BIO RESOURCE MANAGEMENT AND ITS IMPACT ON LIVELIHOOD PATTERN IN NAGALAND: A GEOGRAPHICAL ANALYSIS

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DOCTOR OF PHILOSOPHY

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CERTIFICATE

*This is to certify that the PH.D thesis titled, "**Bio Resource Management and its Impact on Livelihood Pattern in Nagaland: A Geographical Analysis**" is an authentic and original work carried out by **Miss Menoseno Senotsu** bearing Regd.No. 530/2013, dated 23th November 2012 based on her field study conducted under my supervision.*

The thesis fulfils all the norms of PH.D thesis under the rules and regulations of Nagaland University. And to the best of my knowledge, the thesis has not been submitted to any university or educational institution for award of any degree.

This thesis may therefore be place before the External Examiner for evaluation.

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DECLARATION BY THE CANDIDATE

*I hereby declare that the Thesis entitled "**Bio resource Management and its Impact on Livelihood Pattern in Nagaland: A Geographical Analysis**" submitted for the award of the Degree of Doctor of philosophy, in the Department of Geography, Nagaland University, is my original work and the contents of this thesis did not form the basis of the award of any previous degree to me or to the best of my knowledge to anybody else. I have not submitted the thesis for any research degree in any other University /Institution.*

Date: (Menoseno Senotsu)

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Introduction

1.1. Introduction

The acknowledgment of the emerging Worldwide Environment crisis has legitimised the international political involvement in management and conservation of biological diversity and bio-resource. Leading to the report 'Our Common Future'(WCED, 1987) which created the term 'sustainable development' as the key to regain the lost goal of development for humankind with a better environment. It has also documented in the following years, how development inequities persist across the west and east between the nations and the have and have not's within. Breaching the symbiotic relationship of human and nature persistently as well as that of bio-resource and development.

The march of human towards technology and development cravings has degraded the wholeness of the ecosystem, which is the base of their very life. Underdevelopment was seen as an initial stage through which nations had progressed and the gaps in development that existed could be gradually overcome through an 'imitative process' significantly, through a sharing of the experience of West in terms of capital and know-how. [1] This neo-liberal theory has throughout the nineteenth century driven resource management to just one means, yet failed to produce what it promised. Creating debt bondage and resource exploitation for nations with less purchasing power.

Into the twenty-first century, post-developmentalists emphasise grassroots participation and the capacities of organisation at the local level as agents of change. Similarly, local or state participation is becoming a central issue in present time. The current global environmental crisis has acknowledged the indigenous people and knowledge for seeking answers and maintaining the ecological balance.

Whereas, two decades ago, the emphasis was on top-bottom approach for development, today the emphasis is on bottom-top approach-self-reliance, ecosystem stability and

[1] Jennifer A. Elliott (2006), *An Introduction to Sustainable Development*, p.15

sustainability. The reasons why it is so, in the first place, every livelihood is often made up of complex mosaic of enterprise; and components, which may appear minor, may none the less be integral to family welfare, and an important dimension of risk reduction and social safety net. Secondly, the goals of development cannot be attain without equality in shaping the goals and participation whether it is the policy makers or the community concerned.

Nagaland is not far from the influence of westernisation than any other society in its socio-economic structure. With just a few percentage of urban population in the state, the major rural livelihood depends on agriculture and forest resource for their sustenance as well as development. They have developed their agriculture system depending on the physiography and social milieu. It is traditional knowledge and ethos that has fulfilled every socio-economic need as well as conserved bio-diversity in each community. Recently government propagandas and commercial attraction are shifting the well-organised community livelihood system into a transitional stage, which lacks proper planning and action for sustainability.

Embraced in the youngest geologic formation and supposedly most fragile ecosystem, management of the rich bio-resource remains the core issue for their livelihood sustainability. Biologically diverse ecosystems not only maintain but lead to an increase in the flow of ecosystem services, i.e. cultural, provisioning and regulating services. The drastic transition in work culture, belief and attitude towards bio-resources and the environment propelled by growth of population has also severed their harmony with nature. There is also a tremendous pressure of socio-economic change and with this; new modern technologies are overcastting the traditional management system of bio-resource creating age gap and erosion of sustainable resource mobilisation.

In this context, the concept of bio-resource management and its pattern of change with time assume great significance. The understanding of traditional knowledge and practices in relation to bio-resource management is one of the key issues for achieving sustainable development of the state, as the production system has been indigenous for centuries. It is equally important to evaluate the changing pattern with its new technologies that have been either introduced or developed. However, in the present study, the concern will be with the bio-resource in general with special reference to forest and agriculture resource. This is so because firstly, agriculture is the economic backbone of the society and the new emerging resource management strategies are replacing traditional occupation of the people as well as diminishing the rich forest resource to extinction. Secondly, considering the priority of agriculture sector for development and forest resource for maintaining the ecological balance.

The present study is also an attempt to analyze the pattern of livelihood in relation with resource management. Further, an attempt is made to assess whether change in resource management concept has affected people perception towards self-reliance in the traditional society and food sustainability.

1.2. Concept and Meanings

According to Zimmerman, 'A resource is a response to man's appraisal and perception of his environment in a want-satisfying capacity, satisfying individual, group and social objectives.' A resource is a cultural concept, meaning that a resource becomes a resource only when it can be of some utility to human in meeting their needs and wants. Resource in totality is every component of their environment, the biotic and abiotic including human themselves.

As such, resource is dynamic and its concept depends on socio-economic and technological context of a society.

Of all the resources available to men biological resource forms the most important. According to the Convention on Biological Diversity Article 2 (Usage of terms), 'Biological resources' includes genetic resources, organism or parts thereof, populations, or any other biotic component of ecosystem with actual or potential use or value for humanity. Biological resources sustain life and its development has caused the civilisation of human society. Bio-resource and biodiversity are highly interlinked and often used interchangeably. One can interpret biodiversity as a stock and bio-resources as the flow from it; they are mutually interrelated in their existence and function.[2] Biodiversity has been defined by the Convention on Biological Diversity as the variability among living organisms from all sources, including terrestrial, marine and others aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystem. More simply, biodiversity is the variety of the life forms including their genetic make-up and all kinds of their assemblages. In the modern global economy, bio-resources are utilised to produce energy, fuels, chemicals and different consumer products expanding its limit as a resource to a significant level.

The goal of resource management relates to the concept of resource that is to satisfy human's utilitarian needs and wants through the use of some object or set of objects. Thus, resource management may be defined as the set of technical, economic and managerial practices by which stocks are converted to resources for the purpose of satisfying human's utilitarian needs and wants under prevailing socio-economic and technological conditions.

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[2] Prakash Nelliyat & Balakrishna Pisupati (2013), *Biodiversity Economics from Access and Benefit Sharing Perspective,* p.9

The decision-making in management has become more crucial today with human's utilitarian needs becoming more complex and multi-dimensional.

Globalisation is revered in driving the decision making of an individual to the nation for a common purpose in resource management. Anthony Giddens defined globalisation as 'the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa. The impact of globalisation led to the changes in land use impacting on land tenure, biodiversity, ecosystem services, occupations and the wellbeing of the community worldwide. Management crisis emerged all over the world when species extinction, ecosystem destruction and environmental degradation threatened the human welfare and existence for the future. For decades, the very goal of management was questioned until the term 'sustainable' puts it in a better perspective.

The UN report entitled, 'Our Common Future'(WCED, 1987) first used the term 'sustainable development' and defined it as 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

With the accumulation of research works for sustainable development at the international level, there has been a consensus that Global agendas needs to integrate local agendas. This was followed by CBD (Convention on Biological Diversity) recognising that States has sovereign rights over their biological and genetic resources. Putting into effect is the Article 8j and 10c of the parties on promotion of traditional knowledge and customary sustainable use and the adoption of the ecosystems approach as the framework in attaining the objectives of sustainable development. Tribal people have been the custodians of bio-diversity for years. As such, they possess knowledge system of their environment, which could solve the management problem of biodiversity better than any 'imposed system'. Traditional knowledge or traditional

ecological knowledge is an attribute of societies with historical continuity in resource use practice. As defined by WIPO, the term 'Traditional Knowledge' refers to the context or substance of knowledge that is the result of intellectual activity and insight in a traditional context and include the know-how, skills, innovations, practices and learning that form part of Traditional Knowledge systems, and knowledge that is embodied in the traditional lifestyles of a community or people, or is contained knowledge systems passed between generations. As such, it encompasses all aspect of their life, their relation with the environment and with one another, in building livelihood and living well.

Traditional Knowledge that is misrepresented as outdated or inert gains central spot in development, as the past famed developmental strategies could not deliver the projected progress and environmental degradation speeds up. Traditional communities as holders of traditional knowledge exists in harmony with nature, using the resources sustainably especially in the field of agriculture and food production.

The dynamic concept of resources and its management is in alignment with human and their innovation to make life better and luxurious in every aspect. This trend has affected the rural livelihoods the worst since their basic needs in terms of both survival and development are immediate and local; survival in the short term is their primary concern and for this they depend largely on the resources of the surrounding area.

Diversity at any one time and at all scales is one of the key features of rural livelihood system. Livelihood is never just a matter of finding or making shelter, transacting money, getting food to put on the family table or to exchange on the market place. It is equally a matter of ownership and circulation of information, the management of skills

and relationships and the affirmation of personal significance and group identity.[3] Livelihood in the traditional Naga society not only depends on the resource creation but on traditional egalitarianism and resource sharing; sharing of land for cultivation as well as surplus produce which determine the economy of an individual but the society at large. As such, livelihood in the community is not an individual affair or accumulation.

A person's asset, such as land, is not merely means with which he or she makes a living: they also give meaning to that person's world. They are also the basis of an agent's power to act and to reproduce, challenge or change the rules that govern the control, use and transformation of resources.[4] Sovereignty of claim and access to assets both physical and social and it organisation as well as regulation has created an environment where every household plays an equal role and holds equal responsibility in resource management and livelihood sustainability.

1.3. Study Area

Nagaland is a narrow rugged mountainous terrain lying between 25°60'- 27°40' N latitude and 93°20' and 95°15' longitude, on the extreme east of India. The state covers an area of 16,579 sq km with its district of Kohima, Mokokchung, Tuensang, Zunheboto, Mon, Wokha, Phek, Dimapur, Kiphire, Longleng, and Peren (Table 1.1).

[3] Leo De Haan & Annelies Zoomer (2003), *Development Geography at the Crossroad of Livelihood and Globalisation*. p.7

[4] Anthony Bebbington (1999), Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. *World Development* ,pp.2021-2044

Table 1.1. District Profile of Nagaland

SL. NO	District	Area in Sq.Km	Population	Density per Sq.Km	Major Tribes
1	Dimapur	927	378,811	409	All tribes
2	Kiphire	1255	74,004	65	Yimchunger, Sema, Khiamungan
3	Kohima	4041	267,988	183	Angami
4	Longleng	1066.8	50,484	90	Phom
5	Mokokchung	1615	194,622	121	Ao
6	Mon	1786	250,260	140	Konyak
7	Peren	2300	95,219	58	Zeliang
8	Phek	2026	163,418	81	Chakhesang
9	Tuensang	4228	196,596	78	Sangtam, Chang, Yimchunger
10	Wokha	1628	166,343	102	Lotha
11	Zunheboto	1255	140,757	112	Sema

Source: Statistical Handbook of Nagaland, 2014

It is surrounded by the states of Arunachal Pradesh in the North, Assam in the West and Manipur in the South and straddles the Patkai mountain range, adjacent to Myanmar. According to article 371(a) of the Indian constitution, Nagas enjoy authority over the land and its resources.

Nagaland is under the 12-mega diversity centres of the world and within one of the 18th recognised Hotspot of the world. It is a significant zone of the transition zone between Indian, Indo-Malayan, Indo-Chinese biogeographic region as well as meeting place of the Himalayan mountains with that of Peninsular India and acts as a bio-geographic gateway for plant migration.[5] The tallest rice plant and the tallest rhododendron in the Guinness Book of World Records from Nagaland is a highlight of its bio resources.

[5] Sapu Chankija (2014), *Biodiversity of Nagaland*, p.3

This active centre of speciation is a gene of domesticated crops and a secondary centre for several important plant and animals. With altitudes from 200 to 3800 meters, the climate of Nagaland ranges from sub-tropical to sub- temperate, with an annual rainfall of 2,500 mm.

These climatic conditions and altitudinal variations coupled with varied flora and fauna generates a unique biodiversity in Nagaland. The interaction between the mountain people and the natural ecosystem has helped in maintaining the richness of the agriculture and forest as resource base as well as culture diversity in production as well as livelihood system by the community.

According to 2011 census the population is estimated at 19, 80,608 and the literacy rate is 80.11 percent. History of the Naga reflects the vast culture and tradition; the indigenous people for centuries lived in harmony with nature. The state of Nagaland still depends largely on agriculture and its allied activities for their livelihood though various small-scale industries are also emerging. Where 71 percent of the total population are engaged in agriculture. Women participation as cultivators has increased over the years compared to man.

At the time of introduction of regular administration in Naga Hills, the Nagas' usual method of cultivation continued to be of two kinds: the first and the popular system practised by them is known as jhum and the second as terraced. Mixed cropping is the normal form of sowing in jhum field whereas terrace field was solely for rice and both were rain fed. There has not been any drastic change in the cultivation system. However, there is a gradual shift in cropping pattern from traditional crops to commercial crops due to increase in population and improvement in the basic agricultural infrastructural facility.

Forest resource has and still forms an essential part of every household requirement from house construction and fuel wood to utensils, food and medicinal requirement; they solely depended on the forest. However the recent decades projects the increase loss of forest resources due to over exploitation and unplanned developmental activities.

1.4. Statement of the Problem

History shows that every society has flourished in accordance with its natural resources. However, due to increased population growth and human's greed for development, the source for their very livelihood system is diminishing and human has to adapt their livelihood with the changing environment. The prevailing management issue for achieving sustainable livelihood is prioritized to integrate local knowledge and participation with that of the state. Nagaland, a tiny and hilly state under Indian Union is no exception. Nagaland in its quest to cope with the other parts of the country has been undergoing tremendous socio-economic changes. But these changes are taking place rather haphazardly which in turn is having a negative impact on the livelihood bio-resource system.

Various development activities are initiated and have been going on yet the future prospect is unclear. The new emerging resource management strategies are replacing those of traditional community practices and traditional occupation of the people. Like many developing communities, traditional knowledge and skills did not get the needed support to develop to their full potential. As such, many have been drawn into market economy and left their traditional life ways and occupation. The impacts observed and experienced in the last few decades relates to inequality, loss of bio diversity, bio-resource degradation and exploitation, etc.

In this shift of resource management, it is the women and the traditional ecological knowledge, which faces the maximum risk and marginalization. It destroyed women's productivity both by removing land, water and forests from their management and control as well as through the ecological destruction of soil, water and vegetation systems so that nature's productivity and renewability were impaired. [6]

Traditionally for a Naga, land is their identity and ownership portrayed status in the community. For which land is considered as a family heirloom and never sold or transferred unless to save the family from a crisis. However, this deep sense of attachment is decreasing in places where urbanisation has reached. By culture and tradition, land is considered as not only the mother, but also the source of life and is sacred. All its resources is generally perceived to be common property resources as such there was no personal ambition and men lived in harmony with nature. These ethics persist in different aspect for instance boundary land between two villages of different tribe is used for free cultivation as well as harvesting non-timber forest resource.

They have depended on the forest resources for house construction and utensils to food supplements and herbal medicines. Harvesting of every resource depended on a particular time and process for maximum durability and quality. Their resource mobilisation has always been based on sustainability. Wild fauna is a delicacy; however, it is his nature that during the gestation period hunting is not participated. However, in the recent century, there is a growing tendency for bio-resources to be classified based on ownership and monetary value. Their economic value for humen's greed is tending to over ride its ecological significance.

[6] Vandana Shiva (2010),*Staying Alive*,p.3

A closer approach shows that villages nearer to urban establishment are following the trend of commercial cultivation and haphazardly changing their traditional cultivation system depending on market seeds and new technologies. This is rather creating a chain reaction to the neighbouring villages with different intensity. The major attraction being more productive and a good money-earning source. Terrace fields are less preferred and left abandoned, the major cause being man does not support nor participate as before.

On the other hand Jhum land are getting more oriented to high value food commodities primarily to augment income rather than the traditional concept of risk management. Household food requirements by livestock of every community have also shifted from traditional house produce to market products.

Today, new breeds or hybrids have replaced the old traditional major livestock in Nagaland. In totality, the farming community has responded to the changing consumption patterns by diversifying its production portfolio towards high-value food commodities. At the same time putting the traditional crops and livestock at risk for future sustainability.

Agriculture itself is the community lifeline and transition from traditional to commercial farming has changed the community life. There is more case of consumerism and individualism in the society than harmony and community development. This has led to destruction of biodiversity and imbalance in community development. The bigger issue is the loss of crops and livestock that has more adaptability to environmental changes. Lack of marketing system and availability of market network also limits the local product to compete and harvest the benefit of major crop production in many villages.

Although there is monetary gain, many farmers faces problem of food security in their everyday life. The issue of food security for the household and society has been denied serious consideration in this globalisation trend. Another serious challenge is the false advertisement and promise of commercial crops without any proper market networking system as well as establishment of processing sectors.

1.5. Hypothesis of the Study

1. The well- being of a society depends on its resource base

2. Human's ability to manage their resource influences the livelihood pattern

3. Human's activities change the self-sustaining system of our resource base

4. The nature of bio-resource management is fast changing along with that of

   Livelihood pattern

1.6. Methodology and Source of Data

In consideration with the difficulties involved in covering the entire state for the study along with factors of cost and time constraint, only few villages are selected for the purpose of this study using the purposive random sampling. For in depth study, two villages each from the existing eleven districts was selected. This selection was done based on a number of factors such as population structure, proximity to town, and livelihood structure. For instance, in a district, one village which is traditional or with less interference in its livelihood structure to the second village which is experiencing greater diversity of livelihood. Another variable is the schemes of various Government departments implemented in bio-resource development and conservation and community participation in the villages within every district. This will help in evaluating the factors for resource management changing pattern and its consequences

on the livelihood system and resource base of the village. This will culminate to the geographical analysis of the State as a whole for attaining a better management and livelihood development strategy. And will reduce the risk factors that is prevalent due to ignorance and exploitation by the drive towards westernisation.

Samples of 200 were collected from identified household as respondents. The respondents will include both male and female and different age groups. All the Questionnaires were carried out personally staying at the respective villages. Besides the selected 22 villages representing Nagaland, some villages were also visited for field observation and key informant interview in Kohima, Mokokchung and Zunheboto district. In addition to the sample, direct information was also garnered from interviews with key informants and village council executives with regard to the transition in livelihood and resource management of the particular village. Equally important is the group discussion and field visitations, which supported the data collected in firsthand experience. These has explored and help in formulating and evaluating the intricate relationships between bio-resource management and livelihood development, their ground realities and also bring to light people's perceptions, attitudes and experiences on the management of bio-resources and its impact on their livelihood. The data so collected will be analyzed using appropriate statistical techniques. Required maps, charts, diagrams and graphs will be prepared to support the text and simplify the findings.

The present study draws intensively from primary data and secondary source of data as well. Primary data is collected from exclusive fieldwork, covering two village each from the eleven districts of the state as already stated. The various methods used for data collection includes field survey, Questionnaire both schedule and interview, formal discussion and key informant interview. Conclusions and findings are mainly based on

the primary data collected from the sample. Which is supported by the primary data from government publications of different department of the state and publication by different organisations and agencies.

Secondary sources includes books and journals. Different websites on the internet is also used to gather information and help throughout the study.

1.7. Objective

i. To ascertain the bio resource status of Nagaland
ii. To examine the livelihood system and its changing pattern
iii. To analyze the impact of bio resource management on their livelihood
iv. To develop strategies for more sustainable socio-economic growth

The Government owns just about 7 percent of the total land area, which was either gifted or bought from the village. These indicates particularly, the crucial characteristic nature of land holdings in the state whereby, the state had the highest average size of holding due to the highest proportion of area and number of holdings above 10ha.[7] The ownership of land resources by the community in every village, which is managed by customary laws. As for the Nagas, land and nature is not just wealth but it is the sustenance of their livelihood having a significant impact on the culture and traditional life. However, this deep sense of attachment is decreasing in places where the influence of urbanisation has reached and there have been a gradual transition from traditional to commercial management. How is this changing the harmony of nature and development for livelihood in the state? Is it trending towards sustainability or creating resource degradation and polarity in the society?

The study will provide information and status of the current bio-resource management of the State. It will also show the pattern of livelihood system in the State as well.

[7] Bimal J.Deb (2006), *Development Priorities in NE India*,p.76

However, the main significance of the study is to show how and in what way bio-resource management pattern is affecting the livelihood system of the study area. The study will also bring to light the changing pattern of bio resource management from traditional to the emerging composite pattern of management. It will help in ascertaining the relationship of economy and ecology, our dependence and responsibility to our resource management. This can motivate the formulation and implementation of strategies for sustainable development.

1.8. Review of Literature

The following are the major literature in relation to the present study, which have help in understanding and framing the work to be carried about with more propriety and accuracy.

Human well being is dependent on the continued provision of ecosystem services and bio-resources; however, biodiversity is rarely included in our economic outlook because it is mainly a public good and often taken for granted. Biodiversity is credited for the early civilization and is perceived to be their sustenance for the future as well. Decision and process of bio-resource development over the years has posed the question of world poverty and the acknowledgement of every species being part of their sustenance.

The World Bank estimates that forests directly contribute to the livelihoods of some 90 per cent of the 1.2 billion people living in extreme poverty. The Millennium Ecosystem Assessment also found that as many as 300 million people, many of them very poor, depend substantially on forest ecosystem services for their subsistence and survival.

The book *'Economics of Protected Areas and its effect on Biodiversity'* (Kushwah & Kumar, 2001) gives us a clear picture of the symbiosis relationship between human and biodiversity through the economic study of protected areas from Madhya Pradesh.

Where the prohibition of resource mobilisation in the protected areas caused the degradation of livelihood of the communities who depended on the land for their livelihood both economic and social and caused conflict in priorities. In the book *'Environmental Policies for Sustainable Development' (*Khan, 2001) the author studies the impact of bio-resource conservation on the economy of the community stating that for successful conservation, benefit to the local community should exceed that of the cost.

'Forest Management in Tribal Areas- Forest Policy and Peoples Participation' by P.M Mohapatra and P.C.Mohapatro (1997) claims that the existing deep rooted relationship of tribal's and forest in their culture and livelihood are not taken into credit in creating policies and hinders tribal's livelihood management. Another book *'Forest Policy and Tribal Development-A Study of Maharashtra'* by Rucha.S.Ghate (1992) opines that the changing forest policy are failing to meet the tribal's economic needs and creating conflicts among tribal's and policy implementation. *Conservation and Use of Wildlife-Based Resources: The Bush meat crisis* in CBD Technical Series 33 (2008) projects the value of wildlife on livelihood among the forest-dwelling populations as well as on their culture and asserts that many people do not depend on wildlife resources as a full-time source of food or income, but as a buffer to see them through times of hardship, or to gain additional income for special needs. In global aspect, forest ecosystem and its resources are extensively extracted and used for divergent purposes, and have become emerging commercial products for global economy and human welfare. According to the report *'Forest Biodiversity Earth's Living Treasure for International Day'* ,22 May 2011, in 2005 the global sale of pharmaceuticals sourced from animals, plants or micro-organisms reached US dollar 14 billion and globally, standing forest are able to remove about 15 per cent of human-generated carbon dioxide emissions from the atmosphere every year by sequestering carbon; in so doing, they become "carbon sinks".

The concept of bio-resource and livelihood had a paradigm shift with the transition to agriculture. Agriculture reduced the number of species used for food but traditional farming practices steadily increased the diversity within those species through accidental and intentional crossbreeding and selection. History shows that the interdependence of each variety with its ecological and socio-cultural setting contributed to the overall goal of sustainable food production with optimum efficiency.

The late 1960s witnessed the emergence of agriculture systems that emphasised maximising crop yields and uniformity and standardisation of farming systems, varieties and technologies (Kumar, 2002). M.S. Swaminathan and S.Jana, (1992) highlights the pioneering work of N.I.Vavilov (1887-1943) in crop diversity conservation in their edited book *'Biodiversity Implications for Global Food Security'* As early as 18th century, Vavilov organised scientific expeditions to more than 50 countries, major agricultural regions of the world with one goal, mobilising of crop resources to establish food reserves and food security of the country. In his step they explores the prospect of genetic diversity for sustainable agriculture and opines that future increase in global production have to result from productivity per unit land and not expansion of arable land. Shashi Kumar (2002) in her book *'Biodiversity and Food Security'* while discussing the development of biodiversity conservation emphasises that for many farming communities, diversity, be it social, cultural, or genetic, means security. Indicating that genetic diversity provides security for the farmer against pests, disease and unexpected climatic conditions. Crop genetic diversity is also highly considered as humanity's key to maintaining crop resistance to pests and diseases, and adapting agricultural systems to climate change in CBD 2010 report *'Biodiversity, Development and Poverty Alleviation-Recognizing the role of Biodiversity for Human Well-being'*.

The greatest threat to biological diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favour the conversion of land to less diverse systems. Compromising the nature of bio-resource and the livelihood system haphazardly. Rather than promoting the concepts of interdependence and mutuality, globalisation has constructed a 'one world' model that utilises global communication to forge a single market culture. The book *'Agriculture ,Food Security, and Rural Development'* by Asian Development Bank ,2010, traces the changing trend in agriculture from green technology revolution to the silent market-driven revolution over the 18th century with reference to India, the policy changing agriculture and its impact on rural livelihood. He quotes "Tracing the trends since the early 1980s, the DIV (crop diversification) paper documents the 'silent revolution' bringing about steady diversification in agriculture by sub-sectors and crops". An '*Introduction to Sustainable Development'* by Jennifer A.Elliot (2006) very generously explains the role of development pattern affecting the livelihood system and the challenges faced for sustainability. While suggesting strategies for achieving a common future he affirms that too often development patterns in the past have served to remove, or compromise in some way, the opportunities for some groups of people over others.

The book '*In Search of Sustainable Livelihood Systems- Managing Resources and Change'* by Baumgartner and Hogger (2004), integrates the policies of development with that of rural livelihood system, studies the risks and opportunities for sustaining livelihood in the semi-arid region of India and presents a report on the integration and role of local experience and leadership in achieving its goal. The author of the book *'Caring for our Source of Sustenance- The Kalanguya's Territorial Management'*(Daguitan,2010) presents a report on the changing pattern of traditional

occupations and its effect on their livelihood system, stating the need to pursue land use and sustainable development planning to ensure a sustainable livelihood

The author of the book *'Ecology and Economics - An Approach to Sustainable Development'* (Sengupta, 2003) traces the changing attitude of nature as a source and sink for enhancing human consumption to challenges for economic development while balancing the push and pull factor of ecology and economics. He has emphasized that ecology and economy have to be integrated as an organic whole for sustainability of our social wellbeing. *'Ecology and Development'* by Madan Mohan (2000) brings ecology and development closer in his research study of the Indo-Gangetic Divide and adjoining region comprising the state of Haryana and parts of Punjab. He has traced the pattern of socio-economic development and the emerging ecological problems faced, stating that the present ecological problems are human induced; hence, their solution also lies in the hand of human. The author of the book *'Agriculture, Food Security, Poverty, and Environment - Essays on Post-reform India'* (Rao, 2008), explores a key paradox: why are economic reforms of the past not bringing equity to the society? He examines this paradox both through a historical review of economic reforms and development and proposes policies and institutional reform for successful livelihood-based development. '*Biodiversity, Development and Poverty Alleviation- Recognizing the Role of Biodiversity for Human Well-being*' (International Day for Biological Diversity, 2010) illustrates how biodiversity and its ecosystem services contribute to economic sector and the emerging avenues with regard to the challenge and crisis of biodiversity loss.

Biodiversity as life on earth has always fascinated humankind and as early as the age of discovery, documentation of biodiversity and ecosystem has been of great important and interest. Simultaneously, ecosystem services such as food production, soil fertility,

climate regulation, carbon storage gain interest and access into biodiversity resource conservation and management. Human exploitation and neglect of the biological world caused the irreversible loss of many species. The 2002 World Summit on Sustainable Development acknowledged the loss of biodiversity as one of the major problems facing humanity at the start of the 21st century. Wildlife management and conservation is a dynamic concept and the practice of wildlife management is rooted in the intermingling of human ethics, culture, perceptions and legal concepts. According to K.C. Agrawal (2000) objectives of conservation and management are maintenance of ecological equilibrium between biotic and abiotic components of the ecosystem, preservation of the total gene pools of the different species at the global level and ensuring the optimum utilization of the present animal and plant species.

Eric.G.Bolen and William L.Robinson (1984) in their book *'Wildlife Ecology and Management'* credits the emergence of Wildlife Management as a budding science in the 1930s to Aldo Leopold, Professor of Forestry at the University of Wisconsin. Until the 1960s, wildlife management was primarily game management in USA, which shifted with the consensus that some animals have disappeared forever in the wake of human disregard for the landscape; others have become plagues; and some have stubbornly resisted control. The lesson may be that "dominion" over the creature of the Earth may require more than mere strength and advanced technology. Instead, an ecological understanding and the application of that understanding may produce mutual benefits for human and our fellow creatures. And concludes with a bigger dimension "Whether society shall reconcile the limitations of our planet's natural resources against the eroding pressures of human population".

Another book *'Forests for socio-economic and rural development in India'* by S.S.Negi (1996) traces forest management in India to the Mauryan Period about 300 BC which

was based on its functional categories: for religious purpose, for hunting; for supply of forest produce and for grazing of royal elephants. In addition, its transition to multiple use and sustainable development in modern India. India had a positive trend after 1987 with increase in the actual forest cover and increase in the dense forest cover. The author throughout his book stresses in several places that participation of the local people is necessary in all forestry programmes because, ownership motivates people for participation.

'Terrestrial Ecoregions of the Indo- Pacific' (Wikramanayake *et al.*, 2004) presents an explicit study of each defined ecoregions of the Indo- Pacific moving beyond endangered or charismatic species to the number of mammal and bird species, including endemics, in each ecoregion, offering a complete assessment for conservation. Whereas the book *'Plant Diversity and Conservation'* (Singh *et al.*, 2007) presents conservation in another dimension, where papers from Satellite Remote Sensing for forest management to Biodiversity Conservation and Utilisation in Horticultural crops and Impact of Thermal Power Pollution on a medicinal Plant Grown In Vivo and In Vitro.

'Resource and Environmental Management' (Mitchell, 1997) explores the challenges in management of our interaction with the environment, stating that there is no generic model or blueprint for sustainability and each nation would have to work out what was appropriate for its context, needs, conditions and opportunities. He has also stressed the importance of gender and community knowledge and participation in carrying out resource management for development. In the book *'Ecosystem Management - Adaptive Strategies for Natural Resources Organizations in the 21st century'* (Aley *et al.*, 1999) a distinguished group of contributors addresses the major changes that have taken place in the decision-making process, increased participation in bottom-up planning and management and the development of a more holistic model of how ecosystem work and

can be sustained. Similarly the book *'Human Development and the Environment- Challenges for the United Nations in the New Millennium'* (Ginkel *et al.*, 2002) presents a critical analysis of the contemporary issues of the UN for attaining sustainability of humans in a save world. It however offers a rather surprising optimistic outlook on the global future, with the basic supposition that we can make the necessary changes in order to improve our live and our environment. Another book, *'Conservation and Development'* (Adam, 2009) examines the steady role of community-based conservation since 1970s for achieving sustainable livelihood while maintaining the self-sustaining ecosystem. *'Pathways to Participatory Farmer Plant Breeding- Stories and Reflections of the Community Biodiversity Development and Conservation Programme'* (Community Biodiversity Development and Conservation Programme, 2006) is a collection of successful examples on the evolution and development of participatory agro-genetic management and its farmer empowerment. Whereas the *'Compendium on Indian Biosphere Reserves Progression During two Decades of Conservation'* (Palni *et al.,*2012) gives a detailed characteristics of the Biosphere Reserves in India, their management and development priorities and the challenges ahead. *'Incentive measures for the conservation and sustainable use of biological diversity- case studies and lessons learned'* (CBD Technical Series No.56, 2011) also notes the success of India's Joint Forest Management for the management of the forest resources through the local inhabitants according to the Indian Forest Policy (1988). Whereby in 2007, there were over a million JFMCs involving 22 million people managing 22 million hectares of forest area. *'Traditional Ecological Knowledge for managing Biosphere Reserves in South and Central Asia'* (Ramakhrishnan *et al.*, 2002) explores the implementation of Traditional Ecological Knowledge in different Biosphere Reserves for sustainability, highlighting the emphasis that peoples rich knowledge and participation should act as a

trigger for more effective management of these reserves, as envisaged in 'Seville Strategy' document.

Article 8j of CBD stating that Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and locales communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices (SEARICE Review,2009) also reaffirms it. In agreement, the book *"Biodiversity-Principles and Conservation"* (Kumar and Asija, 2000) and *"Biodiversity Conservation"* (Trivedi and Sharma, 2003) claims that conservation is to achieve human welfare and should include innovations for their betterment as well as the bio-resource.

Victoria Tauli-Corpuz (2005) in the paper *'Indigenous Peoples and the Millennium Development Goals'* studies indigenous peoples primarily from developing countries, the issues and challenges facing their very identity in the name of development. The paradigm of economic growth through trade and investment liberalization, deregulation, and privatization, so far has resulted in the further impoverishment of indigenous peoples and the disappearance of their knowledge and cultures. Numerous studies on the adverse impacts of this kind of globalization on developing countries have been carried out. The conclusion is that this one size-fits-all kind of globalization is not appropriate for developing countries. Countries should be given the space to design and implement development policies, which will fit their particular economic, social and political context. This recommendation is equally applicable to indigenous peoples. The key weakness of the MDGs is that it does not question the mainstream development

paradigm nor does it address the economic, political, social and cultural structural causes of poverty.

Women activists share this analysis: “A major problem of the MDGs is their abstraction from the social, political and economic context in which they are to be implemented – the ‘political economy’ of the MDGs.” The path of incurring more debts, engaging in more aggressive extraction of mineral resources, oil, or gas in indigenous peoples’ territories, or further liberalizing imports to the detriment of traditional livelihoods, in all probability, would not alleviate poverty amongst indigenous peoples. The grants or loans provided by intergovernmental development agencies like the UNDP or international financial institutions for government projects implemented in indigenous peoples’ territories can help address indigenous peoples’ poverty. However, serious evaluation of these is required to assess whether these projects are planned, implemented and evaluated with indigenous peoples, whether they are reinforcing or destroying sustainable resource management systems of indigenous peoples and their traditional systems of reciprocity and collective decision-making; and whether such projects have brought about policy changes in favour of indigenous peoples.

The issue of poverty reduction and economic development cannot be addressed separately from the issues of indigenous identity and worldviews, cultures and indigenous peoples’ rights to territories and resources and to self-determination. There is tension, no doubt, between maintaining indigenous identity on one hand and improving economic conditions on the other. In a world where improving economic conditions is equated with the growth of market institutions, nationally and globally, many indigenous peoples find themselves in a dilemma. If they participate fully in the market, they have to forget about their customary land tenure systems, their traditional

practices of redistributing wealth and ensuring more equitable access to and sharing of resources, and their natural resource management system.

'Biodiversity and Indigenous Knowledge Systems in Malaysia' edited by Colin Nicholas and Jannie Lasimbang (2004) claims that indigenous resource management, with its fund of intricate knowledge gained over generation, has been central to the conservation of resources in indigenous people's territories and ensured the continued survival of communities as a whole. The ethos and indigenous knowledge is holistic and ecological. It takes into account, and relies upon, the complexity of interrelationship of all that exists. According to Rural Advancement Foundation International (RAFI) estimates, US$32 billion of sales of pharmaceuticals worldwide are based on traditional medicines. The strength of indigenous knowledge among the tribal's is universal because management practices are incorporated into their everyday life and at a very young age.

In the paper *'Development Initiatives in the CHT: Crisis and Potentiality'* by Mathura Tripura presents how indigenous tribes of Chittagong hills in Bangladesh endured resource destruction and development failures with various donor agencies and countries, who they argued did not recognize and respect the free, prior and informed consent of the people. Another paper by Jennifer Corpuz on '*Integrating Issues of Ethics, Socio-economic and Sustainability in Philippine Policy on GMOs and Regulations on Biosafety'* critics how Philippines, a primarily agricultural economy rich in biological diversity is threatened in its tribal socio-economy due to the introduction of GM crops with lack of local government and public participation in screening activities.

According to *'Adivasi/Indigenous Peoples in India-A Brief Situationer'* (1998), 67.7 million of the 220 or so million Indigenous-Tribal people in the world live in India,

making India with the largest Indigenous-Tribal population. 'Tribal' meaning 'residents from the beginning' or 'first peoples' are today concentrated in the hilly and forested regions of the country after waves of invasions. The land holding system was one in which the individual rights of enjoyment of land and land based resources were enmeshed in communal systems of access to land based resources. In the consciousness of the tribal people, land did not and could not belong to the individual, but the individual belonged to land by virtue of their ancestors being seated in the given territory. Land had not merely an economic significance as a survival resource; it had also a social, cultural and political significance.

In the arena of building a 'national society', the indigenous people became part of the mainstream India. In the process their community culture, politics and identity were bereft for the future generation. This condition of being dominated and internal colonization surface because of its rich natural resources. 80% of the minerals and 72% of the forests and other natural resources are found in Adivasi (Tribal) areas. 90% of the coalmines are also in these areas.

In the words of Dr. M.S. Swaminathan, noted farm scientist, 'Some historians believe that it was the women who first domesticated crop plants and thereby initiated the art and science of farming. While men went out hunting in search of food, women started gathering seeds from the native flora and began cultivating those of interest from the point of view of food, feed, fodder, fibre and fuel.' (Khandelwal *et al.*, 2013). Nature's economy-through which environmental regeneration takes place-and the people's subsistence economy-within which women produce the sustenance for society through 'invisible' unpaid work are being systematically destroyed to create growth in the market economy. For women farmers the essence of the seed is the continuity of life. The

famous Chipko movement in India by local women for their living mountains and living waters reflects the feminine ecological principle.

