatment. The study of these three factors is essential to an understanding of the variations encountered and the interrelationships of the types which is found convenient to differentiate. Topographical situation in respect of altitude, slope and aspect makes itself felt through its influence on local climate and soil (Champion and Seth, 1968). Climate is an important factor determining the nature and types of forest. Temperature, rainfall, relative humidity, wind and evapo-transpiration are interrelated, which lead to a favourable condition for plant growth over a considerable period. Temperature is the most important factor of climate which is influenced by the latitude. The degree of temperature is higher at the equator and it tends to decrease gradually towards the poles. On the basis of variation of temperature at different latitude, the vegetation region of the earth is divided into different zones. These are equatorial, tropical, coniferous, alpine vegetation, etc. Plants vary greatly in their water requirements. The amount of rainfall an area receives has a big influence on the types of plants that can grow there. For instance, in tropical regions, heavy rainfall occurs throughout the year which have resulted in evergreen forests whereas on the other hand the regions with little or scanty rainfall have given rise to xerophytic vegetation. The areas with heavy rainfall during the summer and low rainfall during winter are characterized by the presence of grasslands (Sarma, 2003).

Topography also influences the nature and composition of forest cover to a great extent. Elevation, slope and the direction a slope faces all effect the microclimate for plants on any site. The height above sea-level affects the temperature which generally decreases with height/altitude. Growing conditions for

plants also vary from the top of a hillside to the valleys surrounding it. The ridge top is exposed to drying winds and the soils are typically thinner and drier. Eroding soil and water both move down slope with gravity, so that soils are deeper and moisterer at the base of the slope than further up<sup>5</sup>. The geology of an area can dictate the type of soil produced which in turn determines the types of plants that grow there. Different plants prefer different soil types. Eugenius Warming (1909) emphasized the importance of soil characteristics and proposed five ecological groups of plants as (i) oxylophytes- usually found on acidic soils, (ii) halophytes- on saline soils, (iii) psammophytes- on sand, (iv) lithophytes- on rock surfaces and (v) chasmophytes- in rock crevices (Sarma Siddheswar 2003). Characteristics of soil such as fertility, depth and drainage influence plant growth and soil subjected to repeated fires might be nutrient depleted.

Aspect refers to the direction and exposure that an area faces. It determines the amount and duration of sunlight that reaches an area, along with its exposure to drying winds and rain-bearing winds. It also influences the amount of rainfall, temperature, humidity, frost susceptibility and fire regime of the site. Altitude/Latitude Species diversity and forest complexity tend to decrease with increasing altitude and latitude. Higher altitudes result in lower temperatures and often-higher rainfall, particularly in coastal areas. The top of steep slope may be drier (due to drainage) and nutrient depleted in comparison to surrounding, low lying areas.

#### **3.4. Types of forests in Wokha district**

Classifying the types of forest is important for acquiring useful information on the composition of vegetation, types of forest resources, ecological assessment, socio-

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<sup>5</sup> (<http://www.envirothonpa.org/documents/ForestTypes.pdf>).

economic and intensity of dependence of the people on forest resources, effective planning and management, etc. ( Vanclay et al., 1997, Gillison, 2006). It is not easy to classify the types of forest as the Forest types differ widely which are determined by various factors such as latitude, temperature, rainfall patterns, soil composition and human activity. Forests are classified according to their nature and composition, the type of climate in which they thrive, and its relationship with the surrounding environment. Many different methods have been developed to meet a variety of very general to very specific needs (Gillison, 2006). The revised forest type classification of Champion and Seth (1968) is the most widely used classification systems for India's forests. It is also exclusively used in forest management planning and research all over the country by various organizations and scholars. They classified forest into five major groups based on climatic factors. These major groups have been further divided into 16 type groups based on temperature and moisture contents (Table 3.6). A few of these type groups have been further divided into several subgroups. Ultimately the type groups have been classified into 202 forest types and subtypes based on location specific climate factors and vegetation formation. There have been no significant efforts till recently to show spatial distribution of forest types in India<sup>6</sup>.

Though Wokha district represents only about 9.82% of the total area of Nagaland yet because of its unique geographical location and a wide range of physiographic terrains and climate it has wide varieties of forest types. The forest classification of India done by Champion and Seth can be a baseline for studying and classifying the forest types of Wokha. Basing on their classification the forest types falling under Wokha district can be categorized into the following groups-

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<sup>6</sup> ([http://www.fsi.org.in/fsi\\_projects/national\\_forest\\_type\\_mapping.pdf](http://www.fsi.org.in/fsi_projects/national_forest_type_mapping.pdf)).

Table 3.6. Vegetation types of India

<b>TROPICAL FORESTS</b>		
<b>Sl no.</b>	<b>Vegetation type</b>	<b>General composition</b>
1	Tropical Wet Evergreen forests	Dense tall forest, entirely evergreen or nearly so.
2	Tropical Semi Evergreen forests	Dominants include deciduous species but evergreens pre dominates.
3	Tropical Moist Deciduous forests	Dominants mainly deciduous but sub-dominants and lower storeys largely evergreen. Top canopy rarely dense and even, but over 25m high.
4	Littoral and Swamp forests	Mainly evergreen, of varying of varying density and height, but always associated predominantly with wetness.
5	Tropical Dry Deciduous forests	Entirely deciduous or nearly so. Top canopy rather light and rarely over 25m high, usually 8-20 m.
6	Tropical Thorn forests	Deciduous with low thorny trees and xerophytes predominating. Canopy more or less broken. Height under 10m.
7	Tropical Dry Evergreen forests	Hard leaved evergreen trees predominate with some deciduous emergents, often dense, but usually under 20m high.
<b>MONTANE SUBTROPICAL FORESTS</b>		
1	Subtropical Broadleaved Hill forests	Broadleaved largely evergreen high forest.
2	Subtropical Pine forests	Pine associations predominate.
3	Subtropical Dry Evergreen forests	Low xerophytic forest and scrub.
<b>MONTANE TEMPERATE FORESTS</b>		
1	Montane Wet Temperate forests	Evergreen forest without conifers.
2	Himalayan Moist Temperate forests	Evergreen forest, mainly sclerophyllous oaks and conifers.
3	Himalayan Dry Temperate forests	Open coniferous forest with sparse xerophytic undergrowth.
<b>SUB-ALPINE FORESTS</b>		
1	Sub-Alpine forests	Stunted deciduous or evergreen forest usually in close formation with or without conifers.
<b>ALPINE SCRUB</b>		
1	Moist Alpine Scrub	Low but often dense scrub.
2	Dry Alpine Scrub	Xerophytic shrubs in open formation.

*Source: Champion and Seth, 1968.*

i) Northern Tropical Semi Evergreen forest (2B):

These types of forests are found in some parts of middle range and along the foothill



regions bordering Assam and occur under habitat conditions widely overlapping those of Northern Tropical Wet Evergreen forests and South India Moist Deciduous forests. The mean annual rainfall is typically about 2000mm but ranges from 1500 to 3000 mm or more varying greatly with the topography. The average Humidity is relatively high where the mean annual value is about 78%. The species that make up these forests are similar to those of the Northern Tropical Wet Evergreen forests. The only difference is that in the former case the evergreen species dominates though there are deciduous species like Bhelu (*Tetrameles nudiflora*), Paroli (*Stereospermum chelonoides*), Jutuli (*Altingia excwlsa*), etc. whereas in the present case, the number of evergreen species decreases and the deciduous species are more in number. The tree species that are commonly found in this type of forest are Sam (*Artocarpus chama*), Siris, Sau, Koroi (*Albizia spp.*), Kadam (*Anthocephalus chinensis*), Khakan (*Daubanga grandiflora*), Ou-tenga (*Dillenia indica*), Teeta champa (*Michelia champaca*), *Schima wallachi*, *terminali species*, bamboos, ferns and epiphytes are abundant.

ii) Northern Sub-Tropical Broad Leaved Wet Hill Forest (8B/C1).

These types of forests are found in the hill areas below 1800meters and above 500 meters. The mean annual temperature ranges from 15°C to 20°C and the soils are mostly brown earths. The wet evergreen species are conspicuous by their absence and the dominant species are mostly semi-deciduous. Some of the important timber species found in this type are Koroi (*Albizzia procera*), Pomas, Sopa (*Magnolia rubra*), Gamari(*Gmelina arborea*), Hollock (*Terminalia mvriocarpa*), Sam Bedula (*Artocarpus chaplasha*), Aam (*Magnifera indica*), Badam (*Mansonia dipikae*),

(*Bedula alnoides*), alder, rhododendron, chestnuts, cherry, poma, etc<sup>7</sup>.

### 3.5. Land use and land cover

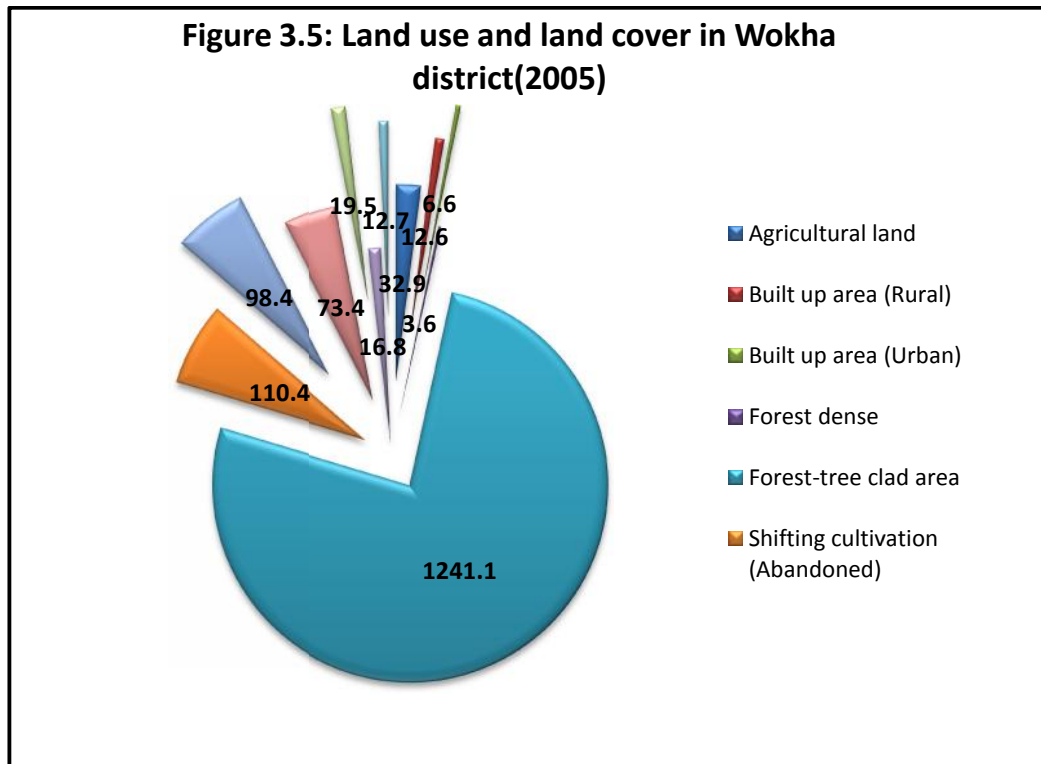
The pattern of land use is an important factor which affects the forest cover to a great extent. The decrease or increase in forest cover is determined by the land use pattern. Utilization of more land for agriculture, infrastructural development, settlement area, etc. requires the clearing of forest land and thus, causes reduction of forest areas. As seen in table 3.7 the major portion of the land is utilized for agricultural purpose which is followed by wastelands, water bodies and settlement areas and the rest consists of forest areas. Despite the coverage of more land under forest cover, the land covered by dense forest is very negligible when compared to the total forest areas. Figure 3.5 shows the various categories of land use in the district in 2005.

Table 3.7: Land use and land cover in Wokha district (2005).

Sl No.	Landuse	Land cover in Sq.Km.
1	Agricultural Land-Crop	32.9
2	Built Up Area (Rural)	12.6
3	Built Up-Built Up(Urban)-	6.6
4	Forest Dense	3.6
5	Forest-Tree Clad Area	1241.1
6	Shifting Cultivation-Abandoned	110.4
7	Shifting Cultivation-Current	98.4
8	Wastelands Dense Scrub	73.4
9	Wastelands Open Scrub	19.5
10	Waterbodies-Reservoir/Tanks	16.8
11	Waterbodies-River/Stream	12.7
<b>Grand total</b>		<b>1628</b>

Source: Department of Science and Technology, Govt. of Nagaland.

<sup>7</sup> Champion and Seth, 1968 pp 88-91, 260-268, Annual Administrative report 2010-2011, Department of Forest, Govt. of Nagaland.



Source: Department of Science and Technology, Govt. of Nagaland.

### 3.6. Pattern of land ownership

Because of the unique and traditional land holding system like that of the other tribes in other districts of Nagaland most of the land in Wokha district is owned by the clan, family, individuals or village and as such the land owned by the State government is very negligible. The ownership of land during the forefather's time was acquired at the time of establishing the village. New villages were established by group of people consisting of families of different clans and the extent of the village area was claimed to the farthest area where they could access and practice cultivation which usually did not extent much because of the fear of foes and enemies, inaccessible terrain and thick forest cover. The ownership of land has been passed on from one generation to the other and as a result even today most of the land are under the control of private owners i.e., individual, family, clan and village in Wokha. Government owned lands are very negligible in the district. Apart from the construction of infrastructures for

the State Government establishments the land purchased for conservation and management of forest is very less in spite of the purchase of about 6.9312 Sq. Km. forest land from private owners by the Department of Forests, Ecology, Environment and Wild life under the aegis of the Government of Nagaland to take up plantation and Biodiversity Conservation which accounts for only about 0.43% of the total geographical area of the district<sup>8</sup>. The fact that the land owned by the people is dominant as compared to that of the State Government can be substantiated by the information acquired from the observations and interviews conducted during the field survey though data in figures of the areas could not be acquired as most of the village areas in the district are not yet surveyed. In all the eighteen sample villages the land is owned by individual, clan or family which ranks first, followed by village land. Besides Richanyan all the other sample villages have some small areas of village land which have been reserved for various purposes. The land belonging to the State Government ranks third where out of the eighteen sample villages only eight villages have land owned by the State Government. These lands have either been donated by the villagers or purchased from the villagers for construction of infrastructures of Government establishments such as offices, schools, roads, etc. (Table 3.8). There are no forest lands owned by the State Government in the sample villages apart from the purchase of 6.9312 Km<sup>2</sup> forest land from private owners in some parts of the district.

### **3.7. Status of forest cover in Wokha district**

As given in table 3.9, the forest cover from 2001 to 2003 show an increase by 24 Sq. Km which remained unchanged in the 2005 assessment. The following two assessment years i.e., 2007 and 2009 shows continuous decrease in forest cover. One

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<sup>8</sup> Annual Administrative report 2011-12, Department of Forest, Ecology, Environment and Wildlife, Government of Nagaland.

of the main reasons for the decrease in the forest cover is because of the practice of the traditional jhum cultivation which is the most practiced agricultural method in the district apart from encroachment of forest area for settlement, cutting of trees for commercial and domestic use, forest fires, development activities and improper management plans and methods.

Table 3.8. Land ownership patterns in the sample villages in Wokha district.

Sl. No.	VILLAGE	LAND OWNERSHIP RANKING		
		I <sup>st</sup>	II <sup>nd</sup>	III <sup>rd</sup>
1	Wokha	Clan/Family/Individual land	Village land	Govt. land
2	Tsungiki	Clan/Family/Individual land	Village land	Govt. land
3	Longsa	Clan/Family/Individual land	Village land	Govt. land
4	Niroyo	Clan/Family/Individual land	Village land	Nil
5	Riphyim (Old)	Clan/Family/Individual land	Village land	Govt. land
6	Pangti	Clan/Family/Individual land	Village land	Govt. land
7	Sanis	Clan/Family/Individual land	Village land	Govt. land
8	Meshangpen	Clan/Family/Individual land	Village land	Nil
9	Chudi	Clan/Family/Individual land	Village land	Nil
10	Lotsu	Clan/Family/Individual land	Village land	Nil
11	Soku	Clan/Family/Individual land	Village land	Govt. land
12	Seluku	Clan/Family/Individual land	Village land	Nil
13	Bhandari	Clan/Family/Individual land	Village land	Govt. land
14	Yimpang	Clan/Family/Individual land	Village land	Nil
15	Pangtong	Clan/Family/Individual land	Village land	Nil
16	Liphi	Clan/Family/Individual land	Village land	Nil
17	Richanyan	Clan/Family/Individual land	Nil	Nil
18	Elumyo	Clan/Family/Individual land	Village land	Nil

Source: Field Study 2011-2012.

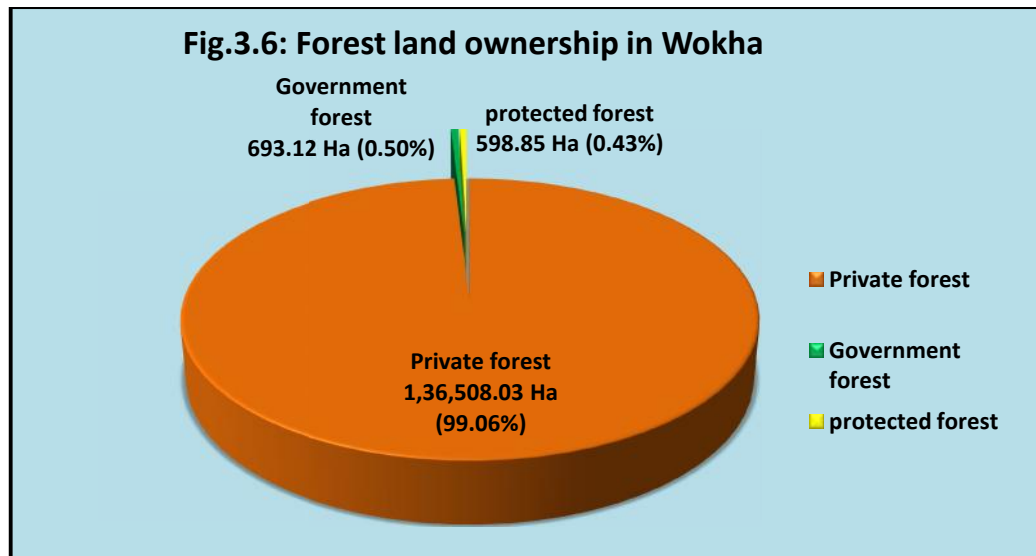
Table 3.9. Forest cover change in Wokha district.

Sl. No.	Year	Dense	Moderately dense	Open	Total in Sq.Km	Total G.A in Sq.Km	Percent	Change
1	2001	518		907	1425	1628	87.53%	
2	2003	7	518	924	1449	1628	89.00%	+24
3	2005	1	406	1042	1449	1628	89.00%	Nil
4	2007	1	511	902	1414	1628	86.86%	-35
5	2009	1	504	873	1378	1628	84.64%	-36

(Source: India State of Forest Report 2001, 2003, 2005, 2009 & 2011, FSI, Dehradun)

Though the State Government does not own much forest land yet with the co-operation and support of some of the villages in the district, initiatives have been taken to demarcate some areas as protected forest keeping in mind the importance of forest. The areas which have been demarcated as protected forest are the Tiyi reserve forest in Wokha village covering an area of 323.75 ha., the protected forest in Aitepyong with an area of 233.10 ha. and Yikhum reserve forest having an area of 42.00 ha.<sup>9</sup>.

Taking into account the area covered by forest in the year 2011 which stood at 1,37,800 h.a representing 84.64% of the total geographical area<sup>10</sup>, the extent of protected forest out of the total forest area is 598.85 ha. (0.43%). The Government owned land which has been purchased from private owners for conservation of biodiversity and plantation covers an area of 693.12 ha. (0.50%) and the rest i.e., 1,36,508.03 ha. representing 99.06% of forest area is owned and controlled by private owners (fig. 3.6).



Source: Annual Administrative report 2006-07 & 2011-12, Dept. of Forest, Ecology, Environment and Wildlife, Govt. of Nagaland.

<sup>9</sup> Annual Administrative report 2006-07, Department of Forest, Ecology, Environment and Wildlife, Government of Nagaland pp 16-17.

<sup>10</sup> India State of Forest Report 2011, Forest Survey of India

It is seen from the present discussion that over the years the forest cover is gradually decreasing in the district. The dense forest cover which was recorded at 518 Sq. Km in 2001 has been drastically reduced to hardly 1 Sq. Km in 2005 and this trend had continued in the following years without any signs of recovery. The year 2004 had shown an increase in forest cover by +24 Sq. km but in the following years the overall forest cover in the district has shown a declining trend. Taking into account the prevailing situations there is an urgent need to check the rapid deforestation taking place in the district. Since most of the forest land is privately owned, the mode of utilization of the land is totally at the discretion of the land owners which is also one reason for the decrease in forest cover. Thus, in order to check the rapid declination of forest cover in the district it is imperative for the State Government agencies to take into confidence the land owners so as to work together for effective implementation of various management plans to check the reduction in forest cover in the district.

## CHAPTER - IV

### UTILIZATION OF FOREST RESOURCES

#### Introduction

Forests are an important resource, which gives great service having economic values and are home to some of the World's poorest people. Forest dependent communities and tribals are so attached to the forest that they prefer to live amidst forests rather than in the so-called modernized human settlements. They get shelter, home and raw materials for house buildings, food, dress material, cultural equipments, spiritual life or pleasure together with psychological contentment from forests. Their way of life is strongly associated with the forests from birth to death (Pandey, 2010). Almost 70 million people, many of whom are indigenous, live inside the forests. Another 735 million rural people live in or near forests and Savannas and rely on them for their fuel<sup>1</sup>. The rural population in Wokha district accounting for 78.96 percent of the total population substantiates the fact that majority of the people in the study area are forest dwellers and are dependent on the forest for their survival and livelihood in one way or the other apart from practicing the traditional method of agriculture popularly known as jhum or shifting cultivation. Throughout generations, the people of this region have had a close relationship with the forest and relied on the forest for food, shelter, recreation and clothing. The forest is intrinsically associated with the socio-culture and the economic life of the people of this region since time immemorial though some cultural aspects such as religious beliefs and practices have changed over the years especially with the advent of Christianity. The forests, apart from being the main source for firewood, which is the only means of energy source for

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<sup>1</sup> <http://lnweb90.worldbank.org>



most of the rural people even in the present times, also provide various materials for construction of houses, fencings and granaries especially in the villages. Many varieties of trees and bamboos are also used for making baskets, mats, handicrafts, various agricultural and domestic implements, rice pounding tables, etc. Different varieties of plants, leaves, fruits, roots, shoots, fungi, insects, birds, fishes and animals obtained from forest are utilized for food and medicines. Forests are also the sources of the materials required for making ornaments are obtained to be worn during festivals and ceremonial occasions. Besides the many uses of the products obtained from the forest, from the agriculture perspective the forests are the sources of all the nutrients required in jhum or shifting cultivation where the vegetation in the forest land are cut, dried and burned in order to make the soil more fertile and productive.

#### **4.1. Demographic and Socio-economic profile**

The demographic and socio-economic attributes such as household size, sex distribution, educational status, occupation, and distance from the nearest commercial center influences forest use and management. Population growth is one important factor, which directly contributes to resource degradation especially as it affects the forest ecosystem. Various demographic attributes have been taken into consideration to study the relationship between population growth and the rate of utilization of forest resources. The provisional census of 2011 shows a negative population growth in Nagaland by -0.6 percent but in the case of Wokha district the population has increased by 3.2 percent in 2011 as compared to the 2001 census. According to the 2001 census report the density of population in Nagaland was 120 persons per Sq. Km. which has been reduced to 119 persons per Sq. Km. in 2011. In Wokha district the population density in 2001 stood at 99 persons per Sq. Km. but this has increased

to 102 persons per Sq. Km. in 2011. The rural population in the district has also increased by 6.3 percent while on the other hand the urban population has decreased by -7 percent (Table 4.1).

According to the 2001 census report the number of recognized and unrecognized villages in Wokha district was 129, this has increased to more than 150 villages in the 2011 provisional census report. The number of households in 2001 was 19,232 in the whole Wokha district, which has increased by about 39 percent in the 2011 census totaling to 31,891 households. The demographic profile of the 18 (eighteen) sample villages which were selected for the purpose of the research study is given in table 4.2.

Table 4.2. Demographic profile of the sample villages in the study area (2011).