The book *'Women Farmers of India'* (Krishnaraj *et al.*, 2008) has illustrated the traditional role of women in farming in India, their continued marginalisation and the present feminisation of farming with higher dependence on women for success development in farming. Another book *'Gender Analysis In Agriculture- Grassroot Realities'* (Grover *et al.,* 2011) also stresses the role of women in agriculture for food security and agro-biodiversity claiming that women are becoming the sole bearer of traditional knowledge.

Shashi Kumar (2002) opines that Dr. Vandana Shiva and Prof. Maria Mies formed the basis for the creation of Women's Agenda 21 as the global platform for action. In the book *'Staying Alive'* by Vandana Shiva (2010), the author argues that there is an intimate link between the degradation of women and nature and states that man's survival can only be reclaimed by restoration and liberation of women and nature. Similarly, *Ecofeminism* by Maria Mies and Vandana Shiva (1993) also argues that women were the first to protest against environmental destruction because of their active involvement in ecology and their relationship with it.

Chatterjee *et al.,* (2006) in the paper *'Biodiversity Significance of North East India for the study on Natural Resources, Water and Environment Nexus for Development and Growth in North Eastern India'* claiming the status of biological diversity in the North East states that while WWF has identified the entire Eastern Himalayas as a priority Global 200 Ecoregion ,Conservation International has upscaled the Eastern Himalaya Hotspot which initially covered the states of Arunachal Pradesh, Sikkim, Darjeeling Hills, Bhutan, and Southern China to the Indo Burma Hotspot (Myers, 2000) which now includes all the eight states of North-East India, along with the neighbouring countries

of Bhutan, southern China and Myanmar based on its high biological diversity and endemism but under severe anthropogenic threat.

'Contribution towards Developing a Roadmap for Biodiversity and Climate Change - Indian Part of East Himalaya' by GB Pant Institute of Himalayan Environment & Development (2011) introduces North Eastern Region also known as Indian East Himalaya region as a rich repository of plant and animal wealth in diverse ecological systems located at the tri-junction of Indo-Chinese, Indo-Malayam and Palaearctic biogeographic realms. Bio-diversity wise the region was considered as the cradle of flowering plants also known for high evolutionary activities. Based on extensive explorations across the world, Vavilov considered the northeastern region of India as "Hindustan Centre of Origin of Cultivated Plants", which is very important for tropical and subtropical fruits, cereals, etc. The prevailing primitive agricultural system of raising crops under stress conditions in the region have resulted in much variability, particularly in adaptive traits.

Most of the hilly terrain in the eastern Himalaya is under shifting cultivation and several promising, agronomically and physiologically well-adapted types/land races belonging to diverse crop species occur in this region. In addition, in isolated pockets, various ethnic groups grow their own preferred locally selected cultivars. All these factors have contributed to enormous enrichment of genetic diversity in land races through conscious and unconscious selections by indigenous farming communities in the Himalaya. Another striking feature of the socio-economic profile of the region is prevalence of tribal culture. It is the home for over 166 separate tribes, 160 schedule tribes and over 400 other tribal and sub-tribal communities and groups, speaking a wide range of languages. These groups retain their cultural traditions and values but are beginning to adapt to contemporary lifestyles.

The book *'Changing Agriculture Scenario in North East India'* (Deb *et al.*,2006) is a compilation by authors who has portrayed the North East state transition in agriculture from traditional to the emerging trend and future prospect with emphasis on the role of women.

Dutta.P.C and Mandal.R.K (2011) traces the transition in resource mobilization and socio-economic development in North East India in their book 'Globalisation, Growth and Inequality in North East India'. Stating that multi-dimensional changes during post reform period led to corruption, economic inefficiency and inequality in the region whereby they are facing the dilemma of economic efficiency versus social and regional inequality. Another book *'North East India -Local Economic Development and Global Markets'* edited by Hans-Peter Brunner (2010) analyse the factors responsible for economic failure from geo-political factors to technology factors and creates the future prospect on the rich bio-resource base of the region.

U A Shimray (2007) in the book *'Ecology and Economic Systems- A Case of the Naga Community'* claims that the introduction of western education and Christian doctrine by the colonists in the late 1890s and the World War-II experiences encourage to abandon the old tradition as a result changes took place in both village morphological structure and social system. He opines that these changes impose a serious threat to the ecological relationships, which has sustained their diverse biological resource base. Similarly, Piketo Sema (1991) in *' British Policy and Administration in Nagaland 1881-1947'* also comments that the rule of British Policy in the Naga Hills changed the traditional values of the society and individual. Wherein their way of living and concept of resource gradually became exploitative to his environment as well. On the other hand B.B.Kumar (1993) in *"Modernization in Naga Society"* states that the advent of political democracy did open new choice and possibilities, but traditional tribal structure of the Nagas were

never affected. On the other aspect, *Nagaland Land Alienation: Dynamics of Colonialism, Security and Development* by Lanusashi Longkumer and Toshimenla Jamir (2012) traces land alienation with the introduction of colonial laws and policies followed by national policies which has induced land alienation to a higher level risking the Communal land practices of the Nagas. The article *'Ethnography of the Nagaland-Assam Foothills in Northeast India'* by Dolly Kikon (2009) projects the identity of a Naga with that of land and claims that conflict of land creates severe stress and underdevelopment for a community especially in a buffer zone.

In the book *'Traditional Naga Village System and its Transformation',* A.Nshoga (2009) argues that in the traditional village, all the able-bodied men and women are equally food growing and producers, within their own self sufficient and self-reliant village economy. Forest and its produce give immense and indispensable help to the Nagas, provide them with building materials for dwelling houses, raw materials for handicrafts and all the food provisions acquired from the forest is at their disposal. A.Wati Longchar (1995) in *'The Traditional Tribal Worldview and Modernity'* signifying the ethos of land and tribal's quotes the tribal rhetoric, "the land is the Supreme Being's land", "one cannot become rich by selling the land", "if anyone should take another's land by giving false witness that person will die soon", "the earth is truth, do not lie to the earth" and so on.

In the report *'State of Environment Nagaland 2005'* , Nagaland Pollution Control Board in collaboration with The Energy and Resources Institute, New Delhi claims that though Nagaland has a very rich biodiversity, hardly any documentation has been done so far. In 2002, under the National Biodiversity Strategy and Action Plan (NBSAP) Project, the State Level Biodiversity Strategy and Action Plan of Nagaland had been brought out for its incorporation into the National Biodiversity and Action Plan of India. The

NBSAP envisages the assessment and stock taking of biodiversity-related information at various levels, including distribution of endemic and endangered species and site-specific threats and pressures. The *Nagaland Biological Diversity Rules 2011* by The Expert Committee, Government of Nagaland, states one of its functions as "Ensure that biodiversity and biodiversity dependent livelihood concerns are integrated into all sectors of planning and management for conservation and sustainable use".

India State of Forest Report 2011 by Forest Survey of India calculates the forest cover in Nagaland State based on interpretation of Satellite data of November 2008-February 2009 as 13,318 km^2, which is 80.33 percent of the State's geographical area. It also reports that the change matrix reveals an increase of 19 km^2 in very dense forest, 34 km^2 in the moderately dense forest and a decrease of 199 km^2 in open forest.

Nagaland Bio Resource Mission (2009) in the book '*Plant Resources of Nagaland'* offers an illustrated guide to various indigenous plants and their uses. It unravels the vast bio diverse plant species and provides a valuable source for accessing plant material information useful for the restoration of damaged and degraded habitat. Whereas the paper *'Traditional Knowledge of Lotha- Naga Tribe in Wokha District Nagaland'* by Jamir et al., (2010) reported 55 ethnomedicinal uses in Wokha district, Nagaland itself. And Chase and Singh (2013) reported a total of 64 herbaceous plants with ethnomedicinal value identified from Khonoma Village under Kohima district in their paper *'Ethnomedicinal Plants used by Angami tribe of Nagaland, India'*.

Agriculture is the main occupation in Nagaland, with over 70 percent of population living in rural areas and dependent on agriculture and allied activities. Nearly 28 percent of the total area of the state is under cultivation, with another 6 per cent under various agro-forestry practices. Of this, 70 percent is located in the hilly region and only 30 percent in the plain areas of the foothills.

Understanding the agriculture scenario of the Naga, *Building upon Traditional Agriculture in Nagaland, India by NEPED and IIRR, (1999)* produce a collective work on the agriculture system of the Nagas and the prospect of agro- forestry for sustainable jhum cultivation through community- based approach. '*Shifting Forest in North East India- Management of Alnus nepalensis as an Improved Fallow in Nagaland'* (Cairns, 2012) presents an explicit study on the development of alder based jhum system as a sustainable land-use, emphasizing its impact on the livelihood pattern of the Khonoma village, Nagaland.

Sapu Chankija *(*2006) in his paper *"Environmental Conservation and Its Impact: Environmental Friendly Indigenous Sustainable Mountain Farming System Practices in Nagaland"* opines that the farming practices based on traditional knowledge of the Nagas have sustained his resource and livelihood but lacks adequate research and support for development. In addition, quotes Warren (1990) "They are not only value for the culture from which they evolve but also for the scientists and planners striving to improve conditions in rural societies". Aier and Changkija (2012) in *'Indigenous Knowledge and Management of Natural Resources'* study the indigenous practices of resource management of the Nagas as a part of their livelihood system. Moreover, states that the indigenous knowledge can help achieve a sustainable source of production and income generation. *Vision 2025, Food For All- Prosperity through agriculture* (2012) by Department of Agriculture and Allied Departments emphasising agriculture in the State's GDP redirects its effort to achieve prosperity for the people. The global experience of growth and poverty reduction shows that GDP growth originating in agriculture is at least twice as effective as GDP growth originating outside agriculture.

Chapter 2

Dynamics of Human- Land Relationship

Land constitutes the base of all resource. The land has nurtured and supported their every economic activity since time immemorial.

Human life both social and economic depends on the land and its resource. Since humans have adopted to control fire and domesticate plants and animals, they have cleared forests to wring higher value from the land for their livelihood. For human existence, settled within certain biotic, ecological and economic conditions the utilisation of land is of prime importance for development. It involves a constant relationship that exists between the societies on the one hand, and cultural advancement, resource planning and carrying capacity of the land, on the other.

According to J.L. Buck "land utilisation is the satisfaction, which the farm population derives from the type of agriculture developed, the provision for future production and the contribution to national needs".[8] Land utilisation also relates to conversion of land from one major use to another use. It has also been described as dealing with problem situations in which people in a given locality are in the process of transformation from activities with certain land requirements to activities with different land requirements.

Systematic utilization of land has promoted economic and cultural advancement. Humans organise and regulate the structure of land system through production technology and lifestyle, occupying a certain area of the land as a place to live and consuming the products of land system, which is increasing the pressure on the productivity of the land system. The total transition of pristine vegetation /forest to a source of production or from one production to another during the last few decades has risen dramatically worldwide. Globally, it has altered the provision of ecosystem services, affected the global climate, and led to vast increases in production of food,

[8] R.B Mandal (1982), *Land Utilisation: Theory and Practice*, p.3

timber, housing, and other commodities but at the cost of reductions in many ecosystem services and biodiversity.[9]

Land is the basic resource of human society. Its utilization shows a reciprocal relationship between the prevailing ecological conditions of a region and man. Land use changes to meet the variable demands of the land by the society in its new ways and conditions of life. The demand for new uses of land may be inspired by a technological change, or by a change in the size, composition and requirements of a community. Some changes are short-lived, whereas others represent a more constant change.[10] However, land use is a dynamic system of high complexity and is the result of complex interactions among socio-economic (such as population growth, urbanization, economic development, institutional changes, technological advances, traffic-condition improvements, and even culture transitions) and environmental factors (such as climate change, land degradation, natural disasters) occurring at multiple temporal and spatial scales.

Identifying the causes of land use change requires an understanding of how people make a land-use decision. Decision-making is influenced by factors at local, regional, or global scale. It is apparent that any direct cause of land-use change constitutes both human activities as well as any immediate actions that originate from intended land use and directly affect land cover that is in progress for the past years. Indirect causes are formed by a complex of social, political, economic, demographic, technological, cultural and biophysical variables that constitute initial conditions in the human-environment relations and are structural in nature for any region. Historically the most

[9] Li *et al*. (*2015),* The relationship between land use and demographic dynamics in Western Jilin Province, *J.Geogr*,p.618

[10] R.B Mandal (1982), *Land Utilisation: Theory and Practice*, p.1

important driving force for most land use change is population growth although there are several interacting factors involved, especially in the developing countries.

Objectives for land use change differ between the developed and developing countries and/or regions. In any developed country, land use change is based on economic reasons such as large-scale farming or urban development and an increasing need to conserve biodiversity and environmental duality for current and future generations, whereas, in the developing countries, rapid population growth, poverty, and the economic situation are the main driving forces.

India, a fast-growing economy in the world is also a country with the largest Indigenous-Tribal population. The indigenous are not evenly distributed all over the nation's land mass but are concentrated in the hilly and forested regions of the country. They are the last remnant of resource rich base both biodiversity, minerals, water and land that globalisation and liberalisation have their eyes set on for years.

The contemporary dominant growth models deny the collective rights of indigenous people, their identity and livelihood. In the consciousness of the tribal people, land did not and could not belong to the individual(as a commodity that could be bought, sold, transferred or mortgaged or alienated in any other manner), but the individual belonged to land (as habitat, history, geography and territory) by virtue of his ancestors being seated in the given territory. The tribal economy was basically variations of shifting cultivation combined with the produce of the forest.

The landholding system was one in which the individual rights of enjoyment of the land and land-based resources were enmeshed in communal systems of access to land-based resources. Ownership was best understood as 'mutual respect and recognition of the access of an individual or family' to a separate plot of land to be utilized for the 'special requirement' of the family. The building pressure of development is cracking down the symbiotic relationship of man-land relationship; where they are in a dilemma for if they

participate fully in the market, they have to forget about their customary land tenure systems, their traditional practices of redistributing wealth and ensuring more equitable access to and sharing of resources, and their natural resource management system.

Nagaland as a tribal-state has been living in close proximity to their environment and the traditional resources handed down through generations. Naga relationship with the land and its changing pattern is complex within as every individual was culturally attached to the land, clan, and village as their sole identity. Sovereignty was practiced by every village among the existing tribes, as such there exist variation even in their relationship to the land as a resource and their management as well as development.

2.1. Changing Man-Land Relationship

Dynamics of land use/ land cover over time has become increasingly recognised as a major global issue for both sustainable resource and environment. Research projects have indicated the need to construct an updated and accurate database concerning these changes, their meaning, their pace and the explanatory factors prompting their appearance. Documentation of changes in land cover over the past several decades has indicated that there is a pressing need to understand these changes from the standpoint of their consequences for human welfare to bring true solution and better clarity for future land development. Therefore, understanding the driving forces and mechanism of land use change is a crucial issue in land change. This issue is not only a key aspect to understanding those phenomena concerning land use change but a basis in solving socio-economic and environmental problems induced by land use change and also land use planning and sustainable use of land resources.

Land use change is driven by synergetic factor combinations of resource scarcity leading to an increase in the pressure of production on resources, changing opportunities created by markets, outside policy intervention, loss of adaptive capacity and changes in social organisation and attitudes. From the facts revealed in many published case

studies, a perception has emerged suggesting that land use change is the result of people's adaptation to natural and socio-economic changes. [11]

The pace, magnitude and spatial reach of human alterations of the earth's land surface are unprecedented. Changes in land cover and land use have become so pervasive that when aggregated globally, they significantly affect the land-ecosystem functioning. They directly impact biotic diversity worldwide; contribute to local and regional climate change as well as to global climate warming; are the primary source of soil degradation; and, by altering ecosystem services, affect the ability of biological systems to support human needs.[12] Bringing to the limelight the negative impact of human conversion of land attributes on their own welfare. Despite improvements in land-cover characterization made possible by earth-observing satellites global and regional land covers and, in particular, land uses are poorly enumerated. Scientists recognize, however, that the magnitude of change is large. One estimate, for example, holds that the global expansion of croplands since 1850 has converted some 6 million km² of forests/woodlands and 4.7 million km² of savannas/grasslands/steppes. Within these categories, respectively, 1.5 and 0.6 million km² of cropland has been abandoned.[13] Land-cover modifications/changes in the structure of an extent cover of a short duration (such as forest succession under slash-and-burn cultivation) are also widespread. Better data alone are insufficient for improved models and projections of land-use and land-cover change.

They must be matched by an enhanced understanding of the causes of change (Committee on Global Change Research, 1999), and this requires moving beyond

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[11] Lambin et al. (2001), The causes of Land -use and Land-cover Change- moving beyond the myths, *Global Environmental Change.* Pp.261-269

[12] Ibid. p.261

[13] Eric F.Lambin, Helmet J.Geist & Erita Lepere (2003), Dynamics of LU & LC Change in Tropical Regions. *Annu. Rev. Environ. Resour*. Pp.205-241

popular ‘‘myths’’. Such myths are simplifications of cause–consequence relationships that are difficult to support empirically but have gained sufficient public currency to influence environment and development policies. Popular status is gained because the simplification fits within prevalent worldviews, suggests simple technical or population control solutions, and may serve the interests of critical groups. Such simplifications rest on generalised models of change which may be insecurely linked to the large body of case study reports in the literature. Global scale assessments may, therefore, conflict with the findings of micro- or mesoscale data sets which, because they are specific to time and place, do not impact on the global debate.

Recent research has largely dispelled the myth that the growth of the local population and its increase in consumption drive the changes in land conditions which is assumed to be irreversible and spatially homogeneous and to progress linearly. A consensus is progressively being reached on\that understanding the causes of land-use change is far from simplistic representations of two or three driving forces to a much more profound understanding that involves situation- specific interactions among a large number of factors at different spatial and temporal scales.

Land Use is referred to “man’s activities and the various which are carried on land” Land Cover is referred to “natural vegetation, rock/soil artificial cover and other noticed on the land” (NRSA 1989).[14] Since both land use and land cover are closely related and are not mutually exclusive are interchangeable as the former can be inferred based on the land cover and on the contextual evidence. The terms Land Use/Land Cover (LULC) are often been used simultaneously to describe maps that provide information about the types of features found on the earth’s surface (land use) and the human activity. International and interdisciplinary research projects have indicated the need to

[14] Rao *et al*. (2014), Studies on Land Use/Land Cover and Change Detection of G. Medugula Tribal Mandal of Vishakhapatnam District, Andhra Pradesh, India using Remote Sensing and GIS Technique, *IJARSE,* p.246

construct an updated and accurate concerning land-use land cover changes, their meaning, their pace and the explanatory factors prompting their appearance. Stating that the ability to recognise that change is a key requirement for the accurate mapping of Land Use Land Cover Change, instead of an improvement in the spatial resolution of image data and a detailed ground survey.[15] The data used in land-use/land cover change represent the land surface by a set of spatial units, each associated with attributes. These attributes are either a single-land-cover category or a set of values for continuous biophysical variables. The discrete representation of land cover has the advantages of concision and clarity, but it has led to an overemphasis of land-cover conversions and a neglect of land-cover modifications. Land-cover conversions (i.e. the complete replacement of one cover type by another) are measured by a shift from one land-cover category to another, as in the case in agricultural expansion, deforestation, or change in urban extent. Land-cover modifications are more subtle changes that affect the character of the land cover without changing its overall classification.[16] The exact future of the behavior of coupled human-environment systems is often unpredictable because it is emergent rather than pre-determined. Land-use change by society/man is therefore, a series of transition. The transition is dynamic and reversible which is not a fixed pattern nor is it deterministic. In the present study, more emphasised is given to land -cover modifications than the land cover change and, the contemporary reasons that are influencing the complex modifications of land ownership and its development despite the close-knitted culture.

2.2. Contemporary Human-Land Relationship in Naga Society

[15] Eric F.Lambin, Helmet J.Geist & Erita Lepere (2003), Dynamics of LU & LC Change in Tropical Regions, *Annu. Rev. Environ. Resour*, p.214

[16] Ibid., 205-41

Community life/solidarity perhaps defines best the concept of land-man relationship in Naga society. Down through generations land is considered as a gift from God/Nature, which formed their identity as an individual/clan or community in a particular place they settled. Their life revolved both social and political around their aspiration in preserving their tribal land, their social structure and cultural identity. Land, for them, is more than just a habitat or a political boundary; it is the basis of their social organisation, economic system, and cultural identification.[17] Community solidarity in the form of clan and village was the epitome of life for a Naga. As such, their every activity both social and cultural was never an individual business but was an affair/concern of his clan or community. Thus, their attachment to land was as deep-rooted traditionally as that to their family and clan.

The Nagas have considered their land as the living abode of both man and spirits. Whom they seek guidance and blessing for their prosperity through worship and sacrifices. The land was the source of their traditional knowledge system, which guided them to read and understand their environment. Their interaction with land have developed a way of life with the land as a traditional resource based on egalitarianism and their economy was close knitted and sustainable. The land with abundant forest and rivers provided them numerous resources for their livelihood and sustenance. It is a fact that no individual can exercise an exclusive legal right over any resource on a piece of land whether it belongs to an individual or community. With the prevailing tradition of resources as a gift for everyone to share and restore. Individual ownership evolved only because of their traditional development of land mainly prevalent in terrace cultivation from a clan or the community land.

[17] A.Wati Longchar "Inaugural Address Significance of Land and its Resources vis-a-vis Tribal Identity" in Takatemjen (2015)*, In Challenges of Land Development in Nagaland*,p.3

An individual in any village can only obtain right to land by virtue of descent, kinship, and residence in a village, but rarely through any other reason. However, once a person left the village on his own sweet-will or was banished by the village authority, he would lose his right on landholding from the village, and all his house site, field and personnel reserve forest would be forfeited or confiscated by the village authority.[18] In the management of land, sustainability was always the core issue; where systematic land allotment was practiced annually for their herds and cultivation. Within the particular plot selected for cultivation, the land was distributed depending upon the ability and capacity of the individuals or family to cultivate and sustain his household requirements. His cultural practice, on the other hand, demanded the resting and rejuvenation of land and its resources through gennas and taboos, which was strictly observed with sacrifices and festivals.

Unlike the Western notion of land as a source for human development, in the Naga society, there was no monetary value attached to traditional land resources as the land was perceived beyond its utility and accepted as the source of all lives on earth. Allotment of land for any purpose is decided by the eldest or senior members of the family or clan according to the availability of land and suitability. There is no individualism with regard to the man-land relationship in the traditional society. The land was shared for free including the resources standing as well as produced which surpassed any formal ownership of land.

2.2. a. Land Holding System

The basic classification of land ownership in Naga society is individual and community. Generally, most of the land belongs to the village community, which has gradually changed its pattern with the new emerging management system of the land. The

[18] A.Nshoga (2009),*Traditional Naga Village System and its Transformation*,p.224

landholding system not only varied among different tribes but even among villages of the same tribe. There exist variation in the ratio between the community and private land among tribes and among villages within the same tribe depending on cultural reasons and practices. Since the beginning of settlement and village organisation, autocratic rule is practiced among the Sumi and Konyak tribes while individual ownership is more common in Angami villages and among the other tribes, most of the land is owned by clans, community or individuals.

Ownership also shows contrasting character in Nagaland when taken at a village level. The Sumi Nagas who practice autocratic chieftainship is nonexistent in Lazami village, where the majority of the forest belongs to the clans and the cultivated land to individuals. Similarly, while the majority of land belonged to the village council in Gaili village of Zeliang tribe, in Benreu village of the same tribe, the majority of the village land is owned by the clans.

Within every sovereign village, the land was the base of every individual as well as the community livelihood system where every household as a citizen of that particular village shared equal rights to the traditional resources for their sustenance. The land in the village belonged to the cultivating community, each family having its share of arable land and abundant supply of raw materials from the forest, which enabled them to use it with no dearth of materials.[19] The land is usually divided into forest, agriculture, and homestead according to land use. Depending on its usage, individual ownership was attained. Clan land consisted major forest area in every village ranging from 60-80% of the total forest, while private land consisted major agriculture land of the villages. Private landholding system is said to have developed only through agriculture practices. When an individual builds permanent terraces and cultivated them,

[19] A.Nshoga (2009),*Traditional Naga Village System and its Transformation*, p.223

it is passed down to the next generation as the most important inheritance. A series of cultivations by the same family in the same place appears to set up a private right to the particular plot, and it is no doubt in this way that private rights in land have arisen. Fieldwork also affirms this trend, where more than 90% of the terrace field is ancestral land. However, the nature of jhum cultivation has a different scenario, because jhum was always an extensive clan or community activity where every decision and labour was a group activity. For this reason, private land for jhum is not prominent or nonexistent.

Landholding system of Gaili village under Peren district of the Zeliang tribe depicts the dynamic of man-land relationship as an example. Land ownership about 80 percent was and is under the name of the village council, where the council has the ultimate power to control and decide all matters regarding the land and its resources including ownership allotment as well as transfer and management decision-making. Besides this the four *khels*[20] has a piece of forest each owned and managed by its *khel* members. Individual ownership is found only in the small ratio of land, which is under terrace cultivation introduced some 40 years ago by an outsider. As such, ownership is claim only through permanent occupation and utilization, which jhum system does not favour. However, with the introduction of rubber plantation, a new system of individual ownership is emerging where one is gaining the right for permanent plantation in the traditional shifting cultivation land.

Once a village is established, the community demarcates its boundary though often imaginary along prominent physiographic features with its neighboring villages as the sole property of the village community. From the community land, a sizeable plot of land is portioned out and divided among the different clans, where allotment of land for

[20] A khel is a social unit composting of a group of clans

residential and agricultural purposes is done fairly depending on their need. As stated before the land was abundant and there was never the need to divide or demarcate one's boundary. Even without any demarcated boundaries, they are not without owners. There exists strict restriction regarding the use of land and transfer of ownership within a village such that no citizen from any other village is allowed to use land for any purpose and selling of the land was a social disgrace to the family/clan.

Though selling of land has happened under unfortunate circumstances, the effort is always taken to retain ownership in the clan as well as within the village. In Naga society, the property is inherited by the male heirs and transmitted through them. They have legal rights in ancestral property regulated by customary laws. Women as such have no inheritance although acquired properties even land can be gifted to daughters also. In every family, though a women/female member is entitled to use the land of their father's or husband's clan, they cannot personally inherit or own land.

Land tenure or land ownership system is intricately and intrinsically related to the way in which a society exists and the systems have kept changing along the development of human history.[21] Increased privatization and individual ownership especially of land under permanent cultivation such as wet rice cultivation, terraced lands, plantations, orchards etc are recent noticeable trends in the state. These trends are more so in the valley areas and lowlands of urban influences than in the isolated foothills. However, it is to be noted that the transferring of ownership from the village by any individual was strictly prohibited in every village.

In all these years of Naga civilisation, there has been no necessity to demarcate area as well as formalise land ownership system in all districts and villages. As such, there is

[21] Alemtemshi Jamir"Land Tenure and Reform in Nagaland" in Takatemjen (2015), *In Challenges of Land Development in Nagaland,*p.182

lack of accurate representation in the area under different ownerships both past and the present situation. In Table 2.1. indication of land under different ownership based on usage is presented. Out of the 22 selected villages, in 15 villages' majority of the forest belongs to the community whereas in five villages individual ownership of forest is greater than community forest. Individual forest dominates in Aotsakilimi village and Sangnyu village due to the presence of traditional autocratic ownership whereas in Tizit village all forest is under the individual property. Households from neighboring villages in search of opportunities migrated and settled as well as bought land in the frontier primary forest in the present foothills and formed Tizit village. As such all land is private including the cultivated land. Tenyiphe 1 is another village similar to that of Tizit village; however, in this village, there is no forest.

Agriculture land ownership (Table 2.1) according to the sample villages also supports and clearly brings out the relation between the type of ownership and farming system that has evolved in land usage for community livelihood. Where in the villages where jhum cultivation is more emphasised jhum fallow land are more in community ownership

Table 2.1. Indication of land under different ownership

SL.NO	Name of village	District	Forest land	Agriculture land	Farming
1	Tsüpfüme	Phek	cl<p<cm	p<cl	Terrace
2	Pfütseromi	Phek	cl<p<cm	p<cl	Terrace
3	Kidima	Kohima	cl<p<cm	p<cl	Terrace
4	Kigwema	Kohima	cl<p<cm	p<cl	Terrace
5	Süngratsü	Mokokchung	cl<cm<p	cl<p	Jhum
6	Longkhum	Mokokchung	cl<cm<p	cl<p	Jhum

7	Chimonger	Tuensang	cl<p<cm	p<cl	Jhum
8	Angangba	Tuensang	cm<cl<p	p<cl	Jhum, Terrace
9	Kiphire,	Kiphire	cl<p<cm	p<cl	Jhum, Terrace
10	Longmatra	Kiphire	cl<p<cm	p<cl	Terrace
11	Aotsakilimi	Zunheboto	p<cl	p<cl	Jhum
12	Lazami	Zunheboto	cl<p<cm	p<cl	Jhum
13	Benreu	Peren	p<cm<cl	p<cl	Jhum
14	Gaili,	Peren	vc<k	p	Terrace
15	Tenyiphe-1	Dimapur	nil	Only p	Terrace
16	Tsiepama	Dimapur	cm<cl<p	cl<p	Jhum
17	Wokha	Wokha	p<cl<cm	p<cl	Jhum, Terrace
18	Longsachang	Wokha	cl<p<cm	p<cl	Jhum,Terrace
19	Hükphang	Longleng	p<cl<cm	cl<p	Jhum,Terrace
20	Bhumnyu	Longleng	cl<p<cm	cl<p	Jhum,,Terrace
21	Tizit	Mon	p	p	Jhum,,Terrace
22	Sangnyu	Mon	p<cm	p	Jhum

Source: Fieldwork (2014-2016). cl-clan; p-private; cm-community; k-khel; vc-village council

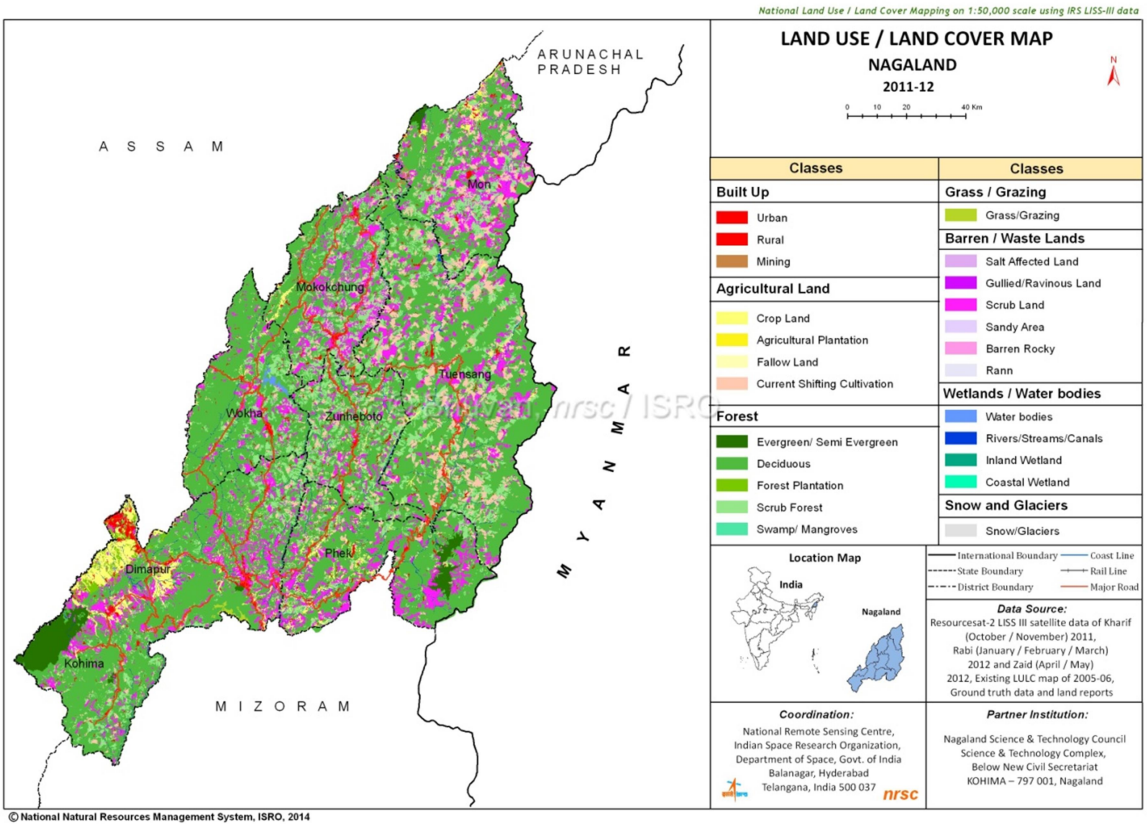
whereas in villages where terrace cultivation form the major agriculture system all the permanent farming land are individual property. Any exceptions as such explain in Tenyiphe 1 village and Tizit village is due to the recent development of modern villages. And the change or increase in individual ownership in jhum farming land in Angnangba village, Chimonger village and Longmatra village are due to fragmentation of clan land into individuals for an access right to the common resource as well ass to deviate management conflict.

2.2.b. Pattern of Land Use

Traditionally land in Nagaland is use for three main purposes-for settlement, that forms the homestead, for agricultural purposes and for conservation of forests. Each Naga village has a well-defined territory, which consists of both the cultivable and uncultivable land in it. They also had well organised plot of forests for their traditional livestock. Their land use pattern is solely define for the village production; exclusively meant for village usage and the entire village population lived in the state of self-sufficient life.

The land use and land cover map (Figure 2.1) gives a clear picture; whereas indicated majority of the area is under forestland. Forest, as indicated by green color, has pockets of darker shade in Peren, Mon, Phek, and Kohima district indicating evergreen forest. Likewise, the area marked pink are barren or waste land whereas the lighter shade of yellow indicates agricultural land which is less when compared to the land use system of the people with majority involve in agriculture. When a cultivator rotates after two or three years in jhum cultivation, the fallow land is allowed to rest and rejuvenate into a secondary forest as much in maintaining jhum fallow, all agricultural land becomes forestland.

Figure 2.1. Land -Use /Land Cover Map



The interpretation of land use pattern in Nagaland of two years ranging 29 years is shown in Table 2.2 Out of the total 1,657,900 ha, the total area for land utilisation is 1122000 ha (1987) which increased to 1651530 ha, of which forests accounts for 288300 ha (1987) but increased to 862930 ha (2014). The land utilised for agriculture includes jhumland, wet terrace cultivation, wet rice cultivation, horticulture and other cash crops cultivation. The fallow land has decreased whereas net sown area has increased including the area sown more than once indicating an improved and concentrated management of agriculture land.

Agriculture is the lifeline of the Nagas and land was extensively used for agriculture where shifting cultivation was the major form of farming except among the Angamis and Chakhesangs who practices terrace cultivation. An official report on the jhumland survey in Nagaland (2005) has stated that 5.65% of the total geographical area is

cultivated annualy constituting 61% of total farming household with 0.67 hectare per jhumia family.

Table 2.2. Land use pattern in Nagaland (In Hectares)

Sl.No	Classification	1984-85	2013-14
1	Geographical area	1657900	1657900
2	Reporting area	1122000	1651530
	Forest	288300	862930
	Not available for cultivation	278400	95358
	Other cultivated land excluding fallow land	264200	163167
	Fallow land	358900	149607
	Net area sown	182800	380468
	Area sown more than once	8500	118843
3	Total cropped area	191300	499311
	Net irrigated area	50300	90970
	Gross irrigated area	54500	99780

Source: Statistical Handbook, Nagaland (2014)

There is continues change in the degree of land use pattern but of late a more drastic change is occurring all over the State. Modernisation has a great impact on the traditional community life of the Nagas. Capitalism and individualism are penetrating every sphere of life, which directly affects the landholding and land use pattern in the society.[22] The major strategy adopted by the farmers was to bring more land into use, for this reason, there was a time when the whole family engaging in farming felled and

[22] Lanusashi Longkumer & Toshimenla Jamir (2012), *Status of Adivasis/Indigenous Peoples Land Series-6, Nagaland,*p.29

tilled the maximum forest land and had to decrease the jhum cycle. Perhaps reaching a point where the Government and people felt the negative response on their land. Yet this was also the time when traditional community participation was maximum and everyone depended on one another for the exchange of labour in terms of peer groups/work gangs.

Today, the major strategy adopted in farming is maximum production from the minimum land cultivated. The major reason given 'younger generations are lazy' 'no one wants to work the field anymore' implies that people are getting involved in other economic activities abandoning their traditional occupation. This is imparting a paradigm shift in the land use system from the urban periphery villages to the far-reaching villages over the state. Extensive cultivation of jhum with rice as the major crop in the mixed cropping system of cultivation is fast changing to intensive cultivation of high-value crops. This has reduced the land under traditional crops as well as increased the jhum cycle where it is practiced. For instance, a widow in Changki village lamenting on the decrease in traditional community jhum farming stated that in the recent years the jhum lands that she cultivates are on well-rested and regenerated fallow land of more than 15 years.

There exists a valid reason for the decrease in labour. When western education was introduced in the state, it replaced the traditional educational system and values. For this simple reason, it is no longer a priority for the parent's even farmers to get their children involved in agriculture and its cultural practices. During field survey, it is observed that majority of cultivators consisted of only the mother or household female member as permanent cultivator whereby the father is semi or not participating and all the children either are students or employed in some other activity.

Given below in Table 2.3, which while indicating the changing pattern of shifting cultivation in the sample villages clearly shows the current dynamics in traditional agriculture system of in the state. According to state jhum land survey (2005-2006) report, no household in three villages namely Tenyiphe 1(Dimapur), Kidima and Kigwema village under Kohima district was involved in jhum land meaning that jhuming is not practiced anymore. The major reason given is with the decrease in family labour; they can

Table 2.3. Changing household in shifting cultivation

Sl.no	Village	No.of jhumia*	Degree of change	Reason
1.	Gaili	200	nil	Other activity
2.	Benreu	200	nil	Banned
3.	Longkhum	300	decreased	Cash crop
4.	Süngratsü	350	decreased	Cash crop
5.	Pfütseromi	350	nil	Cash crop
6.	Tsüpfüme	135	nil	Cash crop
7.	Tenyiphe1	Nil	___	___
8.	Tsiepama	100	decreasing	Other activity
9.	Kidima	Nil	___	___
10.	Kigwema	Nil	___	___
11.	Anganba	320	decreased	Cash crop
12.	Chimonger	550	decreasing	Other activity
13.	Kiphere	300	decreased	Cash crop
14.	Longmatra	120	decreasing	Other activity
15.	Hükphang	700	decreasing	Other activity
16.	Bhumnyu	640	decreasing	Other activity
17.	Lazami	806	decreasing	Other activity
18.	Aotsakilimi	96	nil	Cash crop

19.	Wokha	700	decreased	Cash crop
20.	Longsachang	160	decreasing	Other activity
21.	Tizit	900	decreased	Cash crop
22.	Sangnyu	408	decreasing	Other activity

Source:*State jhum land survey 2005-2006, Fieldwork (2014-2016)

only invest in terrace rice cultivation as the major farming system. However, during fieldwork decrease of the household as well as community participation in traditional

jhuming was found to be a trend in agriculture development. As such, it was found that five villages have shown a drastic change in jhum farmers, whereby from 200 households in 2005-2006 state record it becomes nil because of the ban in practicing jhum in Benreu village. Whereas, in Pfütseromi, Aotsakilimi and Tsüpfüme village there is a drastic shift from jhuming to cash crop cultivation where the jhum land was converted to homestead garden totally invested in monocropping. Gaili village under Peren district situated close to urban center Dimapur has seen the drastic change where paddy is cultivated in terrace field and many farmers are more drawn towards other small business sectors for their household economy.

The major reason is that extensive jhum cultivation requires intensive labour with is also time crucial, and the waning of community participation and work gang has created extreme lack of labour.

Another important reason is the introduction of cash economy into the traditional subsistence farming. This has resulted in the shift to various cash crops depending on the crop suitability and market availability. Where there is the lesser influence of local market availability, farmers are engaged in multi livelihood opportunities. Cash crops include both traditional seeds and market seeds of vegetables and plantation of fruits and timber as well as rubber, bamboo etc.

The terrace fields are still believed to yield greater rice productivity in terms of labour input than shifting cultivation. The sample villages practicing terrace cultivation does not show any noticeable changes as that shown in shifting cultivation. However, the cultivation of winter crops in the terrace field has developed to meet the market demands as well as meet the food requirements. In Kiwgema and Kidima village of Kohima district vegetables like potato, local garlic, spring onion, beans, peas, cabbage, mustard leaves as winter crops occupy the terrace till the beginning of summer that is in may. The last harvesting of the crops heralds the beginning of rice cultivation and the productivity is the same because of traditional knowledge of tending their traditional crops with household manures. Another changing pattern in land or for that matter forest land use is the semi-domestication of bison. The rearing of this traditional livestock was an important part of their livelihood system, which has become a rare activity except in Benreu village under Peren district where they still maintain four areas for the individually owned livestock. The decrease indicates community agreement as well as the individual priority in managing the forest for the diverse resources and crop production.

It is apparent that the change or shift to other activities in the sample villages has seen the decrease in jhum cultivators over the years. Other activities include stone quarrying, mason, carpentry, local grocery shops, other business and formal employment in different professions.

2.3 Dynamics of Human-Land Relationship in Naga Society

Human-environment systems are complex adaptive systems in which properties, such as land use, emerge from the interactions among the various components of the entire system, which themselves feedback to influence the subsequent development of those interactions. These changes are the product of multiple decisions resulting from

interactions between diverse agents, who act under certain conditions, anticipate future outcomes of their decisions, and adapt their behaviours to change in external (i.e. market) and internal (e.g., their aspiration) conditions.

The Government as the political head of the state has ushered in developmental processes post-independent, changing the land tenure as a casual prerequisite to establish development.

As the early Nagaland Land (Requisition and Acquisition) Act 1965 states 'an act to consolidate the law for requisition and speedy acquisition of premises and land for certain public purpose'. And the Nagaland Jhumland Act 1970 had clear provision to impose penalties against anyone removing forest resource from the jhumland areas. Creating vague projection about land rights of the community in the process of regulating the resources for development.

It is observed by many policymakers, that the traditional land tenure system does not allow commercial agriculture and urbanisation to take root in the districts. As outsiders cannot own or invest in land development in any village in the state. In addition, the land is to be retained within the family and the clan/community always.

For years, the Government has promoted the policy to recognise private ownership of land through patta system, which is completely alien to the customary practice of land ownership. The formal land ownership, patta-system, has propagated individual accumulation in the land tenure system, appropriating community land for rich individuals and commercial schemes by the Government. The commoditisation of traditional land has drastically changed the value-system of land and their sacred relation to land as their ancestral bond and identity. The money-oriented culture has

eased the parting of land; the landowner is willing to sell private land to finance a modern lifestyle.

The above scenario seems minor when one considers the threat, which the State Government has recently created, the concept of Nagaland Special Development Zones (NSDZ) soon to be implemented in the foothills. It is a technique of handing market policies to the people as the only option for economic development and coercing the community to reorient their customary law and practices for vague developmental vision. Vague in not only sustainability but also feasibility to the physiography and culture of the people. It is a system/plan for direct alienation of people from their land, not only ownership but also the right to access and utilise the resources.

The Nagaland Tribe Council (NTC) called upon the Government to come out clear on the mechanism to be implemented for the present concept of NSDZs passed by the assembly and how it would be implemented without upsetting Article 371 (A) and other protective laws of the land. [23] The experience of developmental projects has come under serious scrutiny from the community, labeling as mistakes of the past with their land rights alienated and resources misappropriated.

The establishment of administrative sub-centers has created the origin of towns in the districts of the state in the twentieth century. It has initiated the first fragmentation of the formidable community settlement and livelihood activities. The state government has also initiated the people to come down to the foothills of their settlements, for easy access to transport and communication and thus the growth of developmental opportunities. This has propagated the growth of land fragmentation and haphazard

[23] Takatemjen "Nagaland Special Development Zones and Sustainable Development" in Takatemjen (2005), *In Challenges of Land Development in Nagaland,p.*197

developmental activities as well as created a sordid competition of the available foothills for agriculture and commercial activities.

Semi-urban villages are also growing as subdivision centers of administration, which are along the highways and mostly found on the border of two or three villages and all communities form the population structure of that village. In such urban-rural fringe, the land market is essentially a demand-induced phenomenon and land prices usually rule higher than those prevailing towards the village.

This has not only caused the fragmentation of village land but it has also created a market for land ownership transfer. Dimapur the mega city where the majority of the local population are individuals from all over the districts depicts the amalgamation of tribal population in an urban village. The elders created Tenyiphe 1 village in the late 1960s with the concept of wanting to establish a good Tenyimi village, a major tribe in Nagaland. The land belonged to the Chümukedima village, which was according to the tradition given freely for settlement with official recognition of 100 acres for the village and 1000-2000 acres for the field. This initiated the growth of transfer of land ownership to multi-Naga tribe and village settlement in the Dimapur district.

Similar is the story of Tizit village, Tsiepama village, Sechü Zubza village, Pedi village etc where the buffer inter-village zone has developed to fast-growing semi-urban village. The growth of urbanisation as well as the migration of rural population to urban areas within the state has also affected the concept of land to the people. It is the major cause of alienation of the people from their culture, their concept of land as their identity and their responsibility as a custodian of their ancestral land. This detachment from their land and their aspiration for growth/better life is the core issue in the emerging dynamics of the human-land relationship among the Naga society.

Migration of population from the villages to the urban and semi-urban village has seen the selling of land in villages on both sides. To accommodate the urban expansion, land market is more open in the urban settlements. However, it has also been observed that in some villages, selling of land is not only for the family who are transferring to settle elsewhere but also for money.

Transfer in land ownership within the community of a village is not a recent happening. However, transfer of land and ownership outside the village is a current phenomenon that goes unchecked or transient in commercial plantation crops and terrace rice cultivation. In Gaili and Benreu village under Peren district, the village council has passed a strict law to the community to regulate the transfer of land ownership to outsiders. Where it is prohibited for any individual to sell even private land above the state highway that crosses the village and the forest land above the lowland terrace rice cultivation.

Globalisation has also brought about a trend towards increasingly individualised livelihoods, or at least individual decision-making concerning livelihood opportunities. In Nagaland privatisation of land though slow is far more progressive in changing the attributes of land than any other agency.

Every sample village has shared their clan land as well as individual, especially frontier forests to its neighbouring communities to cultivate as well as use the trees both firewood and timber resources for free. It was a common belief that tilling a land for free does not yield its optimum, for this reason the cultivator would offer a gift of 50 paise or some harvest as a sign of gratitude for the land to the owner. At present, the traditional practice of sharing land for free is lesser and a new dimension of leasing land both individual and clan land for a different period ranging from 1-5 years is emerging.

Leasing of land for one year to shifting cultivation where a plot of land for 1 tin at the cost of Rs 2000-3000 is practiced in Tseminyu under Kohima district.

All over the state, practice of leasing land for stone quarrying, logging of forest for timber, firewood, charcoal, and coal mining, has become a new venture for commercial business and quite a successful growing one. It is not just a simple money oriented individual business anymore, leasing becomes a necessity for the land rich but money-lacking household. It becomes their major source of monetary income where the machine affordable and market-connected businessperson extracts the resources with no measure for future sustainability. This has not only exploited the resources at a faster and greater rate but has degraded the land attributes far worse than any other has in just a few years. Quarrying of stones replace the topsoil and completely vanish the once green lush vegetation creating open space and source for soil erosion on the slopes. Massive stone quarrying along the streams has not only changed the natural course of flow, it has polluted the water with sands and mud which makes the water unfit for drinking and even decrease the fauna of the stream. For instance, the Dzüdza river running down the villages of the western Angami villages is the major source of irrigation for the terrace cultivation abundantly practiced along the river. Kohima town situated near the area provides excellent market which has impacted the terrace field, the once clean and clear water is replaced with a free flow of mud all round. The mud is not only unsuitable for rice it also fills up the terrace and changes the soil structure of the field.

Consistent change in land use pattern has facilitated the privatisation of community land all over the State. It has also created a permanent transfer of land rights both ownership and utilisation from the commoner to rich individuals, who are more than ready to exploit the resources with new technology. Though both may procure some benefits in

terms of money, once in the hands of developers there is no effort for rehabilitation of the land and less environmental considerations.

The drastic labelling of land and all its components as a resource with money value has crushed the spirit of sharing, equality, and community in the society. Along the process of development over the last 43 years, resource mobilisation has created disharmony between communities, clans, and families.

As a distinguishable strategic group of resource planners, conflicts arise in the priority of Government and community when it infringes on the sovereignty of his resource and customary practices. Though often unnoticed or not voiced out, there have been instances of conflict between the gender groups in the Naga society. Men and women are differently involved in the level of resource development. Personal interview confirms this changing priority of resource development in the household livelihood. It comes down to the simple tendency of man to exploit the resource for economic gain where women are more concerned about the resource base and sustainability. Conflicts in management priority does not imply subordination by one group over the other or for that matter unorganised mobilisation. Conflict is constructive and community welfare overrules over individual among the community. Field visitation to Changki village in November 2013 has proven a constructive win over land management priority in the society. The youth's organisation of the village as a group took the issue to the village council over the extensive unscientific mining of coals by individuals, which has been a lucrative business for some years. In that year the youth won and mining was totally banned in the village land. Similarly, at the ineffectiveness of the district D.C and village council effort to stop the use of salt as a weedicide in jhum cultivation in the Longleng district. The student body stood up to protect the environment and was finally successful to ban the use of salt after 20 years. Often the frontier zone is the densest

forest, farthest from settlement and least affected from human activity. These frontier zones are also becoming the center for misunderstanding and mistrust between neighbouring villages. Tophema and Lazami are two ancestral villages sharing border between Kohima and Zunheboto districts. Their border is a natural forest resource zone, which each village in some year creates tension due to the cutting of trees, which the other party claims as an infringement on the ancestral boundary line. This has often created hostility between the two communities. Needing a novel solution, both the community agreed to demarcate the whole forest zone as a Community Reserve forest, where both parties maintains the ban on hunting and collecting of forest resource. According to Lazami community, the forest reserve is known as *'Khughutove*' and is 16-17 sq km in area.

To understand the culture of resource management and development of a community or State of tribal inhabitants who are considered as the custodians of nature. It is paramount to study its bio-geographical framework, which establishes their every activity of resource creation and sustenance. The fauna and flora, the soil, the water and even the agro-biodiversity of a region are the attributes of its bio-geography.

Chapter 3

Bio-geographical Framework of Nagaland

Nagaland is a young mountainous hilly state, highly dissected except a narrow belt of foothills bordering Assam and the small valleys in between the lower ranges on the western and north western flank. As an offshoot of the Himalayan mountain system, the topography of the Naga Hills comprises of three-range system[24]:

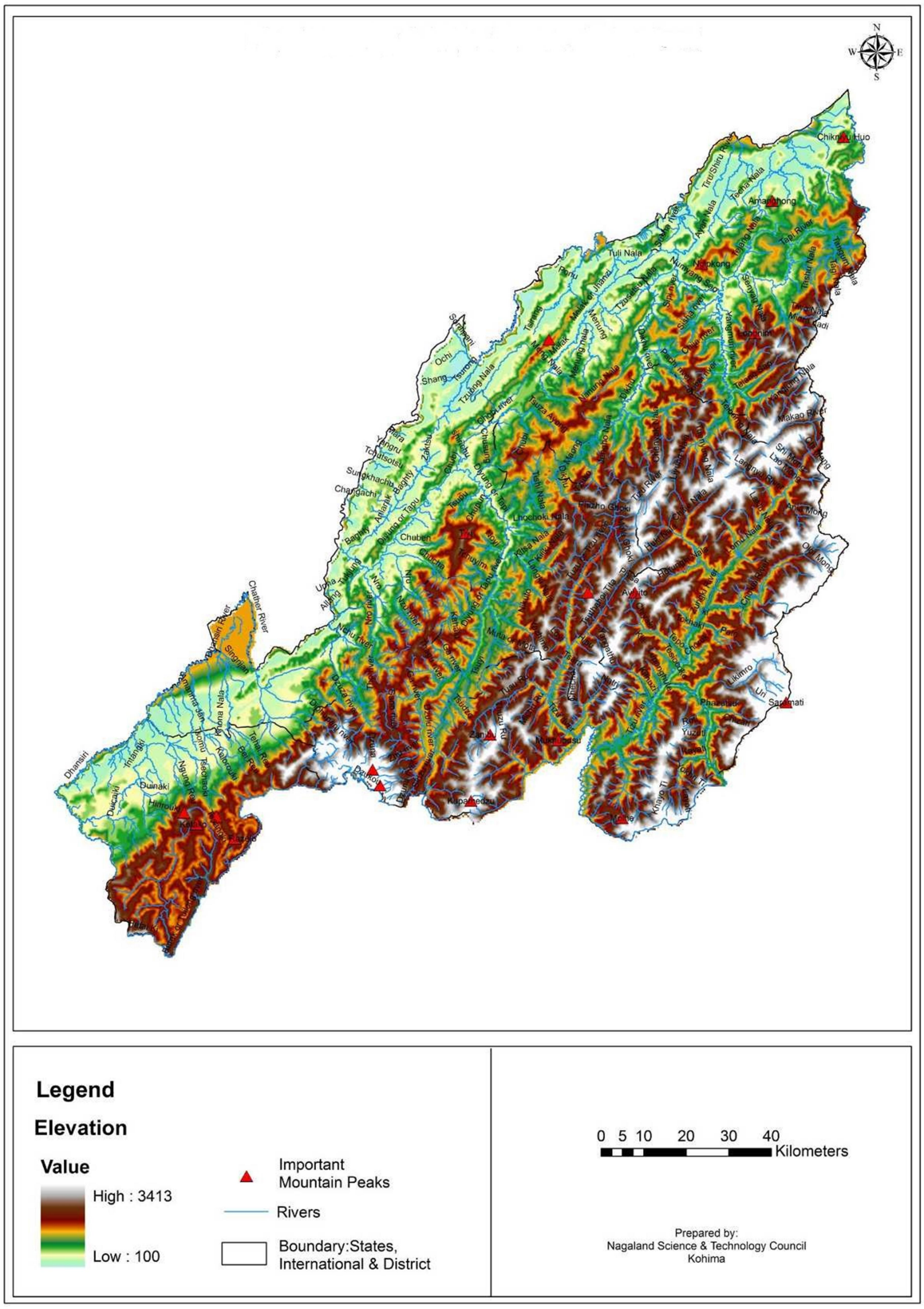
a. The foothills with undulating to rolling topography and having warm subtropical climate.
b. The lower ranges and the mid-slopes with varying degrees of slopes and having submontane climate
c. High hills and mountainous region above 900-metre altitude.

A number of perennial and seasonal streams dissect the hills; the four major river systems in the state are Dhansiri, Doyang, Dikhu, and Tizu. Of these, Dhansiri, Doyang and Dikhu rivers flow towards west and ultimately pour into the Brahmaputra while Tizu river flows towards the East and joins the Chindwin river in Myanmar.

The climate over the foothills is warm subtropical and that over the high hills is cool and temperate. The mid-slopes and lower ranges in the western flank have a moderate submontane climate. The state experience low temperature in winter and high temperature in summer. In winter, the night temperature comes down to an average of 3°C. In summer months, the temperature rises 25°C in the hills and 30°C in the plains. Nagaland receives heavy rainfall ranging from 100 cm to 300 cm. Almost 70 % of the annual rainfall is received from the southwest monsoon starting from June to September. Winter rain is received from the retreating monsoon. Favourable temperature and rainfall has been highly conducive to luxuriant growth of vegetation and agriculture in the state.

[24] Director of Agriculture Nagaland (1986), *Handbook of Nagaland Agriculture*,p.1

Figure 3.1. Physiography Map of Nagaland



microclimatic, edaphic and biotic factors including the influence of shifting agriculture and other human activities has also given rise to very intricate pattern of vegetation development in the state.[25]

3.1. Profile of Biogeography of Nagaland

The distinctive setting of flora and fauna forms the diverse ecosystems/biomes of the earth with the combined effect of geographical factors of rainfall, temperature, altitude etc. The natural setting /bio-geography of a particular region are the resource base of that particular place. Bio-geography in its simplest term means the study of living things in time and space. The patterns of biogeography are said to be the result of the interaction between the two great engines of our planet: evolution and plate tectonics. To understand the distinctive biogeography of Nagaland, it is imperative to relate the evolution of the state physiography and its strategic location in terms of biodiversity. The evolution of the state as a part of the Eastern Hills or the Purvanchal of the Indian sub-continent involves the collision of the Angara land and Gondwanaland in the late cretaceous times about 120 million years ago. This diastrophic movement compressed the Tethys Sea situated between them and developed the Himalayan Mountains, the youngest mountain chains of the world. The eastern hills were the last to be formed in the period of late cretaceous till the sub-recent times. The East-West trending Himalayan mountain takes a sudden pin turn towards the south after crossing Dihang gorge and forms a crescent shape with its convex side pointing towards the west.

The eastern hills from Arunachal in the north to Mizoram in the south consist of the Patkai Bum forming the international boundary between Arunachal Pradesh and Myanmar. This range merges into Naga Hills and forms the watershed between India

[25] Sapu Changkija (2014), *Biodiversity of Nagaland,*p.20

and Myanmar then follows the Manipur hills bordering Myanmar and Mizo hills. The elevation of the eastern hills decreases as we move from north, Patkai Bum (2000-3000m) to the Mizo Hills in the South of less than 1500 meters.

Most globally outstanding ecoregions fall within broad ecotones between biogeographic realms. The range overlap of species from different realms and the high beta-diversity associated with the steep dissected terrain of mountain ranges and archipelagos create species rich zones. The North East India biogeographic zone is a most significant one and represents the transition zone between the Indian, Indo-Malayan, Indo-Chinese biogeographic regions as well as a meeting place of Himalayan Mountains with that of Peninsular India.[26]

Mountains are often found as acting barrier for species isolation and creating rich endemism. Because of their topographic diversity and bio-cultural richness, mountains have always been a place of survival and provide opportunities for climate adaptation[27]. They are also the abode of species migration from the lowland to a higher elevation with change in the climate and human intervention.

Every region or part of the earth has a unique pattern of biogeography or biodiversity. Many scientists from different field have for the past studied and divided the earth or a part of it into the different bioregions and subregions based on different criteria and their respective expertise. For instance, the North East region of India covering nearly 2,62,379 sq km area has been divided into two biogeographic zones -Eastern Himalaya and North East India, based on floristic composition, the naturalness of the flora and the local climate.

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[26] R.R.Rao (1997), Diversity of Indian Flora, *Proc. Indian natn. Sci. Acad*,p.12

[27] Chettri *et al.* (2012), *Mountain Biodiversity Conservation and Management: Selected examples of good practices and lessons learned from the Hindu Kush Himalayan region*, p.1

The terrestrial ecoregions of the Indo-pacific have fascinated many scientists for its species richness and endemism and the varied ecosystem. For which biogeographers both regional and national expertise continues to study and classify. It is a common knowledge that distributions of biodiversity and ecosystem rarely adhere to political boundaries in any region of the world. Moreover, the Indo-Pacific terrestrial region is known for its rich and endemic species. However, considering the location of the state under two major biomes that is Indian subcontinent and Indochina bioregion.

The hierarchical classification by World Wildlife Fund is considered.[28] The reason is with a conservationist approach it is the most comprehensive and detailed study based on bio-geographic units already recognised by the regional and national expert.

It is firstly divided into five bioregions as "clusters of ecoregions that share a similar biogeographic history and share many genera and families of plants and animals". Then follows the different biomes, ten biomes in the Indo-Pacific bioregion that represent variations in ecological processes and patterns of biodiversity, and responses to disturbance are divided. Lastly, the basic of biogeographic region, ecoregion within a biome is classified based on the patterns of vegetation with similar ecological dynamics. Giving below is the four identified ecoregion Nagaland harbours indicating its strategic location.

i. Brahmaputra valley semi -evergreen rainforest:

   This ecoregion represents Tropical and Subtropical Moist Broadleaf Forest biome of the Indian sub continent bioregion. With an area of 56,600 sq km, it is regionally outstanding in its biological distinctiveness.The ecoregion represents the semi evergreen forests along the upper Brahmaputra River plains. This ecoregion harbours India's largest elephant, the world's largest population of the

[28] Eric Wikramanayake *et al*. (2002), *Terrestrial Ecoregions of the Indo-Pacific-A Conservation Assessment.*

greater one-horned rhinoceros, tigers (*Panthera tigris*), and wild water buffalo (*Bubalus arnee*). Most of the ecoregion lie within the eastern Indian state of Assam, but small section extend into the neighbouring states of Arunachal Pradesh and Nagaland into the southern lowland of Bhutan. The ecoregion's vegetation is influenced by the rich alluvial soil and the monsoon rains but have become a problematic zone due to the destruction by human settlement. Intact habitat needs special protection for instance, habitat connectivity should be provided the Barial-Intanki-Kaziranga complex to allow elephants to disperse and migrate.

ii. Eastern Himalayan Broadleaf Forest:

The Eastern Himalayan Broadleaf Forest is one of the few Indo-Pacific ecoregions that is globally outstanding for both species richness and levels of endemism. This ecoregion is a biodiversity hotspot for rhododendrons and oaks. Two species *Rhododendron wattii* and *Rhododendron maecabeanum* are endemic to the Naga Hills in India. This ecoregion represents temperate broadleaf forest between 2000 and 3000 m, stretching from central Nepal eastward to Nagaland. The primary threat to this ecoregion's natural biodiversity is forest clearing for agriculture, plantations and settlements.

iii. Mizoram-Manipur-Kachin rain forest:

These mountains now represent a biogeographic crossroads for the Indian, Indo-Malayan and Indo-Chinese biota. The ecoregion's position along this ecotone endows it with high biological biodiversity and it has the highest bird species richness within the Indo-Pacific region along with other two ecoregion. Intanki with an area of 310 sq km and Puliebadze with 120 sq km are the two protected areas from Nagaland. Besides the lower forests in Nagaland are said to be harboring two primates: the stump -tailed macaque (*Macaca arctoides*) and the

pig-tailed macaque (*Macaca nemestrina*) along with the endemic bird species Blyth's tragopan (*Tragopan blythü*). Almost half of this ecoregion's natural habitat is still intact, especially in the eastern areas within Myanmar. There is a need for awareness and legal enforcement for management of the area.

iv. NE India-Myanmar Pine Forests:

This ecoregion contains moderate levels of biodiversity but remains largely intact, providing opportunities to conserve and protect this ecoregion's biodiversity into the future. The dearth of wildlife was caused by deforestation from existing shifting cultivation resulting in the barren hillsides. Fakim wildlife sanctuary in Nagaland with an area of 4 sq km is the only protected area in this region.

Thepfülhouvi, IFS (Chief Conservator of Forest, Govt of Nagaland) stating on the status of biodiversity comments "There are more varieties of plants in a mountain range in Naga Country than in the whole of one country in the world and there is more aquatic life in a small river than in a thousand kilometre length of the Holy Ganga. Size for size, the area inhabited by the Nagas always in comparison with sub-continent of India, but compared in varieties of flora and fauna, it could be quite possible that the positions of the two would be changed." [29]

Nagaland is under the 12-mega diversity centers of the world and within one of the 18th recognized Hotspot of the world.[30] Hotspots generally refer to the areas rich in diversity, a high degree of endemism and the higher incidence of rare and endangered species of the flora and fauna. Considering the strategic biogeographic location of Nagaland and unique status of biodiversity, one has to but wonder about the people or community who are the custodians of this rich resource. In the current era, the impact of human society

[29] Wetshokhrolo Lasuh (2002), *The Naga chronicle,p.19*
[30] Sapu Changkija (2014), *Biodiversity of Nagaland*,p.44

on the biogeography of a region hold greater significance in its distribution as well as future prediction. Human as a living entity depending on the bioresource and its diversity have always been in conflict with their concept of need and wants.

3.2. Naga Perception of Bio Resource

The two ruling paradigms of bioresource perspective are ecocentrism and anthropocentrism. Between the ecocentric paradigm and anthropocentric paradigm, the ecocentric suggests that all living species have an intrinsic value irrespective of any value that people derive from or attribute to them, and the anthropocentric views biological resources as the collection of 'goods and services' that support human life.[31] Yet there is no denying that bio-resource in its diversity and abundance attributes support human life. Whereby depletion or degradation threaten future stocks of natural capital or endanger ecological functioning and life support system. In modern global economy bio-resource are emerging as powerful drivers in applying new technologies to the manufacture of the modern global economy. Today issues like 'Intellectual property rights' 'Equal Access and Benefit-sharing' and 'Valuation of Bioresource' have become the concern of global top priority, to maintain the stock intact through sustainable utilization for fulfilling various human requirements forever.

In economic analysis, bioresource is classified into use and non-use values. Use value is subdivided into direct i,e the physical goods used by people (such as food, fuel, timber, and herbal medicines) or aesthetic or recreational benefits obtained, and indirect, i,e the ecological functions that maintain the stability and productivity of that environment at local and global scale. The value of bioresource is dependent on the level of analysis. Similarly, the perception, benefits as well as costs are distributed unevenly in society; as such, it is dynamic and not socially neutral. Most local value is utilitarian direct use

[31] Robin Grimble & Maryn Laidlaw (2002), *Biodiversity Management and Local Livelihoods: Rio Plus 10*. Overseas Development Institute,pp.1-3

values that provide immediate and practical benefits to local people. At a regional level, direct use values become less important compared with the indirect values of ecosystem functions and services. At the international and global scale, non-use existence and option values become critical, though questions of biosphere maintenance are also of vital importance.

When one considers the perspective of bioresource among the Nagas their egalitarianism precedes that of their ecocentric or anthropocentric paradigm. Cradled in the mountain ecosystem, the hills, forests, and rivers were held sacred and considered as the source of their wealth and health controlled by supernatural powers. They adapted to their physical environment and participated with nature is creating their livelihood with reverence and as stewards never as rulers or modifiers.

The indigenous Naga worldview is the conviction that the earth, vis-a-vis the land, is a realm not only destined for human but that of spirits also. Every creation is therefore sacred and their perception is wholly based on this concept. Every bio resource as emphasised is a blessing in their land, flourishing for their prosperity and sustaining their livelihood system. It is with unconscious endearing that they consider their environment to be a shield for their life, protecting, providing and sustaining them. It is a blessing to be shared, guarded, restored and respected. Traditional values of bio resource defy that of economic value. Every being is considered not as a commodity or material but as an entity, sacred in their existence on the earth, which is also applied to the mountains, forest, rivers, stones and almost every element of their ecosystem and environment. Their home in this case 'village' surrounded by their traditional resources is an organic whole, every household as a member practice collective rights in ownership and utilisation based on their reciprocal tradition.

Culture has a strong bearing on the perception of nature, bio resource in particular as creations and their relationship with them as a resource. The practice of rituals and

ceremonies defined the locality for a particular purpose and time. A particular land to be cultivated, a tree to be cut, a house to be built, a forest for hunting etc. It also defined the resources to be used by whom and when. *Genna* (Taboo) and *Nanyü* (Religion) and bio resource composed the livelihood activities of the community. The yearly calendar of a cultivator is a series of organised rituals and ceremonies revolving around the land with offering and sacrifices for a healthy harvest and again offering and festivals to celebrate the harvest of their labour. *Genna* not only guided the harvesting of wild flora and fauna for consumption, it also includes the ways and methods to the production of their agriculture. For instance, it is *genna* to sow different seeds together or plant different crops together. A resource (plants and animals) is perceived as a living entity that can have emotional responses to human nature and activities. Human act of violence, greed, defilement, and exploitation often provoke the anger of the land. Every creature requires/demands care and love to grow, particularly the livestock and crops. As such, they bless them and nurture them while tending to them like a child. Wastage of food is highly '*kenyü*' [32], even denying a crop as undesirable or unwanted hurts/grief the crop and results in failure of that a particular person or family to grow it again. The practice of religion, a particular place where they offered sacrifices or performed rituals, a particular place, tree or stone as the abode of spirit or a hilltop as the place of the death has created sacred groves or land. The Lothas used to believe that the spirit of the dead goes to Mount Tiyi, a prominent mountain for the Lothas situated in Wokha district. When a stone is considered sacred, it is feared to even approach that vicinity and is forbidden to collect or even disturb that ecosystem. Surmounting all the above is the culture of reciprocal to land and its resources. Extensive collective access to resources is the practice among the community as explained in the preceding para. The beauty of this practice and sustenance is defined by their reciprocal culture. It is a conscious

[32] Meaning impious and forbidden in Tenyidie of the Angami Naga

attitude that they follow when harvesting any resource, going beyond one's need whether private or community land is offending or *kenyü*. Similarly, it is an offend to land to till it for free, as such anyone who tills the land of someone else pays a tribute to the owner, in terms of money or crops as a sign of reverence.

As a community, they have practiced collective ownership and rights to access and mobilise, the resources for their welfare and sustenance. This, however, does not suggest that mobilisation was rampant or in any way unorganised. This merely indicates their traditional concept of ownership. The traditional philosophy that 'land does not belong man but man to land' or in practice, that' no individual can claim ownership or rule over nature as a private property'. Collective ownership in clans and community within a village also extends to their collective mobilisation of resources. Traditional practices of community fishing, hunting and collection of Non-Timber Forest Products (NTFP) within dedicated season and place, widely denotes the equal rights of every individual to access, participate in resources mobilisation and utilisation. It also exemplifies the sanctity and reverence that culture adheres to with rituals and celebration in sharing and enjoying the wealth/gift that nature provides. When one considers the freedom of access or claim to one's need for sustaining a livelihood system, it surpasses the ownership over the social and political boundary. There is no doubt about the availability of narrative to prove this point. However, in the supplement are some indications procured during fieldwork suggesting the continuing practice of sharing of land and bio resource.

The traditional practice of offering the right to community forestland for jhumming by another community between two neighbouring village free of cost is extensive. Jhum cultivation is by nature a community participating agriculture system. In this case, a group of household consisting of a clan or a whole village is permitted the right to claim the land as a temporary resource for their livelihood.

Another common practice is the cultivation of terrace field or jhum land by a household from private land. If a family cannot till the terrace field mostly due to lack of household labour, the owner offers the field to those family with no terrace field or those in need as a free will. Similarly, when a family cuts a particular plot of land for homestead garden or jhum, and if the plot is more than enough for their needs. Neighbours, friends, and cousins are invited to share the land.

Though the claiming of rights by any individual to a particular tree on both individual and community land has decreased which was widely practiced for timber.The collection of dead trees for firewood is still practiced, based on first come basis or claims made as the person who spotted first.

The collection of bio resource clubbed as NTFP is often seasonal and mostly defy the ownership system, though it is not the exception. Foraging for livestock, the collection of fauna in wet terrace fields, and the herbs in terrace and jhum land all private owned are some other cases worth mentioning.

All the bio resources harvested both direct and indirect uses are not only of utility importance, it is their continuance of tradition and culture. It can be referred that every resource wild or domesticated/ cultivated was perceived beyond individual welfare and accumulation to that of the community. Individual ownership was claimed only of those resources, which one created or produced through hard labour.

3.3. Bio Resource Classification

Based on the cultural practices of the Nagas in managing their bio resources one can identify two major resource base. The two major bio resource bases for livelihood in the traditional Naga society are Traditional resource base and Community resource base. The traditional resource base is the total entirety of their physical spatial attributes/elements confined within the village and defined by supreme sovereignty. In a community, a traditional resource that is land and the bio resources associated with it is

regarded as the birthright of every individual, claimed and processed for their growth and development as a member of the community.

Based on ownership, traditional resource base can be divided into Common Property Resource and Individual Resource base. In Individual Resource base, ownership is practiced and access rights and transfer rights rest on the particular individual. The value of bio resource depends on the aspiration and work culture of the individual as well. Whereas in Common Property Resource individuals do not control the right to access or mobilise resources. Collective ownership is practiced and the bio resource forms the major resource in every village. The value of bio resource depends on the need-based parameter of the members of the community. The welfare of the society both social and economic is the main priority of the use/management of resource use. Equally significant is the Community Resource Base. Community resource has successfully integrated the physiographic and social elements in an organic continuum of livelihood sustenance. Community labour is the social institution that has made it possible for a household to produce sufficiency in food with ease. Considering the arduous time-bound activities from selecting a field to till to storing the harvest safely with just their handmade traditional tools walking to fields near settlement to as far as two hours or more is not easy. The available community labour through rotational basis has aided the management of bio resource judiciously. The practice of community labour has not only inculcated the dignity of labour through generations it is also the medium for learning traditional knowledge. Traditional knowledge is accumulated experiences, adaptation and refinement through errors in everyday life with their conscious environment. The land with its features is a reservoir of detailed ecological knowledge and a repository for the memory of past event. Their inquisitive nature to land and its diversity has provided the required wisdom and tool for their welfare and the Nagas thrive in otherwise the difficult hill ranges.

Livelihood creation through the combination of the above resource base is dynamic and contemporary livelihood shows signs of different level of prioritising of one resource base over another or conversion as well.

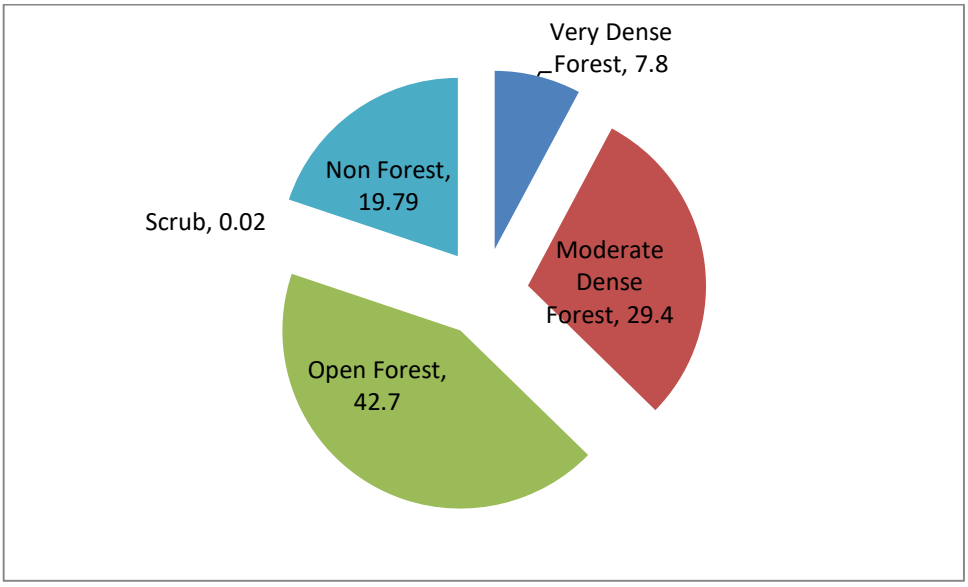
Based on the priority of bio resource to the community livelihood system and the state for economic growth, bio resource is been classified for this study into Forest and Agriculture Bio-resource.

3.3.a. Forest Bio Resource

The forest cover in the state, based on interpretation of satellite of November 2008-February 2009 is 13,318 sq.km, which is 80.33% of the state's geographical area. In terms of the forest canopy, density classes, the state has 1,293sq.km area under dense forest, 4,931sq.km are under moderately dense forest and, 7,094sq.km under open forest (Fig.3.2). The state is endowed with a variety of forest type because of its unique geographical location and a wide range of physiographic terrain. The vegetation ranges from alpine forest to the northern tropical wet evergreen forest and the vegetations in between. The unique and rich floral diversity along the altitude gradient from floodplains of the great Brahmaputra and the highest snow-capped peak Saramati in the east of Nagaland supports a diverse flora and fauna. The complex interaction in variant altitudinal aspects with its microclimatic, edaphic and biotic factors including the influence of shifting agriculture and other human activities has also given rise to very intricate pattern of vegetation development in the state.[33]

[33] Sapu Changkija (2014), *Biodiversity of Nagaland,* p.20

Figure 3.2. Forest Type in Nagaland



Source: Department of Forests, Ecology, Environment, 2013-14

The land ownership in the state is different in nature in that, 88.3% of the forest is owned by the community and the other 11 percent comes under the control of the Government (Table 3.1). The community has always held ownership to the forestland and custodian of the rich forest resource. Each village as a community owns the forestland and have their own customary laws and traditions governing the management and conservation of the forest bio-resource. Traditional ownership includes not only the right to access but includes the responsibility to preserve the diverse bio resource as well as the ecosystem.