Sl. No	Village	Household	Population	Male	Female	Sex ratio	Literacy in %
1	Yimpang	360	1400	666	734	1102	86.68
2	Bhandari	103	382	197	185	939	<b>98.83</b>
3	Pangtong	90	381	167	214	1281	98.49
4	Liphi	143	679	354	325	918	70.7
5	Ruchanyan	106	399	208	191	918	87.82
6	Soku	80	350	180	170	944	77.13
7	Pangti	1209	7825	3826	3999	1045	85.42
8	Sanis	258	1416	664	752	1132	79.12
9	Meshangpen	83	426	240	186	775	88.01
10	Chudi	169	1057	518	539	1040	92.08
11	Lotsu	237	1419	739	680	920	89.18
12	Wokha	931	4724	2359	2365	1002	83.21
13	Elumyo	360	1627	820	807	984	70.25
14	Longsa	395	1452	628	824	1312	89.54
15	Niroyo	179	1016	520	496	953	75.56
16	Riphyim old	461	2933	1485	1448	975	88.89
17	Seluku	171	695	348	347	997	85.79
18	Tsungiki	556	3320	1667	1653	991	76.02
<b>Wokha district</b>		<b>31891</b>	<b>166343</b>	<b>84505</b>	<b>81835</b>	<b>968</b>	<b>87.7</b>

Source: census of India 2011, Directorate of census operations, Nagaland.

Table 4.1: Decadal population change in Nagaland, 2011 census.

Sl no	State/District	Population 2011			Percentage decadal change 2001-2011			Population density 2001	Population density 2011
		Total	Rural	Urban	Total	Rural	Urban		
1	Mon	250,260	215,816	34,444	-4.0	-11.6	107.6	146	140
2	Mokokchung	194,622	138,897	55,725	-16.1	-30.9	78.5	144	121
3	Zunheboto	140,757	113,160	27,597	-9.0	-14.0	19.6	123	112
<b>4</b>	<b>Wokha</b>	<b>166,343</b>	<b>131,339</b>	<b>35,004</b>	<b>3.2</b>	<b>6.3</b>	<b>-7.0</b>	<b>99</b>	<b>102</b>
5	Dimapur	378,811	180,942	197,869	22.9	-6.5	72.7	332	409
6	Phek	163,418	138,843	24,575	10.3	2.6	91.0	73	81
7	Tuensang	196,596	159,822	36,774	5.7	2.3	23.5	73	78
8	Longleng	50,484	42,871	7,613	-58.5	-64.7	0.0	216	90
9	Kiphire	74,004	57,517	16,487	-30.6	-46.0	0.0	94	65
10	Kohima	267,988	146,900	121,088	21.7	2.6	57.2	150	183
11	Peren	95,219	81,429	13,790	4.9	-10.3	0.0	55	58
<b>Nagaland</b>		<b>1,978,502</b>	<b>1,407,536</b>	<b>570,966</b>	<b>-0.6</b>	<b>-14.6</b>	<b>66.6</b>	<b>120</b>	<b>119</b>

Source: census of India 2011, Directorate of census operations, Nagaland.

As seen in table 4.2 Pangti village has the highest number of households (1209 households) and Soku village the lowest (80 households) among the sample villages. In terms of population Pangti village has the highest population with 7825 persons residing in the village comprising 3829 males and 3999 females. Pangtong village has the lowest male population with 167 males while Soku village recorded the lowest female population with 170 females. Among the sample villages, Soku has the lowest population with 350 persons. The sex ratio i.e., number of female per 1000 male is highest in Pangtong village with 1281 female per 1000 male and the lowest is in Meshangpen with only 775 female per 1000 male. Bhandari village has the highest literacy rate at 98.83 percent while in Liphi village has the lowest literates with only 70.7 percent in the whole village.

Before coming in contact with the British in the 19<sup>th</sup> century, the traditional Lotha society was self-sustaining supported by shifting or jhum cultivation, hunting, fishing and by various forest products. The people lived a very simple and contented life in their own isolated villages. Barter system was the most dominant method of trading, as the people knew very little about money economy during those days. The socio-economic attributes of the Lotha society changed significantly after coming in contact with the Britishers and Americans who brought along with them Christianity, education and new lifestyles. Other major factors responsible for the change in the socio-economic attributes were India's post Independence period and the years that followed the declaration of Nagaland as a State in 1963. From 1947 onwards, the Government of India introduced various developmental programmes in the country, which have touched and affected every aspect of life of the people thereby bringing change in the socio-economic status throughout the country.

The poor receive forest products without price by utilizing their surplus labor;

the latter has direct bearings with their socio-economic conditions. Thus, it is essential to examine the relationship between forest utilization and socio-economic status of the people. The findings may be useful to formulate development strategies for the poor and hence reduction in dependency on forest (Pandey, 2010). In terms of change in the socio-economic life, the area under study does exhibit similar pattern of changes, especially after the statehood of Nagaland. Forest resources which substantially augment the economy of the people are used in variety of ways depending upon the socio-economic factors such as number of households, literacy rate, occupation, access to markets, distance from the main commercial centre, i.e., Wokha town and the road connectivity. Table 4.3 shows the socio-economic profile of the sample villages.

According to the 2011 provisional census, the total main workers in Wokha district consisted of 63,514 persons, which account for 38.18 percent of the total population. Pangtong village with 77.42 percent of the total population recorded the highest concentration of main workers. The total main workers in Niroyo village form only 25.09 percent of the total population, the lowest among the sample villages. Seluku village with 99.14 percent recorded the highest percentage of workers engaged in cultivation and Niroyo village with 47.45 percent of the total main workers recorded the lowest percentage of cultivators. Of the total main worker population of 63,512 persons the total other workers who are engaged in tertiary sector are 21, 650 in number representing 34.08 percent. Among the sample villages Niroyo village recorded the highest number of other workers with 52.55 percent while Seluku village with 0.86 percent recorded the lowest number of other workers.

Table 4.3: Socio-economic profile of the sample villages.

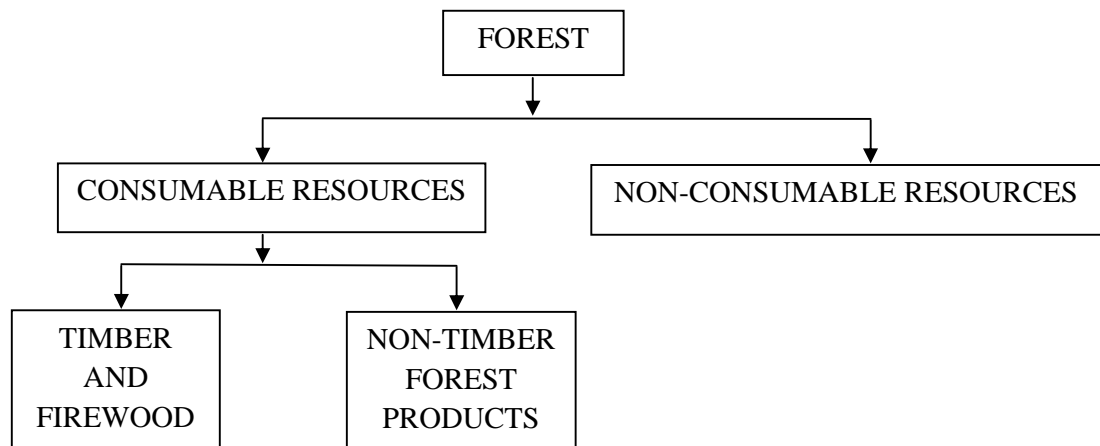
SI No	Village	Distance from Wokha town	Road connectivity	Literacy rate (%)	Household	main workers		Cultivators		Other workers	
						Total	In %	Total	In %	Total	In %
1	Yimpang	75 Kms	Kacha	86.68	360	830	59.28	477	57.47	353	42.53
2	Bhandari	60 Kms	Kacha	<b>98.83</b>	103	239	62.56	146	61.09	93	38.91
3	Pangtong	71 Kms	Kacha	98.49	90	295	77.42	291	98.64	4	1.36
4	Liphi	76 Kms	Kacha	70.7	143	329	48.45	318	96.66	11	3.34
5	Richanyan	80 Kms	Kacha	87.82	106	295	73.93	271	91.86	24	8.14
6	Soku	46 Kms	Partial black top	77.13	80	122	34.85	77	63.11	45	36.89
7	Pangti	83 Kms	black top	85.42	1209	2190	27.98	1611	73.56	579	26.48
8	Sanis	45 Kms	Kacha	79.12	258	743	52.47	667	89.77	76	10.23
9	Meshangpen	46 Kms	Kacha	88.01	83	150	35.21	124	82.67	26	17.33
10	Chudi	55 Kms	Kacha	92.08	169	406	38.41	302	74.38	104	25.62
11	Lotsu	65 Kms	Kacha	89.18	237	437	30.79	394	90.16	43	9.84
12	Wokha	2 Kms	black top	83.21	931	1584	33.53	938	59.22	646	40.78
13	Elumyo	12 Kms	Kacha	70.25	360	725	44.56	642	88.55	83	11.44
14	Longsa	2 Kms	black top	89.54	395	585	40.28	427	72.99	158	27.01
15	Niroyo	9 Kms	Partial black top	75.56	179	255	25.09	121	47.45	134	52.55
16	Riphyim old	17 Kms	black top	88.89	461	1134	38.66	1045	92.15	89	7.85
17	Seluku	15 Kms	Kacha	85.79	171	350	50.35	347	99.14	3	0.86
18	Tsungiki	16 Kms	Kacha	76.02	556	1346	40.54	1102	81.87	244	18.13

Source: Field study 2011-2012 and census of India 2011, Directorate of census operations, GOI, Kohima.

## **4.2. Types of forest resources and utilization**

A wide range of forest resources are utilized in various ways both for domestic as well as commercial purposes. Forest resources are being utilized for food, timber for construction, firewood, fodder, recreation and agriculture practice, watershed protection, soil protection and fertility, gas exchange and carbon storage, habitat and protection of biodiversity and species, etc. which are benefiting the local population to a great extent. Two types of forest resources identified in the study area are consumable and non-consumable. The consumable forest resources includes both flora and fauna species which are harvested from the forest and are utilized by the people for their benefit and livelihood throughout many generations influencing their way of life thereby, rendering the consumable forest resources important from the economic as well as cultural perspective. There is a hidden dimension to forests in that they have a wider role in the maintenance of environmental quality such as soil/water conservation and carbon sequestrations, which fall under the non- consumable forest resources, such ecological functions or environmental services rendered by the forests benefit many people at local, national and international level. For the purpose of the study, the consumable forest resources have been taken into consideration in order to examine and assess the dependence and utilization patterns of forest resources by the people of the region. The consumable forest resources are further categorized into timber, firewood and bamboo resources and non-timber forest resources (Fig. 4.1).

Fig. 4.1: Types of forest resources in Wokha district.



Source: Field study 2011-2012.

### 4.3. Consumable forest resources

The products obtained from the forests, which are utilized by the people for their sustenance and livelihood falls under the category of consumable forest resources. These products are used very frequently and they play an important role in the economy of the people, as they are the source of monetary income and food for bulk of the rural population. The consumable forest resources encompasses a wide array of products that have medicinal, nutritional, spiritual and technical (construction and crafts) value and have been among the most valuable resources for many generations in the study area. The consumable forest resource includes all the naturally occurring varieties of forest products such as fungi, plants, insects, trees, birds, animals, fishes, etc. Besides these products, sand, boulders and mineral such as coal are also utilized in the region.

#### 4.3.1. Timber

Varieties of tree species are found in the study area and they are used for various purposes, but the most important is for construction of houses, making furniture and as fuel for making fire. Some of the common tree species that are abundantly found in



the region and are mostly utilized as timber for construction purpose and for making furniture and other domestic and commercial uses are given in table 4.4 with the scientific, common and local names along with their usage.

Since the forefathers' time, trees have been closely associated with their way of life and have relied heavily on the trees for their needs varying from domestic implements to firewood and construction of shelters. Even in the present days one can observe that trees surround the village area and cutting down of these trees are prohibited and heavy fines are imposed to those who do not adhere to the prohibition. For the Lothas trees were also associated with their beliefs especially before the setting in of Christianity in the region, for instance, a tree of the ficus family called *menkitong* in local dialect also known as head-tree was considered sacred. When a new village is founded a suitable site is always selected for planting of the *menkitong* which was the most conspicuous object in a Lotha village and the people believed that the fortune of the village in a way was dependent on the *menkitong*. During the days of head-hunting the enemies head taken in war were hung on the *menkitong* and at its roots were kept the mysterious *oha* or luck-stones. So sacred was the *menkitong* that even a dried branch or twig that broke were never used for any purpose. Even to break a twig off it would entail the performance of '*oyantsoa genna*' or the village renewing *genna*, which must also be performed if the *menkitong* dies or a branch falls. In some cases trees were also associated with the founding of villages, for instance, a common story, told to account for the founding of Longsachung, Lotsu and several other villages runs as follows: A man had a saw which wandered off one day and could not be found. He tracked it for miles, till he found it lying under a big tree, where it had littered. He at once decided to found a new village on the spot and the tree where the saw had littered became the head-tree (Mills, 1922). Different tree species were

Table 4.4: Some common tree species used as timber found in Wokha district.

Sl No.	Local name	Indian name	Scientific name	Uses
1	Evo	Hollock	<i>Terminalia myriocarpa</i>	Used for construction of houses such as doors, windows, posts and beams and for making furnitures.
2	Jentong	Gamari	<i>Gmelina arborea</i>	<i>Gmelina arborea</i> timber is reasonably strong for its weight, Once seasoned; it is a very steady timber and moderately resistant to decay and ranges from very resistant to moderately resistant to termites. Its timber is highly esteemed for door and window panels, joinery and furniture especially for drawers, wardrobes, cupboards, kitchen and camp furniture, because of its lightweight, stability and durability. It is also used for bentwood articles.
3	Rilum	Tita chap	<i>Michelia champaca</i>	Used for plywood, furniture making, house construction, timber planks, doors and windows.
4	Etsson	Neem species	<i>Azadirachta spp.</i>	Used for plywood, timber planks, etc.
5	Mharyu	Poma	<i>Cedrela spp.</i>	Suitable for making furnitures and other household items.
6	Nchung	Needle wood	<i>Schima wallachi</i>	Used for making plywood, also used for posts and pencil slits.
7	NA	Bonsum	<i>Phoebe goalparensis</i>	Mostly used for building construction and bridges.
8	NA	Koroi	<i>Albizia procerra</i>	Used for paper pulp, sugarcane crusher, rice pounder, wheels, agriculture implements, electric posts, etc.
10	Nohitong	Walnut	<i>Juglans regia</i>	Used for making gunbuds, ornaments, furnitures and pencil slit.
11	Wonsu	Khokon	<i>Duabaga sonneratioles</i>	Used mostly for construction purposes and for making furnitures.
12	Teak	Teak	<i>Tectona grandis</i>	Mostly used for making furnitures.

Source: Field study 2011-2012, Kikon, 2002 and Dept. of Land Resources, Govt. of Nagaland.

protected and preserved by the people before the coming of Christianity in the region because of their animist beliefs and the ceremonies and rituals associated with it. They believed that trees played a significant role in bringing fortune to the people and the village. The introduction of Christianity in the district and the acceptance of the same by the Lothas has been instrumental in gradually discarding their animist beliefs and with it many tree species started losing their significance as the ceremonies and rituals were no longer practiced, this transformation with time coupled with the increase in population and the need for development and advancement in the fast changing world has resulted in harvesting and utilization of all available tree species without any reservations. Variation in the housing types was observed during the field study which is given in table 4.5.

Table 4.5: Variation of housing types in the sample villages.

Sl No.	Village	Household	Housing type	
			RCC/Concrete wall	Bamboo and timber wall
1	Yimpang	360	4	356
2	Bhandari	103	5	98
3	Pangtong	90	3	87
4	Liphi	143	2	141
5	Ruchanyan	106	3	103
6	Soku	80	4	76
7	Pangti	1209	17	1192
8	Sanis	258	9	249
9	Meshangpen	83	3	80
10	Chudi	169	9	160
11	Lotsu	237	5	232
12	Wokha	931	465	466
13	Elumyo	360	5	355
14	Longsa	395	94	301
15	Niroyo	179	7	172
16	Riphyim old	461	12	449
17	Seluku	171	4	163
18	Tsungiki	556	19	537

Source: Field study 2011-2012.

The villages located near the main commercial center i.e. Wokha town namely Longsa and Wokha have more RCC buildings than the ones that are located far from Wokha town. Except for the Church buildings and the community halls where concrete materials are used for construction mostly with CGI roofing, most of the houses in the sample villages are constructed using timber and bamboos with CGI roofing (Plate 4.1, 4.2, 4.3).

#### **4.3.2. Firewood**

Apart from construction, furniture and craft purposes, many tree species found in the region are also extensively used as firewood. Firewood constitutes the major source of cooking energy in India and more than 853 million people use firewood for cooking in India. As per the 2011 census, 49 percent of the households in India use firewood for cooking. In some states, it is as high as 80 per cent. The forest rich states have higher incidence of firewood used for cooking. This trend is evident from Table 4.5, which shows the forest cover of the states with higher incidences of firewood use. As for the total annual volume of firewood use is concerned, it is estimated to be 216.421 million tonnes and of which 58.747 million tonnes (27.14 per cent) are sourced from forests (Nayak et al., 2012) (Table 4.6).

In spite of the introduction of other sources for making fire such as LPG, electric heater, biogas, etc. in the study area some few decades back, firewood still remain the most favourite and the main source of fuel for making fire for the majority of the population especially for the rural inhabitants who rely heavily on the woody plants for firewood because of the fact that they are easily and freely available and is convenient for use. Some of the common tree species that are used by the people of the study area for firewood are given in table 4.7 with the local and scientific names.

Table 4.6. Forest cover and dependence on firewood.

State	Percentage of households using firewood for cooking	Percentage of total geographical area under forest cover
Chhattisgarh	80.8	41.18
Tripura	80.5	76.07
Meghalaya	79	76.02
<b>Nagaland</b>	<b>77.9</b>	<b>80.33</b>
Assam	72.1	35.28
Arunachal Pradesh	68.7	80.50
Madhya Pradesh	66.4	25.21
Manipur	65.7	76.54
Odisha	65	31.41
Kerala	61.9	44.52
Jharkhand	57.6	28.82

Source: Nayak et al., The Energy and Resources Institute India (teriin), 2012.

Table 4.7: Common tree species used as firewood in Wokha district.

SI No	Local name	Scientific name
1	Meshang	<i>Michelia champack</i>
2	Orung	<i>Lithocarpus pachyphyllus</i>
3	Elum	<i>Alnus nepalensis</i>
4	Chukithi	<i>Emblica officinalis</i>
5	Etothi	<i>Artocarpus lacucha</i>
6	Thumpak	<i>Rhus Semialata</i>
7	Tsutssen	<i>Souraceia nepalensis</i>
8	Khyosolothi	<i>Castania sativa</i>
9	Khoro	<i>Macranga spp.</i>
10	Molitong	<i>Bauhinia racemosa</i>
11	Zuvothi	<i>Ficus racemosa</i>
12	Mungmungthi	<i>Prunus serotina</i>
13	Otumthi	<i>Baccaurea ramiflora</i>
14	Ethungtong	<i>Tamarindus indica</i>

Source: Field study 2011-2012 and Dept. of Land Resources, Govt. of Nagaland.

(Plate 4.1, 4.2, 4.3

The main suppliers of firewood to the inhabitants of the towns are the villages that are located within the vicinity of the towns. Selling of firewood to the users in the towns is an important source of generating monetary income for the villagers. In the study area firewood is mostly cut and collected during the dry season i.e., from November to March. The data collected during the field study for analyzing the use of firewood in comparison to the other sources for making fire as given in table 4.8 shows that most of the sample villages are dependent of wood for making fire.

Table 4.8: Various Sources of fuel used for making fire in the sample villages.

Sl. No	Village	Household	Firewood	LPG	Electric heater	Bio-gas	Cowdung cakes
1	Yimpang	360	360	Nil	Nil	Nil	Nil
2	Bhandari	103	103	3	Nil	Nil	Nil
3	Pangtong	90	90	Nil	Nil	Nil	Nil
4	Liphi	143	143	2	Nil	Nil	Nil
5	Ruchanyan	106	106	Nil	Nil	Nil	Nil
6	Soku	80	80	3	Nil	Nil	Nil
7	Pangti	1209	1209	108	79	Nil	Nil
8	Sanis	258	258	7	9	Nil	Nil
9	Meshangpen	83	83	2	Nil	Nil	Nil
10	Chudi	169	169	6	Nil	Nil	Nil
11	Lotsu	237	237	7	Nil	Nil	Nil
12	Wokha	931	931	707	363	Nil	Nil
13	Elumyo	360	360	10	Nil	Nil	Nil
14	Longsa	395	395	115	103	Nil	Nil
15	Niroyo	179	179	12	7	Nil	Nil
16	Riphyim old	461	461	19	15	Nil	Nil
17	Seluku	171	171	Nil	Nil	Nil	Nil
18	Tsungiki	556	556	21	11	Nil	Nil

Source: Field study 2011-2012.

It was observed during the field study that the villages such as Yimpang, Pangtong, Seluku and Ruchanyan did not use any LPG or other source of fuel for making fire apart from firewood because of the fact that these villages have very bad road connectivity and are located far from the Wokha town which is the only centre in the entire district for supplying LPG. Electric appliances such as electric heater,

electric rice cooker, etc., are also not used in most of the villages because of the irregular supply of electricity and also due to the poor economic condition of most of the people in the villages. The use of electrical appliances is mostly confined to the villages that are located within the proximity of the main town i.e the Wokha district headquarters. Use of bio-gas and cow dung cakes are not practiced because most of the villages do not rear cows which is the main source of the mentioned fuel. The reasons for the use of Firewood in most of the villages inspite of the use of other source of fuel for making fire are:

- a) The rearing of pigs which is the most domesticated animal in all the sample villages where firewood is used for cooking the pigs' food. It was observed that an average of two pigs per household was reared in all the sample villages.
- b) The cold climatic condition especially during the winter season is also one reason for the use firewood.
- c) People are also fond of smoked meat which is kept near the fire place and this is also one reason for the use of firewood.

According to the replies given by the respondents it is estimated that an average about two truckloads of firewood is used annually per household in all the villages. The firewood is collected and carried to the village by head load which is very tiresome and painstaking.

#### **4.3.3. Non-timber forest products**

Non-timber Forest products have satisfied human needs since long time back and are currently receiving focused attention from ethno-botanists, conservationists, policy-makers and breeders, as they embody the goals of conservation, development and production activities. Non Timber Forest Products (NTFPs) are the materials of



biological origin, derived from forest or any land under similar use, excluding wood in all its forms. They are either living or non-living items like plants or animals or their parts like boulders, sand, gravel, honey etc. Agenda 21 and Forest Principles adopted at Rio de Janeiro 1992 identified the NWFPs as an important area requiring increased attention, as a source of environmentally sound and sustainable development. It may be noted that in India, at present, Non Timber Forest Produce have a national trade amounting about INR 1000 crores, National Indian System of Medicine market INR 2500 crores, Global Market US\$ 60 billion and India exports to a worth of INR 446 crores. 3000 NTFP species derived from 328 families of flowering plants and 384 species are used for edible products of which 30% is of tribal diet (Bhuyan et al., 2010). It is estimated that in the remote uplands of Vietnam 24 million people out of a population of 82 million inhabitants either live near forests or are dependent on forests, and nearly eight million ethnic minority people spend much of their time gathering NTFPs and hunting (Poffenberger et al., 1998). In developing countries, majority of rural household and a large proportion of urban household depend on NTFPs to meet some parts of their nutritional, health, construction material and income from selling these products. Elsewhere, NTFPs are the only source of income for the local communities. Therefore, NTFPs form an integral part of the rural economy where the majority of the rural populations live especially around the forest resource base (Giliba et al., 2010). NTFPs like fuel-wood, medicinal plants, wild edible vegetables, house building materials etc. are integral part of day-to-day livelihood activities especially for tribal people (Sarmah et al., 2006).

Like any other tribal people, the Lothas of Wokha district are also dependent on the non-timber forest products for their day to day needs. It was observed that the bulk of the people living in the villages used many products that were obtained from

the forest which were also supplied to the towns nearby especially those villages located within the vicinity of the towns, thus, rendering the non-timber forest products an important source of monetary income for the rural population. Utilization of the non-timber forest products is not a new thing as the utilization of these products have been practiced since time immemorial. Though there are not much written records or literatures with regard to the utilization of forest resources in the region yet observing and studying the ways of life of the people throws some light in the ways that the resources obtained from the forest are utilized. Keeping in mind the importance of traditional aspect on the ways of utilization of the non-timber forest products for studying the patterns of utilization, during the interviews informations were obtained from the respondents on how the forefathers utilized the NTFPs and also the changes that have taken place in the present times with regard to the utilization of the NTFPs. Apart from the informations obtained from the respondents, J.B. Mills' monograph on 'The Lotha Nagas' have also been referred in studying the traditional aspect as it provides a reliable and authentic information about the traditional life of the Lothas which were associated with the use of forest resources in one way or the other.

#### **4.3.4. Traditional uses of NTFPs**

Traditionally the Lotha Nagas used almost all the NTFPs that were naturally available in many ways. Apart from utilization, in some cases naming of villages were associated with the NTFPs of which some examples worth mentioning are Seleku which is called so because many flying squirrels (*Selek*) were found when the side was cleared for establishing the village. Niroyo is the place of a plant with red berries called *niro*. Longsa (*Olung*=Stone, *Osa*=Platform) is so called from a flat-topped rock near the eastern entrance of the village. Okotso is said to mean the place where the

pigs of Pangti were eaten by tigers (*Woko*= pig, *tso*= eat). Their beliefs were also associated with NTFPs in some ways. For instance, the Lothas believed in jungle deity called *Siikhyingo* who is the Lord of all wild animals which he keeps just as men keep pigs and cattle. *Ngazo* is another jungle spirit, practically identified with *Siikhyingo*. They grant and withhold the games to hunters and food gatherers. *Jupvuo* (Water master) is another godling who is regarded as the lord of rivers and streams. Small offering is made at least once in a year to invoke its blessings for *Jupvuo* withholds or grants the fishes of the water to the fishermen (Kikon, 2002). During the forefathers' time for a person to construct a house he selects a site and then he goes to a dreamer, of whom there are two or three in every village, with a small present of food, and asks him to dream that night and tell him in the morning if the site will be a lucky one. Dreams of spring, gourds, cucumbers, leaves, daos and spears, among other things are good. Dreaming of digging, hair dyed scarlet and black thread forebodes death. If the dreamer has a vision of frogs, crabs, or tortoises the man who builds a house on the site which is being tested will be ill. The beliefs mentioned above have lost their significance in the modern times especially after the embracing of Christianity by the Lothas which has in a way contributed to the wanton destruction of the forest areas where the resources were harvested for use and development.

The dresses and ornaments that the Lothas wore were mostly derived from the forest. Home-grown cotton were used for weaving cloths and three colours, red, dark blue and light blue used by the Lothas were obtained from the forest. To make red dye the root of *Rubia sikkimensis* (*Karung*) is pounded with another leaf called *ntawo*. Dark blue dye is made from the leaves of *Strobilanthes flaccid-folius* (*Khyimvu-vo*) which is pounded and boiled with water.

Ornaments are important component of the Lotha culture which are mostly

worn during ceremonial occasions. The Lothas wear above the elbow armlets (*Khoro*) consisting of sections sawn from an elephant's tusk but a person who cannot afford real ivory wear *Khoro* made of white wood smoothed and rounded to resemble the real article. The commonest form of necklace worn by the Lothas was made of black beads obtained from the seed of wild plantain (*eshe*). The Lotha women wear earrings made of pheasants plumes bound with red wool or yellow orchid stalk. Necklaces made of plantain seeds strung with elongated cut sections of big conch-shells called *lakup* are also worn. The Lotha warrior wore on his head a wig (*dungkho*) made of either of the Himalayan black bear or the fur of the arms of male gibbon. The Great Indian Hornbill feather (*wotsu emhi*) was fixed on the wig to signify that the warrior had done the head-taking genna once, or if he had done more than once, one hornbill's feather (*Rujung emhi*) is affixed for each occasion. A neck ornament of one or two pairs of wild boar's tusks (*soho*), with their bases bound by red cane and fasten with the square conch-shell button with a cornelian bead in the middle were also worn by persons who had done the head-taking genna. The leggings called *jori* or *joru* of plaited red cane with a design in yellow orchid stalk is worn by a man during dancing ceremonies. A man who has dragged a stone may wear between his shoulders at the back the head of a Great Indian Hornbill (*Wotsu*), a bird regarded by the Lothas as symbolical of wealth.

Much has changed in the modern times with regard to the utilization of forest resources for clothing and ornaments. Except for some ornaments that have been passed on through generations in their original state, in the modern times, the materials used for making dresses are manufactured in the industries which are readily available in the markets. The transition from the traditional use of forest resources to dependence on readymade garments and ornaments manufactured in the industries

through artificial means in the modern times indicates a change in the pattern of utilization of forest resources which have gradually changed with time.

#### **4.3.5. NTFPs used as food**

Various types of food obtained from the forest constitute the bulk of NTFPs which are extensively used by the people of the study area. It was observed during the field study that food items in the form of meat, fishes, insects, worms, leaves, flowers, shoots, fruits, etc., were highly valued and utilized in the region apart from the use of woody plants for construction and as firewood. Though the practice of jhum cultivation in the region supplies rice grain and vegetables for consumption, yet the contribution made by the NTFPs as food items cannot be ignored. Since the forefathers' time the forest has been the source of many varieties of food and it still does in the modern times.

The food items obtained from the forest consisted mostly of meat, fishes, leaves, insects, worms, fruits, shoots, flowers and stems which have been categorized accordingly as given in table 4.9 in order to study the pattern of utilization in the sample villages.

Among the food items derived from NTFPs, leafy vegetables are the most used products in the study area. These leafy vegetables of different species are found in abundance throughout the year and are used for domestic consumption as well as for sale in the markets. Leafy vegetables that are commonly used in the region is given in table 4.10 (Plate 4.4). The villages such as Longsa, Wokha, Elumyo, Niroyo and Tsungiki which are located near Wokha town are the main suppliers of leafy vegetables and other agricultural and horticultural products to the residents of the town. Besides Wokha town the products are also supplied to Kohima and Dimapur for sale.

Table 4.9. Patterns of utilization of NTFPs as food items in the sample villages.

Sl No	Village	Mostly used NTFPs as food							
		Leaves	Shoots/ flowers	meat	Insects/ worms	Fruits	Birds	Fishes/ prawns	Fungi
1	Yimpang	Max.	Aver.	Aver.	Min.	Min.	Aver.	Aver.	Min.
2	Bhandari	Max.	Aver.	Max.	Min.	Min.	Aver.	Aver.	Min.
3	Pangtong	Max.	Aver.	Max.	Min.	Min.	Max.	Aver.	Min.
4	Liphi	Max	Aver.	Aver.	Min.	Min.	Aver.	Max.	Min.
5	Ruchanyan	Max.	Aver.	Aver.	Min.	Min.	Aver.	Max.	Min.
6	Soku	Max.	Aver.	Max.	Aver.	Min.	Aver.	Max.	Min.
7	Pangti	Max.	Aver.	Max.	Aver.	Min.	Max.	Max.	Min.
8	Sanis	Max.	Aver.	Max.	Aver.	Min.	Aver.	Max.	Min.
9	Meshangpen	Max.	Aver.	Max.	Aver.	Min.	Aver.	Max.	Min.
10	Chudi	Max.	Aver.	Max.	Aver.	Min.	Aver.	Max.	Min.
11	Lotsu	Max.	Aver.	Aver.	Min.	Min.	Aver.	Max.	Min.
12	Wokha	Max.	Aver.	Aver.	Aver.	Min.	Aver.	Aver.	Min.
13	Elumyo	Max.	Aver.	Max.	Aver.	Aver.	Aver.	Max.	Min.
14	Longsa	Max.	Aver.	Aver.	Min.	Min.	Aver.	Aver.	Min.
15	Niroyo	Max.	Aver.	Aver.	Min.	Aver	Aver.	Aver.	Min.
16	Riphyim old	Max.	Aver.	Aver.	Min.	Min.	Aver.	Max.	Min.
17	Seluku	Max.	Aver.	Aver.	Min.	Min.	Aver.	Max.	Min.
18	Tsungiki	Max.	Aver.	Max.	Aver.	Min.	Max.	Max.	Min.

Max. = Maximum usage, Aver. = Average usage, Min. =Minimum usage  
(Source: field study 2011-2012)

Table 4.10. Common leafy vegetables used as food in the study area.

Sl No	Local name	Scientific name
1	Hantssan	Edible fern
2	Mhalivo	<i>Gnetum gnemon</i>
3	Mvuthivo	<i>Xanthoxylum oxyphyllum</i>
4	Chungrum	<i>Oceleoprao anium</i>
5	Dezulum	<i>Houttunia cordata</i>
6	Siyanorukho	<i>Contella asiatica</i>
7	Hanpyan	<i>Gynura bicolor</i>
8	Zutsu	<i>Elsholtzia blanda</i>

Source: Field study 2011-2012.

Plate 4.4: Different leafy vegetables

Meat is one of the favourite food items of the Lothas. It is used on all important occasions and is liked by all. Though bulk of the meat consumed comes from the pigs, chickens, ducks and other domestic animals that are reared by the people yet the meat of wild animals and birds also contribute greatly to their diet. Unlike the forefathers' time, meat of wild animals and birds are highly valued in the present times because of the fact that they are not easily available especially to the town dwellers and their taste is also somewhat different from the animals reared for consumption. The common wild animals that are hunted and killed for consumption in the study area are given in table 4.11.

Table 4.11: Common wild animals and reptiles used for food in the study area.

SI No.	Local name	Common name	Scientific name
1	Siyano	barking Deer	<i>Muntiacus muntjak</i>
2	Tsiyo	serow	<i>Capricornis sumatraensis</i>
3	jerhang	Monitor lizard	<i>Varanus prasinus</i>
4	Mhoru terio	Leopard	<i>Panthera pardus</i>
5	Suyu	toddy cat	<i>Paradoxurus hermaphroditus</i>
6	Oni/lipung	Wild boar	<i>Sus crofa</i>
7	Sepvu	Sambar	<i>Servus unicolor</i>
8	Liso	porcupine	<i>Hystrix indica</i>
9	Tsungoro	Leopard cat	<i>Felis bengalensis</i>
10	Jerha	Squirrel	NA
11	Sevan	slot bear	<i>Melursus ursinus</i>
12	Setya	Pangolin	<i>Manis crassicaudata</i>
13	Ooshu	Lesser bamboo rat	<i>Cannomys badius</i>
14	Ezu	Slow loris	NA
15	Shufu	Tortoise	<i>Geochelone elegans</i>
16	Ongum	Python	NA

Source: Field study 2011-2012.

The wild animals are mostly hunted for domestic consumption and for sale which helps in generating monetary income for a good number of families. Hunting is mostly carried out by using guns, traps, snares, nets and catapults. During the



interviews it was revealed that at an average of about forty to fifty different species of wild animals were hunted annually by one fulltime hunter in Yimpang village. Likewise the number of animals hunted varied in all the sample villages.

Many varieties of birds are also hunted in the study area for consumption. One important migratory bird species which are killed in thousands during their brief visit to the study area while migrating from Asia to Southern Africa is the Amur falcon (*Falco amurensis*). These birds visit the wetlands near the Doyang reservoir between the end of October and beginning of November. The villagers from nearby villages like Pangti, Asha and Sungro that are located nearby the reservoir trap and kill thousands of the migratory birds for their meat which is used for local consumption and for sell in the markets in Wokha, Kohima, Mokokchung and Dimapur. A documentation done by Conservation India, a Bangalore based NGO, stated that during peak migration a mind boggling 1, 20,000 to 1, 40,000 birds are being slaughtered and removed from the population every year in the study area<sup>2</sup>. The random trapping and killing of these birds have posed a serious issue in the recent times. Some of the common bird species that are hunted for meat in the study area are given in table 4.12. Plate 4.5, 4.6, 4.7 and 4.8 shows some of the wild animals and birds that are hunted for food in the study area and the skulls of those animals kept as trophies.

Shoots are also other important food items of the Lothas. Bamboo shoot is the favourite of the Lothas and is used in raw state (*evo*) as well as in fermented (*rhujak*), in a dried form (*rhujon/rhuyen*) and as juice (*rhuju*) which are mostly used in the

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<sup>2</sup> Nagaland Post, Dimapur, Monday, August 12, 2013, pp-3

Table 4.12: Some common birds hunted for meat in the study area.

SI No	Local name	Common name	Scientific name
1	Yipya	Red jungle fowl	<i>Gallus gallus</i>
2	Verhak	Kalij pheasant	<i>Lophura lecomelanos</i>
3	Akao	Green pegeon	<i>Treron sp.</i>
4	Yukhi	Spotted dove	<i>Spilopelia chinensis</i>
5	Yuturi	Black bulbul	<i>Hypsipetes leucocephalus</i>
6	Oyini	White cheek bulbul	<i>Alcedo atthis</i>
7	Wolelum	Amur falcon	<i>Falco amurensis</i>
8	Vungi	Himalayan barbet	<i>Megalaema virens</i>
9	Khyutsu	oriental turtle dove	<i>Streptopelia orientalis</i>
10	Velongu	Owl	NA
11	Mungshiro	Serpent Eagle	NA
12	Nrenro	Common rosefinch	<i>Carpodacus erythrinus</i>
13	Juworo	Common kingfisher	<i>Alcedo atthis</i>
14	Zhuzhuv	Oriental white eye	<i>Zosterops palpebrosus</i>
15	Chonyon	Silver-eared Mesia	<i>Leiothrix argentauris</i>
16	Ntsiso rakio Yuturi	Red vented bulbul	<i>Pycnonotus café</i>
17	tsulak-tsuli	Common tailor bird	<i>Orthotomus sutorius</i>
18	Lishu woro	Crow pheasant/ Greater coucal	<i>Centropus sinensis</i>
19	Eyimo woro	Grey-backed Shrike	<i>Lanius tephronotus</i>
20	Yothi ntsupo woro	Streaked spider hunter	<i>Arachnothera magna</i>

Source: Field study 2011-2012.

preparation of varieties of traditional and ethnic curry. The flower and tender core of wild banana plant are also consumed by the people of the region.

Different varieties of wild edible fungi are also liked and consumed by the Lothas. The varieties include Lumphe (*Termitomyces eurrhizus*) which grows from the soil and Pyonkhan (*Lentinus conatus Berk*) and Zunhyo (*Schizophyllum commune*

*Fr. Berk Heim*) that grows on decaying wood. The utilization of these food items is comparatively less.

Insects and worms such as grasshoppers, ants, crickets, larvae of different species of bees, worms obtained from wood, etc., are also some favourite food items consumed by the people of the region.

Fruits such as Chukithi (*Emblica officinalis*), Khyosolothi (*Castania sativa*), Etothi (*Artocarpus lacucha*), Zuvothi (*Ficus auriculata*), Shulongthi (*Syzygium cumini*), Otumthi (*Baccauria ramiflora*), Ora tssupyongthi (*Spondias magnifera*), Yenkhothi (*Terminalia chebula*), Tssuronthi (*Elaeagnus conferta*), Nnyingthi (*Spondias pinnata*), Sheruthi, Mokhothi (*Dillenia indica*) etc. (Plate 4.9), are found in the wild and are used extensively both for medicinal purposes as well as for regular consumption.

Fishes are liked and consumed by the people of the region. The presence of many small streams and big rivers like the Chubi, nzu and Doyang have played an important role in making the Lothas keen fishermen and expert swimmers. Fishes are caught either by using fishing nets, gelatin sticks, generators, bleaching powder, lime or through traditional means such as use of roots, barks and berries obtained from plants for poisoning the water in order to stupefy the fishes. Other traditional practices for fishing are construction of a V-shaped bamboo weir (*Osa*) across the river with gaps to place the bamboo basket traps along the bamboo weir to catch the fishes. Some poisons that are used for fishing are the roots of a small plant called *notsu, cheti* (the berries of a tree with leaves like mahogany leaves), *pitsii* (a creeper with small leaves), *opyak* and *achak* (the bark of two species of trees), *mwemti* (little berries,

Plate 4.5, 4.6,4.7 & 4.8: Wild animals and birds killed for food

Plate 4.9: Some fruits found in the study area

chiefly used in small streams), and *mozi* (a creeper, weak and not much used) (Mills, 1922). Apart from the fishes, some water insects, prawns (*tsungkvu*), Crabs (*hapvuro*), snails (*hamuk*), frogs (*Rana tigris*) etc., are also found in the rivers of Wokha which are consumed by the people. Consumption of the aquatic life forms are more in the villages that are located nearby the rivers such as Pangti, Riphyim old, Chudi, Lotsu, Baghty, etc.

#### **4.3.6. Bamboo resource**

Bamboo is also another important NTFP found in the study area which is extensively used for domestic and industrial purposes. Bamboos are versatile multi-purpose, woody and fast growing tall grasses belonging to the family Poaceae. They occur naturally in some parts of the world and also cultivated by the people for different uses. There are about 150 species of Bamboos in India of which about 90 species are reported from N.E. India (Bhuyan et al., 2010). The importance of bamboo in the lives of the Lothas can be traced back to the forefathers' time where bamboos were also used in the ceremonies connected to founding of new village. Whenever a new village was founded or established the forefathers in order to ensure a good water supply in their new home, it was mandatory for them to bring water in a freshly cut section of bamboo from the spring of the old village and pour it into that of the new spring. Besides this bamboos were also used for erecting fencing around the villages for defense and protection against attacks from enemies.

In the villages bamboos are used extensively in construction of houses and since bamboo is considered as poor man's timber as one goes around the villages in the study area he will observe that most the houses are constructed by using bamboo in one form or the other where the houses have bamboo walls with bamboo decks and bamboo supporting structures. Bamboos are also used in the construction of granaries

(*oson*) in the villages, for erecting fencing around one's house, for making structures for creeper and climber vegetables, for construction of machang locally called *Khantsung* (Plate 4.10), for construction of pig's sty, etc. In the villages bamboos are also used in making household items and domestic implements such as spoons, handles of dao (*Lepok*), axe (*Opvu*), hoe (*Ehe*) and spade (*Chokju/ Khoderang*), carrying basket (*Phari/Okhung*), bamboo mugs (*Rhumpvu*), winnowing fan (*Moro*), mat (*Ophuk*), water carrier (*Juthi/Othi*), etc.(Plate 4.10). Besides the use of bamboo for construction and making of domestic implements, the shoots of bamboo are also consumed as food item which is a favorite food item of the Lothas. The tender bamboo shoots obtained are locally called *evo* which are harvested during the summer season. The shoots are either eaten in the fresh state or are fermented (*rhujak*) or dried (*rhujon/rhuyen*) for longer use. Juice is also extracted by fermenting the tender shoots which is locally called *rhuju* and is used in preparation of curry. In the commercial centers and towns bamboos are also extensively used for scaffolding and slap shuttering purposes in the construction of RCC buildings because of the low cost and abundant availability. Except for the harvesting of bamboos for commercial purposes not much has changed with regard to the utilization of bamboos as compared to the forefathers' time where the bamboos were freely available without any cost and were mostly used only for domestic purposes. When compared to the upper range the middle and lower range have maximum areas covered by bamboo growth and the coverage is more in the lower range when compared to the middle range. In the lower range i.e., Bhandari range the dominant bamboo species that are found consists of ticho, vepvu (*Bambusa ballooa*) and tssiro (*Bambusa atra*) which grow naturally in the forest. As per the outcome of the interview

Plate 4.10 : Uses of bamboo



conducted during the field study, the respondents from the lower range stated that because of the dominant coverage of bamboo in this part of the district the small town such as Bhandari is dependent on the villages located in the middle range for firewood. Table 4.13 shows the different bamboo species that are found in Wokha district and their usage.

Table 4.13. Some common bamboo species found in the study area and their uses.

Sl No	Local name	Scientific name	Utilization
1	Avu	<i>Bambusa tulda</i>	It is used mainly for fencing and construction of houses.
2	Tsintssan	<i>Bambusa hamilton</i>	Used as posts in construction of houses and in handles of various domestic and agricultural implements. The roots are also used for handicrafts.
3	Vepvu	<i>Bambusa ballooa</i>	Mainly used as poles and binding materials for construction of thatch houses, for making plates, the tender shoots are used for consumption.
4	Tssiro	<i>Bambusa atra</i>	Used as flooring materials in construction of <i>khantsung</i> , erection of fencing, extraction of bamboo shoots, walls for houses, etc.
5	Ticho	NA	Mostly used for making walls in houses
6	Onung	NA	Used for carrying water, as shuttering in house construction, etc.

Source: Field study 2011-2012 and Dept. of Land Resources, Govt. of Nagaland.

#### 4.3.7. NTFPs used in traditional medicines

The NTFPs are also rich source of traditional medicines which are used by the people of the study area. Though in the recent times the use of traditional medicines have reduced due to the introduction of modern allopathic medicines yet some elders in some of the villages still acquire the knowledge and practices the use of traditional medicines which have been passed on through generations. Some common traditional medicines obtained from NTFPs for cure are given in table 4.14.

Table.4.14: Some NTFPs used as traditional medicines in the study area.

Sl no	Local name	Scientific name/ common name	Uses
1	Liso	<i>Hystrix indicus</i>	The dried upper stomach is ground up and taken mixed with water for indigestion and stomach problems.
2	Sosuro	Bat	The flesh is eaten as a tonic for children whose mother cannot suckle them properly.
3	Sevan	Bear	The gall bladder juice is taken for indigestion and stomach problem.
4	Khokshu	<i>Albizia lebbek</i>	Cushed stem, bark and roots are taken orally for diarrhea, bronchitis and paralysis.
5	Yikra thera	<i>Mimosa pudica</i>	Leave paste is used as antidote for insect and snake bites.
6	Potsow tsitum	<i>Oroxylum indicum</i>	Root and bark paste is taken orally for jaundice, diarrhea, dysentery and rheumatism.
7	Khumkho	<i>Solanum torvum</i>	Seed extract is used in toothache.
8	Thumpak	<i>Rhus simialata</i>	The husk/cover of the seed is taken for treatment of indigestion, dysentery and allergy.
9	Pongitong	<i>Bombax malabaricum</i>	Root and bark paste is applied on burns, wounds and abdominal pain.
10	Chukithi	<i>Embllica officinalis</i>	The fruit is taken to cure indigestion.
11	Hamvuthi	<i>Roydsia suaveolens</i>	Fruit is eaten for treating cold, cough and malaria fever.
12	Burma limon	<i>Eupatorium adenophorum</i>	The leaves are grinded and applied on fresh wounds to stop bleeding.
13	Ovu	<i>Rana tigris</i>	Eaten for quick healing of wounds.
14	Hapvuro	Crab	For treatment of jaundice and asthma
15	Siyano	<i>Muntiacus muntjak</i>	The gall bladder juice is used for treatment of stomach problems and malaria.
16	Oni/Liso	<i>Sus crofa</i>	The fat is eaten for treatment of rheumatism.
17	Siyanorukho	<i>Contella asiatica</i>	The leaves are consumed for treatment of kidney problems.

Source: Field study 2011-2012 and Mills, 1922.

#### **4.3.8. Rock, sand and mineral resources**

Rock, sand and minerals are other resources that are included in the list of forest resources as cited in Section 2(4) of the Indian Forest Act, 1927 and Section 2(4) of the Nagaland Forest Act, 1968. These forest products are obtained from the forest and are used in the study area with variation in pattern of utilization. The sandstone found in the upper range is compact and hard when compared to the sandstone that is found in the middle and lower range which are mostly coarse and friable. Thus, the sandstone in the upper range is in high demand for use in construction works. The sandstones are cut into square and rectangular shapes which are locally called '*rata long*' and are used in construction of houses, culverts, retaining walls, etc. The rocks are also crushed into small chips of varying sizes and into powder form for use in construction of houses and in soiling and metalling of roads. In Wokha district the three sample villages namely Longsa, Niroyo and Wokha are among the main suppliers of sandstones (plate 4.11). In the middle and lower range the absence of hard sandstones have led to extraction of rock boulders from the Doyang river which are used mostly in the construction of roads in this part of the region. Sand is also collected and used by the people living in the villages that are located along the river (Plate 4.12). Though the quality of the sand is not that good yet the sand is used mostly for construction purpose which is mixed with other good quality sand. One of the respondent from Soku village who is a sand vendor stated that the collection and sell of sand is carried out during the dry season i.e., from the month of December till April and the sand is sold mostly in the nearby towns and villages and sometimes he gets customers from Wokha town also. The sand vendor stated that in a month only about four to five truckloads of sand are sold where the cost of one truckload of sand cost between Rs 3000 to Rs 3500.