Out of the total forest area, 55.40 percent comes under virgin forest whereas 32.90 percent of the total forest is degraded forest. The government has ownership as well as control of 3.43 percent of the total forest under reserved, protected and wildlife sanctuary (Table.3.1)

Table 3.1. Status of Forest in Nagaland

Legal Status	Forest Area (Sq.Kms.)	% of Total Forest Area	% of Total Geographical Area
a) Government owned Forests			
Reserved Forests	62.26	0.72%	0.72%
Purchased Forests	192.47	2.20%	2.20%
Protected Forests	34.69	0.40%	0.40%
Wildlife Sanctuary	202.02	2.31%	2.31%
b) Government controlled (Private owned) Forests:			
Protected Forest	516.79%	5.98%	3.12%
c)Village Owned Forests			
Virgin Forest	4778.27	55.40%	28.82%
Degraded Forest	2842.8	32.90%	17.15%
d**) Ownership**			
State Government	1008.23	11.70%	6.00%
Private/Community	7621.07	88.30%	46.00%
Total	**8629.30**	**100.00%**	**52.00%**

Source: Department of Forests, Ecology, Environment, 2013-2014

Naga habitats are rich in flora and fauna and abound in meeting the nutritional requirements of the people the whole year round. They gather many varieties of wild plants, leaves, roots, tubers, berries, fruits, seeds, and nuts, but most of these have yet to be systematically identified and classified, and therefore many are yet to be found in the botanical literature.[34] The regular diet contains vegetables and fruits from both the cultivated agro-ecosystem as well as the fallow land and the forest ecosystem which are mostly taken as food and also for health reason (Plate 3.1).

[34] V.Nienu (2015), *Naga Cultural Milieu- An adaptation to Mountain Ecosystem*,p.240

Plate 3.1. Forest produces in daily market (Mokokchung Town)

One important forest element that is unalienable to the relationship of nature and Nagas is the collection or harvesting of medicinal plants for direct use by any individuals or the production of herbal medicines by local practitioners for ailments from minor injuries to severe health problems. Nagaland itself accounts for 526 plant species for treatment of 83 different diseases and ailments, where specifically 51 medicinal plants are found to be used in the indigenous system of medicine. From Wokha district, a survey of traditional knowledge and practice of medicinal herbs has recorded 55 ethno medicinal uses for various ailments. [35] Likewise, 64 herbaceous plants with ethno medicinal value have been identified from Khonoma village forest belonging to 37 families commonly used for the treatment of 47 different health disorders.[36] Their intricate knowledge with the resources and uses also reflects their natural talent and the

[35] N.S.Jamir, Takatemjen & Limasenla (2010), Traditional Knowledge of Lotha-Naga tribe in Wokha district, Nagaland, *Indian Journal of Traditional Knowledge*, p.45

[36] Petevino Chase & O.P Singh (2013), Ethnomedicinal Plants used by Angami Tribe of Nagaland, India,*Indian Journal of Traditional Knowledge*,pp.29-42

close affinity that community has with the environment. The herbals are gathered from their homestead, cultivated field, kitchen garden, and the forest. It is often for prevention that many herbal and aromatic plants are preserved as well as planted near their settlement for easy accessibility. Since time immemorial, rearing of animals has always been a part of their culture. Cattles especially Mithun and cows, buffaloes, pigs, and fowls, play important roles, both in terms of consumption and for sacrificial offerings. It was also a sign of status and wealth in some community, where a rich individual will share their prosperity with the fellow community through feasts and gain social status. Their need for meat was also provided through hunting and fishing. Both individual and community participated in gathering their food supplements, whether it is hunting games or fishing. Hunting for the meat of wild buffaloes, boars, deer, stags and other animals and birds was common among the Nagas though it is lesser today. A number of crustaceans, prawns, shrimps, crabs and frogs from the rivers and streams are collected. Even to this day, a number of edible insects, hornets, and grubs make every man's list of food items, whether an avid hunter or not.

To study the forest resource utility and livelihood relation of the contemporary Naga society, analysis has been done based on primary data collected. Field visitation provides a new direction for identifying the availability and use of forest resource in livelihood building. Among the sample villages, Tenyiphe 1 is the only village with no identifiable forest land both individual and community. As such, no providence of the diverse and abundant forest resources to the community settled in this area if not through the market. Another distinct area found is Kidima Village, located in the middle of a natural pine and oak forest ecosystem, the availability of forest resources have been less compared to its neighbouring villages. Besides these two villages, there is a distinction between two types of the abundance and utilization of forest resources. The first type consists of those villages settled nearer to a prominent mountain range, there is

abundant intact forest cover and perennial flowing streams to support the vegetative ecosystem. For example, Kigwema village in Kohima district, Aotsakilimi in Zunheboto district, Benreu village in Peren district, Wokha village in Wokha district etc. The second type consists of those villages settled more towards the valley, where human settlement and development has fragmented the vegetative ecosystem and caused the conversion of primary forest to secondary forests. The use and management of the available resources will be discussed in the following chapter. Important wild vegetables and fruits in the sample villages are listed below.

Table 3.2. List of common harvested forest bio-resource

SL. NO	Scientific Name	Common Name/*Local Name in Angami	Utility	Type of resource	Household, Commercial, Both
1	*Bambusa sp*	Bamboo	Food	Vegetable	Both
2	*Castanopsis hystrix*	Chestnut	Food	Fruit	Both
3	*Centella asiatica*	Pennywort	Medicinal	Vegetable	Both
4	*Clerodendrum colebrookianum*	East Indian glory bower	Medicinal	Vegetable	Both
5	*Costus speciosus*	Spiral ginger	Medicinal	Vegetable	Household
6	*Curcuma angustifolia*	Hidden ginger	Medicinal	Vegetable	Both
7	*Diplazium esculentum*	Vegetable fern	Medicinal	Vegetable	Both
8	*Docynia hookeriana*	Wild apple	Food	Fruit	Both
9	*Emblica officinalis*	Gooseberry	Medicinal	Fruit	Both
10	*Elatostemma sp*	*Gajo**	Medicinal	Vegetable	Both
11	*Eryngium fortidum*	Long coriander	Medicinal	Vegetable	Household
12	*Gnetum sp*	Paddy oats	Food	Vegetable	Both
13	*Ficus semicordata*	Drooping fig	Medicinal	Fruit	Household
14	*Gynura bicolar*	Spinach	Medicinal	Vegetable	Both

15	*Herpetospermum peduculosm*	*Gauri**	Medicinal	Vegetable	Both
16	*Houttunnia cordata*	Stink grass	Medicinal	Vegetable	Both
17	*Impatien sp*	Impatien	Medicinal	Vegetable	Both
18	*Mahonia nepalensis*	Barberry	Medicinal	Fruit	Household
19	*Mentha spicata*	Garden mint	Medicinal	Vegetable	Both
20	*Morus alba*	Mulberry	Medicinal	Fruit	Household
21	*Musa sp*	Banana	Medicinal	Both	Both
22	*Plantago major*	Common plantain	Medicinal	Vegetable	Household
23	*Polygonum molle*	Sikkim knotweed	Medicinal	Vegetable	Household
24	*Prunus sp*	Wild cherry	Food	Fruit	Household
25	*Rhus semialata*	Nutgall	Medicinal	Fruit	Household
26	*Rubus ellipticus*	Raspberry	Food	Fruit	Household
27	*Schizophyllum commune*	Mushroom	Food	Vegetable	Both
28	*Wadelia chenensis*	Bhangara	Medicinal	Vegetable	Both
29	*Zanthoxylum armatum*	Toothache tree	Medicinal	Vegetable	Both
30	*Zanthozylum oxiphylum*	Nepal prickly ash	Medicinal	Vegetable	Both

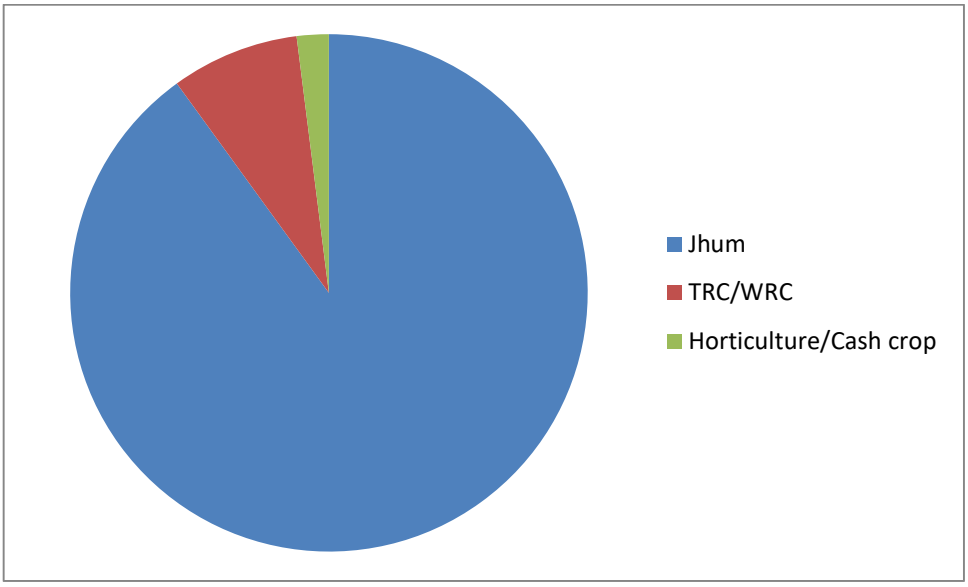
3.3.b. Agriculture Resource

The unique biogeographical location of the state with varied climatic conditions and ecosystems support a rich agro-diversity. This rich agro biodiversity element has evolved, over to a millennium, within diverse agriculture systems in intricate association with the communities distributed from the hill slopes down to the valley. The diversity of crops has much affinity to the tribal community in both cultures as much as their traditional knowledge. The major crops grown in the State are rice, corn, millet, pulses, oilseeds, sugarcane, potatoes, and fibers. Rice is the major crop and more

than 80% of the gross cropped area is under rice cultivation. The important vegetables are cabbage, cauliflower, cucumber, pumpkins, gourd, squash, carrot, tomatoes, bringal, potatoes and colocasia. The major fruits are banana, pineapple, citrus, plum, pear, passion fruit and guava. Tea and coffee are grown as plantation crops in the state. Ginger, turmeric, large cardamom, garlic, chilies are the main spices grown in the state.

In Nagaland, agriculture systems are mostly based on traditional, cultural, geographical and socio-economic factors. The traditional form of shifting cultivation i.e. jhum is the method of cultivation that is widely practiced across Nagaland (Fig. 3.3).

Figure 3.3. Area under various types of Agriculture (2000-2001)



Source: Human Development Report, Nagaland.2004.

The following are the major agriculture systems:

1. Wet rice cultivation (WRC)

Wet rice cultivation is practiced in the low-lying areas, where bunds are constructed to divide the plot into a number of smaller sections. This is done to keep every section of the field well supplied with water and the crops are partially submerged for some parts of the growing period. Different varieties of rice are planted within the sections and kept well irrigated. WRC is carried out in the rainfed lowlands of the State. Majority of

the WRC are seen in the low-lying areas of Dimapur, Peren, Wokha and Mon districts. Rice is grown followed by wheat, mustard and cole crops.

2. Wet Terrace Rice Cultivation (WTRC)

The crops are planted in terraces built along the slopes in WTRC. Irrigation is done through small canals from streams and rivers aided by monsoon rains. The field is also used for cultivation of crops like potato, garlic, cabbage, mustard leave etc. Rice and potato are the main crops grown in the Angami areas of southern Kohima district. In certain other areas like Kohima, Mon, and Tuensang, winter wheat is also grown. Below plate represents the layers of terrace with mustard leaves, local garlic, and potato as winter crops for commercial purpose.

Plate 3.2. Winter crops in WTRC (Kigwema village)

3. Jhum

The rotational system of cultivation through slash and burn method is the most common agricultural system in Nagaland. Mixed cropping is practiced in the jhum fields with rice as the main crop, although in some areas, maize and millet is the staple. Between 15 to 60 different species of crops can be found in a single jhum field (Plate 3.3). Besides, the staple crop, supplementary crops include maize, millet, job's tears, legumes, beans, oilseeds, root crops, and vegetables. After the harvest of the cereals, the fields are generally left fallow and only the vegetables like ginger, beans, chilies, colocasia and green vegetables are grown.

Plate 3.3. Mix cropping in jhum (Wokha village)

Aside from the major crops produce that agriculture system provides, many additional provisions occur naturally and though unaccounted provide food security.

Table 3.3. Important additional bio resource from the Terrace and Jhum field

Sl.no	Type of resource	Source	Value
1	Water bugs, snail, fish, crustaceans	WTRC	Food supplement, market demand
2	Guava, banana, peach, pineapple	WTRC +WRC	Food supplement
3	Pumpkin, beans, tomato, yam, tapioca	WTRC	Food supplement
4	Centella, sweet potato, solanum, alluim	WTRC +WRC	Food supplement
5	Prickly ash tree	JF	Food supplement, market demand
6	Wild cinnamom, akhataru	JF	Medicinal
7	Fig, garcinia, indian olive, gooseberry	JF	Food supplement, market demand

WTRC- Wet terrace rice cultivation, WRC-Wet rice cultivation, JF- Jhum field

They range from cultural delicacies to medicinal herbs and from fruits to fuelwood (Table 3.3). Among them, snail and fish in terrace cultivation reared in terraces with permanent water supply has become a good source of food security to farmers who depend on it as a supplement of nutrition as well as to other consumers who cannot avail it but only depend on the market. Guava, banana, and tapioca are some important boundary crops of terrace it is a good source of food as well as market demand. Most centella found available in the local market are harvested from terrace field, which grows and becomes abundant after the paddy is harvested. It is a bio resource considered as a medicinal plant and is free for anyone to harvest in the individual terrace field. Pumpkin, beans, sweet potato, solanum, allium, cherry tomato as well as tree tomato and chili provides the ingredients in preparing lunch in the field. Similarly, in jhum fallow, gooseberry and prickly ash, a rich source of food supplement to the individual household have also become a wide market produce in the state. Thus, such naturally occurring bio resource is been rightly chanelled to strengthen the food security of the state.

4. Kitchen garden

The kitchen garden is very common among the Naga household. Kitchen garden located close to the house provides easy access to daily diet needs whole year round. The size varies from small to a medium plot of land depending on the size of the individual homestead. A wide variety of crops are grown throughout the year including garlic, onion, tomato, ginger, beans, cabbage, beans, mustard, squash, maize, passion fruit, orange, banana, chili, potato, etc.

On a tiny piece of land, as kitchen garden one can observe the diversity of crops (Plate 3.4) with spices, green leaves, tomatoes, and medicinal herbs for daily household need at close range.

Plate 3.4. Kitchen garden (Jotsoma village)

5. Homestead garden

Homestead garden is market focus cultivation of vegetables, aromatic plants, spice and fruits where households are investing in monocropping of commercial crops for income generation. The emerging wave of market seeds and new cropping pattern are prominent. It is a combination of both traditional and modern cultivation technology. Homestead garden of potato, cabbage, kiwi, plum, local garlic, spring onion, ginger, tomato, mustard leaves has seen the success story in the state having a wide scope for permanent cultivation of horticulture crops.

3.4. Agro Biodiversity

Rice as the staple food has always been the most important crop for the Nagas. Nagas cultivate about 360 different varieties of rice out of which, 50 have been identified and found to be economically viable. The selection of rice crops is of prime importance for any cultivator, and the diverse agriculture system has served as the gene bank for rice diversity. It is observed that generally the rice varieties that they grow in the terrace field and those in jhum are different. Fieldwork implies that among the villages, where terrace rice cultivation is more pronounced than jhum cultivation varieties of rice is more in terrace than jhum cultivation and vice versa. A farmer in Sangratsü village under Mokokchung district practicing both jhum and terrace cultivation plants 4-5 varieties of rice in his jhum field, a mixture of glutinous, normal and special rice. Whereas is his terrace field normally he plants two varieties both normal. Similar is the case with those practicing terrace rice cultivation, a variety of rice is more in the terrace field compared to the jhum land. The choice of rice variety or the mixture planted in a particular field is done only after careful consideration, based on their knowledge. Following are some factors observed in the selection of rice by an individual:

i. Physical factor: Altitude, size of the terrace field, year of jhuming whether first or second, temperature of the water, abundance of sunlight and wind system, availability of water and soil texture

ii. Social factor: System of agriculture i,e jhum, WTRC, WRC, personal choice or preference availability of labour, seed conservation and food security.

Based on altitude, a broad diversity of cultivated crops can be observed in any particular district and village as well. From field survey, three regions are identified.

1. Cold region:

The field adjacent to forest area on mountain slopes near the cloud line is brought under jhum. Cold region crops are commonly cultivated in mixed cropping or monocropping. The most preferred land for winter crops as well as the major vegetables produced for the market is found in this region. Coles of Phek, garlic of Benreu, vegetables of Anangba, potatoes of Kigwema village are famous producers both, both in quality and quantity in the State. Rice is of less importance in this region.

2. Regular jhum area:

This is the zone of highest agro-biodiversity. Rice is the main crop with chili, maize, pumpkin, ginger, spices, cucurbits and every other traditional crop is found in mixed cropping. The region is warmer as such cropping activity is high. A transect walk through the neatly prepared or arranged crops by a woman in Wokha district show cast the abundance of crop diversity in jhum field, where it is hard to even identify or tally the variety of crops and the time of harvest. A survey of crops in jhum by NEPED has stated that at least 167 crops (including 12 rice varieties) are cultivated in a typical jhum field. Whereby the number of species cultivated in each jhum field varies from 18 to 60.

3. Warm region:

Rice is the main crop grown in this region. Crops like ginger, chili, maize, soybean, pigeon pea are also found as intercrops. Fruits and plantation crops are converting the jhum field into permanent farming more and more in the past years in this region.

Table 3.4. Identified traditional crops for commercial purpose

Type of resource	Crops	District
Cereal	Maize	All districts
Cole crops	Cabbage	Phek, Tuensang
Starch crops	Colocasia, sweet potato, tapioca, potato	All districts
Pulse	Kidney, French and rice bean	Tuensang, Kiphire
Vegetable	Mustard, garlic, spring onion	Kohima, Peren
Cucurbitaceous	Gourds, cucumber, pumpkin	All districts
Spices	Chilli, Raja chilli	All districts
others	Ginger, tree tomato, squash	All districts
Fruits	Banana, papaya, passion fruit, beetle nut, plum	All districts

Preference for organic produce and savour of traditional crops has created a growing market demand for traditional crops in the local markets. Below are the major emerging traditional crops (Table.3.4).

Agro-biodiversity in Nagaland is changing where farmers are expanding their crop diversity, besides the traditional crops they are venturing into new cropping system (Table 3.5).

Table 3.5. New cropping system

Bio-resource	Crops	Village
Vegetables	Carrot, cabbage, cauliflower, tomato, chilli, ginger	Mokokchung, Dimapur
Plantation	Rubber, tea, cardamom	Mon, Zunheboto,
Fruits	Kiwi, orange, litchi, pineapple, banana, passion fruit	Phek, Wokha, Zunheboto

According to Long[37] livelihood 'best expresses the idea of individuals or groups striving to make a living, attempting to meet their various consumption and economic necessities, coping with uncertainties, responding to new opportunities, and choosing between different value positions.' Community solidarity conforms the virtue of livelihood among the traditional Naga community. Their livelihood being very dependent on the direct usage of bio resource (forest & agriculture) revolved around the community labour and traditional knowledge. Mobilisation of resources in meeting their specific needs whether forest or agriculture was time bound and industrious. Every household livelihood is homogenous established on the bio resource base within the community defined by its territory; govern by cultural practice of equality in bio resource ownership, rights to access and opportunity for future livelihood sustenance. The tendency to break from this homogenous nature of livelihood is emerging among villages in every district of the state. Creating a wave of transition from livelihood based on traditional resources for sustenance to more extensification and accumulation.

In traditional paradigm, bio resource was considered as those nature provides or wild and those cultivated or domesticated. Their relationship to resources was never individual, as by culture and tradition, land and all its resources were generally perceived to be common property resource. As such, there was no personal ambition or

[37] De Haan & Zoomers (2003), Development geography at the crossroad of livelihood and globalisation, p.352

conflict of interest in resource management and men lived in harmony with nature. However, in the recent centuries, bio resource is classified based on ownership and monetary value. Their economic value for men's greed tends to overrides its ecological significance. With the growth of the economy and social changes in Nagaland, the traditional practices of management of bio resources are fast degrading in both reverence and practices. Exotic crops are fast converting the biodiversity attributes and abundance of the agriculture system and the cultivable land. The contemporary management objectives/priority of the people are not only bringing about major changes in the value of resources, it will also decide the fate of the resource base for the future generation. Management is, therefore, more significant than ever for the household livelihood in both food security and sustainability of resources.

Chapter 4

Management of Bio Resource

Management is a world of lived experience where human interact with the resources and is the subject of transformation as well. In its spatial context, the homestead with the surrounding forest, the fertile land they till, the rich mountains and the pristine rivers they ventures is their everyday living space "home". This intricate relationship with the environment, as in land and all its attributes is personal where different individuals hold a different degree of attachment. The Nagas for generations lived with the land and their every activity is attuned to this relationship. Natural resources are not just raw materials to be inventoried and managed as commodities, but also, and more importantly, "place with a history, places that people care about, places that embody a sense of belonging and purpose that gives meaning to life.

The process of gathering any plant or part of it or for that matter any fauna indicates two distinct innate value of the community. The first is the culture of continuity/sustainability and equally significant is that of egalitarianism. Community sharing is the direct expression of this deep-seated ethics towards resources. Community sharing is a resource distributing system, which judiciously manages the resources for both individuals and the community. In detail, it is a common virtue among the community to share land for cultivation or harvesting of household needs from individual land. Most individuals will share some portion of their yield both wild and cultivated with their fellow community, in precise neighbours, family, and elders and widow or widower.

As such, management of any resource in the Naga society is not the priority of one individual immediate need or attainment, but the welfare of the whole community and the sustainability of this practice. There is no doubt that the livelihood of a Naga is tied to their environment and they depend on the biodiversity attributes for their welfare.

This statement, however, tends to misplace their intellectual and innovative ability as an active and resourceful agent in managing the resource.

The traditional utilization of biologically diverse resources in the region not only reflects a diverse resources use pattern but also the way of maintaining biodiversity in mountain ecosystems by the mountain people. Here the natural resources management systems are localized systems, which form a basis for decision making for rural people, since the majority of the farming systems and all production systems in the region operate under indigenous knowledge systems.[38]

Traditional knowledge in managing the resource is visible not only in their approach to the environment, but in their constant interaction, and in every detail of mobilising, utilisation and conservation of the resource base. Traditional knowledge is practical and a continuing process, which is highly regarded and sometimes propagated in a proverb or saying. The practices and continuation shall be discussed in the following paragraphs.

4.1. Role of Community as a Social Institution

A major strength that contemporary Naga society has inherited is the social capital that has stemmed out of traditional institution and practices. As one set in discourse through the relationship of community and resource, it becomes more than highly visible, the unique customs and tradition that the Nagas adhere to in maintaining the trust and bond in managing resources. Ponds and springs are the main sources of household water resource in all the villages. By custom, no individual or clan can proclaim the exclusive right to a pond or the spring water even if it is in private land. Similar is the case with streams, no individual can raise or built a dam for personal use. Water is considered as a

[38]Sapu Changkija (2014), *Biodiversity of Nagaland*, p.70

flowing resource along with the fauna living in it. Similar is the major and minor rivers in the state. Community ownership over the water resource is supreme in all the villages.

Collective ownership according to the Naga concept means collective and equal utilisation of that resource or part of it. Community fishing, hunting, forest resource gathering and even collective farming are some major examples of this belief and everyday practices. The greatest wealth people derive from rivers and streams is its wealth of fish. Community fishing is one such practice through which community of one or even more village participate in fishing. Fishing rights over any particular stretch of river are governed by local customs. They are usually held by one village or a group of villages, who guard their valuable rights jealously. Each of them can build dams and set traps only in certain parts of the stream.

Community fishing sometime includes women, children, as onlookers, and the men of all age groups of the whole village. Every man gets involved in pounding poisonous creepers and bark of trees, which can stupefy the fishes easily. And the expedition which starts early in the morning ends in the afternoon, each with their own share.

Similar is the community hunting tradition among the Nagas. Community hunting involves different groups of man as the catcher, the teaser, and the chase. If a man gets a kill, he shares his meat with his neighbours and elders. It is believed that by sharing and through blessing can one continue to be prosperous in hunting. The spirit of community hunting is even practiced even today when hunting is lifted during December and January. Wild meat is different from any meat available and is considered as a tonic by custom. One such occasion is the one recently observed by the researcher, where the men went for community hunting for three days and had their game in a feast for the whole khel.

Allotment of land for management is systematic and well planned which is guided by certain social norms. For instance, every village is surrounded by vegetation that varies from village to village. The reasons ranging from protection against enemy, forest fire, destructive winds, to meeting the household requirements of herb and foraging. Another distinct example is the location of Community Forest, always away from the village settlement.

The natural bamboo plantation, palm, and thatch habitation are preserved in and around the village or in the periphery of farmland for its easy accessibility as well as to meet the annual requirement of the whole community.

The practice of social norms in water resource distribution is keen in terrace rice cultivation. The person who first built terrace field near a source of water is often followed by fellow neighbours creating a chain of water distribution down the slope but with permission from the first terrace builder as the owner of the water source. This permanent rice cultivation creates a chain of free irrigation water controlled by fair distribution. As the water is brought through controlled channeled from the main stream, all the household has to take into consideration one another when to puddle the field. This is the time of highest water required to fully flood and decompose the organic materials.

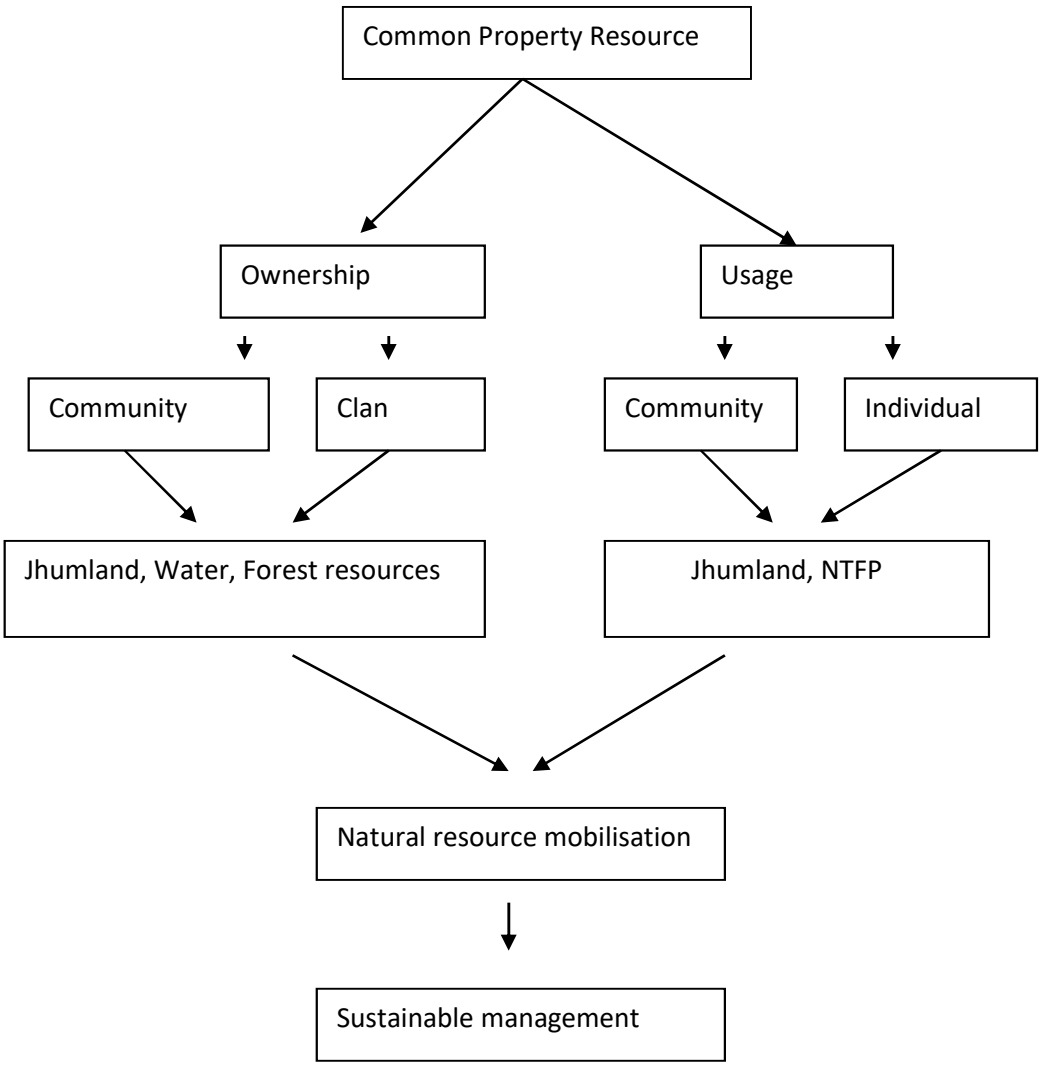
4.1.a. Common Property Resource

In Nagaland, Common Property Resource (CPR) cannot be defined based on ownership alone but usage is equally important (Fig.4.1). It includes not only the natural resources like land, forests and water resources but all the subalterns such as marine fisheries. The dependents get from them benefits such as staple food from jhum or other forms of

cultivation, NTFP like edible fruits, leaves and vegetables, small timber and medicinal herbs.

CPR can be described as the resources on which a community sustains itself through equal usufruct rights as co-owners. It also includes the opportunity that an individual has to access the resources of daily needs in individual or clan land by any individual like banana, bamboo, most NTFP, and foraging.CPR and its role in individual livelihood are immense both for their economic welfare and for livelihood security. For instance there are

Figure 4.1. Flow chart representing CPR practice in Nagaland



individual household who has no private land and each year depend on community land both clan and village community for jhum agriculture, firewood, and NTFP. This freedom for free access and utilisation in the community has created a strong sense of livelihood security for the whole community.

CPR is the resource base for bio-resource individual livelihood in Nagaland. Where an individual household can anytime pool in to meet their need, which is more often immediate than the accumulation of any nature. Modernisation has hit the collective ownership culture and its resource distribution system, leading to conflict and resource exploitation among the community.

Its ancestral purpose is not only the use or administration of the resource but also sustenance that includes people's culture, economy, social system, and identity. All the tribes and villages practices CPR having customary laws and rules to manage and mobilise these resources as well as their protection and benefit sharing. In all the sample villages a common value that no individual can appropriate resources as property and the belief that it is *taboo* to go beyond one's need govern CPR mobilisation and management. In detail, though it is free of access to resources in CPR depending on the importance of the resource to the village community livelihood its access rights is allowed. For instance, bamboo is a multipurpose resource; food, material for household utensils and construction, fencing and post for creepers in farming etc. As such, its use and access right in the villages have been free. When needed anyone can harvest bamboo from near or far with prior information from the individual or community who owns the forest. Whereas foraging and semi- domestication of cattle, which was free in all villages, is prohibited due to the conflict in managing of forest and agriculture in all the sample villages.

The unity of the community for the common welfare and future resource creation has been limited in some villages with the growth of population and its differences in development. Recently traditional management of CPR has often been forced to integrate individual needs to the balanced mobilisation of the community. For instance, in Tsiepama village individual household for the past years has harvested the clan land for commercial selling of bamboo and firewood in alternate years. Similar is the stone quarrying in clan land in Kiwgema village and riverside quarrying in Tizit village.

This is a few prominent exploitation by individuals spotted in fieldwork. However, the real threat lies in labeling CPR with money. This lures individuals to manipulate CPR for personal accumulation and causes its exploitation.

The transition from collective mobilisation to privatisation has seen the cruel branching of individualism. As stated in chapter 3 personal driven ambition has caused the decrease in CPR both area and access rights in many villages due to the division of clan land to individuals, creating more restriction on usage of CPR, and fragmentation of resources in the community.

4.1.b. Labour Exchange System

It is established that agriculture system both jhum and terrace is a well-organised and regulated social system of cultivation. The intensive year-round activities of farming in the hilly terrain have been much acclaim to the traditional institution of labour exchange system. Labour in the practice of work gang and peer group has not only sufficiently met the work demand of a household, it has also blended the community to create a social cohesion that has withstood the ravages of time and circumstances. Everyone in the family participated in farming and dignity of labour was highly regarded to be a virtue in the society. Every individual is brought up in such environment, taught and

practiced at a very young age in peer groups and work gangs. There has always been competition between the peer groups and works gangs as well as among them and it increases their zeal to work together. In other words, Naga society is built on a philosophy of collaborative efforts whereby increased effectiveness results when a group of people team up to work together to achieve a desired goal.[39]

Hard work is very important and they would depend on their traditional tools and labour to procure their sustenance. One can easily observe the traditional work culture among the Nagas in all the villages. Their day starts as early as six in the morning and lasts till three to four in the evening depending on the distance and time taken to reach home before dusk. As noted in the sample villages, the institution of both peer group and work gang has ceased in its functioning as well as importance. The traditional peer group functioning in meeting the labour demand during the peak season of cultivation where household needs to catch up time as well as increase efficiency through traditional tools is meet today through different labour organisation.

Tsiepama village (Dimapur) is the only village where the free labour exchange is still practical to the village farming community. Workgroups ranging from 50 and below consisting of both gender and different ages is easily formed during the time of felling, tilling, puddling, transplanting and harvesting of paddy in both jhum and terrace cultivation to meet the individual household labour demand through rotational basis. As this system is free and cooperative, there is no case of hiring of labour or spending of money to work their field.

[39] V.Nienu (2015), *Naga Cultural Milieu- An adaptation to mountain ecosystem*,p.126

Similar practices are found in all the villages as well though the number may range from as less as 5 to 20. Women as neighbours or friends can easily form working groups and help each other to finish the works flawlessly and in time. One such captivating group work activity in jhum was observed in Sumi Setsü village, where as many as 20 both male and female had the whole work done in one day with ease (Plate 4.1). On the high slope jhum land, well-burnt and bare man while broadcasting the rice dibbled the ground while the women followed them suit breaking the earth and leveled them, covering the seeds. The difference is that though community work together, there exist a mixture of both free labour exchange and daily wage earners.

Plate 4.1. Community participating in sowing (Sumi Setsü).

4.2. Role of Village Council and Bio-Resource Management

Naga village administration was present since the inception of a village. Every village had its own sovereign domain within its territory, where village administration was supreme over social, cultural and economy of the people. Village Development Board

came as an extension of the new administration in the post-statehood. In fact Village Council overlaps the age-old traditional system of village governance.

The traditional belief system with the associated rituals that were the central figure of the Nagas, pertaining to land management and resource creation faced quick disintegration and lost its importance as well as practice. The Village Council, the apex regulatory body in the village created under the Nagaland Village and Area Council Act, 1978, soon took up the responsibility of maintaining law and order as well as resource management within the village. However, the functioning of the Village Council is within the ambit of traditional laws and regulation of the respective village or tribe.

The foremost role of Village Council is regulating the affairs of the village sovereignty and development as a community. The village court was and is the apex body to settle land disputes between the two villages. Inter-village land disputes is usually settled by the village court based on the customary law and in case if the two villages are unable to settle the dispute, the third village is invited to settle the case. [40]

Field survey, however, depicts the different degree of control and involvement of Village Council in decision-making and resource creation. In Gaili village under Peren district majority of the jhum land and forest belong to the Village Council. This is the only village of the twenty-two villages visited where Village Council has the ultimate power over land ownership and decision making regarding the disposition and usufruct to individuals. The role of Village Council in jhum cultivation relating to land selection and assigning a particular date for events in jhumimg has drastically decreased in all the villages. The main factor behind this change is that traditional jhum as a collective work has changed to just a few individuals.

[40]A. Nshoga (2009), *Traditional Naga Village System and Its Transformation*,p.62

This is not an exception. As narrated by the Benreu village, Village Council executives, it is more than 20 years that the Village Council has successfully banned the practice of jhum cultivation in the village. Therefore, the role of Village Council depends on the community and the priority they set on their resource.

On the other hand, Village Councils has taken great effort in the institutionalisation of village community reserve forest in almost all the villages as well as maintaining it. It is also the working body in creating and developing eco-tourism board in coordination with the State Government. One common notable role of Village Councils is the strict ban on hunting in all the villages with no exception for any reason or individuals.

It is true that the Village Council as a statutory body for decentralization of developmental responsibilities formulates development priorities for the village, prepares action plans and executes them.

4.3. State Government and Bio-resource management

Since the community in the state owns the majority of the land, the Government has limited control over the land ownership rights and its resources. In its own capacity, the state government has continuously worked towards the development of land and its resources. A provision has been inserted in the Directive Principles of State Policy (Article 48-A), which declares that "the state shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country".[41]

The Nagaland Forest Act, 1968 is the main Act, which regulates and ensures that the forest resources are conserved in a judicious manner and its exploitation does not have any adverse impact on the ecosystem and environment of the state. Similar is the Forest (Conservation) Act, 1980 and Nagaland Tree Felling Regulation Rules, 2002, which

[41] Soyhunlo Sebu (2013),*Geography of Nagaland*,p.72

directs the state to implement rules and regulation in controlling the forest ecosystem and flora management.