Minerals such as Coal and crude oil are also found in the study area. In a geological investigation done by the Department of Geology and Mining, Government of Nagaland, to delineate and roughly estimate the coal reserve and its viabilities and mining prospects, the department estimated that 17 villages including some of the sample villages such as Sanis, Meshangpen, Chudi, and Ruchanyan were bearing under Middle Lotha Range and Lower Lotha Range covering an approximate area of 450 sq.km and estimated a pragmatic reserve of 11,50,954.6 MT of coal (Patton and Lea, 2008). Among the sample villages Meshangpen village started mining coal since 2009 and according to one of the respondent in whose land the coal deposits were found and mined stated that in one season about five hundred truckloads are mined which are sold outside the state. It was observed during the field study in Meshangpen village that the mining of coal were carried out very crudely without any safety measures which may also lead to loss of life and moreover large track of land measuring less than a kilometer have sunk due to the mining activities carried out in the area thereby modifying the natural landscape and destroying the potential of the land (Plate 4.13). It was also observed that where ever the mined coal was kept the plants that grew around that place withered and died leading to destruction of various flora species.

The study area also has a crude oil reserve which is estimated to be at around 600 million tonnes. Survey work for oil exploration was started by the ONGC in the early 1970s in Changpang area of the District and struck oil in 1981. The ONGC started extracting the oil on trial basis which was stopped by the Government of Nagaland in 1994 on matters of Government policy and since then the extraction of crude oil stopped completely. However, presently there are on-goings talks between, the Lotha Public, the Government of Nagaland, and the ONGC, for the resumption of

Plate 4.11,12: Extraction of rocks and sand

operation for exploration and production of petroleum products in the Changpang oil fields. Due of the lack of proper maintenance of the capped oil wells, in the recent years seepage of crude oil from the abandoned oil wells are observed which has hit the soil and ground water leading to environmental concerns and consequently affecting the people's health and the local economy.

Variations in the pattern of utilization of the NTFPs in the study area was observed which were influenced by the location and proximity from the commercial centre i.e., Wokha town. The villages located near the district headquarters extracted the forest products mostly for commercial purposes which were sold in the markets for generating monetary income. With the changing time and advent of modernization, the influence of modern lifestyles of the town dwellers are felt more in the villages located near the towns which have in turn affected the utilization pattern of forest resources. The utilization of the forest products by the villagers for local consumption was comparatively very less as majority of the population were more into selling the forest products in order to gain monetary income so as to keep up with the changing lifestyles. Some advantages that the villages located near the Wokha town have are firstly, though the condition of the road connectivity from the villages to the commercial centre are bad which includes the sample villages like Elumyo, Seluku, Niroyo and Tsungiki yet the villagers have got use to with walking long distances by foot and thus, the villagers are able to bring the forest products to the market in head loads for sale. Secondly, Wokha town the administrative headquarter of Wokha district is well connected with Dimapur, the commercial town, Kohima, the capital town and other important towns in Nagaland like Mokokchung, Tuensang and Zunheboto by National Highway 61 and by all seasons motorable roads which brings many travelers to the district headquarters during their journeys. These travelers stop

Plate 4.13, Mining of coal practiced in meshangpen

on the way side hotels along the National Highway for refreshing which creates an avenue for good market for sale of the forest products (Plate 4.14). The inflow of travelers enables the people of the upper range to sale the NTFPs especially leafy vegetables, fishes and other seasonal products, creating a source of monetary income. Studying the utilization pattern of forest resources shows that the influence of modernization is felt more in the villages that are located within the proximity of the town as compared to those that are located far from the towns and cities.

Unlike the villages in the upper range, the villages located in the middle and lower range including the sample villages are pretty much lacking behind in many aspects. There is very less avenues for sale of the forest products due to bad road connectivity and lack of proper market facilities; thus, majority of the population utilize the forest products mostly for domestic consumption. The villagers in the middle range bring negligible amount of forest products for sale in Sanis town which is a sub-division with very little development and facilities and is located at a distance of about 44 kms away from Wokha town. In the lower range the utilization of forest products are somewhat similar to that of the middle range. Most of the products obtained from the forest are used for local consumption, except for the sale of timber and firewood for commercial purpose only some negligible amount of forest products are sold in small makeshift marketing sheds constructed along the road and in the weekly markets that are organized in the plains of Assam near the Assam-Nagaland border. This part of the district also lacks good road connectivity and proper market facilities inspite of the potential for forest resources and as a result of which most of the extracted forest products are sold among themselves at a very low price when compared to the prices of the products sold in Wokha town, the district headquarters. For instance a small bundle of edible leafy vegetable weighing about 300 gms which



Plate 4.14: Some of the markets located along National Highway 61 in the Wokha/Upper range.

is sold at a rate of Rs 20/- in Wokha town is sold at a rate of Rs. 10/- in this part of the district. Another example worth mentioning is the variation on the cost of deer meat, the whole deer is sold at Rs 2000 to 2500 to the buyers in the plains of Assam but when the meat is sold to the buyers in Wokha town the rate shoots up to about Rs 5500 or more for the whole deer which inflates even more when sold in Kohima or Dimapur. Likewise, the value of other forest products is also comparatively cheap in the middle and lower range and since the people do not have much source for monetary income they rely heavily on NTFPs and agricultural products which are utilized extensively for domestic purpose. From this study it was observed that the degree of dependence on forest and the pattern of utilization changes with the increase in distance from the main commercial centre i.e., Wokha town.

The role played by forest and its resources in the lives of the people of the study area is immense and cannot be comprehended. Since time immemorial almost all the livelihood activities of the people in the region are in one way or the other associated with the forest. The traditional faiths and beliefs of the people have circled around forest and though most of the beliefs have become insignificant after the embracing of Christianity by the people yet some of the beliefs still do persist which have been instrumental in managing and conserving of some of the flora and fauna species. The basic needs of the people ranging from food to extracting building materials for construction of shelters, the ornaments used for adornment, the implements and other household items used for various domestic and industrial purposes comes from the forest. In the forefathers' time the people were just confined to the four walls of their village. Their knowledge was very limited and they lived a simple lifestyle, their only goal was to meet their immediate needs which were negligible and to have sufficient supply of food grain for the family which would last throughout the year. They took

only what they needed from the forest and because of their animist beliefs they had great respect for the forest. Such was the lifestyle of the forefathers but over the years things have changed and with the setting in of modernization, circumstances have led to the demand for development in various fields which have influenced the utilization patterns of the forest resources available in the study area to a greatly. In the present times it is observed that the modern lifestyles have penetrated the socio-culture and economy of the people and as a result they are more into exploiting the resources available for their prosperity and comfort. The ethical values that prevailed during the forefathers' time have shown a gradual decline with time. The setting in of modernization in the district is a recent phenomenon but its influence felt in many aspects in different parts of the district. The need for monetary income have led to the exploitation of forest resources for commercial purposes especially in the areas that are located within the proximity of the towns, while on the other hand these forest resources are of not much value in terms of monetary income generated in major part of the district like the middle and lower ranges because of the lack of development in many aspects, thus resulting in the variation in pattern of utilization of forest resources.

## CHAPTER V

### MANAGEMENT OF FOREST RESOURCES

#### Introduction

The contribution of forest and its resources in the socio-economic life of the people of Wokha district is immense. Varieties of products obtained from the forest are utilized for commercial as well as domestic purposes which form a major part of their economic activity especially in the rural areas. The communities dwelling in or near forests have in the past ensured that rich and diverse forest areas are preserved and protected. Close proximity to these resources and their constant utilization have enabled traditional communities to develop an understanding of the conservation and sustainable utilization of forests (Tiwari et al., 2010). Forests cover almost one third of the world's land area and nearly all are inhabited by indigenous and rural communities who have customary rights to their forests and have developed ways of life and traditional knowledge that are attuned to their forest environments. These communities have been managing the environment through their own systems based on traditional knowledge, practices, rules and beliefs for generations. Various traditional methods for management and conservation which were practiced by the forefathers have been passed on through generations and are still practiced by the Lothas of the study area for judicious use of forest resources. Traditional modes of conservation and management of forest resources refer to the lifelong practices of mankind in relation to the optimal utilization of the plant and animal resources. It deals with the indigenous methods of conservation and management of plant and animal resources for the sustainable development in their economic system (Gibji & Dai, 2003). Ethnic minority groups developed knowledge and customs by virtue of their dependence on forests, which allowed them to survive and live with nature in

harmony over centuries (CIRUM, 2012). The existing indigenous traditional knowledge which have evolved over the years through practices and experiences if substantiated with more refined and improved scientific techniques, it can pave the way for sustainable livelihood with improved income generation for the forest dependent people.

### **5.1. Traditional management of forest resources.**

A very important aspect that should be taken into consideration in order to get the maximum benefit from the utilization of forest resources without jeopardizing the needs of the future generation is the formulation and practice of proper and effective management plans. Various Traditional as well as modern management and conservation methods are practiced by the Lothas. The traditional practices have been passed on from one generation to the other and the modern practices have been introduced by various departments and experts. The Lothas have been practicing jhum cultivation since time immemorial which is the main source of livelihood for majority of the people. Though large forest areas are cleared for the purpose of jhum cultivation, the people possessed certain ethical values and as a result of which apart from the cleared land the adjoining forest lands were always protected during the burning of the jhum fields. This practice had existed long time ago and has been passed on through generation as a result of which it is still practiced. In this practice which is called '*oli epha*' in Lotha dialect, an area of about ten to twelve feet (the area varies from village to village) along the border surrounding the jhum field is cleared making it devoid of any flammable substances in order to check forest fires and thus keep the forest ecosystem save. In all the villages this practice is strictly implemented and in order to make the implementation effective resolutions are passed in the village general meeting and the case of the defaulters are taken up by the Village Councils.

Those individual who do not adhere to the resolutions passed and are responsible for occurrences of forest fires during the burning of the jhum fields are examined properly under the rules and regulations laid down by the village and if found guilty, they are imposed with fine along with a stern warning. It was also observed that most of villages in the district have passed certain resolution to check the occurrences of forest fires by unscrupulous persons.

Certain management practices applied for proper growth of young plants was also observed during the field study conducted in the sample villages. Some villages in the upper range especially in Tsungiki village, the villagers practice the clearing of creepers, bushes and shrubs in the fallow lands by about two to three years in advance before cutting down the vegetation for jhum cultivation so as to let the young plants grow without any obstruction which is then harvested for use as firewood and for other domestic and commercial purposes. According to the respondents from Tsungiki village, this practice is helpful as the forest areas become devoid of creepers and shrubs and as a result during the clearing of the vegetation for the purpose of jhum cultivation, the villagers find it easy to cut down the vegetation which also reduces the input of labour and time.

Cutting down of trees within the vicinity of the village and in the village reserve forests are also strictly prohibited in majority of the villages in the study area. Those found violating the prohibition are imposed with fine as per the resolutions passed by the villagers; this is one reason why one can see many big trees within the vicinity of the village and in the village reserve forests.

Although conservation in its strict sense is not practiced by the Lothas, their traditional faith and beliefs indirectly help to conserve and manage the forest resources. These traditional faith and beliefs were effectively practiced during the forefathers' time which has been passed over to the younger generations. For instance

in most of the villages there are some forest areas which are believed to be the abode of evil spirits and anyone who cultivates or practices any livelihood activities in that particular forest land are afflicted with serious ailments by the evil spirits which sometimes even leads to loss of life and thus people avoid practicing any livelihood activities in those areas. This belief may seem very childish but it cannot be ignored as the belief has evolved over the years through experiences and in many cases it does come true. Though in the present times such beliefs are showing gradual decline due to various factors prevailing such as acceptance of Christian faith, increase in population resulting in the need for expansion of settlement areas, loss of ethical values, development of infrastructures, influence of modernization, etc., yet they still persist and as a result of which these practices have helped in some ways in maintaining the forest cover and conservation of certain flora and fauna species in the region. The sample villages such as Lotsu, Meshangpen, Riphyim old, Niroyo, Tsungiki and Seluku still have forest areas which are believed to be abode of evil spirits and no livelihood activities are practiced there though there is no restriction imposed to the villagers for gathering of wood to be used for domestic purposes which are carried out at their own risks.

Certain animals and birds are not eaten because of the belief that they are unclean or they are thought to likely impart their properties to the eater or to his children (Mills, 1922) which has led to conservation of some species of animals and birds (table 5.1). Apart from the animals and birds that are forbidden for consumption, during the forefathers' time a tree species belonging to the ficus family called *mhenkitong* in Lotha dialect was considered as sacred because of the belief that it brought fortune to the village and thus this tree species were planted in the villages and were preserved which even to this day the trees still stands in most of the villages inspite of the acceptance of Christian faith by the people. In other words the influence

of the traditional practices of the forefathers still persists even in the modern day which has in some ways contributed towards conservation of the forest resources in the district.

Table 5.1. Traditional mode of conservation and management practices in the study area.

Sl no	Common name	Scientific name	Beliefs and Mode of management and conservation
1	Tiger	<i>Panthera tigris</i>	Killing and consuming the meat of tiger is absolutely forbidden to all because they eat man.
2	Leopard	<i>Panthera pardus</i>	Leopards can only be eaten by old people who no longer cultivate. If a young man to eat it he would get poor crops.
3	Wild dog	<i>Cuon alpinus</i>	Eating the meat of wild dogs causes raging thirst, thus majority of the people abstain from eating its meat.
4	Otter	---NA---	The meat is not eaten because of the belief that anyone who eats or even kills an otter will never be able to get his fields to burn properly.
5	Flying squirrel	<i>Ptaurista yunnanensis</i>	None but very old people may touch; much less eat the big flying squirrel. Anyone who does so will frequently be guilty of indecent behaviour with the opposite sex of his own clan.
6	Short-billed minivet	<i>Pericrocotus brevirostris</i>	It is forbidden to all because of the belief that the cocks are supposed to have got their scarlet markings from being splashed with human blood.
7	Velvet-fronted blue Nuthatch	<i>Sitta frontalis</i>	This bird goes about in little flocks and is such a confiding little bird that if one is killed the rest of the flock will wait near till they are killed too. Therefore if a man were to eat one, one death in his household would be followed by a series of deaths. A solitary old man or woman can, of course, eat this bird with impunity.
8	White-hooded Babbler	<i>Gampsorhynchus rufulus</i>	This bird species is not eaten because of the belief that it would cause the eater to become grey-haired.
9	Indian Roller	<i>Coracias benghalensis</i>	It is only eaten by the old people, for the children of the eater would be as noisy as the bird. Another belief is that anyone who eats the flesh of this bird will



			continuously have his buttock wet and thus this bird is forbidden to eat.
10	Red-headed Trogon	<i>Harpactes erythrocephalus</i>	The bird is not eaten because it is supposed to have got its brilliant colouring from human blood.
11	Hoolock gibbon	<i>Hylobates hoolock</i>	Eating of the meat is prohibited because these animals are supposed to have no more than a single young one once in nine years, and this peculiarity would assuredly pass on to the eater.
12	Long-tailed Broadbill	<i>Psarisomus Dalhousie</i>	The cry of this bird is believed to be a sign of rain and thus whoever eats its flesh will always have bad weather when he goes to work in his field.
13	Black Drongo	<i>Dicrurus macrocercus</i>	This bird species is eaten only by the old people, for as it has only two very long conspicuous tail-feathers and the people believe that whoever ate its flesh would only have two children.
14	Rufous-bellied hawk eagle	<i>Lophotriorchis kienerii</i>	Consumption of the meat of this bird is forbidden to all except the old people who expect to have no more children for there is a belief that sores appear on the heads of the children who eat the bird's meat.
15	Himalayan white-crested laughing thrush	<i>Garrulax leucolophus</i>	The bird is particularly sudden and startling and if a man were to eat its flesh he would become nervous in the jungle and would jump whenever a twig or a leaf dropped near him.
16	Sun-bird	<i>Aethopyga</i>	The flesh of this bird is not eaten because of the belief that the clan of anyone who ate its meat would dwindle in number, for sun-birds used to be as big as fowls, but are now the smallest of all birds.
17	Ashy swallow-shrikes	<i>Artamus fuscus</i>	These birds have a habit of sitting on branches in row, each bird touching its neighbor. It is therefore eaten by none but old people, for were any young man or woman to eat it he or she will never be able to sit alone, but would always want to go and sit cuddled up against one of the other sex, a habit full of possibilities of trouble.

Source: field study 2011-2012 and Mills, 1922.

## **5.2. Modern management practices**

For proper management and conservation of the different species of wild animals and birds in the region, random and unethical killing of wild animals and birds are banned and in order to check such activities certain rules and regulations are framed and passed by the villagers in general meetings whereby the village councils are entrusted with the responsibility for strict implementation of the framed rules and regulations. In one of the sample village i.e., Soku, a forest protection committee exists where the members in the committee are empowered to implement and take up matters with regard to violation of the resolutions for protection of forest by individuals or groups. Likewise in the upper range four villages namely, Wokha, Niroyo, Yanthamo and Koio which are located surrounding the Mt. Tiyi reserve forest have collectively formed the 'Network for Protection and Conservation of Mt. Tiyi Forest' with the main objectives to propagate afforestation and check the random exploitation of the forest resources. This group was formed because of the drastic reduction in the vegetation cover in Mt. Tiyi causing loss of habitat for various fauna species which has ultimately led to disappearance of many wild animals and bird species. Apart from checking the random extraction of forest resources the group has also taken up the noble initiative of releasing some animals and planting of trees in the reserve forest and creating awareness by ways of organizing awareness programmes and seminars in the villages and erecting signboards in the villages and along the roads (Plate 5.1). If the program is effectively implemented than it can be instrumental in regaining the original vegetation cover in the Mt. Tiyi reserve forest and thereby can lead to the increase in number of wild animals and birds. In Pangti village the presence of elephants in the chubi valley had caused lots of hardship to the villagers as they were unable to cultivate in that part of the village due to the destruction of food crops by the elephants. According to the respondents the herd of elephants,

Plate 5.1: Notice boards displaying the prohibition of extracting forest resources in the study area

numbering about 17 to 20 had entered the Pangti village area in October 2001. As the villagers were unable to control the movement of the elephants in the valley area, they declared the elephants as the village asset and ever since the villagers have reportedly been providing uncultivated forest land measuring approximately 5500 acres for their habitat. The herd is now reported to have increased its number to about 75 to 80. Another recent initiative taken up by the village council members of the villages locate near the Doyang reservoir dam namely Pangti, Sungro and Aasha is the pledge for protection of the migratory Amur falcon birds which were in the past years killed in thousands. Such initiative can set an example and pave a way for the other villages to follow which can help in proper management and conservation of forest and its resources. Though hunting of wild animals and birds are banned during the breeding season in most of the sample villages yet in some villages such as Elumyo and Pangtong the ban has been lifted because of the fact that some families in the villages are totally dependent on hunting for their livelihood due to unemployment problem leading to the ineffective implementation of the ban. Apart from the traditional and environmental friendly fishing methods other methods such as use of chemicals, generators and car batteries are also strictly prohibited in the study area. Apart from the examples stated above for management and conservation of forest resources another example worth mentioning is the initiative taken by the villagers of Sanis with regard to the banning of coal mining within the jurisdiction of their village. The people have become aware of the implications that coal mining would have on the environment which would ultimately affect the villagers and thus mining of coal have been banned completely in the village. Table 5.2 shows the villages that have passed resolutions to check forest fires, random killing of animals and banning the use of chemicals for fishing.

Table 5.2. Various resolutions passed in the sample villages for management and conservation of forest resources.

Sl no	Village	Resolution passed to check forest fire	Resolution passed to check hunting
1	Yimpang	Yes	Yes
2	Bhandari	Yes	Yes
3	Pangtong	Yes	No
4	Liphi	Yes	No
5	Ruchanyan	Yes	Yes
6	Soku	Yes	Yes
7	Pangti	Yes	Yes
8	Sanis	Yes	Yes
9	Meshangpen	Yes	No
10	Chudi	Yes	Yes
11	Lotsu	Yes	Yes
12	Wokha	Yes	Yes
13	Elumyo	Yes	No
14	Longsa	Yes	Yes
15	Niroyo	Yes	Yes
16	Riphyim old	Yes	Yes
17	Seluku	Yes	Yes
18	Tsungiki	Yes	Yes

*Source: Field study 2011-2012.*

In the recent years various government departments such as Land Resources Department, Forest, Ecology, Environment and Wildlife department, Agriculture department, Horticulture department, etc. are assisting the people of the region in taking up afforestation projects and take up other alternative source of livelihood apart from the traditional jhum practice. The implementation of Integrated Watershed Management Programme (IWMP) by the Land Resources department with the main objectives to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water have been effective and as a result in many villages afforestation projects are carried out. Introduction of rubber plantation as an alternative source of income for the rural population is also actively carried out in the region. According to the survey conducted by the department of Land Resources, Government of Nagaland out of the district's total geographical area of 1,62,800 Hectares rubber can be successively

cultivated in 1,16,546 Hectares i.e. 71.54% of the total area along the foothills and valley lands of Wokha District (Morung Express 29<sup>th</sup> may, 2012). Because of the favourable climatic conditions and physiographic setting suitable for the growth of rubber trees, plantation is carried out through the assistance of the Land Resources department and through individual arrangements in almost all the sample villages and more so in the villages located in the middle and lower range as observed during the field study. Apart from rubber other tree species are also supplied by the department in order to carry out afforestation of degraded forest land.

The department of Forest, Ecology, Wildlife and Environment, Government of Nagaland has also been carrying out various afforestation projects along with the conservation and checking of illegal extraction of forest resources. Various Forest Acts and Rules have been enacted and passed by the Government of India for proper management and conservation of forest and its resources in the country. Some examples are, The Indian Forest Act, 1927 which consolidates the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce. The Forest Conservation Act 1980 which was enacted to help conserve the country's forests. It strictly restricts and regulates the de-reservation of forests or use of forest land for non-forest purposes without the prior approval of Central Government. To this end the Act lays down the pre-requisites for the diversion of forest land for non-forest purposes. The Wild Life (Protection) Act 1972 was passed with the objective of effectively protecting the wild life of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. The Act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent. The Biological Diversity Act 2002 was born out of India's attempt to realize the objectives enshrined in the United Nations Convention on Biological Diversity (CBD) 1992 which recognizes the sovereign rights of states to

use their own Biological Resources. The Act aims at the conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process<sup>1</sup>. Likewise even the Government of Nagaland has also enacted and passed certain Forest Acts in order to properly manage and conserve the forest and its resources in the State. The Nagaland Forest Act 1968 was enacted and passed with the objective to amend and consolidate the law relating to Forest, Produce and the Duty leviable on timber in Nagaland. The Nagaland tree felling regulation rules, 2002 is also another important rule that have been enacted and passed in pursuance of the directions of the Hon'ble Supreme Court of India in order to regulate felling of trees from non-forest areas including tree plantations on non-forest areas. The effective implementation of this rule in Nagaland has stopped the practice of logging to a great extent in the study area though in some parts of the district logging is still practiced at a small scale. The Government of Nagaland adapted the Joint Forest management (JFM) in 1997 to solicit the active participation of villagers in the creation, management and protection of plantations in order to achieve ecological needs in consonance with sustainable productive forestry and to create a wood based economy for the people. According to the Government's resolution JFM shall be implemented in the private forests as well as in Government forests. In private forests the Forest department shall be the funding agency and shall realize royalty at the time of harvest. In Government forests, the Forest department shall be the funding agency for all forestry works and shall share 80 percent of the forest produce at the time of harvest and the remaining 20 percent shall be given to the participating communities<sup>2</sup>. Till the year 2004 twenty two villages in the district had Joint Forest Management Committees involving 5581 families and covering an

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<sup>1</sup> <http://moef.nic.in/>

<sup>2</sup> *State level Biodiversity Strategy and Action Plan of Nagaland, 2005, Department of Forest, Ecology, Environment and Wildlife, Govt. of Nagaland, pp- 32.*

area of 1098 ha<sup>3</sup>. The department has also introduced the formation of eco clubs in schools with the main objective to create awareness on the importance of the environment and forest to the young people.

Various schemes for distribution of saplings and seeds of agricultural and horticultural crops by the Department of Agriculture and Horticulture have also in some ways helped in checking random extraction of forest resources. These departments are focused more on the production of agriculture and horticulture crops so as to provide food security to the people through implementation of various schemes and projects thereby creating alternative source of income for the people. During the field study it was observed that majority of the people living in the villages and in towns cultivated various agricultural crops and vegetables in the jhum fields and in the kitchen gardens and in most of the villages there were orchards of varieties of fruits. Oranges, passion fruits, bananas, lichi and pineapples are grown in abundance in the district. In Wokha village there are a good number of farmers who are fully involved in the cultivation of passion fruits through which they earn their living, one of the respondents from Wokha village also stated that some families in the village have started practicing the cultivation of only one crop such as beans which is creating a good source of monetary income to the farmers. Likewise there are also some families in the Villages of Elumyo and Tsungiki who earn their living by selling fruits such as oranges, lichi, pineapple and bananas which are harvested from the orchards owned by them. Varieties of agricultural products such as beans, pumpkins, gourds, tomatoes, chilies, brinjals, etc. are also grown in abundance in the study area which are used for local consumption and for sale in the markets in order to generate monetary income. The role played by the agriculture and horticulture

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<sup>3</sup> *Forest Development Agency in Nagaland, Dept. of Forest, Ecology, Environment and Wildlife, Govt. of Nagaland, pp- 71.*



departments have also in many ways contributed to the conservation of forest resources as the people in the study area are provided with alternative means for food and source of income that are not required for destruction of forest like the practice of jhum cultivation which is the main driver of deforestation in the district.

The department of Rural Development has been implementing various central schemes and projects meant for the development and upliftment of the rural population in the district. Schemes such as the Indira Awaas Yojana and Mahatma Gandhi National Rural Employment Guarantee Act which are aimed at providing housing provision to the rural poor and guaranteeing hundred days of wage employment respectively. The introduction of these schemes have provided a source of monetary income for the rural population though the amount that the villagers get is not sufficient to meet the needs of the family throughout the year but inspite of that it is observed that these schemes have also led to the diminution of dependence on forest resources to some extent and thus contributing to the management and conservation of forest resources in the region.

Of late, the people in the study area have become more aware on the importance of forest. Intellectuals and people from different walks of life have come together to form various non-governmental organization groups to save the environment and create awareness. At present there are two NGOs in the district that are actively involved in the protection of the environment and wild life, they are the Green Foundation Nagaland and the Natural Nagas. The Green Foundation Nagaland was formed to work towards environmental conservation and fight against climate crises at the local, regional and national level. The Natural Nagas is another NGO that is focused on conserving the forest and wild life in the district. The Natural Nagas in collaboration with Wild Trust of India were instrumental in signing a memorandum of

understanding with the three villages namely Pangti, Aasha and Sungro where the villages pledged to protect the migratory Amur falcons starting from the year 2013 which is a significant milestone for the conservation of these birds in the district. The roles played by these NGOs are also important aspects of management and conservation of forest resources in the district.

### **5.3. The presence of wild elephants; a boon or menace**

In the study area large tract of fertile lands are occupied by the wild elephants which in the recent times have become a menace for the people who are dependent on agriculture and occupations associated with forest. The presence of elephants are confined to the Baghty valley and the Chubi valley, there have been reports of man-elephant conflict even in the earlier times but they were not as serious as it is today. With time the number of elephants has increased and thus their area of occupation has also increased. According to the respondents from Lotsu and Chudi village the man-elephant conflict became detrimental in the early 1980s resulting in the destruction of food crops and even loss of life. In Pangti village as stated by the respondents, the elephants first appeared in their village area i.e in the Chubi valley in the early 2000. Initially there were only about fifteen to seventeen elephants but with time the number of elephants has increased to about seventy to seventy five. Reports have been submitted to the Government of Nagaland through the Forest department and as a result steps were taken to compensate the loss incurred by the farmers caused by the elephants. Initiatives were also taken involving the villagers to check the movements of the elephants but the respondents stated that these steps were not fruitful. The presence of elephants have no doubt become a menace to the majority of the people in the study area because of the fact that the cultivable areas have reduced drastically due to the occupation of the prime land by the wild elephants and also every year

many food crops are destroyed by the elephants and sometimes even lives are lost because of the man-elephant conflict. On the other hand when the matter is viewed from the perspective of conserving wild life, the presence of elephants in the study area is a boon as most of people do not take the risk of venturing into the elephant occupied areas for hunting and extraction of forest products except by expert hunters due to the fear of loss of lives. This has resulted in the conservation of varieties of flora and fauna species in the elephant occupied areas. The State level biodiversity strategy and action plan of Nagaland has identified two biodiversity hot spots in the district namely Mount Tiyi and Baghty valley but in reality one can observe that in Mount Tiyi most of the vegetation cover have been cleared resulting in the loss of habitat for the wild animals whereas it is no so in the Baghty valley and one reason that can be attributed to the less destruction of forest and thereby providing habitat to the different species of plants and animals is the presence of elephants in the valley. The man-elephant conflict in the study area have become a major concern for everyone and till date no concrete solution could be framed and implemented as the people of the affected villages are unwilling to part with their lands because of the reason that they have no other source of income for livelihood and if this conflict continues there is a high chance that in the near future there will be a serious conflict between the two resulting in the loss of human lives and elimination of the elephant population from the district. After observing the pros and cons of this issue during the field studies the following suggestions are made for peaceful co-existence between the wild elephants and human.

i) The Forest department can take up initiative in assessing the number of wild elephants present in the study area and also observe the movement patterns of the elephants and the area occupied by them so as to formulate effective management strategies.

ii) Since the elephants cannot be driven away or killed it is suggested that the Forest department along with the District Administration conduct meetings with the affected villages and take them into confidence to find out ways and means to convert the elephant occupied areas as elephant sanctuary with a provision for creating means of livelihood to the affected villages.

iii) It is also suggested that the Government through the various departments take up special projects for the affected villages and implement those projects effectively so as to provide other source of livelihood thereby creating a substitute for the donated cultivable lands. In case the affected villages agree to the creation of elephant sanctuary the people of the affected villages can be employed as forest guards and guides which will not only provide means of livelihood to them but also help in checking illegal poaching and hunting and extraction of forest resources by outsiders.

#### **5.4. Scope of eco-tourism in Wokha district**

When it comes to the natural scenic beauty the study area does not lack in that aspect, infact in the State of Nagaland the Study area is also one of the best place having a wide variety of landscape and rich fauna and flora concentration. Like the other Naga tribes the Lothas also have a rich culture and traditions and there are also many places which are associated with the myths and legends of the Lothas. The reality that is prevailing at present in the study area is that majority of the people continue to receive services from the forest and its resources and not much has been done to reciprocate. Eco-tourism can be a good means through which the people can be benefited to the fullest without destroying the forest. If eco-tourism flourishes maximum participation of the people with regard to proper management of the forest can be achieved because of the fact that the people will not want to compromise with the main source of income which gives them the most benefit. Eco-tourism can also

be an effective alternative source of income for the people especially for the rural community which can contribute in checking the random destruction of forest areas.

### **5.5. Factors responsible for ineffective management of forest resources**

Though rich in forest resources the district faces problems of forest resources management due to many factors such as the advent of modernization, introduction of new scientific knowledge and usage of modern machineries, infrastructural development, commercialization of forest products, traditional agricultural practices, increase in population and ineffective implementation of various forest Laws and Acts. Before coming in contact with the outside world and subsequent introduction of new technologies, jhum cultivation was the main driver of deforestation apart from natural calamities. The people upheld certain ethical values which made them respect the forest and allowed them to use only what they needed and thus helped in the prevention of random exploitation and destruction of forest resources. With the passage of time it was observed that the need for development in many areas coupled with the increase in population has diluted the traditional methods compromising with the importance of forests. These factors have become major concerns in properly managing the forest resources in the study area.

#### **5.5.1. Impact of modernization on forest and its resources**

Historically, modernization is the process of change towards those types of social, economic, and political systems that developed in Western Europe and North America from the seventeenth century to the nineteenth and has then spread to other European countries and in the nineteenth and twentieth centuries to the South American, Asian, and African continents (Eisenstadt, 1966). According to Alatas, modernization is a process by which modern scientific knowledge is introduced in the society with the ultimate purpose of achieving a better and more satisfactory life in the broadest sense

of term, as accepted by the society (Ahuja, 1999). Modernization is a term that refers to the process of change through which traditional societies attempt to adapt themselves culturally, economically and politically to the requirements of the contemporary world. According to this point of view, modernization changes the present conditions of society affecting all aspects and it determines the socio-cultural indicators of development. It is a process by which cultures are forced to accept traits from outside, and thereby change their original shape. In the course of modernization, traditional knowledge and techniques give way to the application of scientific knowledge borrowed mainly from the West. Due to modern technology, modernization creates the change in traditions and values (Shakeela et al., 2011). As societies modernize, traditional practices and beliefs often decline in importance, and distinctive cultural traits are often lost which are overshadowed by the process of modernization. Modernization has gradually engulfed the ways of life of the people throughout the world and in the present times we see that the process has brought changes and advancement in all fields.

The Nagas of Nagaland lived an independent and free life till the invasion of the Nagas by the British in 1832. They were confined to their own villages except for occasional encounters with the neighbouring villages and the Ahoms in the Assam plains. They lived a primitive and simple life and were far from the reach of the process of modernization. After the invasion of the British, the first real interaction of the Nagas with outsiders took place during the First World War, when 2000 of them were recruited for service in France. The Nagas, however, came into major contact with the plains people only during the Japanese invasion in 1939-45. This event transformed their traditional way of living (Kanango, 2006).

### 5.5.2. Traditional life of the Lothas

Before the advent of modernization the Lothas traditionally lived in villages which are an independent and well defined unit with distinct land demarcation from the other villages. The people in the village are held together by social, economic, political and religious beliefs. The traditional village hardly had any contact with the outside world for a long time except for the visits paid by the neighbouring friendly villages. Being uncivilized in modern sense, their needs were few and they could somehow be self-sufficient of their basic requirement of food, shelter and clothing in their own ways which continued even towards the end of the nineteenth century (Lotha, 1996). Their social and cultural values were based on traditions which were passed on from one generation to the other and these practices were adhered to very strictly. The family is a very important part of traditional life of the Lothas as it is the source of all knowledge about indigenous life and history. The family is the basic unit of the Lotha society and it is the most important institution of social education and social control. There is deep respect for parents and elders in the Lotha society. Material inheritance such as land and cattle is generally passed on to the male offspring. Every village except the very small ones is divided into two or more khels or *yankho* and in every khel there is a common bachelors' house or Morung which is called *chumpo* in Lotha dialect. Generally, the *chumpo* was the fortress of the village where the young unmarried men used to sleep and guard the village. It was infact, a place of training and learning where the young unmarried men were taught and imparted the knowledge about the ways of the Lotha culture and traditions (Kikon, 2002). It functioned as the guard-house and armory, recreation club, center of education, art and discipline.

The religion of the Lothas was of that type which is vaguely termed animism. They believed in no supreme being who rewarded the good and punished the evil. The

deities to whom he made the sacrifices were neutral if kept in a good temper with the proper offerings, and some of them definitely were malicious. They cheerfully carried out what they conceived to be their religious duties (Mills, 1922).

The economic activities of the Lothas were based on agriculture and use of forest resources which were mostly utilized for local consumption. Since the Lothas did not know the use of money till the introduction of the same by the British, barter system was the order of the day. The traditional agricultural practice known as jhum or shifting cultivation dominated the agricultural method though in some valley and plain areas wet rice cultivation was also practiced. The main agricultural produce was rice which constituted the staple food of the Lothas besides varieties of vegetables grown in the jhum field for domestic consumption. The resources obtained from the forest consisted of wood and bamboo products which were mostly used in the construction of houses and as fuel for making fire. These products were also used in making furniture and household and agricultural implements. The forest also provided them with food which consisted of meat, edible leafy vegetables, aquatic life forms, medicines, fruits, shoots, stems, flowers, etc. The activities associated with the forest formed the secondary occupation, the primary occupation being the practice of agriculture. While considering their lifestyle and economic activities we can conclude that the Lothas lived a life of subsistence and they were more concerned about meeting their daily needs and acquired enough stock of rice to last throughout the year. This could be cited as one reason why the Lotha family consisted of more children as they ensured the cultivation of large areas and thereby could produce maximum amount of rice grains.

### **5.5.3. The dawn of modernization in Wokha district**

The present Wokha district remained an unadministered area for a very long time.



Though there are historical reports of occasional interaction of the Lothas with the Ahom Rajas, the first European met by the Lothas was Lieut. H. Bigge in 1841. This was followed by the visit of Captain Brodie in 1844 and later by Captain Butler in 1875 who was in charge of a survey party that was ambushed by the Pangti village and in which Captain Butler was mortally wounded and succumbed to his injuries. The killing of Captain Butler angered the British and as a result a stockade was established at Wokha in 1878. Within no time all the nrung villages i.e., the villages located in the upper range were annexed and the rest of the tribe was annexed and brought under the British rule in 1889 (Mills,1922).

With the subjugation of Lotha country by the British, the missionaries started to venture into the land of the animists. Christianity and education which they brought gradually changed the socio-economic life and culture of the Lothas. The first European missionary, sent to the Lothas was the American missionary Rev. W.E Witter and his wife. They landed at Wokha in 1885, a little over two decades after the missionaries had reached the Aos. The preaching of the Gospel by the missionaries and the acceptance of the same by the Lothas marked a departure from their tribal customs and traditions. Introduction of English education was another landmark which heralded the onset of modernity in the Lotha country. Mmhommo Tungoe of Wokha village is said to be the first convert among the Lothas. His conversion was followed by Shanrio of Tsungiki and Nkhao of Yikhum, who were baptized on October 2nd, 1898. Chijamo Ovung of Pyangsa village was converted and baptized on May 13th, 1900. In the same year, Shanjamo of Yikhum was converted and baptized on October 10, who then went to Impur to study. The Perrines while going to furlough took him along with them and let him study at Mt. Hermon School USA. He was the

first among the Nagas to go to America<sup>4</sup>. In Wokha district, informal education was started for the first time by Rev. W.E Witter and his wife in 1885. They went through a lot of hardships and obstacles, and by the year 1887 there were nine boys in the Wokha station school. However, Witter encountered difficulties and the mission dropped the scheme of educating the Lothas for the time being. Later, in 1905, it was started in Wokha again (Kikon, 2002). It was only in 1941 one Government Middle English school was established in Wokha town (Ghosh, 1979).

#### **5.5.4. Introduction of education**

It has been more than a century since Christianity along with education was introduced to the Lothas and in the present days we see that these two factors have effectively changed the traditional life and values of the people. The propagation of Christian faith has been consistent since its introduction and thus, today almost all the Lothas are Christians. Likewise, even in the field of education the scenario has changed to a great extent. Since the introduction of the first informal school by Rev. Witter and his wife in 1885 and subsequent establishment of the first Government Middle English School in Wokha town in 1941, there is no looking back. The National Human Development Report regards education as the single most important means for individuals to improve personal endowments, build capability levels, overcome constraints and in the process, enlarge their available set of opportunities and choices for a sustained improvement. It is not only a means to enhance human capital, productivity and hence the compensation to labour. But it is equally important for enabling the process of acquisition, assimilation and communication of information and knowledge, all of which augment a person's quality of life (NSHDR, 2004). Table 5.3 shows the latest status of educational institutions that have been

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<sup>4</sup> <http://okotso.com/Christianity/>

established and are imparting formal education to the younger generation in the district.

Table 5.3. Status of educational institutions in Wokha district (2012).

Sl no	Name	College	Higher Secondary School	High school	Middle School	Primary School
1	Government	01	02	23	65	112
2	Private	01	02	18	NA	NA
Total		02	04	41	65	112

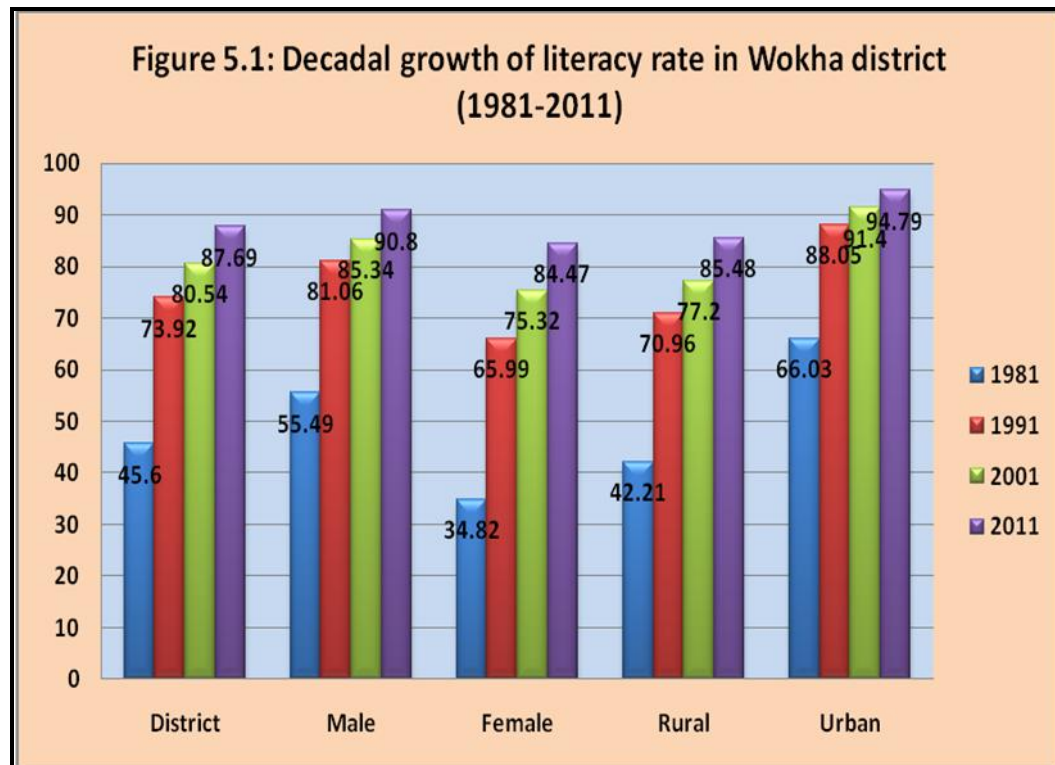
*Source: Directorate of Education, Govt. of Nagaland.*

Imparting of formal education to the Lothas has been effective in nurturing the human resource in the district. Initially the people were illiterate and as a result the traditional knowledge and cultures were passed on through oral tradition. The mode of education prevalent in Lothas before the coming in of the Church was centered around the Morung/Chumpo. This institution served the Lotha society for centuries and incorporated in its functioning time-honoured tribal values, life-centered learning and exposure to customary practices and experiences. The introduction of education to the people has not only made them literate but also equipped them with the knowledge required for adapting to the rapid changes that have been taking place in all fields. Today as we examine the development in human resource among the Lothas, it is clearly evident from the placements of the Lothas as administrative officers, academicians, politicians, doctors, engineers, etc. Education has played a very important role in gradually bringing them on par with other advanced communities in the country. In the recent days we see that the district has made a lot of progress in the field of education. Though there are no official written records available with regard to the literacy rate in the earlier period other than the official census records from 1981 to 2011, taking into account the census records of the four decades as given in table 5.4 and fig 5.1, it is observed that the literacy rate has shown an increasing trend in the four decades resulting in the growth of human resource in

Table 5.4. Growth of literacy rate in Wokha district (1981-2011).

Year	District (%)	Male (%)	Female (%)	Rural (%)	Urban (%)
1981	45.60	55.49	34.82	42.21	66.03
1991	73.92	81.06	65.99	70.96	88.05
2001	80.54	85.34	75.32	77.20	91.40
2011	87.69	90.8	84.47	85.48	95.79

Source: Directorate of Census Operations, GOI, Kohima.



Source: Directorate of Census Operations, GOI, Kohima.

the district and this growth has in turn led to the development of the region which has in some ways compromised with the importance of forests and thus contributed to the problems of forest resources management in the district.

#### 5.5.5. Introduction and use of modern machineries

Introduction and usage of advanced and sophisticated machineries is an important aspect of modernization which has greatly replaced the traditional and indigenously

made implements and thus has revolutionized the ways of life of the people. The traditional machineries of the Lothas were confined to the usage of simple implements and tools which evolved as a result of observation and practices carried out through generations. Their lifestyle and activities were so simple that the necessity to adopt advanced technological machineries did not arise. Moreover, they did not possess the knowledge to utilize the modern machines. The coming of the Europeans and imparting of education to the people equipped them to adapt to the changes that modernization brought and thus, they gradually started to take the path to modernization without much hesitance. Though the process of industrialization in the district is still in the nascent stage because of various factors prevailing in the region, it is observed that the people's interest is gradually growing. Nowadays there are a good number of small scale industries in the district. The introduction and subsequent usage of these machineries have been instrumental in facilitating the maximum exploitation and usage of forest products in the region. As per the records of the department of Forest, Environment, Ecology and Wildlife, Government of Nagaland, there are three saw cum veneer mills registered in Wokha district<sup>5</sup>. However, during the field study it was observed that the sample villages such as Liphi, Bhandari and Sanis had one mini sawmill each and Pangti had two mini sawmills (Plate 5.2). It was also observed that due to the non availability of matured trees most of the trees that were harvested and brought to the mills for cutting ranged from seven to ten years. If these trend continues than there will come a time where no matured trees will be available for use.

The practice of starting stone quarry mining business especially in the upper range of the district is also one factor which has contributed to the problems of forest

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<sup>5</sup> *Annual administrative Report 2011-2012, Department of Forest, Ecology, Environment and Wildlife, Govt. of Nagaland, pp.38.*

Plate 5.2: Mini saw mill located at Bhandari

Plate 5.3: Stone quarry located along the Highway resulting in the modification of natural landscape

resources management. It is observed that stone quarry mining is mostly practiced in Longsa, Wokha and Niroyo villages. The stone quarry mining business is a recent event but it is observed that this practice is quickly picking up pace because of the high demand for construction materials such as dimension stones, construction aggregate, gravel and sand. The use of excavators, stone crusher machines and trucks for extraction, processing and transportation has also contributed to the over exploitation of the rocks which has in turn resulted in the degradation and modification of the natural landscape (Plate 5.3). Apart from the use of machines, this practice also provides employment and livelihood to a good number of people who are solely dependent on them for source of income. The places where Stone quarry mining were carried out were devoid of any vegetation growth.

The introduction and use of motor vehicles in the study area is another important development that has taken place as a result of the setting in of modernization. Before the introduction of motor vehicles people would travel long distance on foot which was time consuming and caused lots of inconveniences. The respondents from the sample villages as well as some elders from different walks of life with whom the researcher interacted stated that even till the early 1960s there were very less government and private vehicles and on many occasions the elders who were students during those days had to come from their villages carrying their weekly rations by head loads and walked long distances to reach their place of study which was Wokha town for most of them. Now the scenario has changed and people have started using motor vehicles for private as well as for commercial purposes which have contributed immensely towards convenient movement of people and goods, thus, reducing the distance barrier. The usages of motor vehicles have no doubt enabled the people to access even the most remotest place having motorable roads. Motor vehicles have become the main mode of transportation of forest products from

the extraction side to the factories and markets. Table 5.3 shows the number of different types of motor vehicles registered in Wokha district till 31<sup>st</sup> of May 2013.

Table 5.5. Different types of vehicles registered in Wokha District as on 31-05-2013

Heavy vehicles	Light vehicles	Two wheelers	Taxi
6115	1153	1456	157

*Source: District Transport Office, Wokha.*

Use of modern weapons such as guns has also resulted in the wanton hunting of wild animals and birds. The traditional hunting weapons of the people are spear (*otsso*), cross bow (*olo*), dao (*lepok*) and traps (*tsurhu*). These weapons were used for hunting and trapping varieties of animals and birds. According to J. B. Mills, the use of gun was comparatively scarce even in the early 1920s as the people still hunted wild animals with dogs and spear as their forefathers did before them (Mills, 1922). Such was the scenario even in the early 1920s but gradually the people started to learn the use of guns and as a result many wild animals and birds became easy prey to this modern weapon. The use of gun has greatly contributed to the reduction in population of many species of wild life making them endangered and scarce. Though other factors like extension of settlement areas, increase in human population, developmental activities, etc. are also responsible in the displacement and reduction of wild life, the greatest factor responsible for the reduction in the wildlife population is the hunting activity carried out by using guns. It is stated that in a year a fulltime hunter kills about forty to fifty different species of wild animals. The figure definitely goes to thousands if the total number of animals killed by all the full time hunters is considered. The number of wild animals and birds which was found in abundance is now rapidly dwindling (table 5.6).