As an important and necessary measure in forest conservation, afforestation in jhum land and permanent cultivation is encouraged as well as propagated in farming for years.

While on the other hand the Wildlife (Protection) Act, 1972(As Amended in 2002) is a pro-active participation between the Government and the community for the conservation of wildlife and specified endangered species all over the state. In order to conserve wildlife, the state manages four Protected Areas with an area of 24121 ha, namely, Intangki National Park, Fakim Wildlife Sanctuary, Singphan Wildlife Sanctuary and Puliebadze Wildlife Sanctuary.

Over the years, the traditionally preserved 'community forests' are getting attention at state level and significance to the world as a plausible participation of the community in the conservation of biodiversity-rich ecosystem. However, beyond this acknowledgment, there is lack of investment and long-term conservation framework incorporating all the community forest as well as the state ecosystem consideration its geographical location in the biodiversity hotspot region of the world.

The successful efforts in providing a safe passage for Amur Falcons in 2013 have placed Nagaland on the world map as one of the best Community-based Conservation models.[42] It represents a paradigm shift in conservation both the community as a concerned citizen and Government departments coming and working together. The efforts of Communities that have taken up conservation by way of self-imposed restrictions have shown tangible and exemplary success towards in biodiversity

[42] Annual Administration Report 2013-14 (2014), *Department of Forests, Ecology, Environment and Wildlife*,p.42

conservation. Recognising the importance as well as, success of such conservations all over the state, projects and schemes are directed towards promoting and strengthening community conserved areas.

It is more necessary to emphasise that bio ecosystem cannot be isolated and expect to retain its diversity as well as flourish in nature. Forest ecosystem acts as biological corridors, which ensures the maintenance of biodiversity and ecological and evolutionary processes. By providing landscape connections between larger areas of habitat, corridors enable migration, colonisation and interbreeding of plants and animals.[43] Forest ecosystem also serves as the sole in situ gene bank for cultivars as well as the source for new cultivars in provision. As such, any conservation policy has to be in attuned with all these factors and not just to protect it from the human.

However, the present study in the sample villages has pointed out that there has not been any community-involve awareness programme on biodiversity resource or policy implication by the state and global intervention at the village community. Where factors as alien to Naga culture such as bio piracy and bioprospecting existence in our biodiversity ecosystem is highly neglected.

In pursuance of the treaty "Convention of Biological Diversity" Bio-diversity Act, 2002 in the state has link biological resource and knowledge associated with it to the community for both management and benefit sharing. It also shares the responsibility to regulate any illegal practices with bio-resource extraction and utilisation by any individual or organisation from within the community or by outside agent.

The formal Act has still no practical solution for sustainable management within our culture and traditional practice of common property both the seed and knowledge in agriculture as well as the forest bio resource unexplored and the ethno- bio resources

[43] Department of Environment and Conservation 2004, Wildlife Corridors

and the knowledge associated with it. Leaving wide-open scope for future benefit appropriation and ineffective policy to manage our resource both for the future generation as well for the environment.

4.4. Traditional Knowledge and Practices in Bio Resource Management

The economic development of a community among the Naga society is linked to their ability to manage their own resources. Traditional knowledge transforms biodiversity into bio resources and is apparent from the tiny detail of identifying a plant to its sustainability and function in the ecosystem. Traditional knowledge in the Naga culture includes the traditional ethics, values and social relation to all resources. It is truly a complex nature linking everything together and making their livelihood ecosystem one organic whole and not separate entities or activities. For instance, it is regarded unethical to harvest any wild flora or fauna for personal accumulation of wealth. All natural resources are highly regarded as spiritual, where pride and selfishness with one's wealth of resources and ability lead to scarcity and stagnant yield.

Their traditional knowledge about the farming ecosystem is tremendous. They focused on the locally organised form of food security, which was not embedded in any laws or formalised in written rules but was always context-specific and restricted to sustainability. Traditional knowledge practices in farming are information intensive and do include understanding the local biotic system. It is but the result of continues observation and direct interaction with nature and with one another. The traditional indigenous agriculture system was based on the use of heap manure, mixed cropping, specific crop rotation and well-adapted indigenous genotypes giving high productivity.

Organic manure-enriched soil fertility while mixed cropping allowed a variety of microbes to flourish in the rhizosphere of different plant species, thereby enhancing the natural fertility of the soil as well as helping pest control.

Tillage mixes air into the soil, which leads to a mineralization of the soil organic matter and increases fertility. In terrace rice cultivation tillage is considered as establishing the fertility of the field. The first tillage is carried in January-February while breaking the surface crusting helps in burying the stubble and controlling weeds. Here organic matters in the form of roots and residues are added, soil macro and micro fauna and flora are re-established resulting in better soil fertility. Then in the month of March-April, it is a priority to break down the clods to increase the activity of the soil as stated by the farmers literally meaning the growth of fauna and loosening the crust or soil particles. Then tillage with water is followed in May-June, pudding minimizes seepage, loss and percolation rate by destroying the soil structure. Fine soil particles are dispersed as the clods are destroyed and fill soil cracks and macropores. It is also done to level the soil surface, to control weeds, and to mix residual plants and manure into the soil.

In the case of jhumming, farmers all over the state to control soil or fertility erosion/loss down the slope practice conventional tillage or zero tillage. Where contour bunding is built to hold the soil particles. And the rotation of natural vegetation soil fertility regenerative advantage and process is adopted to procure yield of multiple crops.

In the permanent cultivation of terrace and kitchen garden, even the pest system is first a part of the cropping system as a whole and then a part of the agro-ecosystem. Weeds are considered as the main source of manure for the field and supplements for the growth of crops. Conversion of weeds into manure depends on the type of weed, some weeds can only decompose under complete emersion of water, some through sunlight or

dehydration and some fire. It is very specific for every weed and farmers maintain specific time in their calendar to restrain the weeds. For common pest of birds, rats and insects, the most practical and effective methods of scaring with scarecrows, setting of traps, planting of repellent plants and clearing of the boundary of the field are practiced.

Alder based jhum cultivation and homestead gardening among the Angamis and Chakhesang tribes is a classic example of the traditional ecosyste- based approach to land management. The nitrogen-fixing module in alder roots not only stabilises the loss of fertility, pollarding of alder trees is also a good source of firewood for the owners. For instance, in Phek town, farmers who built terrace kitchen garden on the slopes of Glory peak (2600 meter), preserve natural alder vegetation as a part of their farming system (Plate 4.2). This sustainable and productive system has the potential to be adopted on a wider scale.

On the slopes maize, cabbage, peas, local garlic, ginger, beans as well as creeper crops such as cucumber, pumpkin is well suited and meet not only the household food requirement but is also the source marketable produce.

Plate 4.2. Alder based farming in Phek Town.

Kidima a southern Angami village in Kohima district is situated in the vegetative zone of natural oak and pine which according to the villagers is considered unsuitable for productive jhumming. Permanent terrace cultivation of both dry and wet are the two agriculture system practiced in the village so far.

Here the concern is the unique utilisation and perfection of the finely built terrace fields to not only cultivates the summer rice but the winter crops on the same plot as well.

One unique traditional management practice that has stood the test of times in meeting the household food requirement of the whole village is *'A-azou'*. This 'land of vegetables' is situated along the homestead, cultivated for winter crops of potato, spring onion, cabbage, peas, garlic and in summer, rice in the fine engineered built terraced fields along the slope. It is as old as the village, however, the production has not decreased instead its value and asset has much improved for the villagers in both food security and income generation. The question is without any input of fertiliser,

irrigation, and labour as often follows modern agriculture, the continues harvesting of the land has not exhausted the fertility of the field but remains healthy and rejuvenated. The plausible reason is the practice of household production of manure from the local availability of cow dung in a dugout structure of approximately one meter in breadth to two meters in length with one meter deep. Where they collect the raw material and gives sufficient time to compose and then dry it thoroughly in the open. (Plate 4.3)

Plate 4.3. Traditional household manure (Kidima village)

This is not the only reason but the detailed working knowledge of preserving the seeds and the exquisite preparation of soil has equal significance for every crop. This village is most famous for spring onion production. As a monocropping, the surplus yield brings an easy fetch of 10,000 - 20,000. Stressing the support of *a-azou* in livelihood, a widow notes that besides meeting the family food requirement the annual income of

rupees 50,000 - 60,000 from selling the produce sees her through the year. Kohima and Moa gate are the two markets where the produced are sold.

Lazami village in Zunheboto district practices two types of jhum cultivation, the first system is the normal jhuming, which according to the farmers is the land with thin and loose soil. The second is the jhum land with deep and firm soil, which is identified by thatch and grass vegetation. In such type of soil, the farmers can harvest the same amount of rice for two consecutive years, and the soil can be cultivated for more than two years. The villagers enthusiastically promote the land yield and the jhum system, where out of 650 farmers, 600 of the families are self-sufficient in their stable food for the whole year round. This does not suggest some unnatural growth, except the farmer's industrious nature and knowledge in managing the resource.

There has been much documentation of the acclaimed crop diversity in a farmer's field of the Nagas. No matter the size of the plot, it is always a well-arranged diverse cropping pattern where the food security of the household is of prime focus. Food security for the people is not only about surplus production it is also the continuation of the field as the in situ repositories of generation crop attributes. Fieldwork has imposed that due to their attachment to crops as an extension of their livelihood Nagas often find ways to preserve their crops even if they leave the agriculture system. Benreu is one village that it is more than 10 years since the community ban on practicing jhum cultivation. The traditional crops of jobs tear and millet mostly found in rotational cropping system is successfully propagated in the terrace fields as boundary crops. Which otherwise could be easily lost from the field and the culture of the community.

Their inquisitive knowledge about the life cycle of traditional crops supports their innate ability to harvest the optimum yield of the environment and labour. It does not make sense as to how much acreage a crop is been invested. The focus for them as in

mixed cropping is the number of a particular crop planted for instance they will count the number of cucumber, chilli, pumpkin, tomato etc and easily assess the amount that will be harvested and meet the need of the diet according to the consumption pattern. Here the focus is on every particular plant, for which while transplanting chilli from the nursery bed or thinning the sprouting seedlings the tip of the plant is cut off to propagate branching and thus more fruit. In Tsiepama village, a farmer counts the number of Naga King chili planted and accordingly estimate the yield, where one Naga King chilli plant bears 100 fruits and more. Normally the yield approximately ranges from 20-30 per tree. One distinct technology practiced here is the planting of Naga King chili in the bamboo groves for the traditional reason that the soil of bamboo groves are good reservoirs of water and hence retains moisture for the growing season. Another factor is the bending of the single tree when young that encourages the sprouting of new shoots from the nodes and thus more branches, which more or less bear fruits like individual plants. Naga king chili is commonly cultivated in jhum field and is one important source of money from the traditional subsistence cropping.

Microclimate for farmers is an essential knowledge that is taken into account for sowing and harvesting of crops. The kharif crops are sowed into the well-prepared soil after the early winter rain in the month of December and January. Seedlings of crops like maize, peas, and beans are easily injured by drought condition and its growth slowed, for this reason, the seeds are soaked in water for a week or more before sowing. Harvesting of chili when it is raining causes moisture to seep into the plant and rot as such plucking of chili is avoided when it rains. Another caution is the harvesting of rice during '*sezo*' when it rains continually correlated with the blooming of a creeper *'garibou'*.

Selections of a seed of a particular crop are decided and choose from the standing plant itself, which cannot be random or done by anyone. Women keenly observe the growth

and health of the whole plant and not the fruit or seed itself. Selection of pure race is common in rice cultivation, and new race has been produced where a hybrid of glutinous and normal rice is planted adjacent. Most developed and matured seeds are selected as well as the whole plant is kept aside solely for seed. Equally efficient is the preservation of seed until the next sowing time. Proper drying by the sun and preservation above the hearth in appropriate bamboo baskets or open hanging is done after harvesting. The skill in selection and preservation of seed is an innate ability of women often appraised for management. Harvested rice winnowed and dried under the sun is stored in granaries of a bamboo basket, bushel and granary house. To facilitate aeration of grains stored in baskets, a bamboo split into a funnel shape or hole allows air to enter the basket. There is also a case of smoking the basket in the open area with wormwood, an aromatic shrub to prevent from infestation. Personal interview of a farmer in Tsüpfüme village has revealed that in bushels varieties of paddy 30, 50, and 70 years old has been preserved and is still consumable. (Plate 4.4)

Plate 4.4. Household paddy stored in bushels (Tsüpfüme village)

4.5. Community Management of Forest Bio Resource

If a person were to narrate the value of the forest, from a management perspective, the value of forest as the source of water and the storehouse of life would surpass any other factor. Management of forest is based on the ecosystem approach, where every element or part of the forest is considered as an organic whole. Contemporary conservation measures are but an extension of the traditional ethics that has ruled management of forest among the Nagas.

Benreu, Kigwema and Wokha village are the three villages thriving on the mountain ecosystem of the prominent Mount Pauna, Mount Japfü and Mount Tiyi. Beautifully expressed as the source of all life and wealth of their livelihood, conservation of the

ecosystem is more of affection than duty for the people. These mountain peaks are intact virgin forest, a direct evidence and assertion of nature as the provider and protector of their livelihood.

Conservation of Mount Pauna started in the 1980's when logging in the individual forest started to make their land bare and rob them of their resources. The Plate 4.5 shows the location of Mount Pauna right above the homestead/village of a vibrant human activity with the conserved and protected forest side by side. The response or effect experienced was the decrease in summer rain and its direct consequence for the community household water. It also reflected in the sudden decrease of tragopan population, where the sight of tragopan became rarer near the homestead. Conservation in the community reserve includes the ban on collecting of herbs for commercial purpose and extraction of any firewood and fauna. Their sincere effort has attracted many Government Department for creating and developing an eco-tourism economy in the district. Benreu village, community conserve ecosystem with an area of 8 sq km has attracted both local and national tourist pool for trekking and bird watching. More than 160 varieties of birds and 50-60 population/numbers of tragopan has been spotted.

Plate 4.5. Homestead beneath the CRF (Benreu village)

Benreu village has taking management of forest to a completely new level in the state. The village council in the 1990s ban the practice of jhum cultivation in the village and this rule is still followed as of 2016. Management of forest is well planned and demarcated, as well as practical/accommodative for the economic activities of the society. On the one hand selling of firewood even from the individual forest have been prohibited but on the other four areas are reserved for rearing individual wild mithun (*Bos frontalis*) which is the major source of income for some household.

Though jhum has been practiced for generations, personal interview in Hükphang village in Longleng district has divulged the existence of dense intact forest named as 'Yungsham' 'Phangnyu' 'Ophed' 'Nyanyal' 'Owpha' and 'Yangkshang' by the community.

Table 4.1. Community Conserve Forest

SL. No	Name of the village	Purpose	Status	Aprox.area(Hectare) (2012-2016)
1	Aotsakilimi	Wildlife	Intact	62
2	Angangba	Wildlife	Intact	870
3	Benreu	Ecosystem	Intact	800
4	Bhumnyu	Wildlife	Intact	100
5	Gaili	Wildlife	Recovered	200
6	Hükphang	Wildlife	Intact	1000
7	Kigwema	Ecosystem	Intact	811
8	Lazami	Wildlife	Intact	1600
9	Sangratsü	Wildlife	Intact	870
10	Tsiepama	Wildlife	Recovered	30
11	Tsüpfüme	Wildlife	Intact	700
12	Sangnyu	Wildlife	Intact	300
13	Wokha	Ecosystem	Intact	323

Of the 22 villages surveyed 13 villages have community reserved forest ranging from as old as the village as new as 5 years, in which eleven villages are intact forest and two are recovered (Table 4.1). Forest with intact vegetation has always played a social and cultural significance and relationship to the community. In Gaili village, when the past village settlement was shifted down to the foothill for easy access to development, the old settlement became a forest which is the present community reserve forest. Similarly, in Tsiepama village though small, a particular clan has demarcated their clan land as community reserve forest for its biodiversity and landscape.

Firewood is a necessity for every family to cook and keep their house warm throughout the year. They depended on the forest for their annual needs both living and dead wood collected annually personally. Two system of harvesting firewood is observed among the Nagas. The first is jhum cultivation; the clearing of trees provides the annual demand of household fuelwood. For faster regeneration of vegetation, pollarding of trees especially alder trees are common in jhum field. The other is private homestead forest, reserved and managed for fuelwood where selective cutting of trees is practiced. Trees from the natural forest are managed through the cutting of stunted growth, matured, even young trees of inferior fuel wood and pollarding of oak, alder etc. At an average, for a family use, three to four five to six feet of average quality of the wood is used. This varies according to the size of the family and in the present use of LPG. The household fuelwood requirement in the sample villages is met within the village, both from individual and clan forestland.

Discussion through fieldwork has strongly established that the freedom of hunting by individuals on forest land whether private or community is officially forbidding the year-round all over Nagaland. Hunting is opened for two months or one month between November to January in all the villages. Illegal hunting when caught is heavily fined, firearms are confiscated and each individual participating has to pay an amount of Rs10,000- Rs5000 in different villages. One such incidence is recorded in Benreu village where recently a group of men was fined with Rs 10,000 when caught with arms by the Youth guards inside the community conserve the forest.

4.5.a. Non Wood Forest Products and Food Security

In brief, NWFPs (Non Wood Forest Products) includes all tangible outputs from forests or from other wooded land with the exception of timber, forest services and forest

benefits.[44] The NWFP thus include output like medicinal plants, fibres, gums, resins, leaves, mushrooms, fruits, seeds, flowers, dyes, mammals, birds, reptiles, fishes etc.

The original consumers of NWFPs are the forest-dwelling population, who were involved in the mass non-destructive harvesting of annually renewable plant parts, animals, and insects. The sense of collective ownership and strong customary laws has managed the resource on sustainable basis till recently. The marketization of NWFPs has enabled the original user population to harvest the resource for personal monetary gain. In other words, the center of consumption has moved from the local village to meet the demand of immediate and distant urban consumers. The growing market demand for indigenous food has increased the trade in NWFPs.

However, dependence on NWFPs as a full-time source of food and the household requirement is found to have drastically decreased in the community but as a buffer to see them through times of hardship or to gain additional income for special need has increased. A user group consisting of women is identifiable in all villages, who has retained the skill and knowledge in harvesting particular resources.

Commercialization of NWFPs has also brought about a change in the collection strategy. The incentive to augment his labour is high and two-four items are collected together for maximum possible monetary gain. NWFP which is considered as a low impact forest use compatible with forest conservation is today highly related to market demand and supply. Making the rich resource vulnerable at the demand of the market and on the hands of a few collectors.

As stated above, the cultural practice of mobilising wild resources to supplement the household diet has become rarer among the community. Yet its importance has increased for some individuals and household sustainability. Mobilisation of NWFP in

[44] D.D.Tewari (2015), *Managing Non Timber Forest Products(NTFP) as an economic resource*,p.2

the sample villages clearly indicates the role and participation of women in both harvesting and selling of the produce. Wild vegetables, fish and crabs, are the most widely collected and sold along the highway market and in the urban centres. Collection of young bamboo shoot is also common and important, for both household consumption and market demand (Plate 4.6). Harvesting of the wild resource is time-bound because of their involvement in agricultural work and seasonal as well. Collection of vegetables by an individual includes not one or two but a combination of 5-6 varieties, to increase the quantity and variety and thus the profit, in exchange for their labour and time.

Plate 4.6. Important NWFP in market as local food item

Fishing in Community River is an important practice to supplement the protein diet but also earn money for farmers in Longmitra and Kiphire village. It is the only process of harvesting NWFP that is done by men folk.

Every household is found to depend on forest resources for building houses, firewood, food supplement either harvested or bought in some quantity or form. While 17.6 percent of the total sample are involved in harvesting NWFP from forest, rivers, and abandoned jhum field for sale in various amount. Though it is seasonal, the amount they receive ranges from Rs 5000 to 10,000 annually.

4.6. Agriculture Diversification

Decision-making is influenced by factors at local, regional, or global scale. Direct causes operating at the local level of individual, households or communities are in transition with greater force of indirect causes from the regional and even global levels in the Naga society. Indirect causes are therefore exogenous to the local communities managing land and are thus uncontrollable by these communities. It can be highlighted that internal consumption affects land less than external demand, so subsistence croplands consequently decrease while land under crops for markets increases with a parallel increase in agricultural intensity.

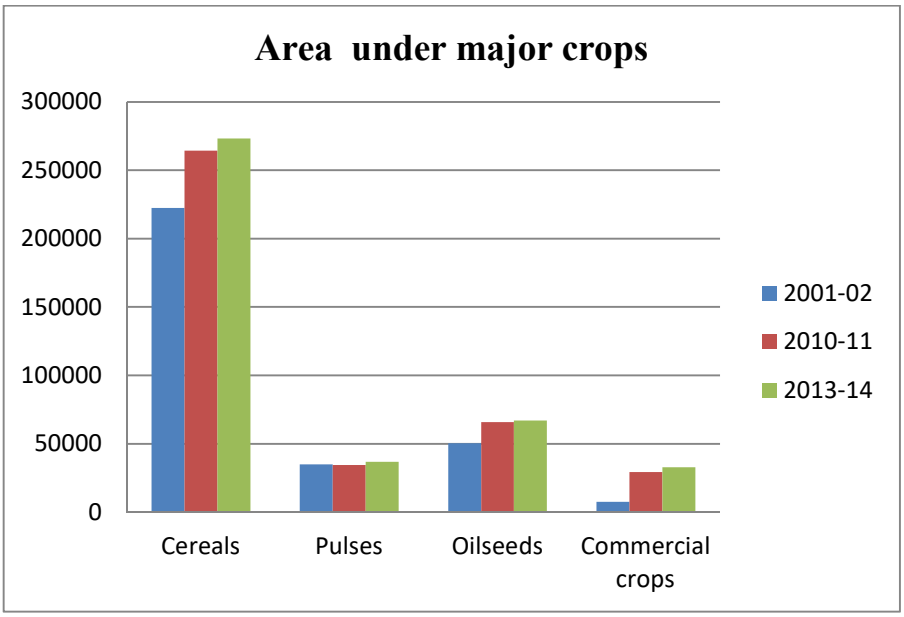
According to state records, the total area under agriculture in a given year accounts to 222,787 ha, which is 13.44 percent of the total land area. The net area under jhum cultivation in the year 1985-86 in the state was 99345 ha which increased from 78,000 ha (1995-96) to 86,000 ha (2000-01) and reached 93,000 ha in 2010-11. Similarly terrace cultivation showed a similar pattern from 58509 ha in 1985-86 to 62,000 (1995-96) and 64,200 (2000-01).

Rice as the staple food occupied more than 70 percent of the cultivated area. There has not been any drastic change in the cultivation system. However, there is a gradual shift in cropping pattern from traditional crops to commercial crops due to increase in population and improvement in the basic agricultural infrastructural facility. The analysis of annual growth rates of crops shows that cereal crop productivity during the

period 1980-81 to 2010-11 was about 0.9 percent whereas higher annual growth rates were observed in case of oilseeds (3.375), pulses (4.07) and commercial crops (12%). A gradual shift was also observed in the crops cultivated during the two cropping seasons of the year. In the past, cereals were main crops grown in kharif but gradually the trend has changed to other crops. Whereby pulses (3.36%) and oilseeds (2.80%) showed a high annual growth rate of crop productivity (1960-61 to 2010-11) nearing that of cereals (3.47%). Similarly, analysis of rabi crops shows a steady increase in the productivity of oilseeds, and variation in case of pulses, cereals, and commercial crops.

The area under major crops during the period 2001 to 2014 shows an increase in all the major crops (Fig 4.2). However, it is the area under commercial crops with shows a formidable increase from 2.42 percent of the total area from 2001 to 8.03 percent in 2014. Another increase is the area under oil seeds, which shows a percentage increase from 15.9 percent to 16.36 percent. The expansion of commercial crops has introduced new exotic plants/crops as well as market seeds into the field which today creates the loss of soil fertility and new weeds and also change the generation of fallow land with fewer trees and more shrubs and weeds which

Figure 4.2. Change in area under major crops in Nagaland



(Source: Statistical Handbook, 2014)

does affect the yield of the following year. As such, this cyclic process advances the loss of soil fertility. Another aspect is the practice of plantation and horticulture crops in the jhum fallow land. At present, horticulture that was considered a backyard activity by most farmers is getting a focused attention for agriculture development. For this reason, the jhum system exists with new crops and new technologies and are getting more oriented to high-value food commodities primarily to augment income rather than the traditional concept of risk management.

Agriculture diversification has increased its role as the pathway of agriculture development in the economy of the farmers. A household depending solely on agriculture has maximum diversification of both on the farm and off-farm activity to enhance and stabilise income as well meet food requirement. This, however, has always been within the boundary of household labour and land intensive cropping.

This implies that a household does not depend on one single activity or for that matter crop diversity in one activity alone. All the activities are equally important for their livelihood. Since 1990 agriculture in Nagaland has, experience like other states a significant change with diversification becoming the focus of growth and development. All farmers are incorporating new crops and reorienting their cropping pattern.

For instance, traditional farmers in all the districts practicing jhum crop diversification depended on jhum for their staple food (rice, maize) and all the leafy vegetables, spices, cucurbits, starch crops, oilseeds, cole and bulds. Backyard farming for meat and eggs, and kitchen garden for fruits mostly banana, plum, pears, peach, fig and winter crops like mustard leave, garlic, chow-chow, chilli, tomato, potato, beans etc. Recently, an addition homestead garden is gaining importance. Homestead garden is the commercial garden both practiced by jhum farmers and terrace cultivators.

Winter crops with short gestation period and land intensive crops have quickly emerged as the new commercial crop with great potential to the local farmers. Potato, cole crops, beans, local garlic, tomato, carrot and peas are the main crops grown in the homestead garden.

Backyard farming of poultry and piggery is growing to be a good stable source of income for farming household. Where an exchange is local and direct and there is no fuss about shelf life or transportation.

4.6.a. Crop Diversification in Nagaland

A Naga village is distinguished as an agricultural society with its subsistence nature lacking the feasibility of modern technology to irrigation and commercial activity. Under this appearance, agriculture has been undergoing rapid change in the traditional techniques of cultivation, the pursuit of agriculture as a way of life and its subsistence nature for commercial activity. Often a village may have the appearance of continuity, hiding the break from the past or it may have the appearance of change, disguising the fact of continuity. Interview in the different villages of the eleven districts proposes a progressive paradigm shift in the household and community participation in agriculture. Along with the growing complexity of labour division, the interests of a household's individual members are growing to be inconsistent in farming.

Agriculture system in Nagaland has encouraged crop diversity in the field and among the community. It is a matter of self-dependence and sufficiency in food for a household. Crop diversity is a rich array of varieties of one crop and different crops planted in explicit order and harvested throughout the year. Crop diversification is a traditional agricultural method to increase crop intensity, increase diversification of

agricultural production, enhance crop productivity and avoid risks and uncertainty of crop failure due to climatic and biological change.

For a Naga farmer crop diversification has always been a strategy, where his skills and labour is invested to procure not only his sustenance but security in food. Crop diversification studies in the different districts and villages visited shows a trend that all the diversifying farmers have added on one or the other crop in the crop combination that is more profitable in terms of per hectare net return in comparison to its competing crop that shows a declining trend in net return. Thus, farmers have been responding to the profitability signal and such a phenomenon is not exclusive to the process of diversification, but for most cropping pattern changes.

First, it is imperative to analyse the status of crop diversity in Nagaland state. For this very purpose, Crop Diversity Index of the eleven districts has been computed for the years 2008-09 and 2013-2014 (Table 4.2) using Gibb and Martin Crop Diversity Index formula.

Gibb & Martin CDI = $\mathbf{1- \sum x^2 \div (\sum)^2}$

Where **x**= percentage of cropped area occupied by each crop

If the index value goes towards one the diversification is relatively high and vice versa.

Table 4.2. District wise Crop Diversification Index in Nagaland

Sl.no	District	Gibb & Martin CDI (2008-2009)	Gibb & Martin CDI (2013-2014)
1	Dimapur	0.51	0.47
2	Kiphire	0.74	0.70
3	Kohima	0.84	0.75
4	Longleng	0.74	0.73
5	Mon	0.76	0.69
6	Mokokchung	0.69	0.68
7	Peren	0.67	0.69
8	Phek	0.77	0.75
9	Tuensang	0.74	0.76
10	Wokha	0.70	0.68
11	Zunheboto	0.75	0.73

Based on the diversification value, the districts have been grouped into very high, high, medium and low diversification levels (Table 4.3).

Both the tables itself shows a clear indication that crop diversity in the districts is dynamic where Kohima district had changed from the level of very high to medium. Except for Tuensang district, all the other districts have decreased in the CDI level, indicating the rise of intense competition among various grown crops for space in a given region.

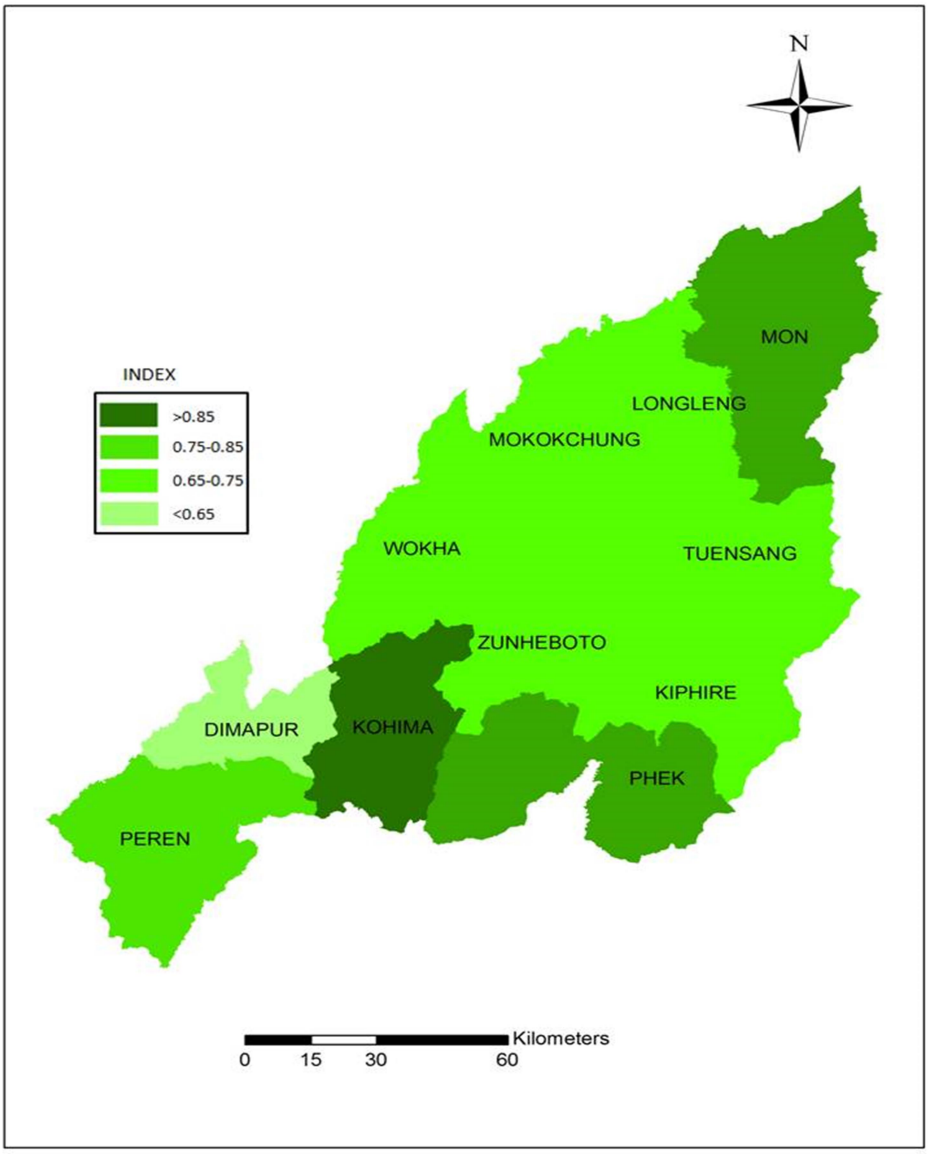
Table 4.3. Crop Diversification Index (Gibb & Martin Method)

Sl.no	Range of diversification	Category	2008-2009	2013-2014
1	Above 0.85	Very High	Kohima	
2	0.75-0.85	High	Phek, Mon	Tuensang
3	0.65-0.75	Medium	Kiphire, Peren, Longleng Mokokchung, Zunheboto, Tuensang, Wokha,	Kohima, Phek, Wokha, Kiphire,Longleng, Peren, Mokokchung, Zunheboto, Mon,
4	Below 0.65	Low	Dimapur	Dimapur

The introduction of horticulture and plantation crops is increasing and farmers are experimenting and changing the cropping pattern to suit their own needs. The changing crop diversification will be discussed in the following paragraph.

Introduction of new crops into the long practiced jhum system as well as the changing importance of one crop over the other for a farmer has become a part of the process of diversification. Diversification is not only the increase in number of crops cultivated in a year, it is also the appropriate utilisation of land to crops cultivated. Through diversification, farmers not only secure their food security but also create a surplus to exchange for commodities they desire.

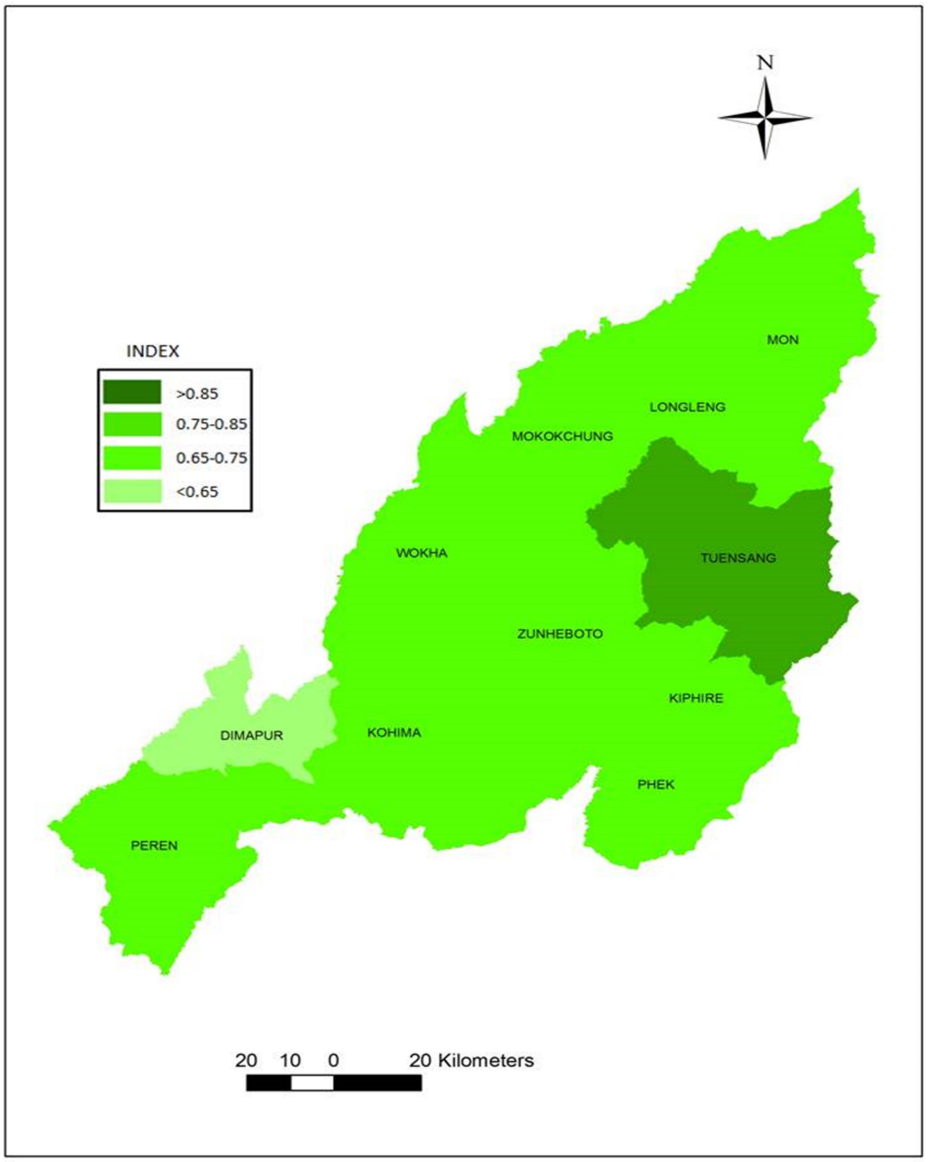
Figure 4.3. Crop Diversification, Nagaland (2008-2009)



Both the tables itself shows a clear indication that crop diversity in the districts is dynamic where Kohima district had changed from level of very high to medium. Except for Tuensang district, all the other districts have decreased in the CDI level, indicating the rise of intense competition among various grown crops for space in a given region.

The introduction of horticulture and plantation crops is increasing and farmers are experimenting and changing the cropping pattern to suit their own needs. The changing crop diversification will be discussed in the following paragraph.

Figure 4.4. Crop Diversification, Nagaland (2013-2014)



Introduction of new crops into the long practiced jhum system as well as the changing importance of one crop over the other for a farmer has become a part of the process of diversification. Diversification is not only the increase in a number of crops cultivated in a year, it is also the appropriate utilisation of land to crops cultivated. Through diversification, farmers not only secure their food security but also create surplus to exchange for commodities they desire.

In 2013-2014 within a period of five years, (Fig.4.4) crop diversity has decreased all over the state where Kohima district shows a drastic change from very high to medium category. This change as represented in Chapter 2, was also found in Kidima and Kigwema village under Kohima district where the practice of jhum is nil or non-exixtent among the farmers as such crop diversity is lesser compared to the past. Jhum crop diversity especially that of jobs tear, millet, jhum paddy and sorghum are becoming lesser, whereas, the other jhum crops are easily added in kitchen garden and homestaed garden. As such, the abandoning of jhum cultivation in Kohima district has resulted in the decrease in its crop diversity.