The use of chemicals, gelatin bombs, batteries and generators for fishing has caused considerable damage to the aquatic life forms in the study area. Wokha district



Table 5.6. List of wild animals and birds that have become scarce in the study area.

Local name	Common name
Yakso	Monkeys
Mhorru tsupov	Tiger
Mhorru Teriv	Leopard
Kvuso	Hoolock gibbon
Wotsu	Great Indian hornbill
Rhuchung	NA
Tsuro	Mithun
Tsiyo	Serow
Sepvu	Sambar

Source: Field study, 2011-2012.

is blessed with many perennial streams and rivers, the biggest being the Doyang which is also the biggest river in Nagaland. These rivers and streams harbor a wide variety of aquatic life forms which are utilized by the people for food. Before the introduction of these modern fishing substances and materials the fishing methods practiced by the people were eco-friendly and caused little damage to the environment and the aquatic life forms. The people practiced community fishing where the members of one or more village come together and catch fishes using certain parts of plants such as the bark, roots, fruits and leaves so as to disorient the fishes, and catch them. Apart from this, dam like structures were constructed with gaps at intervals where each gap is blocked with a basket trap made of bamboo to trap the fishes as they pass through the gaps. Occasionally spears, daos and crossbows were also used for fishing purpose, especially during the abundance of fishes in the rivers. The trend of fishing method has changed greatly in the recent times due to the usage of chemicals, bombs, batteries, etc. which not only recklessly kills the aquatic animals but also harms the environment. For instance, bleaching powder which is used to poison the water causes mass destruction of the aquatic life including plants and animals and is also detrimental to human beings if consumed. Likewise the use of lime and other chemicals also kills a lot of aquatic animals which creates a problem

for properly managing the aquatic resources. Because of the greed and the diminishing ethical values the usage of gelatin bombs, generators and batteries are carried out randomly resulting in the destruction of more aquatic animals. In the recent times, their usage is gradually increasing which has aggravated the problems of management.

#### **5.5.6. Infrastructural development**

Another important factor which has led to the problem of forest resources management is the development in infrastructures. Modernization brings new ideas and scientific knowledge which are utilized in infrastructural development so as to meet the changing and growing needs of the people. The need for infrastructural development results in the clearing of forest areas whereby the natural habitat of the flora and fauna is destroyed causing ecological imbalance and this process also adversely affects the people as their source of livelihood is reduced especially for the forest dependent community like the people of the study area. Formulation and implementation of proper and effective long-term management plans are a prerequisite taking into consideration certain ground realities before the implementation of projects for infrastructural developments which are found lacking in the study area and thus in the name of infrastructural development the importance and the role played by the forest has been compromised considerably. Except for the construction of the Doyang hydro electric dam for generation of power and construction of roads and extension of settlement areas, infrastructural development is yet to pick up pace in the study area. Among the infrastructures the Doyang hydro-electric dam and construction of roads for connectivity are the two major drivers of deforestation making management of forest resources difficult in the region. As per the record the total land acquired for the construction of the dam was 8493.95 Acres

i.e., 33.9 Sq. Km (Plate 5.4). As a result of the construction of the dam a vast portion of forest land have been submerged which has not only led to the destruction of many plant species but have also destroyed the natural habitat of a large number of animal species thereby displacing them and causing ecological imbalance. The other outcome of the construction of the dam is the reduction of the availability of cultivable land in the affected villages which has also partly contributed to the decrease in the fallow period and ultimately leading to various problems such as decrease in the fertility of the soil, decrease in the crop yield, increase in area of open forest, etc. Though the construction of the dam was carried out with the intention of providing basic amenity such as electricity and employment opportunities to the people yet the outcome is very disheartening as the development has taken place at the cost of destroying the forest areas with animals and plants in it and the benefit received is confined to only a handful of people who have donated their land for the purpose whereas the problems caused as a result of the construction of the dam has a far reaching effect. Due to the lack of long term management plans some problems have cropped up, one such problem is the submergence of unacquired land belonging to the Pangti village covering an area of about 627.19 Acres. This situation has aggravated the problems of livelihood of the people who are dependent on agriculture and forest associated activities.

Construction of roads for transportation and communication is another factor which has contributed to the problems of forest resources management in the district (Plate 5.5). For a region to develop in all spheres, good road connectivity is a necessity. Wokha is well connected with other important districts such as Kohima and Mokokchung by the National Highway 61 and by the NEC road which passes through Wokha-Bhandari-Merapani-Golaghat and ultimately joins the National highway 39 in Assam (Patton and Lea, 2008). Apart from these two important roads there are other

Plate 5.4 &5.5 Doyang dam and construction of roads

roads that connect the administrative circle headquarters with the villages. Of late, the construction of agri-link roads has come up in most parts of the district, connecting the rural areas. Agri-link roads have helped in the development of the region to a great extent but nevertheless this process also greatly contributes to the random exploitation of the forest resources because of their easy accessibility.

#### **5.5.7. Commercialization of forest products**

Since the people lived a very simple life and were not under the influence of the modern world they were satisfied with what they had. In other words their economy was based on subsistence. With the advent of modernization the people started to get exposed to the outside world, got influenced by the process of modernization and gradually commercialization of forest products also started to grow. Unlike the forefathers' time where the forest products were used only for domestic purposes due to the prevailing subsistence economy and absence of markets for sale, today the situation has changed drastically as the products obtained from forest have become a good source of monetary income and livelihood for the bulk of the population. Because of the high demand of wood products in the construction of houses, making of furniture and as fuel for making fire many forest areas have been randomly cleared to extract the wood for sale in the market. Moreover, the need for monetary income and better standard of living especially in the villages located within the proximity of Wokha town has led to the cutting down and sale of different varieties of tree species before being fully matured. Before the ban on logging was imposed, this activity was the major cause of deforestation in the study area till the late 1990s. The extraction and use of wood in the construction of houses and making of furniture and other household items continue to exist but now in many places especially in the rural areas

it is the use of wood as fuel for making fire that leads to maximum deforestation (Plate 5.6).

Non-timber forest products which exclude wood in all forms are also extensively used both for domestic as well as commercial purposes causing problems to the environmental settings. The products obtained are sold in the local markets or bazaars at an affordable rate which are a quick source of monetary income especially for the forest dependent people (Plate 5.7). Though most of the non timber forest products are seasonal they are utilized to the fullest during their occurrences. In spite of the ban and restrictions imposed by the villagers and the Government agency people continue to sell the forest products at Wokha town and in the villages and small towns. One very important factor responsible for the ineffective management of these resources is the high demand of these products by the people living in the towns who are ready to pay huge sum of money for the products especially the meat of wild animals and birds thus rendering these products a good source of monetary income for the rural people. The problems of forest resources management are more in evidence in the villages located near the main commercial center i.e., Wokha town.

#### **5.6. The impact of demographic changes on forest and its resources**

Since the dawn of human history, the destiny of humans and trees has remained tightly bound. Forests have exerted a tremendous influence on livelihood and economic development in many societies. One of the most important concerns of this age is the question of population growth and whether the earth's resources can sustain this rapid expansion of population in most parts of the world. This has reignited an extensive debate worldwide on the relationship between population growth, depletion of resources and environmental sustainability (Asongu et al., 2011). Being the heart

Plate 5.6 & 5.7 Timber products and Sale of wild cat.

and lungs of the world, forests act as barometers of environment and economy (Kumar, 2001). Forests have exerted a tremendous influence on survival and economic development of many societies. Despite the fact that forest plays an important role in the lives of the people in many parts of the world various factors have led to the problems of forest resources management, one of them being the growth in population. The demographic pressure has chiefly affected the forest use in most of the countries. Kumar (2001) is of the view that some important processes stimulating rapid deforestation in most Third World Countries are expansion of commercial agriculture and cattle ranching, growth of industrial mining and timber exploitations, migration to agricultural frontiers, and speedy urbanization. According to him the greatest damage to forests is caused by growing rural population. Increasing urban population also stimulate demand for agricultural and forest products. The pressure of population and poverty has made rural households increasingly dependent on forest for their needs. As per survey of NCAER (1985), rural households of most of the populous states had more than 90 per cent dependence on non-commercial energy including fuel wood. Moreover, the intense pressure on land and absence of subsidiary occupation compel the local people to clear the forests and marginal land for cultivation (Sengupta, 2001). Population pressure, poverty and weak institutional framework have often been viewed as the predominant underlying causes of forest depletion and degradation in developing countries. Excessive population and livestock pressure and the requirements of forest products for essential development generate a pressure on forest resources like firewood, fodder, timber, lumber, paper, etc. which in turn triggers a deforestation process. Overexploitation of the forest's resources as compared to its incremental and regenerative capacities escalates the forest depletion and degradation process. Demographic pressure also leads to clearing of forest land so as to accommodate the ever increasing human



population. Many forest lands which were once covered by rich vegetations in the past are being cleared for various development and settlement purposes. Rapid urbanization leads to fast conversion from natural land uses (e.g., forest, rangeland, and wetlands) to human-dominated land uses (e.g., urban and agricultural lands), thereby affecting natural ecological systems pro-foundly. In particular, the changes of land use and land cover (LULC) modify the physical parameters of the earth surface, thus affecting material and energy interchanges between land and atmosphere. Moreover, such LULC change can also affect biochemical cycles, influencing nutrition transport between soil and vegetation. In addition, LULC change directly impacts biodiversity, modifying the composition and structure of ecosystems. In summary, the conversion from natural lands to urban lands degrades the functions, including goods and services, of natural ecosystems (Zang et al., 2011).

#### **5.6.1. Population Pressure**

Population pressure is one of the important factors that have resulted in the clearing of forest areas for settlement purpose such as establishment of new villages and expansion of the towns. The population growth in Wokha district shows an increasing trend in all the official census decades since 1971. The burgeoning population in the district has grown from 38,297 in 1971 to 1, 66,343 in 2011 showing an increase by more than four times in the past forty years where the male and female population has increased from 19339 in 1971 to 84505 in 2011 and 18958 in 1971 to 81838 in 2011 respectively. The population density shows an increase from 23 persons per sq. km in 1971 to 102 persons per sq.km in 2011. With the increase in human population the number of villages has also grown from ninety two villages including recognized and unrecognized in 1971 to one hundred and fifty two villages in 2011. Along with this the number of households has also increased from 8153 in 1971 to 31891 in

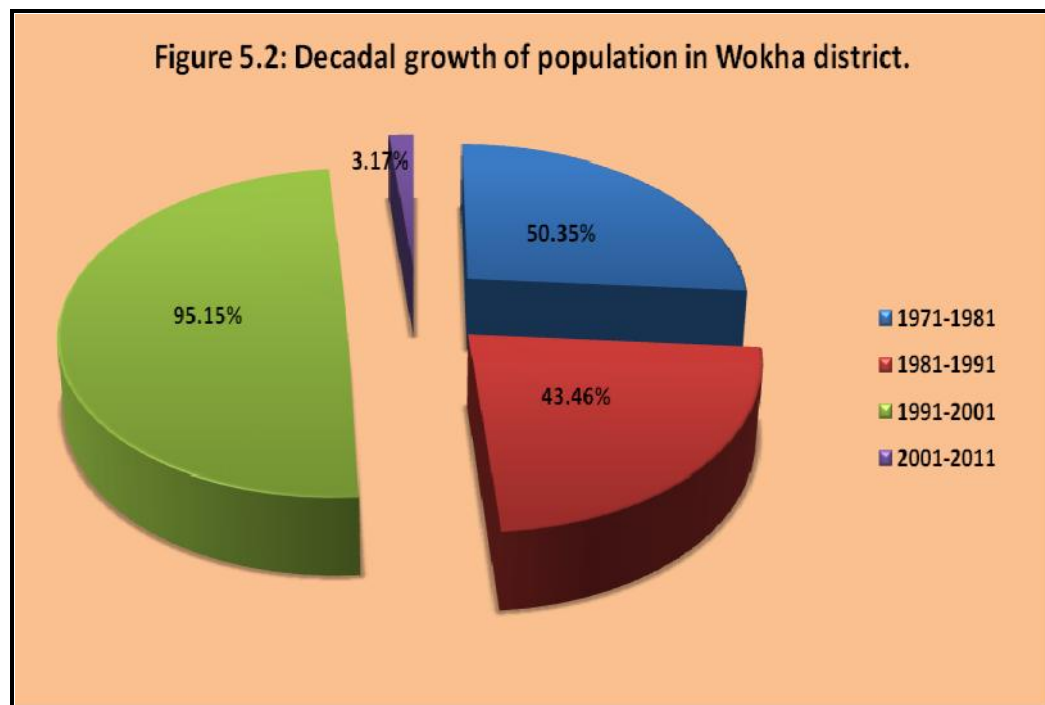
2011. Over the years the population has been increasing gradually at an average rate of 40.03 % since 1971 till 2011 and it will continue to do so even in the near future if this trend persists. Table 5.7 shows the changing demographic profile of the study area from 1971 to 2011.

Table 5.7. Changing demographic profile of Wokha district from 1971 to 2011.

Year	Population	Male	Female	Density	Sex ratio	Villages	Households
1971	38297	19339	18958	23	980	92	8153
1981	57583	30016	27567	35	918	95	10700
1991	82612	35070	33165	51	917	113	15684
2001	161223	83670	77553	99	926	129	25899
2011	166343	84505	81838	102	968	152	31891

Source: Directorate of Census Operations, GOI, Kohima.

As given in table 5.8, the decadal change of population from 1971 to 2011 shows an increasing trend except for the decrease of urban population in the 2011 assessment by -7.51 percent. The district recorded the highest decadal growth in 2001 where the population increased by 95.15 percent and the lowest decadal growth was recorded in the 2011 census with 3.17 percent increase (Figure 5.2).



Source: Directorate of Census Operations, GOI, Kohima.

Table 5.8. Decadal change of population from 1971 to 2011 in Wokha district.

Decade	District	Urban	Rural
1971-1981	+50.35 %	NA	+22.48%
1981-1991	+43.46%	+43.09%	+27.59%
1991-2001	+95.15%	+61.8%	+44.78%
2001-2011	+3.17%	-7.51%	+5.9%

Source: Directorate of Census Operations, GOI, Kohima.

Since humans are the primary agents responsible for forest change, increasing human population has long been considered a major driver of deforestation which has contributed to the problems of forest resources management in the district. It is observed that the expansion of settlement areas is more in the towns when compared to the villages and even more so in Wokha town, the district headquarters. The fact that more forest lands are cleared so as to accommodate the ever increasing human population is clearly visible in Wokha town. Till the declaration of Wokha as a district in 1973 Wokha was a sub-division under Mokokchung district and it did not have any urban centre. It was only after the declaration of Wokha as a district that Wokha town became an urban centre which gradually developed to become the main commercial centre in the district. Wokha town, the district headquarters is the biggest town and also the only comparatively well developed commercial centre. The development in various fields has created opportunities in many aspects, and as a result there is maximum inflow of people from different villages and small towns which have led to the increase in population. This in turn leads to clearing of more tracts of forest for their settlement. Urbanization is quickly picking up pace in the district headquarters. Some twenty years back the villages located within the proximity of the town such as Wokha, Longsa and Niroyo were distinctly demarcated as individual villages by unoccupied and thick forest areas between the town and the villages but now the gap is being filled up by settlements and Wokha and Longsa have almost merged with the commercial centre. Increase in urban population has not

only led to clearing of forest areas for settlement purposes but have also resulted in random extraction of forest products from the nearby forest areas. One such example is the mount Tiyi reserve forest which was once upon a time covered with thick vegetation but now there is hardly any vegetation cover there because of the lack of proper management plans and unethical extraction of forest products from the reserve forest. The absence of vegetation cover has also affected many fauna species as their natural habitats are destroyed and as a result they are forced to either migrate to some other places or are hunted for food by the people. Though there is a ban on these unwarranted activities, people seem to be least bothered.

Apart from the process of urbanization many new villages have also been established in the past few decades which have led to the clearing of vast forest areas for settlement purposes and since majority of the rural population are dependent on forest resources and agriculture for sustenance and livelihood the dependence on forest is also immense which aggravates the problems of forest resources management in the district. The unique land holding system in prevalence where majority of the land is owned by clan, family and private has enabled the people to liberally establish new villages in private lands without much opposition from other parties and the government.

### **5.7. Ineffective implementation of Forest Rules and Acts**

Initially no Forest Rules and Acts existed in the Lotha society as the utilization of the forest resources were governed by the needs of the people and practice of ethical values. The people extracted only what they needed from the forest and took utmost care to protect the forest based on ethical values and traditional practices which were passed on from generation to generation. With the change in time like the other districts in Nagaland, random extraction of forest resources has started to take place

and the ethical values that the people possessed gradually are losing their significance resulting in the mismanagement of the forest resources.

The increasing demand of forest resources for various purposes has led to random and excessive extraction of forest resources worldwide and thus in order to check and properly manage the forest resources various Acts and Rules were framed and implemented. In India various forest laws have been enacted to check the random exploitation of forest resources and to properly manage and utilize the forest resources for the benefit of the people. Some of the forest laws that are currently being implemented in India are The Indian Forest Act, 1927 which consolidates the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce. The Forest Conservation Act 1980 which was enacted to help conserve the country's forests. It strictly restricts and regulates the de-reservation of forests or use of forest land for non-forest purposes without the prior approval of Central Government. To this end the Act lays down the pre-requisites for the diversion of forest land for non-forest purposes. The Wild Life (Protection) Act 1972 was passed with the objective of effectively protecting the wild life of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. The Act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent. The Biological Diversity Act 2002 was born out of India's attempt to realize the objectives enshrined in the United Nations Convention on Biological Diversity (CBD) 1992 which recognizes the sovereign rights of states to use their own Biological Resources. The Act aims at the conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process. Taking into consideration the various prevailing situations leading to the exploitation of forest and its resources the Government of Nagaland has also enacted and passed the Nagaland

Forest Act of 1968 with the objective to amend and consolidate the law relating to Forest, Produce and the Duty leviable on timber in Nagaland. Besides this Act the Nagaland tree felling regulation rules, 2002 is also another important rule that have been enacted and passed in pursuance of the directions of the Hon'ble Supreme Court of India in order to regulate felling of trees from non-forest areas including tree plantations on non-forest areas. In spite of the passing of so many laws to protect the forest and its resources all over India it was observed that these laws were not effectively implemented in the study area as a result of which most of the forest resources are still randomly exploited which have contributed to the problems of forest resources management in the district. Hunting and extraction of other forest products are still carried out without much restriction by the Government and the products are also sold openly especially in the rural areas despite the framing of forest Laws and Acts. Such practices are mostly carried out without proper management plans and if these practices continue to go unchecked than there are high chances that in the near future these practices will have adverse effect on the people who will ultimately have to pay the price at the end.

#### **5.8. Absence of markets and ineffective implementation of livelihood projects**

The Wokha district is dominated by rural inhabitants which accounts for about 78.95% of the total population according to the 2011 provisional census and majority of the rural population are dependent of forest in one way or the other for their livelihood besides the practice of agriculture. Of late due to the increase in population and commercialization of forest products the forest and its resources are gradually declining. In order to protect and conserve the forest and its resources various projects and schemes aimed at providing alternative source of livelihood are in force. Interacting with the respondents during the interviews revealed that in spite of the

implementation of many projects and schemes most of them remain unsuccessful. The reasons for the ineffective implementation are as follows:

- a. Lack of research at the grass root level to study the feasibility of the projects.
- b. In most cases proper training and guidance were not given to the people before the implementation of the projects.
- c. Introduction of two or more projects by different departments which leads to division of time, labour and land which most of the people are unable to give and thus results in the failure of the projects and also loss of forest cover.
- d. Non availability of fund for managing the projects as majority of the beneficiaries are poor farmers.
- e. Lack of follow up programmes so as to examine the progress and effectiveness of the projects.
- f. The absence of cold storages and marketing facilities are some major drawbacks for failing to effectively provide alternative source of livelihood to the people despite the success of some of the projects.
- g. Poor communication and transport facilities especially in the Sanis and Bhandari ranges is also another factor which has contributed to the ineffective implementation of projects.

Despite the fact that the Government is trying its best to provide alternative source of livelihood to the people most of the projects have failed to help the people. Instead of benefiting the people and helping in the protection and conservation of forest these projects and schemes in most cases have rather contributed to the problems of forest resources management in the district.

### **5.9. Impact of jhum cultivation on forest and its resources**

Agriculture is the main source of livelihood for the people of this region. Though wet rice cultivation is practiced in some parts of the study area such as the Baghty valley and in the areas along the Assam border but Jhum or shifting cultivation which is an age old agriculture method is the most dominant agriculture method which has evolved over the years and it still forms the basis of economy and livelihood for majority of the people. Shifting or jhum cultivation is a form of agriculture adapted to the uplands where slopes are steep and soils are poor, whereby the forest is cut and burned to release nutrients from the forest biomass to the soil. Shifting cultivation is a common agricultural practice that is the basis of subsistence for many rural populations throughout the tropics (Grogan et al., 2012). Estimates suggest that it is the basis of subsistence for at least half a billion people (Carswell et al., 1997). Jhum cultivation was the main stay of the people of Nagaland during 1950s, when almost 96.5 percent of the population was dependent on agriculture. Though the dependency for employment on agriculture has declined to 70 percent in the 1970s and further to 65 percent by 2000, it continues to be the main source of livelihood (NSHDR, 2004). Due to many reasons such as the hilly terrain which dominates the landscape, unavailability of proper water source for practicing terrace cultivation, less investment of money, lack of scientific knowledge and modern farming equipments, etc. the inhabitants of this region has to resort to jhum or shifting cultivation for survival. Jhum cultivation is not just another method of agricultural practice but it is deeply rooted in the customs, beliefs and folklore of the people. It influences the cultural ethos and social fabrics of this agrarian society. In fact, '*Tokhu Emong*' the most important festival of the Lotha Naga tribe is also centered around agriculture and is celebrated after the harvest.

Jhum cultivation begins with the selection of site called '*Liphi*' in local dialect



by the village elders and the cultivable size of the land depends on the number of households or families. The cultivable land is divided among the families where they toil in the field throughout the year so as to harvest good yield of agricultural products which are used for consumption. After the site is selected clearing of the jungle locally known as 'Ntssoli ejon' is done mostly towards the end of December and continues till January. The cleared jungle is left in situ to dry which is then burned during the month of March. The sowing of seeds is carried out in the month of April and finally the harvesting is done in the month of August and September. Apart from the cultivation of rice/paddy, other agricultural products are also grown which includes maize, millets, soyabeans, beans, yam, ginger, pumpkin, gourd, brinjal, chilly, peas, cucumber, tomato, etc.

Though jhum cultivation is the main source of livelihood for bulk of the population it has its own drawbacks. In the present scenario besides infrastructural development and expansion of settlement areas jhum cultivation is considered to be the main driver of deforestation and loss of biodiversity in the district especially in the rural areas where jhum is practiced to the maximum. The clearing of vegetation cover have resulted in the destruction of natural habitats for many species of wild animals and birds which threatens their existence. The introduction of improperly managed alternative source of livelihood projects and schemes coupled with the increase in population have led to the decrease in availability of cultivable land which have shortened the fallow period drastically and causing various environmental concerns. The fact that jhum cultivation is the most dominant form of agriculture method practiced in the study area have also in many ways contributed to the problems of forest resources management in the district.

#### **5.9.1. Status of jhum cultivation**

Analysis of the datas collected from the sample villages shows that 84 percent of the

total households in the sample villages practiced jhum cultivation. In spite of the introduction of other sources of livelihood activities it was observed that majority of the rural population still continues to practice jhum cultivation. As per the data published in the Wasteland Atlas of India 2011 by National Remote Sensing Centre, Hyderabad, out of the total geographical area of 1628 sq.km in Wokha district the jhum cultivated area in 2008-2009 was 75.42 sq. km. A similar survey of jhum cultivated area was also conducted by the Department of Soil and Water Conservation, Government of Nagaland in 2005-2006. In the survey a total of one hundred and five sample villages were studied and it was estimated that jhum cultivation covered an area of 94.94 Sq.Km. annually in Wokha district.

Majority of the people in the district are cultivators and they greatly depend on agriculture for sustenance and livelihood. As given in table 5.9, according to the census report from 1971 to 2001 the main workers in the district shows a steady decline while in the 2011 census it increased to 63512 persons representing 38.18 percent of the total population. Out of the total main workers of 16993 persons in

Table 5.9.Variation in the composition of different categories of workers in Wokha district (1971-2013).

Census year	Population	Main workers		Cultivators		Other workers	
		Total	% of total population	Total	% of total main workers	Total	% of total main workers
1971	38297	16993	44.37	15337	90.25	1656	9.74
1981	57583	24491	42.53	18841	76.93	5650	23.06
1991	82612	32833	39.74	23550	71.11	9283	28.27
2001	161223	49679	30.81	31723	63.85	17956	36.14
2011	166343	63512	38.18	41862	65.91	21650	34.08

Source: Directorate of Census Operations, GOI, Kohima.

1971, the cultivators were composed of 90.25 percent of the total main workers and since then the composition of cultivators has shown a gradual decline till 2001 (63.85 percent). In the 2011 census the cultivators increased to 41862 persons representing 65.91 percent of the total main workers. Though the cultivators have shown a

declining trend till 2001 which slightly increased in the 2011 it is observed that among the main workers the cultivators are more in number as compared to the people engaged in tertiary sector who on the other hand have shown an increasing trend from 1971 to 2001 but steadily declined in 2011.

The State Government through its departments and agencies have started introducing various projects and schemes for substituting the practice of jhum cultivation in the study area because of the adverse effects that this practice have on the environment but it was observed that despite the introduction of these projects and schemes the people in the region are still practicing jhum cultivation along with other livelihood activities. The number of families who are fully dependent on jhum cultivation for sustenance seem to be gradually declining over the years as most of the families have started taking up other livelihood practices such as business, plantation, rearing of livestock, horticulture, etc. but in spite of these practices majority of the population are still continuing with the jhum cultivation practice.

### **5.9.2 Drawbacks of jhum cultivation**

Despite the major role played by jhum cultivation in meeting the needs for sustenance of the people especially in the rural areas it has many drawbacks which are directly affecting the forest and its resources to a great extent. Shifting cultivation was an economically and ecologically efficient agriculture practice in the former times when village population densities were low, and the fallow abandonment period matched or exceeded the time necessary for full recovery of the sides (Bruun et al.,2009; Ramakrishnan 1992; Tanaka et al., 2001 in Grogan et al., 2012). In many regions across the Globe, shifting cultivation systems are undergoing important changes, one of the most pervasive being the shortening of fallow cycle (Dalle and Blois, 2006).When the population density is low and the area of forest relatively large

shifting cultivation may be environmentally benign. But as population expands and the available forest area shrinks, this process can lead to a high level of habitat fragmentation and an insufficient time for cleared fields to recover before being cut again. The consequences of shorter fallow periods are deterioration of faunal and microbial organisms, lowered soil fertility, increased soil erosional losses during periods of heavy rainfall and reduced annual crop yield (Grogan et al., 2012). Land degradation is one problem that has been caused by jhum cultivation in the region (Plate 5.7) as a result of short fallow period due to the decrease in availability of cultivable land which have been triggered by the increase in population, infrastructural development, introduction of horticulture and plantation crops for commercial purpose and the occupation of wild elephants especially in the middle and lower range. Table 5.10 shows that the fallow period has been reduced to more than half of what was practiced in the past in almost all the sample villages making the soil less fertile because of the insufficient time to recover the nutrients that it has lost. Some of the outcome of short fallow period in the study area as reported by the respondents and observations of the researcher are:

- i) Decrease in crop yield which have been reported in all the sample villages which have been caused by lack of fertile soil as the time required by the soil to regain the nutrients have been restricted due to shorter fallow period.
- ii) Absence of big trees in the fallow lands were also noticed because of the fact that the young plants does not get enough time to grow and recover its original size.
- iii) Occurrences of soil erosions were also observed in jhum fields and fallow lands during heavy rainfall due to the absence or very thin vegetation cover to hold the soil.
- iv) There were also reports of scarcity of water in the village water sources whenever jhum cultivation was carried out within the proximity of the water sources.

te 5.8. Jhum cultivation and fallow land

Table 5.10. Involvement of households in jhum cultivation and the outcome of short fallow period in the sample villages.

Village	Household	No. of household practicing jhum	Fallow period in years		Decrease in land productivity	Soil erosion	Water scarcity
			Past	Present			
Sanis	258	204(80%)	10	5-4	Yes	Yes	Yes
Meshangpen	83	77(96%)	10	6-7	Yes	Yes	Yes
Chudi	169	160(95%)	10	4-5	Yes	Yes	Yes
Lotsu	237	227(96%)	10	6-7	Yes	Yes	Yes
Pangti	1209	1088(90%)	12	8-9	Yes	Yes	Yes
Soku	80	72(90%)	9	6-7	Yes	Yes	Yes
Niroyo	179	134(75%)	11	7-8	Yes	Yes	Yes
Seluku	171	137(80%)	10	6-7	Yes	Yes	Yes
Elumyo	360	288(80%)	9	8-9	Yes	Yes	Yes
Wokha	931	466(50%)	8	8	yes	Yes	Yes
Tsungiki	556	500(90%)	15	8-9	Yes	Yes	Yes
Longsa	395	276(70%)	12	8-9	Yes	Yes	Yes
Riphyim old	461	369(80%)	10	5-6	Yes	Yes	Yes
Liphi	143	129(90%)	10	6-7	Yes	Yes	Yes
Richanyan	106	101(95%)	10	4-5	Yes	Yes	Yes
Pangtong	90	81(90%)	9	5-6	Yes	Yes	Yes
Bhandari	103	88(85%)	10	5-6	Yes	Yes	Yes
Yimpang	360	324(90%)	14	8	Yes	Yes	Yes

Source: Field study 2011-2012.

Shifting or jhum cultivation is considered as a major driver of deforestation globally, until the year 1991, shifting cultivation had accounted for 61% of overall tropical forest destruction (Karthik et al., 2009). The practice of clearing vegetated area is an important component of shifting cultivation which has led to cutting down of many standing trees in the process. As shown in table 5.11, the datas of the survey of jhum cultivated areas conducted by the Department of Soil and Water Conservation, Government of Nagaland in 2005-2006 have been taken into consideration for assessing the approximate number of trees cut in one jhum season in terms of truckload. As per the survey report the availability of land for jhum

Table 5.11. Estimation of trees cut (in truckloads) in one jhum year in the sample villages based on the Nagaland State Jhum land Survey (2005-2006).

Village	Households	No. of Jhumia families	Jhum area (Hectare)	Jhum area available per household (Hectare)	Average trees cut (Truckloads) per household
Longsa	547	500	325	0.65	2
Seluku	93	86	65	0.75	2
Tsungiki	270	250	175	0.7	2
Pangti	980	950	665	0.7	3
Riphyim Old	303	250	188	0.75	3
Sanis	200	190	143	0.75	2
Soku	52	40	32	0.8	2
Lotsu	142	130	98	0.75	2
Chudi	160	150	117	0.78	3
Meshangpen	94	90	77	0.85	2
Bhandari	71	50	38	0.76	3
Yimpang	210	180	135	0.75	3
Liphi	81	75	60	0.8	3
Niroyo	104	70	53	0.75	2
Wokha	828	700	490	0.7	3
Elumyo	200	170	119	0.7	3
<b>Total</b>	<b>4335</b>	<b>3881</b>	<b>1780</b>	<b>11.96</b>	<b>40</b>
<b>Average</b>	<b>289</b>	<b>258.7</b>	<b>185.3</b>	<b>0.74</b>	<b>2.7</b>

Source: field study 2011-2012 and State jhum land survey report 2005-2006.

cultivation per house hold ranges from 0.65 hectares to 0.85 hectares in the sample villages. According to the respondents the number of trees cut in one jhum field per household when evaluated in terms of truckload comes to about two to three truckloads at an average which varies depending on the location and thickness of the vegetation. Analysis of the datas reveals that there are variations with regard to the amount of trees cut in one jhum field per household in all the sample villages. An average of 2.7 truckloads have been calculated and considered for assessing the

amount of trees cut in one jhum field by one household in the sample villages. Taking into account the two aspects i.e., the total area engaged for jhum cultivation in all the sample villages and the average amount of trees cut in one jhum field per household which have been calculated at 2.7 truckloads, it has been estimated that approximately 4,806 truckloads of trees are cut in one jhum season in the sample villages. Thus a conclusion can be made on the basis of the evaluation done that the practice of jhum cultivation is also one of the main factors responsible for deforestation in the study area. Most of the trees cut for the purpose of carrying out jhum cultivation are burned and only a negligible amount is utilized for firewood and other purposes due to the lack of transport and communication facilities coupled with the rugged and hilly terrain in most of the parts of the district. If the trees that were cut for carrying out jhum cultivation from the sample villages were to be sold in the markets at a nominal price of Rs. 9000 per truckload it would generate an income of Rs. 4,32,54000 where each household would get an average income of about Rs. 11,145 annually from sell of wood.

The clearing of forest areas, burning of the dried vegetations coupled with accidental occurrences of forest fires while preparing for jhum cultivation has also affected the indigenous biodiversity to a great extent. Many varieties of plant and animal species that were endemic to this region have become very scarce or have totally disappeared. Some examples worth mentioning as stated by the respondents are the disappearance of the Great Indian hornbills, Hoolock gibbons, Serows, Sambars, Monkeys, etc., from the region.

To some extent jhum cultivation has also contributed to climate change mainly because of the clearing of vegetated areas and burning of the dried vegetations thereby reducing the vegetated area and releasing carbon-dioxide in the atmosphere.



Forest ecosystems capture and store carbon dioxide (CO<sub>2</sub>), making a major contribution to the mitigation of climate change. When forests are destroyed, over-harvested or burned, however, they can become a source of CO<sub>2</sub> emissions (Van Bodegom et al., 2009). The respondents stated during the interviews that the heat produced by the sun has become unbearable and the rainfall and other weather conditions have become erratic and unpredictable which they have started experiencing since some 15-20 years back. For instance, the respondents from Lotsu village stated that the area where the Government high school is located, it used to be a cold place surrounded by trees and many varieties of birds used to flock and cross that place, ice and mists were a regular sight in that area but in the recent years these are no longer visible. Likewise all the villages have their own tale to tell when it comes to the changing trend of climatic conditions which are the outcome of lack of proper management of forest and its resources in the region.

### **5.9.3. Changing trend of jhum cultivation**

Jhum cultivation continues to play an important role in meeting the needs of the people in spite of the application of primitive and crude methods passing down from one generation to the other. The various methods applied in jhum cultivation such as burning of the cut vegetation for derivation of nutrients, use of crude implements, post harvest management, etc. which were practiced by the forefathers are still practiced by the people.

Though the practice of jhum cultivation is still prominently carried out in the region, this traditional practice is being sidelined and slowly losing its significance due to various. One of the main factors is the decrease in availability of cultivable land. The increase in population and settlement areas coupled with the introduction of various projects and schemes aimed at providing alternative livelihood to the people

especially in the upper range have resulted in the decrease in availability of cultivable land while the situation in the middle and lower range is slightly different from that of the upper range. In the middle and the lower range the occupation of the most fertile and accessible land such as the Baghty, Chubi and Tsurang valleys by the wild elephants coupled with the introductions of the livelihood schemes are the main causes for the decrease in availability of cultivable land. In the past the people of the middle and lower ranges were able to practice wet rice cultivation in the valleys but with the elephants occupying the area it is no longer practiced. According to the respondents the occupation of the elephants in the valleys is a severe problem which has not only led to the reduction in cultivable land but it has also resulted in damage of crops and loss of human lives.

Another cause for the decrease in cultivable land is the introduction of planting horticulture crops and various tree species for commercial purpose especially rubber which is actively taken up by majority of the households in the villages on the land areas which are not utilized for agriculture purpose. In the middle and lower ranges the little land that is left unused apart from the large track of land occupied by the wild elephants are utilized for the above mentioned purposes. According to the survey conducted by the department of Land Resources, Government of Nagaland out of the total geographical area of 1,62,800 Hectares rubber can be successively cultivated in 1,16,546 Hectares i.e. 71.54% of the total area along the foothills and valley lands of Wokha District (Morung Express 29<sup>th</sup> may, 2012). Almost all the families have taken up plantation of rubber because of the potential it has to benefit and improve the economic conditions of the rural population. The plantation of horticulture crops and various tree species especially rubber in the study area has led to fragmentation of land and division of labour which has affected the practice of

jhum cultivation as the people are made to divide the cultivable land and time between the different livelihood activities.

Implementations of poverty elevation programmes such as the Indira Awaas Yojana and MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) in the recent times which are aimed at giving housing provisions and guaranteeing one hundred days wage have in some ways provided a source of monetary income to the people though it is negligible. Of late these schemes have also in some ways contributed to the sidelining of jhum cultivation in the study area because of the fact that these schemes have provided some source of income making the people a little less dependent on jhum cultivation for their livelihood.

Decrease in involvement of persons per household in jhum cultivation is also one important factor. Till the early 1970s there was maximum involvement of persons in jhum cultivation but gradually increasing number of rural population started migrating to the urban areas for higher and better education, employment opportunities and better standard of living along besides the introduction of other livelihood activities. During the field work it was observed that migration of the rural population to the urban along with the introduction of alternative source of livelihood have resulted in fewer hands for the hard work on jhum fields, rendering it less attractive and lucrative. Due to the changing trend of less involvement of persons in jhum cultivation the cultivated area is also gradually decreasing with time. The land capable of accommodating 4 to 5 tins (mustard oil tin) of paddy seeds was cultivated by one household in the past but in the recent years due to shortage of man power, land and time that particular land is distributed among 2 to 3 households for cultivation.

The forest resources have met the needs of the past generations and it still

continues to meet the needs of the present generation so also the future generation will depend on the forest resources for their needs. Just as the past generations have managed and conserved the forest resources for use by the present generation, it is now the responsibility of the present generation to properly manage and conserve the resources available for the future generation by integrating the traditional knowledge and modern scientific techniques so as to formulate and implement refined management and conservation techniques. Not much have changed with regard to the management and conservation of forest resources in the district. The traditional methods still persists in the present times inspite of the introduction of new modern methods which have supplemented the traditional practices. The people are aware of the importance of forest and thus they are also actively getting involved in the proper management of forest and its resources by ways of formulating and implementing various rules and regulations in order to safeguard and protect the forest resources. In spite of the eager involvement of the people it is observed that they lack proper scientific knowledge and skills which are important for effective management practices. Apart from the traditional methods, involvement of various government departments and NGOs for management and conservation of forest resources are the new developments that are taking place in the study area which are gradually picking up pace. In spite of implementing projects and schemes by the Government departments for providing alternative source of income and livelihood to the people in order to reduce their dependence on forest, it was observed that due to some drawbacks effective management and conservation of forest resources could not be carried out and thus complete diminution of dependence on forest could not be achieved in the study area. The problems of forest resources management was practically absent during the forefathers' time because of the fact that they lived a simple and contented life and were far from the influence of the outside world. They

obtained only what they needed from the forest and since the population was also comparatively less there was no problem for managing the forest resources. With the passage of time the situation gradually started to change which was the outcome of the interaction with the outside world and the onset of modernization coupled with the increase in population and gradual loss of ethical values. In the process of modernization various developments have taken place which has contributed to the well being of the people but in the process, the importance of forest and its resources have been compromised to a great extent due to the lack of formulation and implementation of proper management plans prior to implementation of developmental projects. Ineffective implementations of forest Laws and Acts have also in some ways contributed to the problems of forest resources management. The decrease in the forest land due to the increase in population, introduction of alternative livelihood projects and schemes, practice of jhum cultivation and the presence of wild elephants has compounded the problems of forest resources management in the district. The increase in population has led to clearing of more forest land so as to establish new settlement areas and accommodate the growing population. Introduction of alternative livelihood projects and schemes which are aimed at decreasing the dependency on forest have led to the destruction of forest areas as the implementation of most of the projects require land areas. Despite the clearing of more forest lands for implementation of the projects, the failure of many projects have aggravated the problems of management. The age old jhum cultivation which is the dominant agriculture method practiced in the region has shown a declining trend in the recent times due to various prevailing problems such as decrease in manpower, introduction of alternative livelihood activities, migration of people to urban areas, reduction of cultivable areas, presence of wild elephants, etc., but despite these problems since jhumming is deeply rooted in the traditional life of

the people it is still practiced thereby contributing to the problems of forest resources management in the study area.

## **CHAPTER VI**

### **CONCLUSION**

#### **Summary**

The research study on utilization and management patterns of forest resources in Wokha district of Nagaland was undertaken with the main objectives to study the status of forest cover, classify the types of forest resources, to study the utilization patterns of forest resources by the people, to study the impact of human activities on the forest leading to problems of forest resources management and lastly to propose improved management strategies for sustainable use and conservation of forest resources and restoration of ecological balance. In the research study purposive sampling method was adapted for the selection of eighteen sample villages from the three different ranges in the district and based on the prepared questionnaires focused group discussions were conducted so as to obtain the data required for the study. The importance and the role of forest and its resources in the life of the people of the study area and the various forest related concerns that have evolved because of the activities of the people have been discussed in the preceding chapters.

Despite the important role played by forest in the socio-economic and traditional life of the people in Nagaland, the discussion in chapter III clearly indicates that forest has become a waning resource because of the fact that the forest cover in the State has shown a reducing trend which is also the same in the case of the study area. The land is the most prized possession of the Nagas so is also with the Lothas and because of the unique land holding system in the district more than 99 percent of the forest land is privately owned and the remaining is owned by the State Government.

Forest resource is termed as multi-purpose resource as it benefits the users in

many ways. The types of forest resources utilized in the study area have been discussed in chapter IV and it is observed that modernization which has brought along development in many fields coupled with various factors such as the location and distance of the villages from the main commercial centre i.e., Wokha town, transportation and communication facilities and storage and marketing facilities have influenced the use of forest resources to a great extent leading to the variation in the patterns of utilization in the district. Nature has endowed the study area with varieties of tree species which are mostly used as timber for construction, for making furniture, household and decorative items and as firewood. Despite the use of other sources of fuel for making fire, firewood is widely used in the study area which is one important reason for the declining forest cover as discussed in the preceding chapter. It is observed that the role played by the non-timber forest products (NTFPs) such as leafy vegetables, meat of wild animals and birds, shoots, flowers, fishes, bamboos, fruits, insects, worms, snails, etc., is immense and the rural population are greatly dependent on the NTFPs for food, medicines and various other uses. Besides, the NTFPs were also in the past associated with their beliefs and rituals. The utilization of other NTFPs such as rocks, sand, mineral and petroleum resources are gradually increasing because of the potential that these resources have in generating employment and income to the people in the study area. Apart from domestic consumption, bulk of the forest resources are sold in the markets which acts as a good source of generating monetary income for the majority of the people residing in the villages.

Close proximity to the forest and the traditional faith and beliefs practiced by the Lothas indirectly helped in the conservation and management of the forest resources although conservation in its strict sense was not practiced by them. Over the years there have been a realization of the importance of forest and the role that it



plays in the socio-economic life of the people as a result of which various management plans and practices have been introduced so as to wisely and sustainably utilize the available forest resources keeping in mind the needs of the future generation. The traditional and modern management practices have been discussed in the later part of chapter IV which brings to light the management patterns in the study area.

Though majority of the people are gradually becoming aware of the need for proper management strategies and the effective implementation of the same, it is observed that management practices could not be effectively implemented in the study area because of many reasons. Since the people living in the villages constitute 78.96 percent of the total population in the district, their livelihood activities are in many ways associated with forest which contribute to management problems of forest resources.

Of late the development of infrastructures coupled with the increase in population has been a major concern for ineffective management of forest resources in the study area. The need for development and expansion of settlement areas have prevailed over the need for forest areas which ultimately imposes adverse affect on the people in the long run.

The fact that the district is dominated by agrarian society where jhum cultivation is the dominant agricultural practice which requires the clearing of large areas of forest land is another major concern which causes large scale deforestation. The decreasing trend of fallow period and the clearing of vegetated areas have also triggered various environmental problems such as soil erosion, climate change, loss of natural habitat for flora and fauna, absence of dense vegetation cover, etc.

Other factors such as ineffective implementation of forest Laws and Acts,

ineffective implementation of alternative livelihood schemes, lack of markets and storage facilities, poor transport and communication facilities and use of modern machineries which contribute to the problems of forest resources management in the study area are discussed in chapter V.

The research study is based on extensive field survey and first hand interaction with the people at the grass root level as well as review of related literatures and since no research study of this kind have been conducted in the study area as well as in Nagaland before the outcome of the study can be a base for the research scholars, academicians, students, NGO s, Administrators and policy makers. The present study can also be a good source of information about the study area such as the location, area, people, physiography, drainage, soil, geology, vegetation, etc.

### **6.1. Findings**

- a) All along forest has been playing a very important role in the socio-economic and traditional life of the people. Though forest was associated with the traditional beliefs of the people but with the coming of Christianity the traditional beliefs are no longer practiced. Despite the setting in of modernization in the study area majority of the people especially the rural population are still dependent on forest for their livelihood.
- b) The utilization of forest resources in the sample villages differed with the location from the proximity of the commercial centre i.e. Wokha town. The villages located near the commercial centre sold most of the forest products in the markets for generating monetary income which were facilitated by the presence of markets and accessibility. On the other hand the villages located far from the commercial centre utilized the forest resources mostly for

domestic consumption and very little was sold due to the absence of markets and poor transport and communication facilities.

- c) The types of minor forest resources utilized for and domestic consumption and small scale commercial purposes included leafy vegetables, meat of wild animals and birds, shoots and flowers, aquatic life forms, bamboos, fruits, etc. The most used minor forest product is leafy vegetables. For large scale commercial purposes the types of forest resources that are utilized includes logging, firewood extraction, extraction of rocks and boulders and coal mining. Extraction of rocks and boulders is concentrated in the Wokha range while coal mining is carried out mostly in the Sanis range and in some parts of Bhandari range. Firewood is the most utilized forest product in this category.
- d) Disparity in development has also led to the variation in the patterns of utilization of forest resources. For instance, the villages located in the Wokha range have better access to markets and transport facilities because of which they are able to sell the products without much difficulty whereas in the case of the villages located in the Sanis and Bhandari range most of the forest products are utilized for domestic consumption due to the absence of markets and good transport and communication facilities.
- e) Besides the utilization of forest resources, there is ample scope for eco-tourism in the study area. The mesmerizing natural landscape, the traditional lifestyles in the villages, places associated with myths and legends and the presence of varieties of wild life especially wild elephants and the migratory amur falcons can be an attraction for many tourists.
- f) Except for the 'oli epha' which is widely practiced even in the recent times, the other traditional management practices are gradually declining with time. It was observed that factors such as loss of ethical values, the increasing need

for livelihood income and the introduction of new management methods are responsible for the declination of the traditional management practices.

- g) In order to reduce the pressure on forest and its resources various projects and schemes aimed at providing alternative source of income and livelihood are being implemented by different State Governments departments which have to some extent contributed to the management of forest resources in the study area.
- h) Variation in the management practices were also seen in the study area and it was observed that there were maximum involvement of NGOs and the Village Councils in the villages located within the proximity of the main commercial centre i.e., Wokha town as compared to those that were located far from the town. This is so because of the fact that more forest resources are extracted so as to meet the growing demand of the people settled in the urban centre which has led to the need for better management plans and more participation by the people. Some positive development that are taking place in order to protect and conserve the forest and its resources are the formation of Network for protection and conservation of Mount Tiyi reserve forest involving four villages which are located within the proximity of the reserve forest, formation of NGOs such as Natural Nagas, Green foundation Nagaland, etc.
- i) Sanis and Bhandari ranges that are known for the presence of wild elephants contribute to the conservation of wild life to some extent. Because of the presence of elephants except for the expert hunters the other hunters fear to venture in the elephant infested areas which help in the management of wildlife.
- j) The process of modernization has brought development in many fields as a result of which effective forest resources management cannot be achieved in

the study area. Factors such as increase in population, infrastructural development, use of modern machineries and implements and the commercialization of forest products for generating monetary income have contributed to the problems of forest resources management in the district.

k) Various alternative livelihood schemes and projects introduced by the different departments are not being implemented effectively. Most of the projects and schemes require time, energy and land for implementation but it was observed that due to the absence of research and survey at the grass root level and lack of co-ordination between the different departments two or more projects are introduced at a time which the beneficiaries are unable to manage and thus leads to the failure of the projects and clearance of more forest lands resulting in the decrease of dense forest cover.