A farmer or village only follows a new crop diversification when it is proved favourable to the climate and soil as well as the agriculture system of the place. The analysis reveals that crop choice and crop diversification decision-making is more based on the agro-climatic favourable than their profit maximisation objectives.

The exceptional increase in the Crop Diversity Index in Tuensang district is reflected in Angangba village, where farmers cultivated maize and french beans as the major crop in the jhum land. As observed by the farmers, they expressed the rise in temperature have increased the rice diversity in the jhum land. Gradually, the famous crop combination of maize and french beans have increased to cole crops and carrots, peas etc. The jhum land cultivated annually has not increased but the orientation of crop intensity has increased agriculture production. Diversification in favour of high-value crops is largely determined by the risk-taking ability of the farmers. For a household depending solely on farm income is likely to be much more cautious of adopting innovations or changes within its production system compared to a household which only derives part of its income from farm activity.

4.7. Crop Concentration

Crop diversification also brings to it, crop concentration as specialisation in high-value crops through monocropping. The concentration of a crop in an area depends largely on its terrain, rainfall, and pedagogical conditions. Most high-value crops in Nagaland are labour intensive, have low gestation periods and generate quick returns within the domestic market. Hence, they offer a perfect opportunity for farmers to utilize surplus labour and augment their income.

Crop concentration in the sample villages is highly invested in the homestead and the jhum fallow land where vegetables, plantation crops, and fruits have found to be favourable through permanent and semi-permanent farming system. Crop concentration has also been encouraged by non-cultivators who invest in building farming as a business venture.

In the sample villages though crop concentration of one or two in individual household is observed, in most household both traditional crop diversity and commercial mono cropping are practiced side to side. As such, commercial cropping is yet not truly techno-centric but is open.

Delineation of crop concentration region helps in ascertaining the areas where a particular crop grows well with minimum input and thus great significance for agricultural development and planning. The present analysis is based on Bhatia's formula

$$Cx=a/b \div a'/b'$$

Where a =area of particular crop in the unit area (District)

b= total cropped area in the unit area (District)

a'= area of particular crop in the region (State)

b'= total cropped area in the region (State)

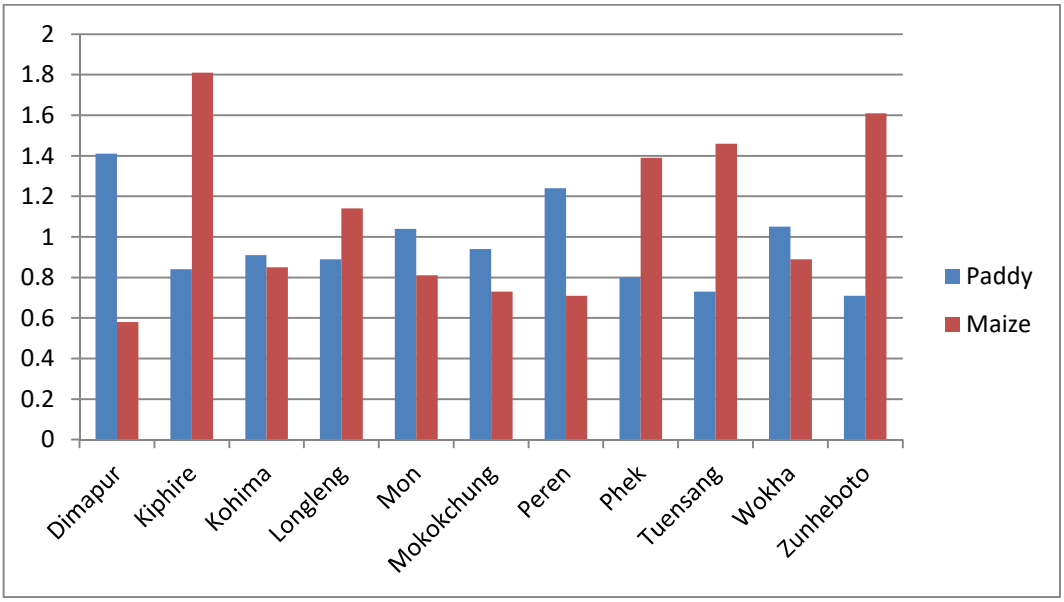
The higher index value represents high concentration and lower value represents low concentration. Using Bhatia's method, the crop concentration indices of all districts are calculated for major crops like paddy, maize, potato, kholar (French beans), soyabean, colocasia and tea. Table 4.4 represents the seven major crop indexes of the eleven districts.

Table 4.4. District Wise Crop Concentration Index

SL. NO	Name of the district	Paddy	Maize	Potato	Kholar	Soya bean	Colocasia	Tea
1	Dimapur	1.41	0.58	0.94	0	0.47	0.33	3.99
2	Kiphire	0.84	1.81	0.57	3.82	0.68	1.54	0.07
3	Kohima	0.91	0.85	4.47	0.57	1	1.98	1
4	Longleng	0.89	1.14	1.15	3.35	1.07	2.42	0
5	Mon	1.04	0.81	1.13	0.77	1.17	2.01	2.52
6	Mokokchung	0.94	0.73	2.19	1.05	0.55	1.32	2.25
7	Peren	1.24	0.71	0.66	0	0.65	0.84	0
8	Phek	0.80	1.39	3.25	0.39	0.88	1.42	1.70
9	Tuensang	0.73	1.46	2.17	4.36	0.81	1.1	3.55
10	Wokha	1.05	0.89	1.48	0.64	0.69	1.4	0.38
11	Zunheboto	0.71	1.61	0.53	0.63	3.24	1.05	0.20

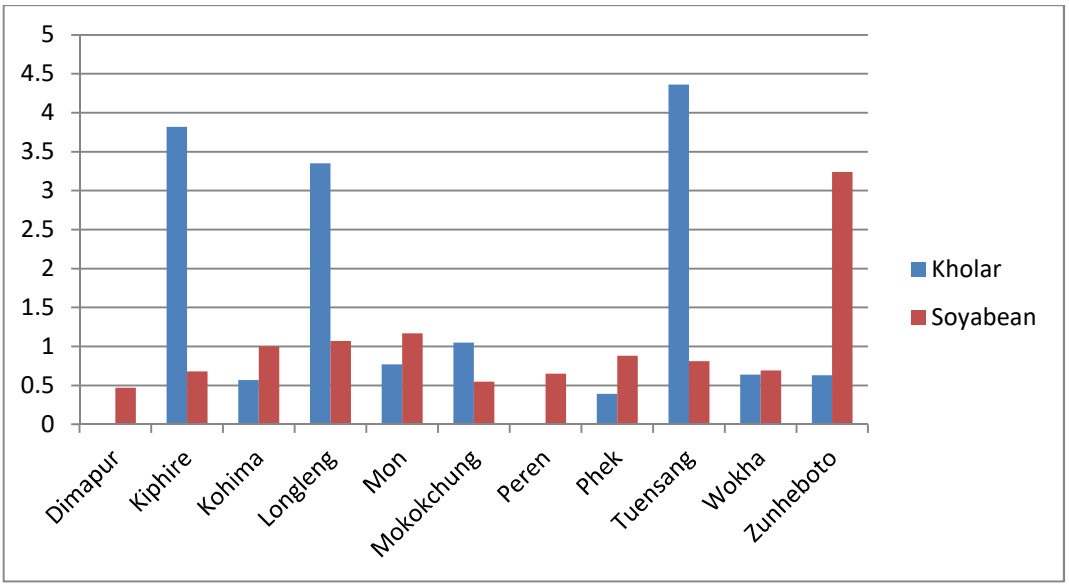
Rice the stable crop is highly concentrated in Dimapur, Peren and Mon districts whereas the concentration of maize is more than rice in Kiphire, Zunheboto, Tuensang, Phek and Longleng districts (Fig.4.5).

Figure 4.5. Crop concentration of Paddy and Maize



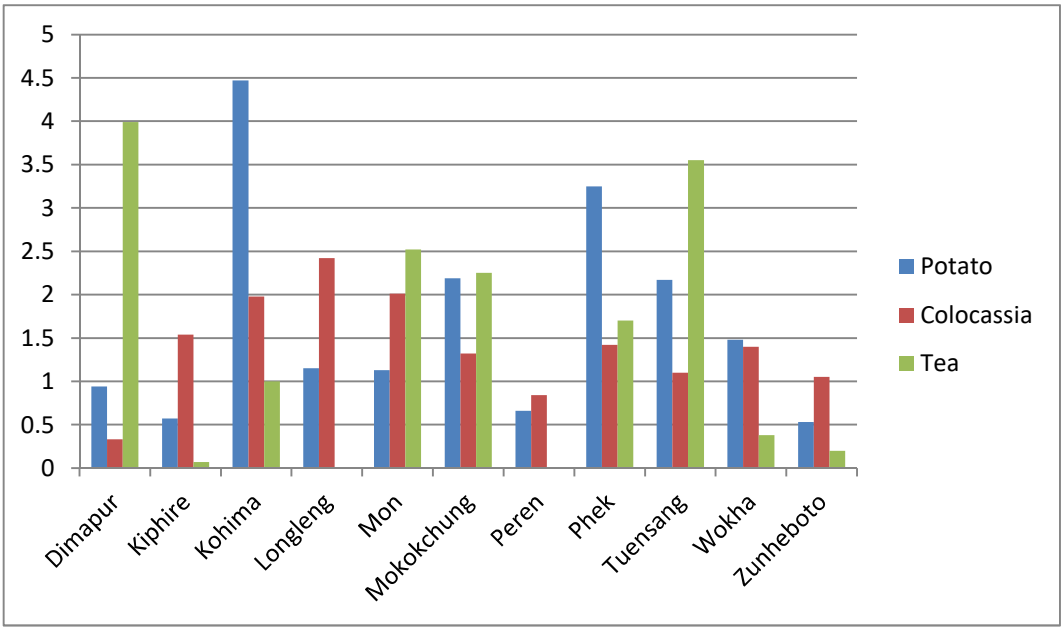
Very high concentration of kholar is found in Tuengsang, Longleng and Kiphire districts whereas it is nil in Peren and Dimapur district and low concentration is found is Kohima, Wokha, Zunheboto, Mokokchung, Mon and Phek districts. Similarly, Zunheboto district is the only district with a high concentration of soyabean, with a medium concentration in Kohima, Mon and Longleng districts with low concentration in the other seven districts. (Fig.4.6)

Figure 4.6. Crop Concentration of Kholar and Soyabean



In Figure 4.7, it clearly shows that potato as a cash crop finds very high concentration in the district of Kohima and Phek followed by Tuensang and Mokokchung. Medium concentration in Longleng, Mon and Wokha districts and low concentration in Dimapur, Kiphire, Peren and Zunheboto districts. Colocasia is an important crop with very high concentration in Longleng and Mon district. Medium concentration in all the other districts. Whereas Tea as a cash crop predominates in Dimapur, Mon, Mokokchung and Tuensang districts with very low importance in Longleng and Peren districts. Whereas medium concentration is found in other districts.

Figure 4.7. Crop Concentration of cash crop



There is a growing demand and market for organic produce, increasing the market value of traditional crops. This prospect for income generation has opened up a completely new vigour in farming. Farmers have reoriented there cropping system as well as accommodated new crops to meet the market demand.

Interaction with the farmers in all the villages has proposed the distinct shift from jhum cultivators to commercial farmers. According to the Naga concept, jhuming is always associated to cereals (rice and maize) as the main crop with all the multiple additional crops. And the farmers who still practice jhum, have their own value added crop which are traditional crops and of local market demand. French beans, colocasia, maize, ginger, cucumber, chili and raja chili are the major high value added traditional crops cultivated within the jhum rice cropping system. These crops were once additional crops, which have become the main source of money from jhum cultivation.

Traditional crop specialisation has recently converted jhum land to household mono copping of colocasia in Süngratsü, French beans in Longmitra village and patient fruit in Wokha village. Süngratsü is famous for *anüshi*, an Ao Naga speciality for its exquisite quality among the tribe. It has become the most important agricultural product in the village. Of the total farming household in the village, more than 50% of the agriculture household is involved in cultivating colocasia, the raw material for *anüshi.*

While interviewing the production of *anüshi* in the village among the women, a woman narrates the importance of this small-scale home production as the main source of income in the family. Through her skill and dedication, for the past fifteen years, she has been able to generate money and effort quality education for her children. As in 2014, she had one acre of land under colocasia, maize and cucumber, where she could make more than 400 kg of *anüshi* earning Rs 1, 20,000 annually and 20,000 from sale of vegetables.

In Longmitra village of Kipheri district, French beans, maize, and soya bean are the three major crops for Atsaba, a 48-year-old farmer who like many farmers in the area do not cultivate rice. He was able to produce French beans (130 tins), maize (120 tins), and soya bean (80 tins) procuring an income of 1, 00,000 annually in 2015.

Large-scale monocropping of commercial crops like potato, cabbage, tomato, kiwi, cardamom, and tea are the most favoured and considered as a progressive development of agriculture both in the village and the state as well. These crops are intended to meet the growing market potential of domestic produce, as the diet expands with increasing purchasing power and health consciousness. Monocropping of commercial crops has become the key to survive the hard labour low money income of agriculture and drive the rural farmers to economic development.

4.9. Emerging Trend of Bio Resource Management

Twenty-first century bio-resource management in Nagaland faces both an opportunity and a threat. On the one hand as the backbone of the community, it is widely counted on and expected to deliver both sustainable development and prosperous community. On the other hand, it must supervise the constant conflict between traditional ethics and modern value of resources, and between traditional and modern contemporary developmental goals.

Table 4.5. Representation of two farming characters

Traditional farming	Commercial farming
Food security centred	Market or monetary centred
Self dependence	Market dependence
Traditional method	Modern technologies merged with
Preservation of agro-biodiversity	traditional practices
Community sharing	Alienation of traditional-agro-diversity
Ecosystem based approach	Individual accumulation
Conserve Ecosystem	Degradable impact on both ecosystem
	Technocentric and Open-application

The above table is a simple representation of traditional and modern management practices of agriculture resource and its impact on livelihood resources.

The transition to modern agriculture as the forefront of agriculture resource management and development has seen the greatest threat to a traditional resource in the community. Commercial farming has not only ushered the extinction of agro-biodiversity in the individual household it has also extinguished the practice of traditional knowledge. Traditional practices accumulated and perfected through time and situation has successfully sustained not only the resources but also the base. If the system is to be replaced or in any case reduced in its importance, there lies a threat not only to our resource but the whole ecosystem as well. The real danger lies in the risk that one takes to commercial farming in exchange for our ability and skill to till the land which is a tiller's greatest wealth.

The loss of traditional farming also means the loss of our culture in resource management. Where community farming and community sharing will cease and there will be an age gap in transferring of TEK to the next generation. It does make our agriculture community lifeless when we consider it robbed of all the innate traditional and cultural aspect.

For it is in open view that in commercial farming one has to depend on the market for seeds to saw, fertilisers to make it grow and chemicals to protect it and then the market to sell our produce. In all this process of production, there is no scope for self-dependence in livelihood security.

Commercial farming as in monocropping has no interest in diversity. If a year practice of monocropping has to be at the expense of 50-60 crops and its varieties for an individual farmer. The loss that can be emancipated for a community is immense and horrendous for future livelihood and food security.

Commercial farming has not only initiated the breakdown of community participation in agriculture and thus its ability to maintain mutual growth. It has been the fastest engine for the smooth propagation of individualism in the community. Individual accumulation of land for plantation crops in community land is a recent development of farming mostly prevalent in the frontier lands and border areas in the valleys. Sadly, it has created an open market for transfer of land rights to non-residents of that village.

Commercial farming in conflict with traditional farming has also brought to the farmer's door the challenge for soil fertility regeneration in wet terrace cultivation. As narrated by farmers who employ sharecroppers in wet terrace cultivation in the plain area of Dimapur, Peren and Mon districts, the annual excessive use of fertilisers has made the soil chemical dependent. Whereby the employee's only goal is maximum produce,

continues to abuse the soil with chemicals in the knowledge of the owner. Also called as the rice bowl of Nagaland the valley of Dimapur district is known to employ maximum sharecroppers, where landowners are not directly involved in their field and have no control over the quality of the field.

The use of common salt (sodium chloride) as a weedicide is found to be beneficial and highly practiced in the districts of Mokokchung, Wokha, Longleng and Zunheboto where jhuming is extensive. It is believed to have started from Ungma village, Mokokchung in the 1990's. Salt use is found to decrease not only the workload but suffice the labour demand. The dramatic increase in yield of rice in the jhum fields where salt is used also caused the rapid adaptation of the method into their agriculture system.

Kiralo a 66-year-old woman from Wokha village, when asked about the effect of salt on the yield replies with certainty that though it increases the yield of rice, all the other vegetables are less productive.

The soil is dibbled for rice in the month of March, and salt is applied two-three times in the month of April, August, and September for weed control. Continues use of salt for nearly 20 years has seriously leached the top soil. It not only kills the weeds but also the tree saplings and does kill the vegetative recovering system. Hence, the result is compact/ hard soil and degradation of the natural ecosystem. This is the most challenging indication of decrease in household labour participation and its impact on the resource.

Human by nature and process of development are evolving several strategies in utilising and management of both individual and community land. However, this process and objectives are not attuning to the traditional community economy, which is sufficient

and exclusive. It also has the tendency and power to alienate the people from their culture, their customary laws, where collective rights and community economy are superseded by the individual accumulation of land and wealth. Leasing of land and sharecropping as discussed benefits more the labourers and businessperson than the landowners. These are determining the value of land to the people and the process to attain the resources by individuals. Tea plantation in Tizit area and wet rice cultivation in Dimapur, situated in the urban center of the foothill valley of the state are the two most prominent representation of alienation from cultural practice of farming to mere landholders. Leasing of land for commercial quarrying, logging and mining is also another sector that is recent yet a growing venture for the local businesspersons. This has not only affected the land value, it has caused vegetation cover destruction and increased soil erosion and created disharmony among the community. These economic ventures in terms of road connection and landfill, waste disposal and labour settlement becomes a source for diminishing the land biodiversity as well as an agent of environmental pollution.

The question arises if commercial farming is to be doted as the prodigy for economic development. What will become of our traditional farming, traditional knowledge, agro-biodiversity, community sharing and self-dependence in livelihood? The slow yet progressive alienation from our culture will become the end of all these resources. In continuing to streamlining every piece of cultivated land to market and profit lies the threat to our community lifeline. It creates unhealthy competition and breeds greediness/selfishness for personal welfare and accumulation.

Chapter 5

Impact of Bio Resource Management on Livelihood

Management of individually owned resources and their ability alone cannot define livelihood in a Naga community. More significant is the community resource confined in spatial village entities, the established source of human, social, and natural resources. It is not merely a means through which they can make a living; it also gives meaning to their world, and the capability to develop with mutual advantage. Every individual household had equal access rights to the resources and every individual shared equal obligation in conservation and sustainability of the resource.

Common Property Resource among the Naga society is regarded with more value than individual owned resources. For every individual household, the notion of the resource as goods and its utilisation has always been within the parameter of community and environment sustainability. The respect they possess towards resources as their sustenance has made them hard workers and efficient.

Change is inevitable in human society. Though the demanding adaptation of both internal and external influence for growth towards modernity has brought new impact on both the resource and livelihood. It is too early to conclude, as an adaptation of modern ideal does not necessarily mean that prosperity has increased. It is just the beginning.

Livelihood activities are not neutral but engender processes of inclusion and exclusion. Even in a community-based society, the introduction of new opportunities and policies has made exclusion a reality whether intentional or unintentional. When the emerging models prioritise one resource over the other, and favour one household over the other. The impact is equal. The loss of bio-resource or mismanagement is the loss of livelihood sustainability.

The priority in decision making with livelihood pathways supported through an iterative procedure in which goals, preferences, resources, and means is constantly reassessed in new unstable conditions is decreasing. It is less self-tested and more of a rapid expedition in favour of visible prosperity. With the increase in the ability and opportunity to pursue different livelihood strategies, the relationship/dependence of bio-resource and livelihood in the community has become more dynamic and crucial.

When the emerging bio-resource management strategies focus more on building independent household than the community, it has intensified individual control and ability to procure advantage through resource exploitation as a transient to economic prosperity. Introducing the power of individuals in resource management, decision-making and the consequent decomposition of community livelihood.

Livelihood dependence on bio-resource has become more diverse and dynamic, as gradually once exclusive village communities open up to the monetary economy and individuals embrace new opportunities for growth. Reorienting the cultivated land to stimulate money economy and to the extent of replacing the abundant traditional crops without measure for conservation. The impact of bio-resource management has become more crucial than ever for sustainable livelihood.

Women and their role, as well as their responsibility in nurturing bio-resource for livelihood are receiving increased recognition both at the international and national level of planners and academicians. Women in Naga society has played an equal role in managing and decision making with regard to resource creation and livelihood sustainability. The impact of bio-resource management on livelihood will be incomplete if women and their participation are not considered. As bio-resource management is becoming the domain of women's life in Naga society.

5.1. Bio Resource and Livelihood

Livelihood has always been closely associated with the right to access and participate in resource creation. Access to a resource in a community-based resource management for an individual household in fulfilling their sustenance as well as aspiration is of prime responsibility for the community over the years. Community sharing of land, labour, skills, knowledge, and seeds, as well as support or mutual assistance in agriculture management on both individual and community land, has been the backbone of livelihood in the village.

Livelihood in a community is well integrated with common resource, on which individual livelihood sustains itself through equal usufruct rights as co-owners. Common property resource is considered people-centred resources with mobilisation at zero prices. Everyone in the community can take as much of the resources without having any price to pay for the resources used.

The principle of equity in resource distribution and mobilisation has provided every household with equal opportunity and resource for livelihood development. Livelihood in the Naga society is homogenous with no subordination, landlessness or begging. Beyond maintaining close ties with blood affinities into clans(khel), Nagas are not segmented or segregated into special interest groups, but live a well-organised, society, independent and self-sufficient, providing for all of the activities and needs of its members.[45] Prosperity or food security depended on their sincerity and traditional knowledge associated with the environment. In the traditional society, poor or weak household were those of widows, widowers, elders, and orphans, who lack labour to till the land for sufficient food. However, today's reality is that not every Naga individual or household is a cultivator.

[45] V. Nienu (2015), *Naga Cultural Milieu-An Adaptation to Mountain Ecosystem*,p.221

In the short advancement of modern education and communication, the growth in the economy has created an emergence of new social classes, haves, and have-not, educated and uneducated, agriculturalist and commercials, government service holders and contractors, village society and urban society. This has created polarity and exclusion in livelihood development in the community society. Though dynamic and complex, livelihood and common resource face new challenges and prospect. How advance or developed a contemporary livelihood resource mobilisation it may be for a person or within a community, it may not be the same for other livelihoods or may not benefit or restore every livelihood of the community.

Community-based resource management system works because of the presence of appropriate common property institution, not merely because of a superabundance of resource. Further, just as the resources of a specific area are linked together, members of different endogamous groups are also linked together in a network of reciprocal exchange and mutual obligation. The emerging proposition for growth directly challenges the ideal of common resource and community livelihood. The first is the tending reversal role of village council and elders as social institutions in resource management. The decision in resource management, conservation and mobilisation are changing with the change in objectives for community welfare and prosperity.

CPR as a careful resource system, which engendered a strong sense of value and obligation to share and conserve, is being replaced with the culture of individual priority. The growth of communication and opportunities for the economic venture in the state has seen the disintegration of collective mobilisation of CPR. The weakening of community solidarity and waning of community participation in agriculture as the major livelihood system both terrace and jhum has brought individualism into the land resource management. For instance, the road to the fields and the trees associated with it

through the private land is a community road and no individual can change the road or cut trees for individual purpose.

All developmental activities require land, for which, more of compulsion and to maintain peace the clan and lineage lands are been fragmented to accommodate the new emerging developmental opportunities. Individualism has promoted separation of not only lineage land but the clan land and community as well; it also transfers the decision power from the community to the individual. For instance, fragmentation of clan forest and jhum land is undeniable, for equal and fair distribution of community land and development for households: where different individuals' pursue a conflicting interest in resource management.

Recently traditional management of CPR has been forced to integrate individual needs to the balanced mobilisation of the community. For instance, in Tsiepama village under Dimapur district, individual household for the past years has harvested the clan land for commercial selling of bamboo and firewood in alternate years. Similar is the stone quarrying in clan land in Kiwgema village, Kohima district and riverside quarrying in Tizit village under Mon district. These are a few prominent indications of a few individuals exploiting the common community forest. The primary objective of subsistence and sustainability has reached the level of exploitation by individuals, for man is aided by road, vehicles, open market, and money to procure more money.

However, the real threat lies in commoditisation and labelling community property resources with money. This lures individuals to manipulate CPR for personal accumulation and causes its exploitation. Water is a necessity for living and has great value as such demand. People owning land with good water sources, usually from springs, develop water collection ponds and sell the water in towns or even in the

village.[46] This is practiced by villages in and around towns where there is no provision for household water scarcity during the dry season and the demand for water is high.

The government introduced plantation crops is also a process through which individuals are claiming the community land and thus decreasing the community land in the state. Exclusion arises because of unequal access and profit from the common asset. Not every household has the means to obtain neither profit nor pursue CPR for their livelihood.

Similarly, the market demand of the well-off urban population is also causing the degradation of the forest resource such as birds, animals and tender shoots, tubers and green vegetables. One such instance noted during field interaction is the collection of a perennial herb, *gajo*[47] (*Elatostemma platyphyllum*) from Wokha village which is supplied to Kohima town because of the demand in local hotels. Because of the demand in the local restaurant, the easy to harvest plant is collected and supplied directly to hotels. Another threat is market driven bio piracy of medicinal plants, through middlemen who engage locals to collect naturally grown species for a paltry sum.

Where no appropriate regulatory mechanism is in place, bio-resource has experienced 'booth and bust' cycles. A typical example is local ginsengs and *Paris cordifolia* in Nagaland, at first, it commanded a high price, both men and women collected freely excessively. The hunt for ginseng in the state has resulted in the massive exploitation of the natural habitat as well as extinction near the homestead and availability to the local need. The black market influence of Manipur and Myanmar has deprived the state of a medicinal plant well preserved for centuries within a few years by individuals for easy

[46] Amba Jamir "Shifting Option- A Case study of Shifting Cultivation in Mokokchung District in Nagaland, India in Christian Erni (2015) *Shifting Cultivation, Livelihood and Food Security- New and Old Challenges for Indigenous Peoples in Asia*, FAOUN,IWGIA & AIPP

[47] *Gajo* meaning 'green vegetable' is used in local cuisine

money.[48] The entry of market into our forest resource poses a severe threat to the cultural sanctity of the biodiversity and ecosystem sustainability. Realisation and action for ginseng conservation by the community is prominent in the villages visited. However, it also is a revelation to the lack of rules in common resource for particular plant or animal. There is a strong tendency of bioprospecting for commercially valuable genetic and biochemical resources in the community forest, a need for community controlled research with a strong mechanism to control and safeguard the resources within the village.

In community livelihood terms, modernity represents first the appearance of nature separate from culture, followed by the gradual withdrawal of social significance from the cultural values. The transition of community resource, a reciprocal obligation of land, labour and kind to money value has created a completely new level of livelihood and bio-resource. The means of survival are no longer the control of human communities, but subject to the vagaries of the marketplace.

5.1.a. Access to Resource

Access to land resource for agriculture is the foremost right in livelihood, as such the unequal access of resource will affect livelihood more extensively than ownership. Nagaland had the highest average size of holding due to the highest proportion of area and number of holdings above 10 ha.[49] The high value of operational holding is due to the practice of CPR and community sharing culture in the society.

According to Agriculture Census 2010-2011, the average holding size of the state is 6.02 ha which has decreased from 6.92 ha in 2005-06 reflecting the fragmentation of landholding size over the years. The percentage distribution of operational holding

[48] The herbs are taken to Moreh on the Manipur-Myanmar border trade point in trucks
[49] Bimal. J .Deb. & B.Datta Ray (2006), *Changing Agriculture Scenario in North East India*, p.76

occupied by different size class indicates that nearly 71 percent of the operational holders fall in the category of medium and semi-medium size holding. In Nagaland, about 14 percent fall in the small size category and only 4 percent of the operational holders falls in the marginal size. The above figures reflect that unlike other Indian states where marginal holding dominate the landholding pattern, in Nagaland more than 70 percent of the land holding fall in the category of semi-medium and above. Highlighting that over generations, every household has been land secure.

To a Naga farmer, the availability of land or the size of it has never been an issue for any household to acquire food security and prosper as a citizen of the community. In upland terrace cultivation of Kohima, Phek and wet terrace cultivation in Peren, Mon and Dimapur districts, majority of the land are private property. Whereas individual household cultivation especially jhuming in Nagaland is heavily dependent on village community land and clan land except in the districts of Mon and Zunheboto.

In Zunheboto district, the Sumi tribe practice Chieftainship, where the village chief called *'Akukao*' owns and controls the majority of the land in the village though another individual land also exists. In Lumami village, the Chief owns about 60% of the land and about 40% are owned by a handful of other villagers.[50] Under this system, there are many landless villagers, who depend on the chief for their livelihood. Each year the chief allocates enough land in a particular plot of his land for the villagers to cultivate (Plate 5.1). This temporary user right is free. The villagers give a part of their produce to the Chief during harvest. In addition, the Chief jhum land is cultivated by the villagers and he enjoys free labour.

[50] Jacob George & Khrieto Yhome, *Community Forest Management: A case study of Nagaland, India.* Presented at "Governing Shared Resources: Connecting Local Experience to Global Challenges," 12th Biennial Conference of the International Association for the Study of Commons, Cheltenham, England, July 14-18, 2008

Plate 5.1. Community cultivation in Chief land (Lumami village)

Similarly, among the Konyak tribe in Mon district, the noble chief called as the *'Ang,'* has an autocratic system of governance and hence enjoy a wide range of control over the land, both in ownership and usage. Among the Konyaks, the commoners cultivate Ang's jhum field and nominal tax is collected from all the farmers, which are also considered as

tribute to his Angship.[51] Individuals also cultivate private and clan land.

Survey has proved that because jhum cultivation is a collective agriculture system, even in the villages where a household has individual lands, they cultivate in community land in some particular years. Primary data reveals that 32.9 percent of farming household surveyed cultivate people's land where 7.7 percent of the total household has no privately owned land and depend on community land and individual land for agriculture. Where cultivation on community land is 23.2 percent and individual land consist of 9.67 percent. As emphasised in the previous chapters, agriculture the major livelihood system is a collective farming system where the land was used freely and

[51] Lanusashi Longkumer & Toshimenla Jamir (2012), *Status of Adivasis/Indigenous Peoples Land Series*-6, *Nagaland*,p.26

ownership was temporary. There was no sense of land demarcation or property boundary.

However, there is a new emerging monetary value to agricultural land, where the price for a tin plot of land ranges from (200-1000) rupees depending on the owner and village. This transition from free usage to lease of agriculture land proves to be detrimental for livelihood and for the resource. Renting with money to procure food on any land not only increases the input of the farmer but also causes detachment from the resource.

Water, which is considered as a free-flowing resource at one time in all the villages has a restriction in access by individuals. The restriction in access to rivers and streams is to check the CPR from individual exploitation. Where deemed as a necessity, access is allowed through money transaction for household water supply or fishing, or riverside quarrying. As alien as it may sound it is a reality that water, as a household resource in private land is fast becoming private property both in claim and access as well. This is more prominent in the urban areas where high demand makes it a good source of income.

The same applies to forest resources on both community and private land. There is no doubt that any NTFP as food is of free access on any land. However, open cattle rearing and foraging in the individual land is restricted in all villages of the twenty-two sample villages.

Access to forest resource has limited over the years as community collective mobilisation decrease and individuals prioritise their own welfare over the community. The new system of access is through the open market.

5.1.b. Agriculture and Livelihood Diversification

Physiography and connectivity are two major key issues determining the livelihood strategies of a village whether it be bio resource in particular or other land-based. As stressed, physiography determines whether a livelihood option even if feasible is economically viable or not. However, more than physiography, connectivity favours the diversification of livelihood through bio resource development. Connectivity through road is more dependent on its nearness to an urban or semi-urban area then its maintenance. However, it is not an exception or rule.

For any household in a Naga society, livelihood diversification, does not mean having an occasional earning besides the main activity, it means multiple food sources. The changing scenario of agriculture has forced the farming community and policymakers in agriculture to search for a more remunerative and viable production portfolio. Agriculture diversification reveals that crop choice, and therefore, crop diversification status, is the outcome of a number of factors such as policy intervention, consumption pattern and market orientation of production, region-specific resource endowments such as labour, land availability and infrastructural support. The diversification of agriculture towards non-food grain and high-value commodities has been the right answer for this because these commodities have the potential of income augmentation, employment generation, poverty alleviation, and export promotion.[52]

Unlike the Green Revolution, the silent revolution was market-driven and it is likely to gain further momentum in the decades to come owing to continuing rise in income, expanding urbanization, infrastructure development, and liberalization policies.[53] Households are adopting intensification of their farming through capital and labour. A common process of intensification including livestock rearing, aquaculture, and forestry among the villages is often supported by external inputs and policy led. During

[52] Bimal. J Deb & B.Datta Ray (2006), *Changing Agriculture Scenario in North East India*, p.60
[53] Asian Development Bank (2010), *Agriculture, Food Security and Rural Development*, p.181

fieldwork visitation, there has been a narration of concern Government officials visiting a particular village where, after testing and deliberation, a particular plot of land is chosen for agriculture intensification. Once established in the village, other households who have the capacity to invest will venture along forming a distinct pattern of intensification within that village. It is identifiable to be known as a vegetable village for a particular crop or two, likewise a village famous for a particular intensification. For instance, Pfutseromi village (Phek district) known for its Kiwi and cabbage crop, Kidima (Kohima district) and Longkhum (Mokokchung) are Government recognised vegetable village, Wokha village (Wokha district) for orange and passion fruit etc. There is an unmeasured risk involved in the replacement of traditional self-dependence to market dependence for food security. Behind the fame of introduction and adaptation of new crops is the misrepresentation of commercial crops for livelihood security. Money does not measure up to the expectation of community livelihood with the lack of market for horticulture crops especially those that have no local market demand. A farmer has lesser control over the yield, price and market competition from other produce available in the market.

Extensification as a livelihood strategy and pathway have been more prevalent in the foothills and valleys through sharecropping and increase in labour investment. This trend is prominent in the wet terrace cultivation and plantation along the valley of Peren, Dimapur and Mon districts. Farmers in and around Dimapur, Peren and Mon districts are transferring the right to use and develop their wet terrace land to families of non-locals as sharecroppers. For instance, the majority of farmers in Gaili (Peren), Tenyiphe-A (Dimapur) and Tizit (Mon) villages practice sharecropping system. Settled in the field with free access to water and firewood, they till the land with their choice of seeds both khariff and rabi crops and have been living on the land for more than a decade. Maximum use of chemical fertilisers is recorded in the sharecropping zone.

Agriculture for the sharecroppers is only a production system, their only objective to farming is to produce maximum yield. In the process, the use of chemical fertilisers has made the soil highly chemical dependent and the soil regeneration ability is degraded. Kuleuneing a 70-year-old farmer in Gaili Village paid Rs 45,000 to the family employed as sharecroppers in the year 2015 to produce 500 tins of rice. Similarly, in Tizit village under Mon district, a family provides the cash required managing the terrace field through the process from tilling to harvest, and at the end of the year, the rice is shared between the owner and sharecropper at the ratio of 5:1. All the produce of winter crops in and around Dimapur valley, cabbage, tomato, cauliflower, peas, mustard leaves, carrot etc are market seeds grown with fertilisers and pesticides. As such, the surplus bounty and multiple harvests entering the market as locally produced are not local. This indicates a serious contamination in the food chain and loss of traditional crops. It is an irony that we pay people, outside labourers, to till our land free and feed us and our children with chemically contaminated food.

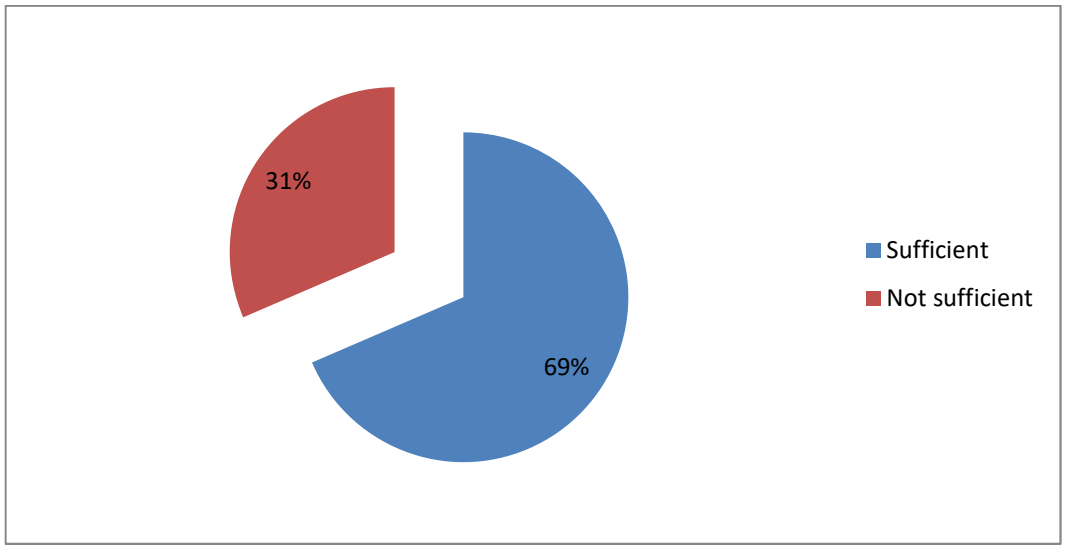
Tea plantation as an influence of the Assam agriculture has created individual tea plantations along the Tizit town and its surrounding villages. Benei Tea Estate with an area of 4.07 hectare is an individual tea plantation producing 75,000 kgs (2015) of tealeaves in Tizit village, one of the many existing tea plantations. This tea estate employs 20 non-locals as permanent labourers from manager to daily wage earners. Indeed, every household maintain tea gardens ranging from 20.7 hectares (large) to 4.07 hectares (medium) as well as smaller plot next to their settlement. All the daily labourers and managers are non-locals as well as the tea leaves are transported to Assam as raw materials.