1. In spite of the successful implementation of the some of the projects and schemes and the vast scope for production of agricultural and horticultural crops, the lack of cold storage and marketing facilities in the district especially in the Sanis and Bhandari range for have become a major bottleneck in tapping the potential and the people of the region are unable to fully obtain the benefit from them. The poor transport and communication facilities are also causing hindrances for effectively managing the forest and its resources as most of the products derived from the alternative sources of livelihood cannot be transported to other places for sale.

m) Though there are various forest Laws and Acts for protection and management of forest and its resources there is evidence of random exploitation of forest resources in the district resulting in the scarcity and disappearance of some

wild animals and birds. In the villages located far from the commercial centre most of the forest products are sold openly without any restrictions.

- n) Jhum cultivation is the dominant agricultural method practiced in the district, and it engages about 84 percent of the total households in the sample villages practiced jhum cultivation. The amount of trees cut in one jhum year is calculated at about 4806 truckloads. These figures support the fact that jhum cultivation is the main driver of deforestation in the district leading to decrease in forest cover.
- o) Lack of small and big industries in the district for processing and preserving the agricultural and horticultural products is also a very important drawback which needs to be looked into so as to help in the proper management of forest resources.

## **6.2. Suggestions**

For proper utilization and effective management of forest resources the following are the suggestions that are based on the present study.

- a) Though the people are gradually becoming aware of the importance of forest yet they are unable to effectively conserve and manage them due to lack of scientific management skills and knowledge and absence of reliable alternative source of livelihood. Thus, imparting scientific management skills and knowledge by organizing workshops and seminars at administrative circle levels can help in the proper utilization and management of forest resources in the region.
- b) Emphasis can be given on the development of eco-tourism in the region as it has the potential to provide alternative source of livelihood to the people without destroying the forest ecosystem. Once eco-tourism is developed the

people will automatically take care of the forest by themselves because of the income that they receive through eco-tourism.

- c) There is a clear linkage between forest resources and livelihood dependence, thus, Conducting proper research in order to study the ground truths at the grass root level is the need of the hour which will not only contribute towards effective implementation of the alternate livelihood practices but this will also help in proper and effective management of forest resources in the region.
- d) For the effective implementation of providing alternate sources of livelihood co-ordination among the different departments should be encouraged so as to provide only what the farmers can handle and not over burden them with many projects. Micro level research studies can be conducted in order to study the problems, the needs and the feasibility of the projects at the grass root level before the implementation of the projects. After the implementation of the projects they should be reviewed from time to time so as to identify the loopholes or problems and rectify them for effective implementation. This can be facilitated by development of storage and marketing facilities and construction of good roads.
- e) For protecting and conserving the forest and its resources strict enforcement of the various forest Acts and Laws should be carried out by the concerned department in collaboration with the district administration, police and the village councils which can help in checking random exploitation of forest resources.
- f) Since firewood is widely used in the study area which contributes to decrease in the forest cover, other sources of fuel such as bio-gas which is environmental friendly and efficient can be introduced phase wise as substitute

of firewood. The dependence on firewood may not stop fully but this can reduce the use of firewood to some extent.

- g) The reserve forests in the villages under consideration can, in collaboration with the State Government or Government agencies, be converted into botanical gardens which will not only help in the conservation of flora and fauna but this can be a source of knowledge for the upcoming younger generations.
- h) Establishment of forest resources monitoring cell equipped with the latest scientific technology such as GIS and Remote Sensing and experts in the field can be initiated. This cell can help in monitoring the utilization of forest resources and subsequent forest cover change and forest related problems and identify the most affected areas which can be verified through field surveys. Necessary steps can thus be taken so as to effectively manage the forest resources.
- i) Because of the unique land holding system most of the forest land in the district belongs to private owners and it was observed that the forest and its resources are being exploited randomly. For proper utilization of the resources the people in the study area can be encouraged to demarcate selected areas for different purposes such as area reserved for firewood, area reserved for timber, area reserved for agriculture purposes, etc.
- j) Unlike the other States in India where more than 90% of the forest land are owned by the Government, the forest land of more than 90% in Nagaland and Wokha are privately owned , thus, practical approach should be adapted for effective implementation of forest related programmes and projects.



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### Research papers published in peer reviewed journals:

Sl No.	Title of the Research paper	Name of the Journal	Remarks
1	Jhum cultivation in Wokha district, Nagaland.	Geographic	Accepted for publication
2	Utilization pattern and management of forest resources in Wokha district of Nagaland.	Goa Geographers	Accepted for publication

- ❖ Participated in the NU Research Poster competition at Lumami campus on the 6<sup>th</sup> September 2009.
- ❖ Participated in the MoES sponsored workshop “Understanding Earth System Science” held from 27<sup>th</sup> - 28<sup>th</sup> March 2010 at Hotel Saramati, Dimapur, Nagaland.
- ❖ Life member of Mizoram Geographers Association.



Plate 4.1: A house with bamboo walls in Seluku village

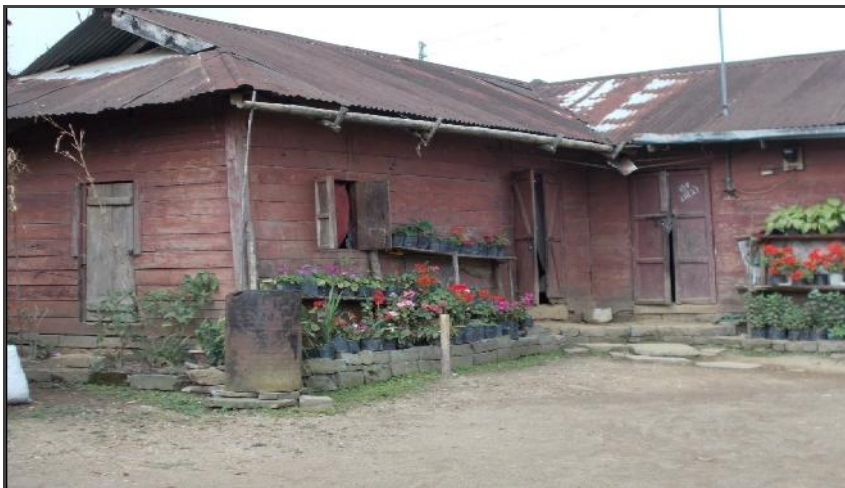


Plate 4.2: A house with timber walls in Niroyo village



Plate 4.3: An RCC building in Elumyo village



Plate 4.5: Wild animals and birds hunted for meat.



Plate 4.6: A barking deer killed for meat.



Plate 4.7: Different bird species hunted for meat.



Plate 4.8: Skulls of various wild animals hung as trophies in Elumyo



Plates 4.9: Some fruits found in the wild (*Ficus auriculata*, *Spondias pinnata*, *Dillenia indica*, *Embllica officinalis*)



Plates 4.4: Varieties of leafy vegetables used as food





Plates 4.10: Various uses of bamboo



Plates 4.11: Extraction of rock carried out in Longsa and Niroyo villages



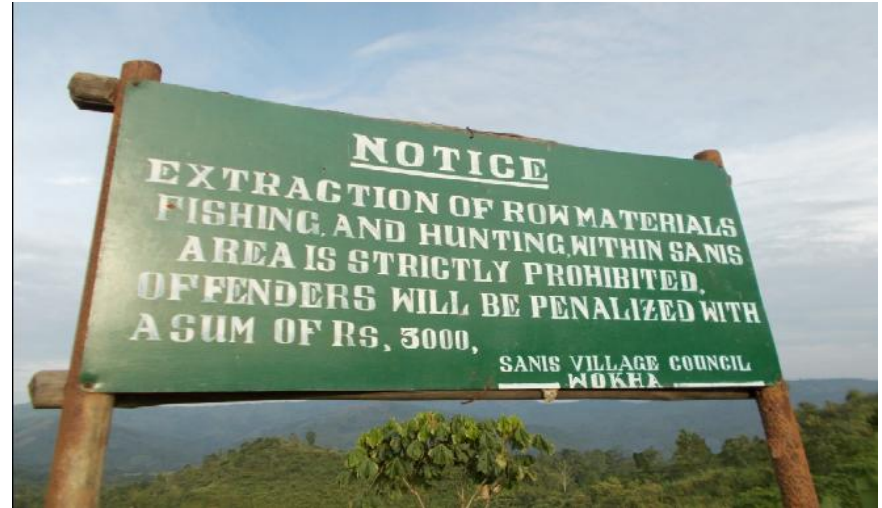
Plate 4.12: Collection of sand practiced in Baghty



Plates 4.13: Mining of Coal practiced in Meshangpen and the modification of landscape caused by mining.



Plates 4.14: Some of the markets located along National Highway 61 in the Wokha/Upper range



Plates 5.1: Notice boards displaying the prohibition of extracting forest resources in the study area



Plates 5.2: Mini saw mill located at Bhandari



Plates 5.3: Stone quarry located along the Highway resulting in the modification of natural landscape



Plates 5.4: The Doyang reservoir (Source: Google earth & field photo)



Plates 5.5: New road cuttings observed in the study area



Plates 5.6: Firewood being displayed and sold for commercial purpose



Plates 5.7: Some non-timber forest products being sold in the market





Plate 5.8: Cut vegetation left to be dried in a jhum field



Plate 5.9: Burning of the dried vegetation in a jhum field



Plate 5.10: A couple engaged in jhum cultivation in Meshangpen



Plate 5.11: A jhum field surrounded by fallow land devoid of thick vegetation



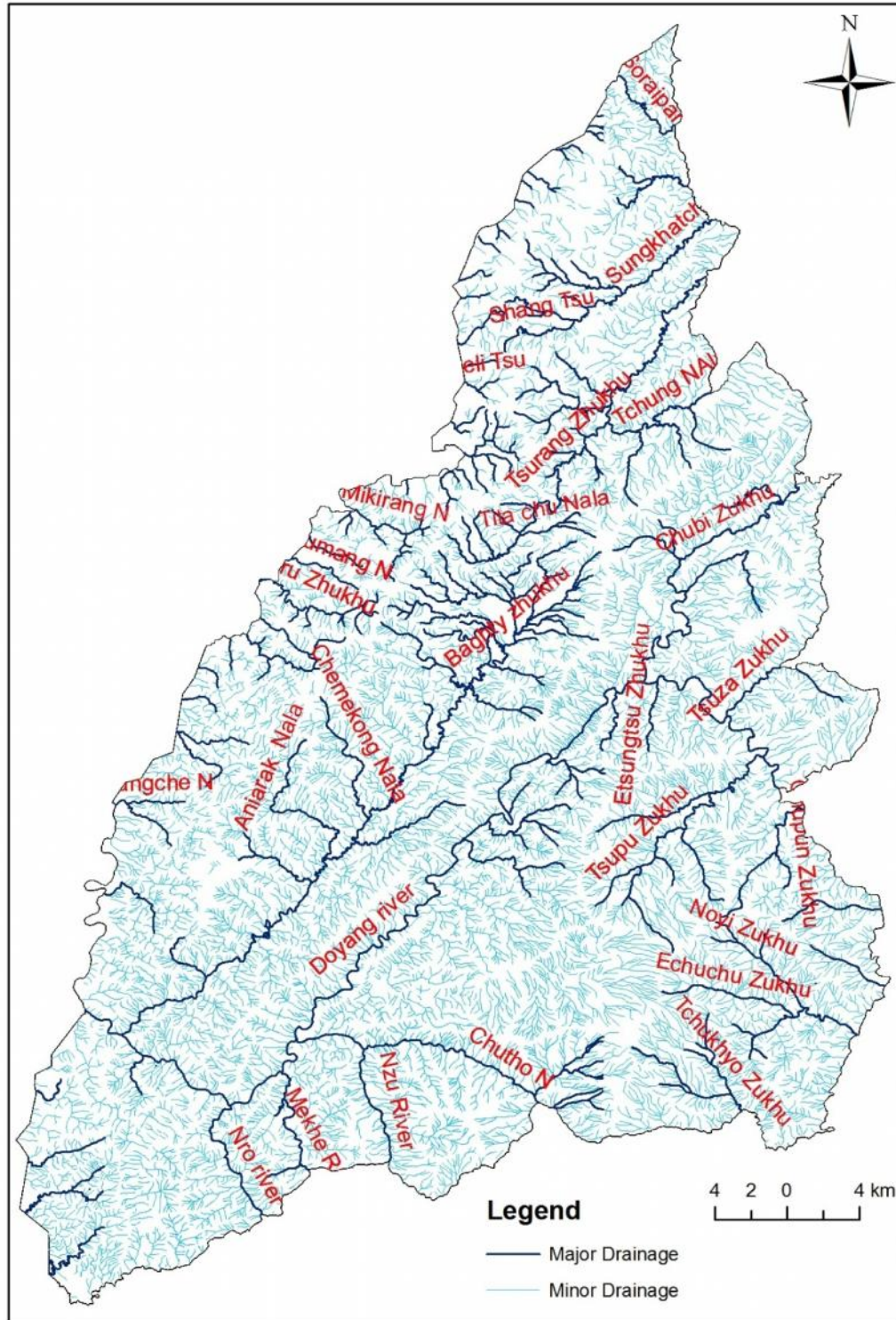


Figure 2.3. Drainage map of Wokha district (Source: Nagaland GIS and Remote Sensing Centre)

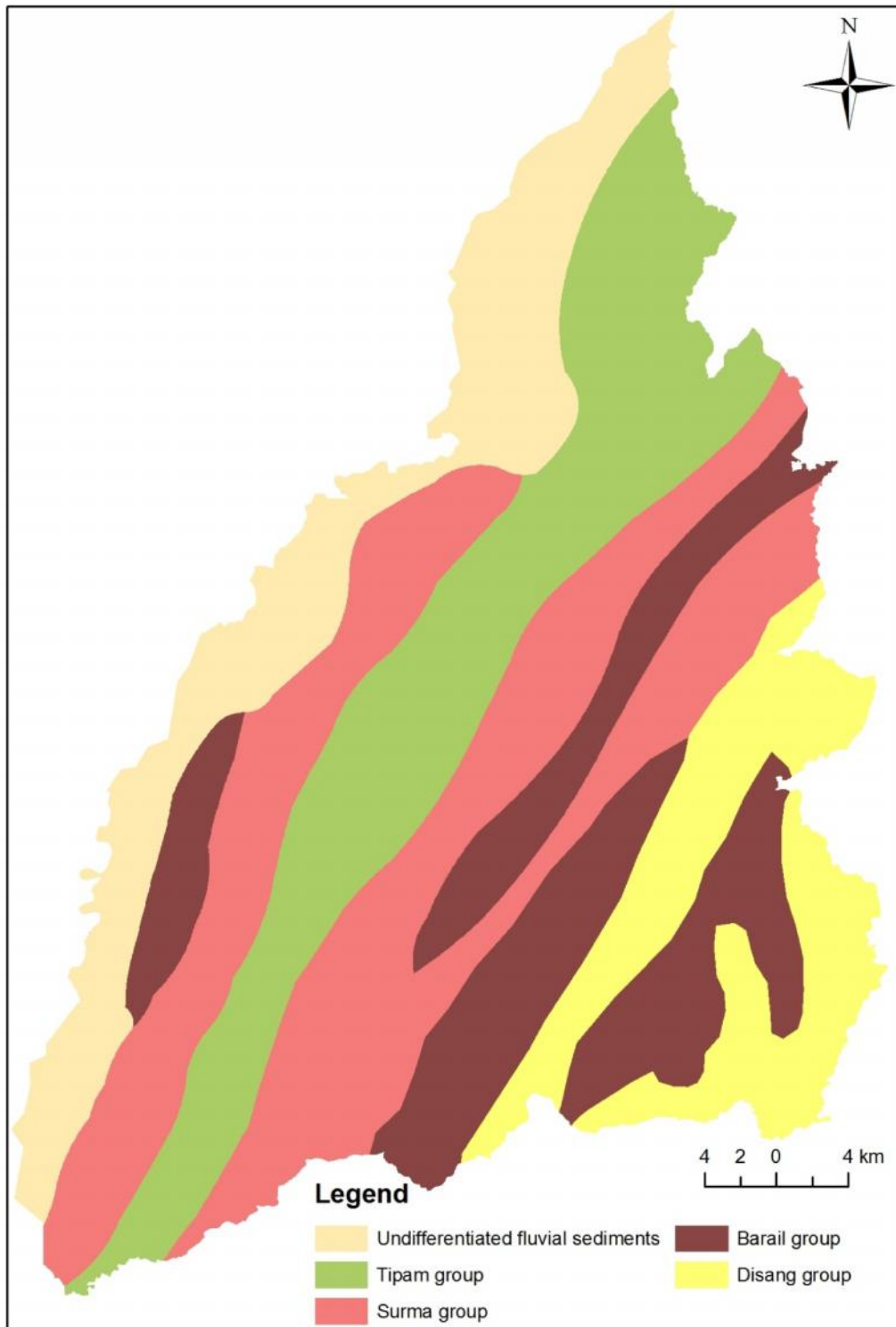


Figure 2.2. Geological map of Wokha district (Source: Geological Survey of India)

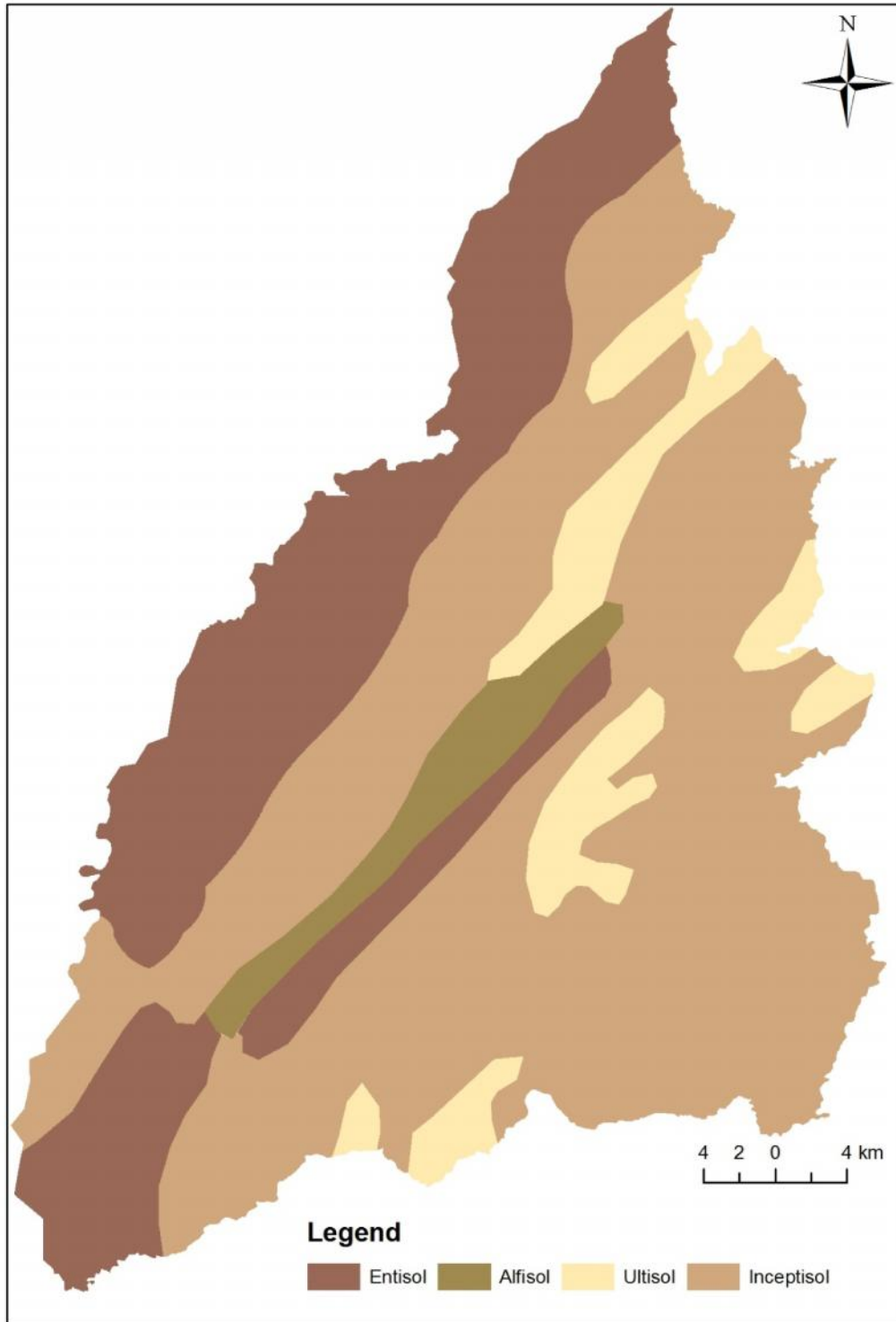


Figure 2.7. Soil map of Wokha district (Source: NBSS &LUP)

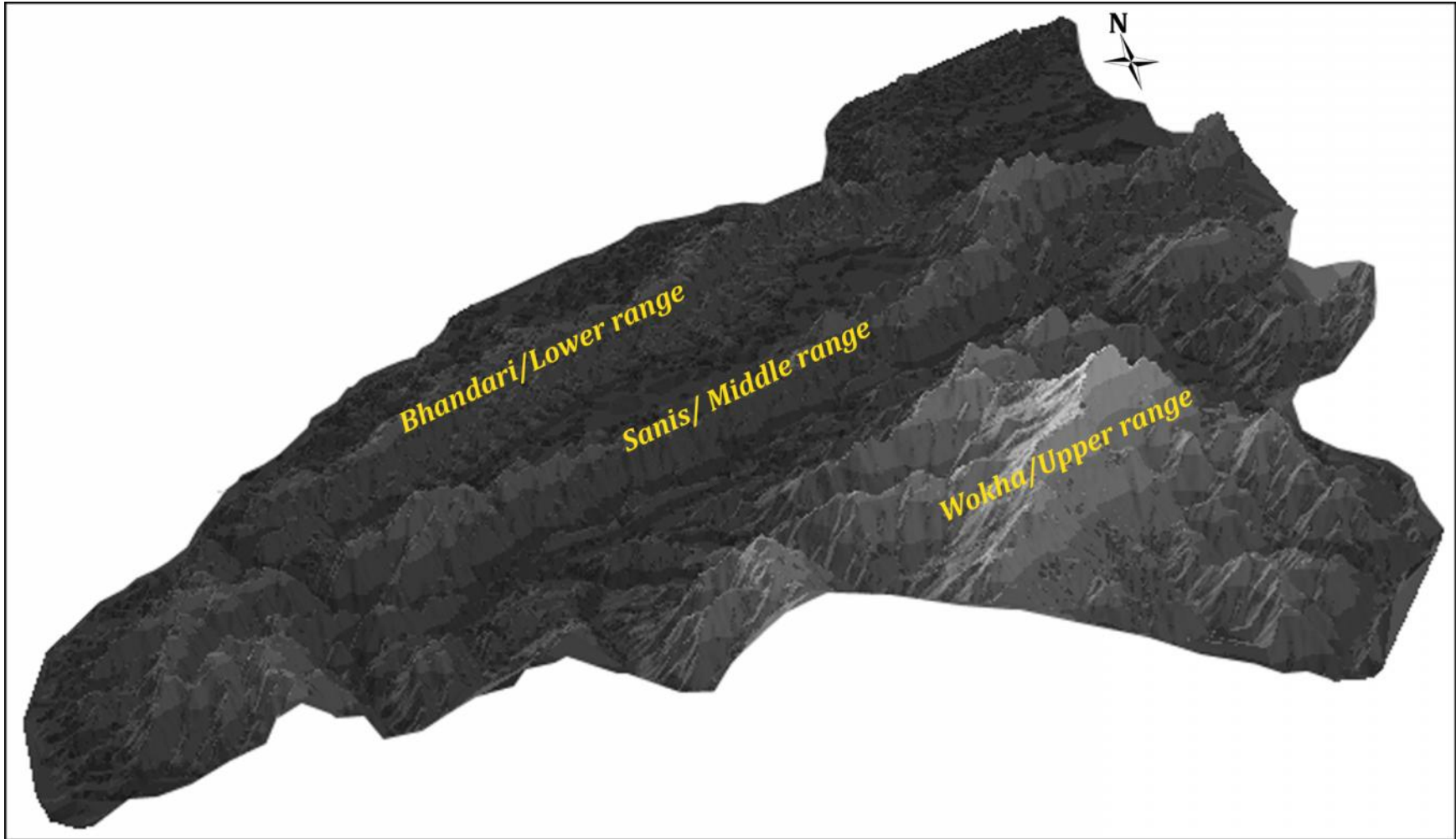


Figure 2.1. Digital elevation model showing the three Ranges in Wokha district (Source: Nagaland GIS and Remote Sensing Centre).