The issue is the negative impact on the resources is neglected due to monetary income and the ample market facilitates their growth. It is important to raise the question

whether these new developments are improving the livelihood of the concerned individuals as owners or are becoming an important source of livelihood for other immigrants. The physical affinity and availability of work force from the neighbouring towns of Assam have seen the labour migration and employment in tea plantation and terrace field. It is not an exaggeration to say that this is a process where we are allowing other people to live off our land.

The change of priority in agriculture as a source of income than a tradition of food security ecosystem in the community has seen a drastic change in the cropping system. Each household is self-employed cultivators, yet it is a fact that there are households who do not produce sufficient rice for a year and buy from the market (Fig.5.1).

Figure 5.1. Chart showing the status of rice production in food security



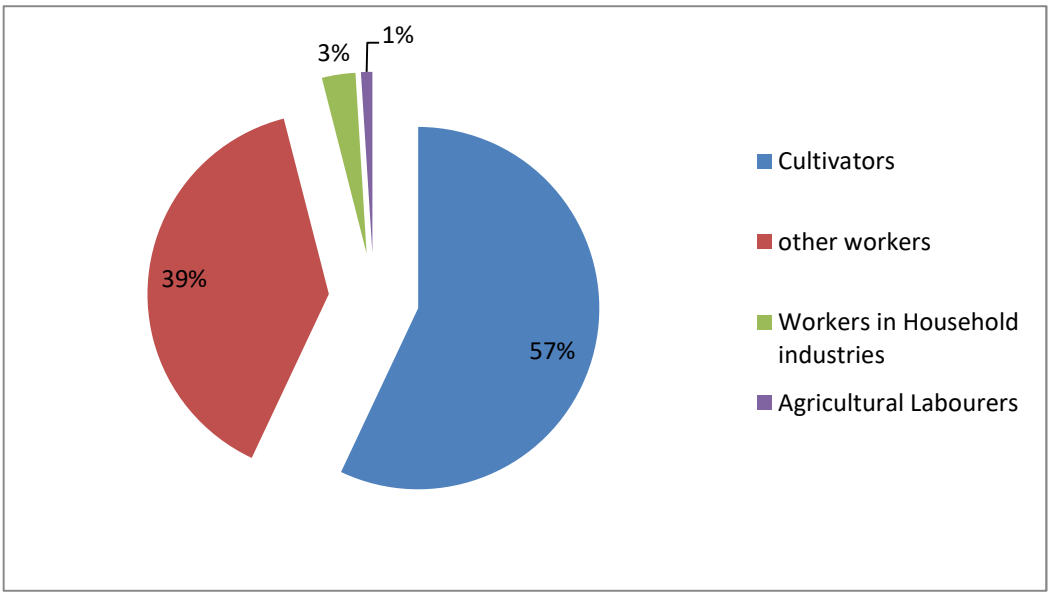
This changing pattern is a boost with the growing money economy and lifestyle infiltrating to every corner of the state. Farmers are satisfied and find it more productive to invest in commercial crops rather than be stuck in their traditional farming. Out of the total household, 4% depends on the modern commercial crops to augment income and provide all the diet and food needs for the year that is the market. Whereas, 17% till the land for multiple crops with no paddy.

As such, beneath the calm surface of jhum and traditional farming, there is a much more dynamic process in play. Cultivators are more than willing to change their agroecosystem to fit into the modern production system.

5.2. Employment Sector

The impact of bio-resource management on livelihood and its linkage with development dynamics is a matter of increasing concern to the state. The state is predominantly rural with 82.26 percent of the population living in villages and 57% of the main workers are cultivators (Fig. 5.2).

Figure 5.2. Distribution of Main Workers in the State



Source: Statistical Handbook of Nagaland, 2013.

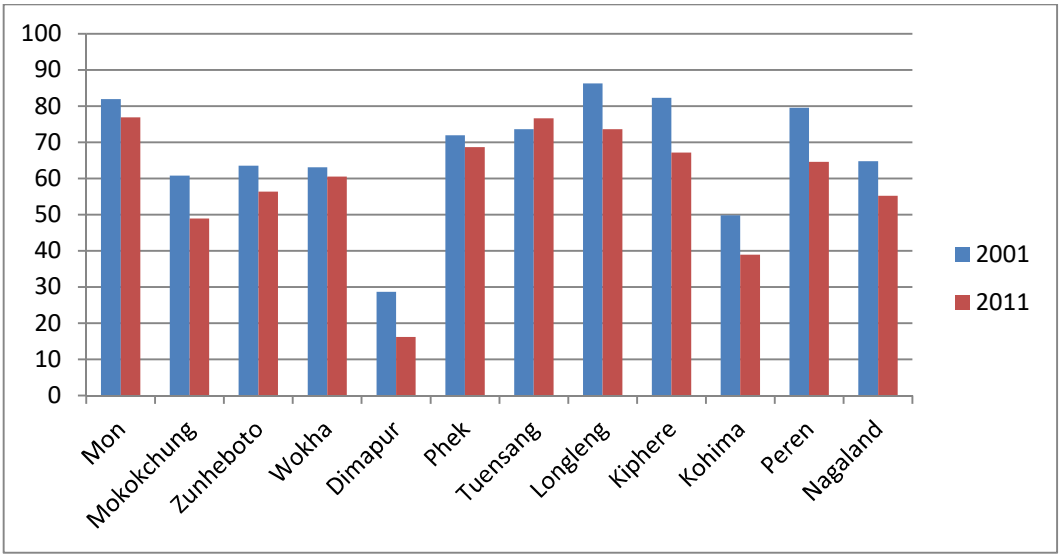
The main economic activity is agriculture, with a very small proportion engaged in the rearing of livestock, weaving, blacksmithy and handicrafts. The state does not have any major industry and almost the entire urban population depends on the Government services for employment and livelihood.

According to 2011 Census, out of the total workers, 55.2 percent are cultivators against 64.7 percent in 2001, 68 percent of the total workers in rural areas are cultivators while

9.8 percent of the total workers in urban areas are engaged in cultivation. The district with the highest number of cultivators is Mon district with 76.9 percent, while Dimapur has the lowest percentage of cultivators with 16.2 percent.

Figure 5.3 clearly indicates that the percentage of cultivator to total worker has shown a negative growth in the state and all the districts except Tuensang. Tuensang district is the only district, which has shown a major change in its agriculture yield.

Figure 5.3. Cultivators percentage to Total workers (Nagaland)

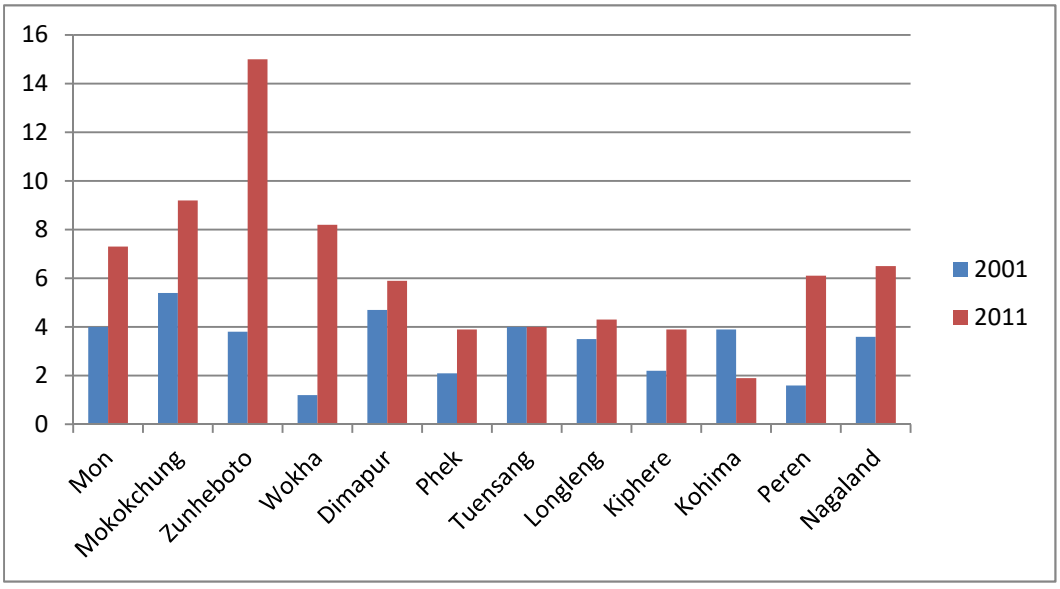


Source: Census of India 2011 and Primary Census Abstract,2011

Agriculture for the people is more productive than the past. Rice yield in jhum land has increased much more, which increases the staple food security and the famous two double cropping of maize and beans has increased to multiple cropping in the villages.

As narrated by the villagers before, the harvest of sowing one tin of rice in jhum was 10 tin, which in the recent time has increased to 30-40 tin. Deducing that agriculture in the district is much more favoured than other districts in the state because of the recent developments. On the other hand during the same time span of ten years a major increase in agriculture labourer to total worker in the state is observed except in Kohima district (Fig.5.4). The major reason for decrease of agriculture labourers in Kohima district is the growth of opportunity for employment in other sectors than cultivation, with the growth of urbanisation and urban population increasing as the capital of the state. Within the other ten districts, Zunheboto district has shown an abnormal growth, which is not accountable in the land-agriculture system of the state pointing to the questionable data from the government department.

Figure 5.4. Agriculture Labourers percentage to Total Workers (Nagaland)



Source: Census of India 2011 and Primary Census Abstract,2011.

The major reason for the decrease in cultivators is that agriculture as a community way of life with a strong bond to their cultural institution and resource management is undergoing transition. This is often been fuelled with the lack of the Government and policy maker's directive in channelling the biggest sector to a steady growth for

community livelihood. Where the leap from agriculture sector to other sector is considered necessary for economic growth and development of the household.

On the contrary, analysing the decrease in work force in agriculture, Reimeingam[54] has stated

It must also be true that there exist a wide spread disguised unemployment because of high agricultural density. The decline is, thus, because of the implication of the principal of "law of diminishing returns" that more and more people when pressed to work on a given piece of land, their marginal productivity declines. Nevertheless, in line of Meller's definition of traditional agriculture of labour intensive, the existing large share of agriculture workers indicates a traditional character.

One plausible reason for the growth of agricultural labourer mostly identified in the survey is the demand for labour in the agriculture sector and the new hiring system. As emphasised in the previous chapters, the traditional labour exchange system is lacking in meeting the labour demand and need of each household farming. When cultivators decrease yet agriculture area increase in the years, it creates a high labour demand in the state. Except in the districts of Kohima, Peren, Mon and Dimapur urban fringe villages where non-local migrants meet the demand for labour in terrace rice cultivation, horticulture crops and plantations. In all the other villages, it is the villagers themselves who meets the labour need through daily wage system, thus spontaneously increasing the agriculture labour percentage to the total worker.

As with other narratives about agricultural change, with an implicit evolutionary argument about progress and modernisation, the assumption is that the endpoint, with agriculture as a business, driven by entrepreneurship and vibrant markets, linked to a burgeoning urban economy, is the ideal to strive for.[55] Such permissible definition of

[54] Marchang Reimeingam,9th May 2009, Agriculture Employment, Production & income of the Nagas: A case of Nagaland State*, Morung Express*

[55] Ian Scoones (2009), Livelihood Perspective and Rural development. *Journal of Peasant Studies*

progress in a particular path has opened up a wide scope to the agriculture sector in Nagaland for growth and expansion.

Green revolution introduced during the early 1960's is a revolution of the plain areas of the country. The mountain slopes did not see the positive as well as the challenges caused due to the massive adaptation of Green revolution in agriculture. The only revolution in agriculture in the state is the long struggle to replace jhum cultivation with other farming activities, permanent and more productive.

Between 1983 and 1999-2000, the share of high-value food commodities like fruits, vegetables, dairy products, poultry, meat, and fish in total food consumption increased from 34 percent to 44 percent in rural areas and from 55 percent to 63 percent in urban areas indicating an upsurge in demand for these commodities.[56] Modern agriculture creates unequal access to resources by the individual household for their livelihoods. Whereby, a pattern of social differentiation emerges between people who have succeeded in choosing modern agriculture as successful trajectories of upward mobility and those who have not. In simple words, modern investment in agriculture does not favour every household

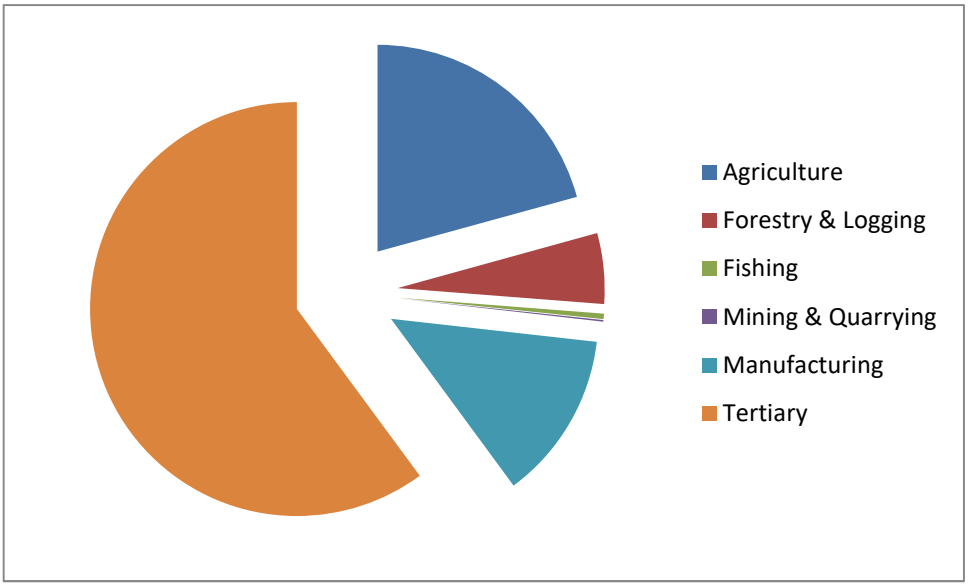
5.3. Government Policies for Bio Resource

Agriculture as the largest employer of the workforce in the state is also a major contributor to the Gross State Domestic Product (Fig.5.5).The global experience of growth and poverty reduction shows that GDP growth originating in agriculture is at least twice as effective as GDP growth originating outside agriculture.[57] In attune to this goal, agriculture strategies are aimed at improving farmers access to technology in order to improve sustainable production, enhancing the quantum and efficiency of public

[56] Asian Development Bank (2010), *Agriculture, Food Security and Rural Development*, p.7
[57] Vision 2025 -Prosperity through agriculture (2012), Department of Agriculture and Allied Departments, Government of Nagaland, p.12

investments, increase system support while rationalising subsidies and encourage diversification towards higher value crops, and live stocks and protection against food securities concerns. It further seeks to achieve inclusiveness through a more decentralised decision making that focuses on solving specific local problems and foster group by which, the poor get better access to land, credit, skills, and scale. Over the years, the state government has adopted alternatives to shifting cultivation and its introduction to farmer's field has been emphasised over the years. In the process of agriculture development, horticulture has emerged as one of the potential agricultural enterprises in accelerating the growth of the state's economy.

Figure 5.5. Distribution of GSDP across sectors (2011-2012)



Source: Statistical Hand Book of Nagaland (2013-14)

Its role in the state's nutritional security, poverty alleviation and employment generation programmes is becoming increasingly important. It offers not only a wide range of option to the farmers for crop diversification, but also provides ample scope for sustaining a large number of agro-industries, which generate huge employment opportunities.

The horticulture department has adopted a policy for the cultivation of vegetables on village and community basis where potential vegetable growing village in each district is selected. Initiation of the vegetable village in the state is claimed to be a first of its kind in the country by the State Government. At present, there are 52 active vegetable villages in the state. Under this policy, the department provides quality seeds of both hybrid and open pollinated for kharif and rabi season.

The success story of Zhavame village under Phek district is a proponent of the vegetable village for growth of the village economy. Horticulture department has adopted Zhavame village to implement the vegetable village programme in the year 2009 and as of now, 550 families are cultivating different vegetables round the year. Cabbage, cauliflower, carrot are cool season crops and such vegetables are grown during winter in the plain areas and the produce is made available during the months of November-February. However, on the high hills, where the temperature is moderate during summer months, these cool crops can be successfully cultivated making the vegetables available in the market from June-November. Irrigation is not a problem because of the monsoon rain.

In 2009-2010, the annual income generated through the sale of vegetables in Zhavame village was Rs 50, 67,235 which rose to 1, 70, 36840 in 2012-2013.[58] Cabbage and potato is the two-target crop cultivated by the farmers of Zhavame village.

In 2012, cabbage is grown in about 18 to 20 hectares and has produced about 1672 tonnes of chemical free cabbage in the kharif season. Besides cabbage, there are 170 tonnes of potato production and other vegetables like carrot, pea, squash etc is a small quantity.

[58] Vegetables bring prosperity to Zhavame, February 23th 2013, *Sunday Post*

Here, the vegetable cultivation is not just an occupation but has become an industry now. It has created jobs for many. The women folks, young and old are responsible for the field works for producing the vegetables. A group of skilled harvester harvests the healthy matured cabbages. The main task force in the entire industry is the packers and loaders. Some of the villagers also have become transport providers and market links. It can be analyzed that from a single commodity, the whole community has been benefited and the income is highly significant.

One has to question, whether such is the reality or an exception. Because inside is a different story. Interaction and observation within the vegetable village visited has concluded that the government department has no role in marketing the produce. Nor thus, it provides the basic infrastructure of storage and a processing unit. However, it profits as the flag bearer of vibrant agriculture in the state.

Similarly, through the integration of IWMP (Integrated Watershed Management Programme) the entire village of Tsüpfüme village under Phek district, comprising of 363 households are engaged in kiwi cultivation apart from growing other cash crops. Tsüpfüme village was also christened as the 'vegetable village' by the Department of Horticulture for its cabbage and potato cultivation. In the year 2014, 30 percent of 15,000-16,000 standing kiwi plants in the whole village started bearing fruits and generated a net profit of about Rs 2-3lakhs. From a humble harvest of 50 kg in the year 2012, Tsüpfüme went to harvest a total of 2500 kg in 2014. By 2015, the villagers harvested an overwhelming 5000 kg indicating an increase of 100 percent. Chairman of the Tsüpfüme Watershed Committee IWMP, Ngonyi Lea disclosed that the kiwi-fruit is

sold on the wayside of NH 29, Pfutsero and also in the surrounding villages at the rate of Rs90-120 depending on the quality of the fruit.[59]

Similarly, major commercial mono crops promoted includes cardamom, coffee, apple, kiwi, orange, tomato, cabbage, pineapple, cucumber, french beans, potato etc. Government policy is to make mono commercial farming a common farming, to produce maximum yield from the soil and pave the way for future prosperity through agriculture. There is no doubt that the Government has successfully introduced and incorporated modern agriculture into individual households. However, another reality also needs to be emphasised. In the process of modernising agriculture, the individual field as the in situ gene bank is been reduced to mere land waiting to be developed. In addition, the rice- ecosystem, the most stable agro-ecosystem is been replaced by mono ecosystem, which is vulnerable to even a minute change in the environment. Making farmer's livelihood much more vulnerable to the current crisis of climate change and environmental instability.

Since the State Human Development Report, 2004 that highlighted the huge potential for organic farming as a new area of livelihood and employment option and emphasized on the need for proper organic certification, significant effort has been made. During 2008-2009, Organic Certificate was awarded to the Tuensang Organic Farmers by the SGS India Pvt. Ltd. benefiting 32 villages in Shamator and Chessore circle comprising 3423 farmers covering 3002 hectares for crops such as kholar, maize, ginger, large cardamom, passion fruit and chili.

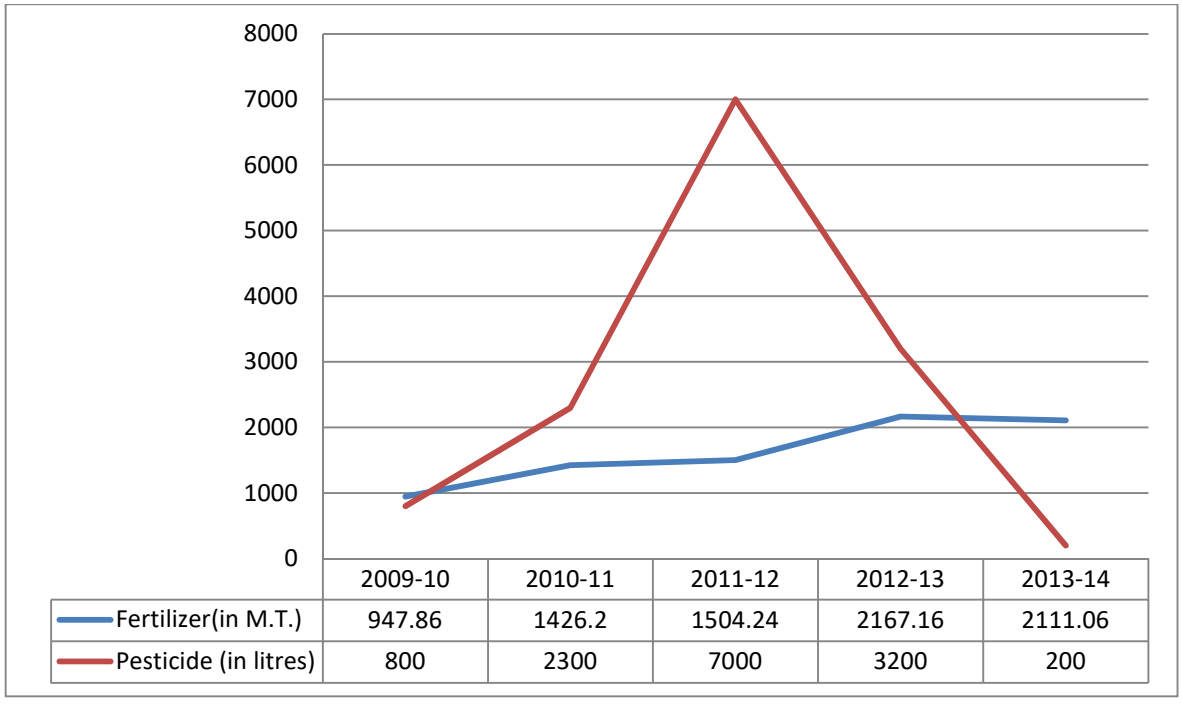
Nagaland is one of the lowest consumers of chemical fertilizers in the country at 1.5 kg per hectare, which is negligible by any standards. In 1990-1991, it was 6 kg per hectare of net sown area, which decreased to 4 kg per hectare during 2000-2001. In Figure 5.6 it

[59] Tsupfume recognised for Kiwi cultivation, August 18th 2016, *Morung Express*

is clear that during the six year period, the dependence and use of pesticide has drastically reduced whereas that of fertiliser has increased.

Because of customary laws regulating land use by outsiders and the hilly physiography, the state has always opted to equip individual farms with quality seeds and fertilisers to produce optimum yield. Nevertheless, the state has no measure or regulation to contain or control the use of fertilisers or for that matter pesticide so far. Similarly, it is not the seed bank or does not provide annually the seed free or charge to the commercial farmers. They depend on the market sold by different unknown companies.

Figure 5.6. Consumption of Fertilizer and Pesticide in Agriculture, Nagaland



	2009-10	2010-11	2011-12	2012-13	2013-14
Fertilizer(in M.T.)	947.86	1426.2	1504.24	2167.16	2111.06
Pesticide (in litres)	800	2300	7000	3200	200

Source: Statistical Handbook, 2013-14.

One need to reason whether the government land based development goals has been a complete meticulous participations encompassing overall development or compartmentalised and disassociating.

In the past years of agriculture development, there has been less research and motivation to learn from our traditional farming or build upon it. Instead, foreign technologies have been modified to fit in and are imposed on the land, without much consideration to the traditional modes of production. Today, the biggest threat to our traditional agro-ecosystem comes from the mono commercial farming. The government is a fervent proponent of commercial farming. However, in revolutionising the traditional agriculture, there has been no effort to give space for traditional agriculture to evolve or no measure to conserve the agro-biodiversity pushing our land races to the brink of extinction and robbing the farmers their livelihood security.

Though there has been growth and production of horticulture produces in the state, it is observed that marketing system of the local produce is not only weak but lacking in the state as a result of which horticulture produce market is exploitative and devoid of competition. The state is weak in organised marketing structure and the co-operative marketing is weak.

Processing facilities are also inadequate for fruits, vegetables, and spices. Storage facility for horticultural produces is also inadequate in the state. The state experiences periods of glut and shortage and reports of wastage of horticultural reports during the peak season of production have been reported in tomatoes in Longkhum village of Mokokchung district and passion fruit in Wokha district leading to huge losses, which deter the farmers from taking up horticultural activities.

Besides, proper post-harvest care for sorting, grading, packaging etc are lacking in the state, which, results in loss from 35 to 51 percent of fruits and vegetables in transit leading to high losses and thus detrimental for horticultural production.

It is high time that the state stops compartmentalising agriculture and take its stand to fulfill the goals as envisioned 'prosperity through agriculture'. As emphasised, there is

an urgent need for storage infrastructure to increase the shelf life as well as market strategies to equip the local market in the state to be self-food sufficient and food secure. Agro-biodiversity, both crop diversity, and agro-ecosystem diversity, has a vast untapped yield potential that the state should not reduce or neglect in its chase for economic prosperity.

A sustainable farming system is a system in which natural resources are managed so that potential yield and the stock of natural resources do not decline over time. Government goals and the process of development are evolving several strategies in utilising and management of both individual and community land. However, this process and objectives are not attuning to the traditional community economy, which is sufficient and exclusive.

5.5. Women and Bio Resource

Both men and women contribute effectively to the livelihood and food security of the households in Nagaland. Men's contributions come in the form of services to agricultural activities that are physically demanding and seasonal in nature, while women's contributions happen in day-to-day activities that are tedious and continuous in nature. It is the attitude, behaviour and participation of the women in all the activities that determine the quality of life of her family and the entire society.

In Naga society, it is believed that women became more empowered in agriculture production and management due to head hunting warfare tradition that every Naga village followed. While men pursuit the protection of the village and family as well as hunting, women raised children and crops. In the past, a woman's worth was measured by her abilities in the agricultural sector among the Naga society. The responsibility of the family food security totally rested on the wife/mother as such she learned and accumulated knowledge for sustainable food production of the field. In all this, the diverse technology and knowledge women develop became her specialty in creating

resource for the welfare of the household. Because food collection required a thorough knowledge of plant and animal growth, maturation and fruition or reproduction, women have been credited with the discovery of domestication and cultivation of plants and animals.[60]

Food security has always been the most crucial issue in any agricultural development and women as the primary agent of agricultural development and its sustainability, the international bodies have emphasised the role of women in achieving this goal. CBD through Agenda 21 and Article 8(j) has emphasised traditional ecological knowledge and women's participation as a must for a healthy environment and its sustainability. As such, strengthening women's access to, and control over resources and services in both the economic and social spheres unleashes the productive potential of half of the population.[61]

Of late, the crucial role of women in agricultural development is gradually being gaining recognition in different levels. Existing women participation and crucial role in forest and agriculture resource management, as well as conservation, have been emphasised and validated through multi disciplinary research. Consequently, women are getting more attention in policymaking however, formulation and empowerment still lack in action. Initiation of women selfhelp groups, exposure trips, training in modern agriculture technologies are the recent development found most active in the state. However, there is still lack of any change towards the land ownership or control over decision making in land use as well as development of the women in the society. Where women though are solely responsible for the growth and yield of food produce has still no say in decision making according to the customary law. Empowerment 'has to be more than simply opening up access to decision making; it has to include also the processes that lead the individual or group being enabled to perceive themselves as able

[60] Vandana Shiva (2010), *Staying Alive*, p.104

[61] IFAD (2012), *Gender Equality and Women's Empowerment*, Policy,p.13

to occupy that position.'[62] Nothing should compromise women to organise themselves to increase their own self-reliance and to assert their independent right to control resources.

5.4.a. Women in Agriculture Sector

In Nagaland 65.2 per cent of the female total workforce is engaged in cultivation, 7.3 percent as agricultural labourers, 3.1 percent as household industry workers and 24.4 percent as other workers (Table 5.1). The work force distribution by gender clearly shows that female participation in agriculture is higher than male not only in the state but in all the districts. Clearly, indicating the role of women in agriculture and food security in the state.

Percentage of cultivators by gender shows 47.4 percent of the total male workers are engaged in cultivation while female cultivators account for 65.2 percent of the total female workers. Reflecting the dominance of women in the farming sector over men and the existing scenario of women-oriented agriculture sector (Table 5.1).

Compared to women more men are moving out of agriculture because of low returns from agriculture, putting farming increasingly in the female hands. During a personal interview in the villages, when one enters a household it is more often that the man approaches first for interaction about the household, but the moment the farming details is enquired, the man passes the interaction over to the women.

[62] Krishnaraj Maithreyi and Kanchi Aruna, 2008,*Women Farmers of India*,p.37.

Table 5.1. Distribution of Work Force by Gender to Total Work Force in percentage (Nagaland, 2011)

State/district	Cultivators		Agricultural labourers		Household industry		Other workers	
	Male	Female	Male	Female	Male	Female	Male	Female
Mon	72.2	82.2	6.8	7.9	1.7	1.2	20.0	8.6
Mokokchung	43.1	56.6	9.3	8.9	2.3	5.7	45.2	28.8
Zunheboto	50.6	62.4	13.2	17.0	2.0	3.1	34.2	17.5
Wokha	52.9	69.4	7.8	8.7	2.0	3.1	37.3	18.8
Dimapur	13.6	21.3	4.5	8.8	2.0	6.0	80.0	63.9
Phek	59.0	78.9	3.6	4.3	1.2	2.0	36.2	14.8
Tuensang	69.6	84.9	3.9	4.1	1.0	1.3	25.5	9.8
Longleng	68.5	79.4	4.1	4.5	1.8	2.2	25.7	13.9
Kiphire	57.1	78.1	3.6	4.3	1.8	2.9	37.5	14.7
Kohima	28.3	54.4	1.6	2.3	1.4	2.3	68.6	41.0
Peren	60.5	69.2	6.1	6.1	3.6	4.9	29.8	19.9
Nagaland	**47.4**	**65.2**	**5.8**	**7.3**	**1.7**	**3.1**	**45.0**	**24.4**

Source: Computed from Census of India 2011, Primary Census Abstract, 2011.

This scenario represents that man have less interest and less knowledge about what is grown or reared and how it is managed for food or sold or kept for the future. It is the woman who keeps the detail of the family farming activities both seasonal and annual and not the man.

The district with the highest female workers engaged as cultivators is Tuensang with 84.9 percent of the total female workers in the district and Dimapur has the least number of female workers engaged as cultivators at 21.3 percent of the total female

workers. The percentage of female agricultural labourers to total workers in the state is 7.3 percent, with the highest in Zunheboto district with 17 percent and the lowest in Kohima district with 2.3 percent (Table 5.1).

The variation among the districts in cultivators and agricultural labourers is geographical as well as social. However, the concern here is the growing importance of women in agriculture not only as a resource for economic creation but also as the pillars of the biggest sector in the community. Women in villages and communities are forming working groups to shoulder the lack of family labour and participation in the agriculture activities. It is through exchange labour system and wage earners by women that most household has filled the absence of men in farming.

Women work together in groups to harvest the paddy (Plate 5.2.) to increase the efficiency in work, which includes threshing, and cleaning (Plate 5.3) with no machines but using hand tools. Each stage of farming according to the women farmers has a premium time. For them there is a specific season and time when one crop has to sowed, similarly there exist a specific time when the harvest of their labour should be collected and saved.

Plate 5.2. Women harvesting paddy in TRC (Jotsoma village)

Plate 5.3. Women involved in cleaning chaff (Jotsoma village)

The sustainability of our agriculture system and food production depends on the women as individual cultivators, who select the crop to be cultivated and maintain the soil

fertility. A woman not only provides us the food we eat each day, they are also the holder of the seeds and the knowledge and skill to grow the numerous agrobiodiversity. Women also enhance the economic status of the family by finding markets to dispose of surplus farm produce. They contribute productively through value-addition by preserving and processing from the surplus fruits and vegetables for their own use as well as for sale. A woman in a family is first a mother than a cultivator. Agriculture diversification for a household includes backyard livestock-rearing, kitchen garden, homestead garden (Plate 5.4) and the jhum field or terrace farming. The existence of a variety of ecosystems, different species, and genetic diversity is essential to maintaining human health, in terms of food security and adequate nutrition, resistance to infections and diseases and reduction of disaster risk.

Plate 5.4. Winter crops from homestead garden (Kigwema village)

Crop genetic diversity is the key to maintaining crop resistance to pests and diseases and to adopting agricultural systems to climate change. As the basis for the development of new crop varieties and for the improvement of existing ones, genetic diversity will become increasingly important to food security both household,

community and state level. Women's ability to continue to grow food critical to achieving livelihood development will depend on how they manage agriculture ecosystems and crop diversity at the species genetic and landscape level.

5.4.b. Women and Agro Biodiversity

Agriculture is highly women oriented reflecting her skill and innovation in crop selection, seed bank to surplus management. The point, however, is not so much that in farming systems women labour more than men but that, traditionally, they are productive in precisely those links in farm operation which involve a partnership with nature and are crucial for maintaining the food cycle- in the soil, and in the local food economy. [63] In every agriculture system women have been experimenting new cultivars and new varieties of crops by introducing and studying them at close hand its viability to the environment as well as the crop system. Before taking any new crops first, it is observe in and around farmhouses in jhumming and with the seed produced, it is incorporated into the cropping system. Similarly, kitchen garden with close proximity and as the daily vegetable basket, women takes full advantage as a laboratory for new cultivars. In Kohima district varieties of *Elatostemma sp, Impatien sp, Zanthozylum sp, Clerodendrum colebrookianum, Polygonum sp, Gynura sp etc* as new cultivars has maintain the biodiversity of the forest as well as increase the food security of the household.

Women are more passionate about the land resources and have a deeper appreciation of the value of land, forests, and biodiversity. For them farming cannot be separated from nature, it is through communication with the environment and interaction with nature that every activity of farming is carried out. Managing soil fertility and providing nutrients to supplement the stages of growth for all the crops is a major concern and priority.

[63] Krishnaraj Maithreyi & Kanchi Aruna (2008), *Women Farmers of India,*p.114

It is common in jhum cultivation to prepare a seedbed for varieties of *Capsicum sp*, *Solanum sp*, *Ocimum sp*, *Elsholtzia sp* etc on the valley or plain, because of the moisture detainment and quick germination. (Plate 5.5)

Plate 5.5. Seedbed in Jhum cultivation

Household manure like farm manure, ash and the paddy husk are the most easily accessible and used organic fertilizer by women in cultivation. One distinct technology was observed in Kidima village where crop rotation is practiced on the terrace field, right before sowing every potato and spring onion tuber or bulb, a handful of household manure is added to the hole where the seed is sown. This not only saves manure but also the health and increases growth at the early stage. Taking the advantage of mulching, hand weeding is done continually to add sufficient nutrients to the crops to grow and mature. Women consider every organic matter in the field as manure; the fertility management is a cyclic management of residue and weeds, the strategy is feeding the crops with the needed amount at the right time.

To be self-dependent and food secure, women value agro biodiversity no matter the size of the plot cultivated seasonally or annually. Each crop and variety is valued for

specific characteristics and farmers endeavour to retain those characters. Women farmers are particularly sensitive to domestic attributes of varieties such as storability and cooking quality. As keepers of seed and knowledge, when a woman marries into another village, she will take with her seeds, which are introduced and propagated, in that new village. In this process, women have built the relationship of seed flow and diversity in the community. To take in as many varieties as possible women have become experts in arranging multiple crops and its varieties as mixed cropping system. Variety of maize and rice the staple food, ranges from normal to glutinous, red to white, soft to hard; jhum rice to terrace rice; a diversity of taste and nutrients in the diet. Women through kitchen garden and jhum cultivation have propagated cultivars of medicinal herbs and shrubs. For example, *Zanthoxylum sp, Gynura sp, Allium sp* and *Poligonum sp* are common species with varieties found in different districts.

Women have shared the ability to store and generate quality seed in terms of germination and purity. Every household maintains seeds and is self-sufficient. Farmers have adopted many strategies to ensure that the seed they select maintains its viability and its value for cultivation. Seed is selected from the standing crop, when the quality of the parent plant may be taken into consideration in addition to the quality of the seed itself. However, seed selection varies according to the plant or crop or may be in the location. It has been reported that farmers have produced a new variety of rice, by collecting off type. These are then planted, separately from the main body of the crop and evaluated during the growing season for some useful traits. In Kiwgema village, the traditional potato is cultivated both on the terrace field and homestead garden, but the seed is only selected from the homestead garden due to the high incidence of infestation. Another practice is that traditional spring onion (*Allium chinense*), local onion (*Allium cepa*) varieties do not store well, and so the field is the seed bank from where it is transferred and planted the next year.

5.4.c. Women and Market

Women's participation in agriculture has extended from the grower, confined in the field and household to the open market food chain. Naga women are engaged in vending forest and locally grown products. Almost 95 percent of the traders are women who sell from market sheds near their village or in nearby towns, whereas men sell to buyers from outside the state.[64] Primary data shows that 82 percent of women sell some amount of their produce. While 30 per cent sells their produce in the local market, 52 per cent sell their produce both in the local market to towns as well.

The hotspot for traditional seasonal crops is the roadside markets. Along the stretch of National highways from village to village, one can observe vegetable vending spots permanent as well as temporary. Where women come together from different villages and sell their produce, fresh and healthy varieties right from the field. Example of permanent marketing shed in Angangba (NH 202) and Piphema (NH-29) (Plate 5.5), where a good variety of local produce from the kitchen garden, jhum field, forest produce etc is made available year round to the travelers.

[64] *Market Development Assessment for Organic Agri-horticulture Produce 2014* (2015), Govt. of Nagaland-UNDP-GEF, p.17

Plate 5.5. Roadside market with produce from Forest, Jhum and Garden (Piphema)

In the semiurban areas, therefore, local food items are sold by Naga women to meet their own need of earning an income and make possible for the urban dwellers to have access to local food ingredients. To facilitate the farmers and customers, Wednesday bazaar and Saturday bazaar are initiatives undertaking in Mokokchung town and Ungma village in Mokokchung district by the community. In both the markets, women from other districts are allowed to sell their produces. It is also the centre for women to create awareness about farming, seeds and knowledge as well as price and value of their crops. In the present market space, products from outside are invading the local market in which rice and vegetables are sold at a cheaper price than local produce. Hence, outside traders dominate the trade while the locals who are mainly women sell the local vegetables, fruits, and forest products. Local producers and vendors although invisible,

most of the time are keepers of our health-providing fresh fruits and green vegetables throughout the year. Naga women continue to be managers of local food variety.

5.5. Bio Resource and Livelihood: Changing Paradigms

There is a paradigm shift in the worldview among the Nagas in their relation to bio-resource as the building block of their livelihood. From the twenty-two villages surveyed in the eleven districts, it becomes clear that in the recent time farmers' perceptions and attitudes toward bio-resource dependence and growth is accounted in money-exchange and not sustenance or security.

Accordingly, the dependence on bio-resource for livelihood is said to have increased in ten villages out of twenty-two villages. Aotsakilimi village (Zunheboto), Sangratsü and Longkhum village (Mokokchung), Tsüpfume and Pfütseromi village (Phek), Wokha village (Wokha), Kidima village (Kohima), Angangba village (Tuensang), Sangnyu village (Mon) and Longmitra village (Kiphire). As the people narrate, farmers are not just farmers who till and labour through the year for mere sustenance but they are free to exchange their harvest for new commodities and improve their living standard. Agriculture is thriving in these villages, where households are proactively participating with modern technologies and trying out new cropping pattern. These are the villages with high value crops and value added crops cultivated in response to the demand in the local market having an annual income.

In the nine villages where dependence is the same, cultivators are subsistence and failing to break the barrier of subsistence would at anytime pursue other more lucrative opportunities. Kigwema village (Kohima), Benreu village (Peren) Bhumnyu and Hukphang village (Longleng) Gaili village (Peren), Kiphire village (Kiphire), Lazami village (Zunheboto), Tsiepama village (Dimapur) and Tizit village (Tizit). Whereas in

three villages Tenyiphe-1 (Dimapur), Longsachang village (Wokha) and Chimonger village (Tuensang) where dependence has decreased, farming as a way of life has lost its traditional significance and households are employed in another sector more than farming.

Interactions strongly suggest that forest and agriculture as a source of food sustenance and food security have been underrated both in farming and in the community livelihood. Indicating misled priority over a few resources that can deliver money to the whole agro biodiversity ecosystem both in the present and for the future. Indicating high probability of over-used resource and unchecked extinction of lesser-known or used resources.

Land with its entire attribute that our culture and tradition so revere not as an individual but as a community is an ancestral inheritance where the transfer of ownership even within the community was a taboo. Any resource to be taken was strictly based on egalitarianism and free. For the past years, there has been so much change in this relationship, that today it is considered unethical to stop an individual to put the interest or welfare of the community before that of his or her own. Moreover, the forests are constantly divided between restricted and individual property, bounded and limited by us for oneself.

The emergence of individualism in livelihood, as well as, resource creation has seen the face of landlessness, and there is no greater vulnerability and risk to a household livelihood than landlessness. Differentiation also leads to exclusion and polarity in community and society.

It is normalised to appropriate resource for individual accumulation or exploit individual even CPR by individuals who have the influence, whether social or financial.

Concisely, separation of CPR and community resource management with livelihood, plus the detachment of community with the production ecosystem has created a livelihood based on manufacturing ideology.

Chapter 6

Conclusion

Nagaland located in the easternmost part of India comes under the Indo-Burma Biodiversity hotspot of the world. Cradled in the mountain ecosystem, the homestead with the surrounding forest, the fertile land they till, the rich mountains and the pristine rivers they venture is their everyday living space 'home'. It is with unconscious endearing that they consider their environment to be a shield for their life, protecting, providing and sustaining them. The land with its features is a reservoir of detailed ecological knowledge and a repository for the memory of past event. Their inquisitive nature to land and its diversity has provided the required wisdom and tool for their welfare and the Nagas thrive in otherwise the difficult hill ranges.

A Naga village functions as a social, political and cultural unit and is defined by its territory and sovereignty where the land belonged to the community. The state covers an area of 16,579 sq km where Tibeto-Burman speaking 14 major Naga tribes and many sub-tribes inhibits the eleven districts. It indicates the settlement of diverse cultural landscape and manifestation in the state. The basic classification of land ownership in Naga society is individual and community. Landholding system not only varied among different tribes but even among villages of the same tribe. There exist variation in the ratio between the community and private land among tribes and among villages within the same tribe depending on cultural reasons and practices.

The Sumi Nagas who practice autocratic chieftainship is nonexistent in Lazami village, where the majority of the forest belongs to the clans and the cultivated land to individuals. Similarly, while the majority of land belonged to the village council in Gaili village of Zeliang tribe, in Benreu village of the same tribe, the clans own the majority of the village land.

Their interaction with the mountain ecosystem has developed a way of life with the land as a traditional resource based on egalitarianism and their economy was closely knitted

and self-sufficient. Community sharing, a resource distributing system, is a common virtue where they work together building houses, cultivating the land and procuring food. When one considers the freedom of access or claim to one's need for sustaining a livelihood system, it surpasses the ownership over the social and political boundary. The concept of traditional philosophy that 'land does not belong to man but man to land' or in practice, that' no individual can claim ownership or rule over nature as a private property' is revered among the Nagas.

Sample villages representing different tribes binding their identity to land and its use as a direct expression of their culture is diverse (Table 2.1) among the Nagas. In all its complexity and diversity production technology of CPR in jhuming and NTFP drives the individual livelihood as equals and sovereign. This traditional system recognizes the ownership but also permits its temporary use by others.

They have adapted to their physical environment and participated with nature in their livelihood with reverence and as stewards never as rulers or modifiers. The rich agrobiodiversity elements have evolved within diverse agriculture systems in intricate association with the communities distributed from the hill slopes down to the valley. The diversity of crops has much affinities to the tribal community in both cultures and their traditional knowledge.

The unique bio geographical location of the state with varied climatic conditions and ecosystems support a rich agro-diversity. Rice is the major crop and more than 80 percent of the gross cropped area is under rice cultivation. They practice mix cropping and multi cropping in jhum cultivation, terrace rice cultivation, homestead garden and kitchen garden producing an abundance of traditional crops, fresh, disease free and organic whole year round. Additional bio resource from the terrace field is water bugs,

snail, fish, crustaceans, pumpkin, beans, tomato, yam, tapioca, guava, banana, peach, pineapple, sweet potato, stink grass, pennywort etc.

Similar is the forest resource, their dependence on diverse flora and fauna as NTFP was broad and mass harvesting of annually renewable parts of plants, animal, and insect population met their food requirement both nutrition and medicinal. Their intricate knowledge about diverse plants parts, insects and games, season, habitation, names and uses reflects the close affinity that community has with the environment. Many cuisine and delicacies are forest products and hold significance to their culture.

Naturally occurring as additional crops from both terrace field and jhum fallow plays a significant often-unrecognised role in food security of the community. Snail from wet terrace rice cultivation is considered as meat even today, *Zanthozylum sp* (prickly ash) is a medicinal plant in jhum fallow used in Naga cuisine. It is fair to state that forest produce of fruits, young shoots, tubers; mushroom, flowers, herbs, bees, frog, crab, fish etc meet the food supplement and complete the diet of the community yet often unaccounted in the production.

However, not every village in the state has the same biophysical resource base and the culture associated with management. Terrace rice cultivation and wet terrace cultivation is prominent in Kohima and Phek districts through irrigation from perennial rivers and streams. Jhum cultivation and pockets of terrace rice cultivation are practice in all the other districts, whereas terrace cultivation and plantations are expanding in the low-lying valley of Peren, Dimapur and Mon districts. Each agriculture system has its own unique practice of tillage, soil conservation and soil fertility management, weed control, sowing, and cropping system.

Minimum tillage in jhum cultivation, conservation tillage or zero tillage is a technology to prevent soil erosion and soil fertility loss, broadcasting and dibbling of seeds, and mix cropping is an organic agriculture system, unique to the physiographic and food needs of the household. In contrast to this is the winter tillage that is the first step in preparing the surface crusting for plant nutrients and puddling in summer in permanent terrace cultivation.

Rice and maize the staple food of the state is diverse both in the jhum and in terrace farming system. For a community who practice jhum, they cultivated different rice variety in the first and second year of jhuming, similar in terrace cultivation varieties of both glutinous and normal rice is cultivated each year. The field is their seed bank, taking as many crops and its varieties. It is also the in situ conservation of cultivars and new crops and the traditional knowledge associated with farming.

Semi-urban and urban areas and villages depend on the neighbouring villages for forest produce that are delicacies in the local market. Banana flower and stem, bamboo shoot, mushroom, honey, amla, crab, fish, frog etc are the most abundant and common food item all over Nagaland.

A variance is observed in the forest common green leafy vegetables in the villages, varieties of *Elatostemma sp, Diplazium esculentum, Impatien sp* in Kohima district while among the other tribes *Zanthoxylum sp, Gnetum sp* are more utilised as food.

All the technology associated with mobilisation, utilisation is hand based, and only traditional tools are used. Every household is self-employed in farming and depended on the community for labour through exchange system. Livelihood in Nagaland through collective mobilisation and management of the rich bio-diversity was self-dependent and sufficient.

The ideal of every individual commuting with the land collectively with no sense of claiming assets as private property does little in contributing to a more contemporary understanding of tribe-land relationship and on how this relationship might be undergoing change.

Similar is the rhetoric confinement of community life within the spatial entity 'village' bounded by their relationship to land and the society.

The twenty-first century has ushered in the state phases of change and development often labelled as progress and civilization. Amidst this acculturation is the conflict between traditional practices and modern values. Firstly identifiable is the alienation of an individual from the land as their identity and its ancestral bond. As a modern society, the sacred relationship to the land is no more sacred. This uncomfortable notion has seen the day light of land becoming a commodity among the community. Boundary dispute and tension among neighbours and villages emerge because frontiers lands were shared for usage and there existed no clear line demarcation. In the present century, every inch of land is valuable.

Urbanisation, growth of communication, education and modern lifestyle has disintegrated the formidable village resource and livelihood system in the state. The pull factor of urbanisation has also seen the abandonment of ancestral land by households in villages and overcrowding in the urban areas. In the process, the value of land in both the concern village and the urban destination is reversed. The process of migration often includes selling of private land and the reverse rocketing of land price in the urban area.

In the culture of Naga society, it was taboo to sell ancestral land or appropriate community land by any individual. However, it was observed that there are some household with acquired land indicating the change of ownership among the

community. Consistent change in land use pattern has facilitated the privatisation of community land all over the State. It has also created permanent transfer of land rights both ownership and utilisation from the commoner to rich individuals, who are more than ready to exploit the resources with new technology.

Selling of land to those considered outsiders in a village is more where land development through wet terrace cultivation and plantation is favourable in the frontier foothills. Another less paid attention internal process of land alienation is the leasing of land for commercial firewood, logging, quarrying and mining. These are determining the value of land to the people and the process to attain the resources by individuals. There is no stopping, as it is not just a simple money oriented individual business anymore; leasing becomes a necessity for the land rich but money-lacking household.

This process has not only affected the land value, it has caused vegetation cover destruction and increased soil erosion and created disharmony among the community. These economic ventures in terms of road connection and land fill, waste disposal and labour settlement becomes a source for diminishing the land biodiversity as well as an agent of environmental pollution.

Dynamics of human-land relationship posits the questionable legislation of the State Government with false promise for progress appeasing the alienation of the community from their land. Threatening traditional practice of community sovereignty as the state repeatedly affirms the need for comfortable access to land to deliver smooth and speedy development into the state.

Similar is the assertion of borrowed technology to suit the needs of the state by Government Departments without long-term consideration that it becomes more of an experiment and wasteful in many instances.

The state-centric approach to development and halfway commitment poses as the principal threat to indigenous sovereignty. The industries set up so far has the name but failed to deliver the people the projected benefits. Creating mistrust and lack of zeal between the government and people for newer establishment and functioning.

The state government has initiated the people to come down to the foothills of their settlement, for easy access to transport and communication and thus the growth of developmental opportunities. This has propagated the growth of land fragmentation and haphazard developmental activities as well as created a sordid competition of the available foothills for agriculture and commercial activities.

The rush to increase production and uplift the farmers from their lacking economy leave less scope for traditional farming and its role in food security in the modern economy. It is observed that marketing system of the local produce is not only weak but lacking in the state as a result of which horticulture produce market is exploitative and devoid of competition. The state experience period of glut and shortage and report of wastage in horticultural produce during peak season. Production has been reported cabbage in Phek district, tomatoes in Longkhum village of Mokokchung district and passion fruit in Wokha district and ginger in almost the entire state leading to huge losses, which deter the farmers from taking up horticultural activities. Though different departments have introduced plantation crops and high value crops, in failing to bring strong marketing and post harvest management facilities, there has been a conspicuous failure to exploit those resources to the desired level. For instance, in Tsüpfüme village under Phek district in 2013 community cabbage produce was lost when a landslide blocks its only connectivity to its market source. With no storage or other modes of transport, all the year labour and investment lay rotten and wasted. Interactions with market oriented farmers find that though the land yields premium organic produce due to lack of good

road, transport facility and the proper market they have suffered loss and unstable income.

The entry of departments into farming has also seen the introduction of exclusion and segregation in community livelihood when it favours individual household over the community, commercial crops over traditional crops, and one village over the other. Government policy for farmers to progress through agriculture has facilitated the erosion of traditional agro ecosystem, replacing a variety of crop that has better trait and adaptability to the climate, physiography and agroecosystem of the community.

When one says commercial, it is the exploitation of land resources as a necessity for the advancement of; both the detached farmers who are venturing into business as well as the farmers who are compelled to lease their land rights to augment income and finally the well off individuals to improve their lifestyle. There is no household whether government employed or otherwise who does not involve in land development for livelihood. This, however, does not imply a mass agreement for exploitation of land as a commercial entity. Interviews suggest two classes or category of prominent land value often stated as "money does not stay, even if we acquire money today in exchange of our traditional richness, tomorrow it will be gone" "new development as a choice is the ultimate source for household economic needs and growth".

Likely, another aspect of alienation is from the community (clan, khel,village) land both the right to access and utilise as collective owners. It is more of a persistent threat for landlessness than any other factor. If the community lands are to be privatized, it will create a class of landlessness in the Naga society. Privatisation of community land is a process, which does not favour every household of the community. For instance, to establish individual ownership on a community land where it is allowed, only the influential, as well as the individual with money for land development, can attain

ownership. On the other hand, clan land which formed majority forest both cultivable land and woodland are been granted individual ownership through division among the members.

Traditional collective responsibility to forest ecosystem management has shrunk and doted to just a few hundred hectares in the sample villages (Table 4.1). The impose prohibition on hunting, fishing, and collection of any vegetative part in the community reserve forest has been targeted to flourish the ecosystem and restore their ancestral link to biodiversity. The presence of six intact forests in Hükphang village (Longleng district) clears the often-blamed culprit 'jhuming' for wiping the primary forest in the state, sacrificing our environment over primitive agriculture.

For the thirteen villages, the designated community reserve forest is not random; it has a historical significance both culture and ecosystem to the community. The absence of community reserve forest in the other nine villages has one looking into the footprint of urbanisation and local biogeography. Urban development takes away the integrity of man to the environment, changing the local landscape. The semi-urban villages like Pfütseromi, Tizit village, Tenyiphe 1 are fast transforming settlement with the concentration of socio-economic changes and progress from all the neighbouring villages.

Unorganised hunting and fishing became illegal in the traditional society, as the fast disappearing fauna threatens not only the population but the diversity as well. Recently, the need of prohibition has become a phenomenon all over the villages, where the importance of conservation is resurging especially among the younger generation.

The silent disassociation of community hunting and fishing, a resource mobilisation practice, has marked the lost of collective culture and the birth of individualism. NWFP

an overwhelming food and medicinal source is also a food security base. It includes both the less known vegetables that are seasonal and the more consumed varieties that are available in the market whole year round. The centre of NWFP consumption has moved from the local village to the expanding open market system.

This transition in all the villages has brought to light two management strategies. The first is the mass non-destructive harvesting of annually renewable plant parts, animal, insects etc to individual livelihood and household food security. The second is the role of women in NWFP management, the habitat knowledge, and selection of cultivars, the season, varieties, and food security of the household.

Traditional knowledge is the epitome/source of self-empowerment in managing the local specific resource for their livelihood and its sustainability. In the past, traditional knowledge has guided human interaction with nature and till date is very active in creating a favourable yet often-dynamic resource use system. The general apathy towards individual learning from the laboratory of life and its dissemination among the community threatens the relativity of one's ability to building the livelihood.

When the readymade fame of western technology and ideal is place on the pedestal, it overshadows the practical nature of traditional knowledge to the people and their resources. One will be at fault to romanticise about the relation of people and resource for this case nature. Details of traditional knowledge in play whether with the resource base or a particular resource conclude that resource sustainability among the Naga society is linked to their ability to manage their own resources.

Traditional knowledge in relating to their environment, resources and one another both for the present but more importantly for the future generation will be at risk if

modernisation is allowed more credit than it deserves in the management of our resources in recent development and progress.

To subordinate traditional knowledge as primitive or inferior through the introductive policy of new seeds and new farming is robbing the people great opportunity to bestow upon generations the art of living in harmony with nature.

Gibb and Martin, crop diversity index among the eleven districts (2008-2009), (2013-2014) show that in all the districts competition between crops for the area, and importance to the farming community is increasing. The present study shows that 17.55 percent of the total sample does not cultivate rice and 4.58 percent only commercial mono cropping. Horticulture crops are gaining higher significance than the staple cereal crops of rice and maize. Cultivators as self-employed are more than willing to modernise their field and its production system, to access formal agriculture and marketing and thus income for the household.

Crop concentration index (Table 4.4) among the eleven districts indicates the present existing region wise crop status. Where traditional crops like Kholar in Tuensang (4.36) has the highest concentration whereas it is nil in Peren and Dimapur. Likewise, Plantation crop such as tea is highly favourable in Dimapur (3.99) and less in Peren and Longleng where it is nil. The current study also finds that not every crop should be imposed in every district as a phenomenon economy driver nor all district should have the same planning. Even if the agriculture system is traditional, each region should be examined and analyse separately before any projection and investment in its development.

The surge of marketable mono crops into the jhum field has changed the cropping system drastically. Analysis through personal interaction has proven that village

specialisation of potato; tomato, cabbage, tea, French beans, kiwi, cardamom, orange etc are becoming a phenomenon not only in the village but also in and around its neighbouring villages. The linking of farming to market has in no doubt increase the purchasing power of the farmers but total dependence on the market for food security. One honest observation of market products though abundant is never secure and much more costly when it reaches the distant village.

Farmers embrace crop diversification to meet the household food security as well as cash in the surplus produce. Crop concentration towards high value added crops in mostly market driven. Market interest and growth is high within the state because of the organic quality of the crop and the cultural affinity. Cabbage in Phek district, local garlic in Benreu village, Naga king chili in Tsiepama village, spring onion in Kidima village, potato in Kigwema village are known for its reputation of quality and taste maintaining its own geographical indication in the state.

Food production in the state is organic without default. Cultivators aid the soil ecosystem to host the growth and health of the diverse agriculture system with no chemical manipulation or dependence. The low value of chemical consumption in the state itself and when compared to other state or country makes us feel secure from all the discourse of detachment and poisoning in food production. However, it is disheartening to find that chemical concentration both fertilizers and pesticides are found in particular crops and location. Firstly, the introduced commercial crops are part of the food industry and manufacturing policy, manoeuvred for high yield and productivity. Moreover, the benefits are harness by providing the controlled medium through which it is inbuilt. Once a farmer is introduced to a commercial mono cropping, it comes with the use and dependence of fertilisers and pesticides. Commercial and mono cropping of tomato in Longkhum village, tea in Tizit town,

vegetables in Tenyiphe1 village, paddy farming in Gaili, Tizit and Tenyiphe villages are locations and crops specific where the crop and soil are chemically dependent.

The abusive nature of chemicals on the soil ecosystem among the community is widely observe and agreed, in the instant degradation of natural soil regeneration ability. However, there is no report of action against the use of chemicals. Confirming the normalization of chemicals in farming where it is practiced and its liability on individuals. The use of common salt as a weedicide is long been labelled as a traditional practice in the academic purview with less focus on the ill effect it has on the soil ecosystem. Among the jhuming village communities, it is found that the negative impact has long surpassed that of its advantage. It is still an ongoing conflict of priority between farmers and the civil body in Mon,Tuensang, Longleng, Mokokchung, Wokha and Zunheboto districts in management. For instance, the Deputy Commissioner in Longleng district has repeatedly issued orders since 2012 yet failed to implement the prohibition on the use of common salt in jhuming to rehabilitate the soil and vegetative system. As the prohibition was simply imposed with no replacing solution or answer to their problem. This initiative has been stronghold by the student body in Hükphang village (2015), where the ban of salt in the village has been successful for two years.

The resurgence of chemical concentrated, context-specific agriculture system is challenging the self-employed, food secure and seed secure livelihood system. Self-employment in agriculture is changing rapidly in its workforce. Figure 5.3 and 5.4 depict the changing scenario, decrease in cultivators to the total workforce and the increase of agricultural labourers to total workforce. This also proves that there is a growing increase investment of money and thus, expenditure in agriculture.

Farmers in and around Dimapur, Peren and Mon districts are transferring the right to use and develop their wet terrace land to families of non-locals as sharecroppers. For

instance, in Gaili village under Peren district, every cultivator with terrace rice cultivation have employed sharecroppers, similar is in Tenyiphe-1 (Dimapur) and Tizit (Mon) villages. Settled in the field with free access to water and firewood, they till the land with their choice of seeds both khariff and rabi crops and have been living on the land for more than a decade. Tea plantation as an influence of the Assam agriculture has created individual tea plantations along the Tizit town and its surrounding villages. All the daily labourers and managers are non-locals as well as the tea leaves are transported to Assam as raw materials.

It is important to raise the question whether these new developments are improving the livelihood of the concerned individuals as owners or are becoming an important source of livelihood for other immigrants. It is not an exaggeration to say that this is a process where we are allowing other people to live off our land.

Traditional labour exchange system of the peer group and work gang has ceased to meet the intensive year-round activities of farming creating a new system of labour demand in all the villages. Farmers in the semi-urban and urban villages have resorted to migrant sharecroppers, the seasonal hiring of migrant labourers and local wage labourers to local wage labourers in almost all the villages. One organisation of work gang is 40-50 groups of different age and gender in Tsiepama village, where all the major works is done through labour exchange system and there is no hiring of labour.

A livelihood strategy through agriculture intensification and market linkage is setting the priority of money over food security. Many farmers buy from the market everyday staple food and other supplements.

It is a misconception to think that the mere availability of seed means seed secure in livelihood.

Seed security is not only about the availability of quality seed and desired varieties self acquired or bought; it also includes the management of germplasm diversity that is intergenerational and an ongoing process. Every farmer is not only a custodian but are also breeders and has great control over intracultivar diversity over the years with their intricate knowledge associated to reproduce each cultivar. To lose even one is a great loss in not only agriculture but also culture and knowledge associated with it.

Each landrace has a story or cultural attachment to the community. In addition, each has a character trait that made all equally superior. All landrace can be grown with low inputs, under different physical and biological stresses and maintain its seed quality in germination and purity. It is seed confident and self-dependent.

Agriculture is a dynamic process. Farmer's relation to seeds as custodians is changing as their socio-economic situations change and new varieties are been introduced with one or many better traits. The influence of commercial high yield market seeds is still at its initial stage and as such, there is no case of market seeds replacing the traditional cultivars in the sample community. However, a common danger not yet realised or fathomed by a farmer is the assumption that somebody else is keeping the varieties one is discarding; there is the danger that none will keep them and they will be lost from the reference area.

There is also an observable decrease in the value of a field as the in situ conservation of agro biodiversity as modern value rules/projects farming as a food production system. A landrace is the basic building block of traditional farming and to consider otherwise will be reckless and unwise.

As agriculture and NTFP management secured more importance and relevance in the livelihood front so did the role of women in livelihood security. Revisiting our nature-

food ecosystem, women are in the spotlight, as a grossly underutilised resource capable of almost limitless development as well as crucial for livelihood sustainability.

Women's participation in agriculture is extending from the grower, confined in the field and household to the open market food chain. As women in each household take up the responsibility to balance the traditional-food secure and modern money-need of the family. Their dedication and knowledge have become more crucial as the community enters the phase of money-oriented culture where everything/ every resource have become market exchangeable. The sustainability of our agriculture system and food production depends on the women as individual cultivators, who select the crop to be cultivated and maintain the agroecosystem. In simple terms, the fate of agriculture largely depends on women, as gender and generation gap increases in farming. The type of landraces and its varieties saved and the knowledge associated with it will depend on the choice of the women, today and tomorrow.

The quality of food and thus our diet and health are in the control of women as they provide varieties of produce from the forest, kitchen garden, jhum filed, and homestead garden year round. One major challenge observed in the state is that even when local food produces increases to meet the food security of the population, the market space and standard is still negligible.

Nothing should compromise women to organise themselves to increase their own self-reliance and to assert their independent right to control resources.

Livelihood in the Naga society has been as a community and not as individuals. Collective access and sharing of resources are inalienable right as well as responsibility, which links them together with the resource as sovereign and cannot be reduced to a commodity to be traded or 'accessed and benefited' via monetary payment.

The modern diversion from this worldview has sprouted the force of exploitation in access, erosion in traditional knowledge and self-dependence and polarity in livelihood creation. As ancestral property, what will the future inherit from the present generation? When all the innate quality of livelihood and resources as a community is reduced to just monetary value.

It is high time to learn one lesson then that sustenance has no market value but life value. The compartmentalisation and disassociation between traditional and modern bio-resource management has merge development into a fight over superiority and replacement.

Showing the weakness and failure in policy and goals for development that has failed to encourage and build from the resource within, both human and bio-resource creation to inbuilt sustainable livelihood. The present study provides a sound base in the status of bio-resource as well as the dynamics of resource and livelihood. Future research is also much needed to guide us better. Through the present analysis and findings, below are some major suggestion that has been incorporated in policy making as well as further research and study.

The present study clearly depicts/projects the current slow yet progressive threat to the forest ecosystem and its bio-resource, as individual ownership and priority supersede that of CPR value and responsibility. Renting or leasing of community land for commercial purpose as well as of that of jhum land to individuals are becoming common as well as normalised. Revitalisation of such practice in resource management can enhance the resource sustainability as well as livelihood security of the community. Leasing of community forest to individuals for the purpose of commercial use has to put to a complete stop as well as community control over any bio prospecting and bio-piracy.

According to the Nagaland Biological Diversity Rules 2011 (4, 8, 11) the power vested for any policy making through the State Biodiversity Board is been confined to just a few prominent Government officials and eminent university members. Whereby, the provision given by UN in article 8(j) in recognition of Traditional Knowledge in larger policy matter has been void. Mainstreaming of biological resource management in the state has reduced community participation and responsibility to just gathering and providing data about their resource, whereby in no clause they are given power or priority as decision-maker or policy maker. Therefore, unless the community is given top priority in policymaking, management will not be successful in the future. In this regard, it is to be noted that the Nagas have been the custodians of biodiversity for years. As such, they possess knowledge system of their environment, which could solve and prepare for management problem of biodiversity better than any 'imposed system.'

Food security and agriculture development cannot be separated. As commercial mono cropping increases in individual household farming, the variety of crops is decreasing. The decrease in crop diversity as well as replacement of cultivars robs us of food security in livelihood. Food security includes self-dependence in seed, control in production and diet of the household. It is important that development policy/state understand and appreciate the significance of local genetic resources and the limited choice of high-yielding varieties and support should be clear that the introduced varieties should be seen as an addition to existing diversity rather than a replacement for them.

The diverse agro-ecosystem and forest-ecosystem produce enough to meet the food supplement of the state and be self-food secure. Government policy in providing post harvest infrastructures such as cold storage in strategic areas, the creation of market chain, regulation of market price, processing and packaging is highly needed to have a

sustainable impact on the rural economy. Such development will attract and increase human resource investment in agriculture and thus, bring sustainable development to the state economy. The direct disadvantage to our rich resource is lack of market. With no market space, the policy aiming to increase production is meaningless. Communitization of market network and post harvest infrastructure is desired to enhance the role of private agencies, NGOs, and Women self help groups. For instance, women through *Watsü Mongdang* (Women organisation) has come together forming a unique chain of bio-resource exchange and conservation through the market system from the neighbouring four districts (Tuensang, Wokha, Longleng and Tuensang districts). Such success should also be initiated and stronghold in other districts.

As livelihood and bio resource relationship has become more dynamic and complex with new policies both state and central, schemes are incorporated to attain/achieve prosperity and development for the people. It has become significant to readdress resource management. Introduction of plantation crops has led to mono forest growth, which is considered as 'green desert' and poses a threat to endemic species. Similarly, introduction of hybrid vegetables has multiple negative impacts; their usage in the farm is uncertain relating to stability of agro-ecosystem. It is the need of the hour that Government should help document all indigenous crops, do more research and help the farmers to enhance its quality, preserve the seeds, knowledge, and agro-ecosystem.

As the present study reflects the focus of women oriented agriculture production and market management of bio-resource in livelihood, it is only imperative that any policy in the management of bio resource has to be through a thorough consultation and opinion of the women who are taking the major responsibility. Such strategy will be an investment in women human resource and empowerment for sustainable goals.

In the force of globalisation, the Indigenous Communities around the world has intensified their call for protection, access and control of their livelihood bio resources. Nagas like the rest of the Indigenous Communities face similar situation due to a drastic change in resource distribution and management pattern in the recent years. In this context, the larger issue is rethinking the conservation of biological diversity through reinforcement of community participation. Both development and conservation could be achieved only when age-old traditional knowledge and practices are given due recognition in the framework of the government programmes and policies largely dominated by modern scientific resolutions. It is only through such policy that communities can be channelled with freedom and self-dependence in bio resource management, attachment, and responsibility to their ecosystem and build livelihood with equity. Not to consider otherwise will be to load them visions with no tools.

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ANNEXURE

Questionnaire survey for Bio Resource Management and its Impact on Livelihood Pattern in Nagaland: A Geographical Analysis.

Name: _____

F/Name/H/Name: _____

Sex: _____

Age: _____

Qualification: _____

Occupation/Profession: _____

Present Address: _____

_____

_____

Permanent Address: _____

_____

_____

PART A

TO BE ANSWERED BY A VILLAGE CHAIRMAN/ PASTOR/ VILLAGE EDUCATION BOARD CHAIRMAN OR TEACHER.

1. Name of the village/ town :_____
2. Total geographical area of the village/ town:_____
3. Total area under forest :_____

   Specify: Private _____ hectare/ acres.

   Family land_____ hectare/acres.

   Clans _____ hectare/acres.

   Community _____ hectare/acres.

   Government _____ hectare/acres.
4. Total area under cultivation:_____
5. Total area under settlement :_____
6. Total population of your village/ town :_____
   a) Male :_____
   b) Female :_____
7. Total number of household :_____
8. Total number of schools :_____
   a) Primary :_____
   b) High school :_____
   c) Any other :_____
9. Any medical facility in the village/town? Yes/No

   If yes, name:

_____

10. What is the distance of your village/town from the district headquarter/nearest town?

_____

_

11. Is there any commercial crop that has changed the traditional agriculture system in your locality? Yes/No

If yes, name the crops:

_____

___

12. Has the dependence of livelihood on Bio-resource in your locality increased/decreased or stayed the same over time? (Describe the trend)

_____

_____

_____

_____

_____

13. Is your village specialized in any of the regular activities of Bio-resource business/activities eg food processing/ tea leaves/ charcoal :

_____

__

_____

__

14. Do you think the ongoing economic activities are impacting any Bio-resource base? Yes/No.

If yes, state

briefly_____

_____

_____

_____

_____

_____

_____

___

PART-B

1. What is your major source of livelihood?

   a) Govt/Private service : ☐

   b) Cultivation : ☐

   c) Animal rearing : ☐

   Please specify: Piggery: ☐ Numbers: _____

   Poultry: ☐ Numbers: _____

   Diary: ☐ Numbers: _____

   Any other: ☐ Specify: _____

   d) Any other:

   Specify:

   _____

2. Are you dependent on Bio-resource? Yes/No

   If yes, tick where necessary:

   a) Food: ☐

   b) Household material: ☐

   c) Medicine: ☐

   d) Any other: ☐

   Specify: _____

3. Is there any virgin forest in your locality? Yes/ No. If yes, area

   _____ acres/ hectare.

4. How often does your household go to forest in a month?

   a) Father: ☐ times.

   b) Mother: ☐ times.

   c) Others: ☐ times.

5. Name some major resources collected from the forest:

   a) For household purpose :

   _____

   _____

   ____

   _____

   _____

   _____

   b) For commercial purpose :

   _____

_____

_____

_____

_____

_____

6. Is there any resource you collect for commercial purpose from the followings given below? Yes/ No

   If yes, state the names and the amount you earn annually:

   a) From river, animals(eg fish/insects)

      :_____

      __

      _____

      ___

      Amount earned annually: _____

   b) From forest, birds or animals or insects:

      _____

      _____

      _____

      Amount earned annually: Rs_____

   c) From forest, fruits or

      vegetables:_____

      ___

      _____

      ___

      Amount earned annually: Rs_____

d) From forest,

timber:_____

__

_____

___

Amount earned annually: Rs_____

e) Any other,

specify:_____

__

_____

___

Amount earned annually: Rs_____

7. Has the availability of wild Bio-resource for your livelihood increased/decreased or stayed the same over time? (describe the trend)

_____

__

_____

_____

____

8. Is there any law controlling the collection and use of forest resource? Yes/no

If yes, please state briefly:

_____

___

_____

__

9. Are these laws implemented in practical? Yes/No. If yes, state some examples:

_____

_____

_____

_____

10. Any community conservation of forest/river or land happening in your locality? Yes/No

    If yes, please specify the nature:

_____

_____

____

11. Is it illegal to collect any particular plant/bird/animal in your locality? Yes/No

    If yes, what are they?

_____

___

_____

12. State the reasons why it is so?

_____

__

_____

__

_____

__

13. Have you attended any awareness program on Environmental conservation or Bio-resource management? Yes/No. If Yes,

    a) Name of Program/Workshop:

       _____

    b) Place: _____

    c) Date and Year: _____

PART-C

1. Do you own land? Yes/No. Please specify area:_____
2. Do you farm? Yes/No. Please specify area: _____
3. What farm?
    a) Fruit orchard: ☐
    b) Animal: ☐
    c) Fishery: ☐
    d) Crops: ☐
    e) Any other: ☐
4. Do you also farm land that you do not own? Yes/No_____

    If yes, whose land do you use? _____
5. How do you manage your farm in the following terms:

    a) Subsistence farming or b) Commercial crops: ☐

    a) Traditional method or b) New technology: ☐

a). Traditional crops or b) New exotic crops: ☐

a) Household labor or b) Hired labor: ☐

6. Name some major products of your farm (Specify quantity) :

_____

___

_____

_____

_____

_____

___

7. Do you sell any products? Yes/No

   If yes, what are the products:

_____

___

_____

___

8. Where do you sell your products?

   a) Local market:

   b) Neighboring villages:

   c) Town:

   d) Any other:

      Specify:_____

      __

9. How much do you earn from them annually?

_____

10. Do you have kitchen garden? Yes/No.

If yes, name the major vegetables/fruits from your garden?

_____

__

_____

_____

_____

_____

11. Do you sell any product from your kitchen garden? Yes/No.

If yes, state some names:

_____

__

_____

_____

____

12. How much do you earn from them annually?

_____

13. Do you cultivate rice for your household? Yes/No.

If yes, through:

a) Wet terrace: ☐

b) Dry shifting: ☐

c) Both a & b: ☐

14. How much rice do you produce annually (In tins/ bags/quintals)?

_____

15. Is the rice produced sufficient for a year? Yes/No. If no, why?

_____

_____

_____

16. Do you only depend on your own preserved seed/nursery? Yes/No.

If No, what are the other sources?

a) Other farmers: ☐

b) Family friends: ☐

c) Marketed seeds: ☐

d) Supplied seeds: ☐

17. How do you manage the fertility of the soil for your crops?

a) Through traditional method: ☐

b) Through marketed fertilizers: ☐

c) Both: ☐

18. Has the agriculture production increased/ decreased or stayed the same over time

(describe the trend)?

_____

_____

___

_____

___

Part -D

1. What is the major source of household water:

a) Supply water: ☐

b) Bore well: ☐

c) Rainwater: ☐

Any other : _____

2. By what type of road is your village or town connected to the nearest village/town?

a) Black topping road: ☐

b) Kacha road: ☐

c) Foot path: ☐

d) Any other: ☐

3. Is there any item of Bio-resource you preserve for future use?

Yes/No

If yes, what are they?

Items	Quantity(amount/no/weight)	Duration

4. Is any member of your family involved in any local group/society or any organization in the Bio-resource Management or business? Yes/No.

   If yes, who and what is the name of the organization?

   _____

   __

   _____

5. What are the activities of the group/organization?

   _____

   _____

   ____

   _____

   __

6. Has the dependence of your livelihood on Bio-resource increased/decreased or stayed the same over time? (describe the trend)

_____

__

_____

__

7. Any Government developmental activities happening in your village?

   Yes/No.

   If yes, state the nature of the work:

   _____

   _____

   ____

8. From the ongoing economic activities in your locality what according to you has the most negative impact on Bio-resource? Why?

   _____

   __

   _____

   __

   _____

   __

   _____

   __

9. Any suggestion:

_____

___

_____

_____

_____

_____

Signature of the respondent: _____

Date: _____