NORTH-EASTERN HILL UNIVERSITY
CENTRE FOR ENVIRONMENTAL STUDIES
Mayurbhanj Complex, SHILLONG – 793 014, INDIA

Prof. B. K. Tiwari
Head

☎ 0364- 2231630 (Office)
Fax 0364- 22316919
Dated: 14.07.2003

Shri Ashish Kothari
Coordinator, TPCG
National Biodiversity Strategy and Action Plan
Kalpvriksh, Apartment 5, Shree Dutta Krupa
908 Deccan Gymkhana, Pune- 411004

Sub.: Final report of Biodiversity Strategy and Action Plan of Nagaland

Dear Ashish,

Please find enclosed a copy of the final report of the Biodiversity Strategy and Action Plan of Nagaland. The report has been finalized in the light of latest suggestions/ comments of the Prof. P. C. Bhattacharjee, Mr. Gam Simray, Mr. Khelchndra, members of the Departmernt of Forests, Environment & Ecology and Wildlife, Government of Nagaland, and all other concerned. We hope this is in order and as per the requirements of the NBSAP.

We would like to bring to your kind notice that so far we have not received the third installment of the grant sanctioned for preparation of the Biodiversity Strategy and Action Plan of Nagaland. We have already submitted the Utilization Certificate to the Biotech Consortium India Ltd, New Delhi as well as to the PCCF, Departmernt Forests, Environment & Ecology and Wildlife, Government of Nagaland, Kohima. I shall be thankful if you kindly take necessary action for the release of third installment of the grant which will enable us to settle the expenditure already incurred for the purpose.

With regards

Sincerely yours

B K Tiwari

B. K. Tiwari

Enclosure: as above

National Biodiversity Strategy and Action Plan
(NBSAP)



State Level Biodiversity Strategy and Action Plan of Nagaland

Prepared

by
O. P. Singh and B. K. Tiwari
Centre for Environmental Studies
North-Eastern Hill University
Shillong - 793014

on behalf of
Department of Forests, Environment & Ecology and Wildlife
Government of Nagaland, Kohima.

2003

National Biodiversity Strategy and Action Plan
(NBSAP)



State Level Biodiversity Strategy and Action Plan of Nagaland

Prepared

by
O. P. Singh and B. K. Tiwari
Centre for Environmental Studies
North-Eastern Hill University
Shillong - 793014

on behalf of
Department of Forests, Environment & Ecology and Wildlife
Government of Nagaland, Kohima.

2003

Preface

Nagaland is rich in biological diversity owing to its varying physiography and geo-climatic conditions favourable for luxuriant growth of vegetation. A majority of people of the state live very close to nature and depend on natural resources for their day-to-day needs. Hence, the well being and survival of the people are largely dependent on numerous species of plants, animals and microorganisms found around them. During recent times, however, the biodiversity of the state is experiencing serious threats by human activities leading to severe shortage of bioresources like wild fruits and vegetables, fodder, fuelwood, medicinal herbs and degradation of ecosystems. Of late the government, non-government organizations and public, in general of the state have realized the value of biodiversity and people are coming forward to join hands for regeneration of forests and restoration of degraded ecosystems. However, there is an urgent need for assessment and stocktaking of biodiversity related information of the state to conserve and sustainably use this precious wealth for the benefit of the mankind.

The NBSAP project of the Ministry of Environment and Forests, Government of India envisages preparing detailed Biodiversity Strategy and Action Plan of all the states for its incorporation into the National Biodiversity Strategy and Action Plan of India. The Centre for Environmental Studies, North-Eastern Hill University, Shillong has undertaken the task of preparation of the state level Biodiversity Strategy and Action Plan (BSAP) of Nagaland on behalf of the Department of Forests, Environment & Ecology and Wildlife, Government of Nagaland. It is our pleasure to be associated with this project of national importance. We are thankful to the Department of Forests, Environment & Ecology and Wildlife, Government of Nagaland for assigning us this prestigious job.

The BSAP report has been prepared following the guidelines supplied by the Technical & Policy Core Group, NBSAP, and consulting people, experts, government departments, NGOs and major stakeholders of biodiversity in Nagaland. The report contains eleven Chapters, which include important aspects of biodiversity of Nagaland, and suggests Strategy and Action Plan for its conservation. Chapters 1 and 2 provide introductory information and methods and processes of the NBSAP. Chapters 3 to 6 deal with basic information of the state ranging from geography and people to political and ecological profiles. Brief descriptions of various biodiversity related land based activities are given in Chapter 7. Chapter 8 deals with the status of biodiversity in Nagaland and Chapter 9 enumerates various factors and activities perceived as threats to biodiversity of Nagaland. Chapter 10 includes some investigatory project proposals that need to be undertaken to fill the information gap on biodiversity of Nagaland. It also provides for training and human resource development needs for conservation of biodiversity of Nagaland. Chapter 11 suggests Strategy and Action Plan for conservation of biodiversity of Nagaland. The report also contains relevant information and data in the form of Tables, Boxes and Appendices.

We have taken all possible care to provide relevant information in this report. However, there may be several omissions. We consider BSAP report a dynamic document, which has ample scope for its improvement as and when needed.

During the preparation of this report, we received valuable information in the form of published and unpublished literature, personal discussion, comments and suggestions, reports of government departments, and a number of research publications from experts, academicians, scientists and researchers, government officials, NGOs and common people. We find it difficult to mention names of all those, whose contributions helped us in preparing this report. However, we would like to make special mention of names of the following officials and experts, whom we frequently approached for their expert advise, help and cooperation during the course of the preparation of this report: Dr. S. C. Deorani, Commissioner and Secretary to Government of Nagaland; Shri N. Lolenmeren Ao, PCCF,

Government of Nagaland; Dr. C. L. Goel, CCF, Government of Nagaland; Shri Rongsenwati Ao, Chief Wildlife Warden, Government of Nagaland; Shri Supong Keitzar, Director, Department of Agriculture, Government of Nagaland; Shri K. R. Lyngdoh, CF (WL), Government of Nagaland; and Dr. Sapu Changkija, Reader, Nagaland University, Medziphema.

While writing this report, we consulted a large number of publications pertaining to Biodiversity of Nagaland generously provided by Dr. N. P. Singh, Principal Scientist (Agronomy), ICAR Research Complex for NEH Region, Shillong and Dr. D. K. Hore, Scientist In-charge, NBPGR Regional Station, Shillong. We are thankful for their contributions.

We are grateful to Shri Ashish Kothari, Coordinator, Technical and Policy Core Group, NBSAP, Prof. P. C. Bhattacharjee, Member, Technical and Policy Core Group, NBSAP and Sri Khelchandra, Kalpbriksh-NBSAP and Sri Gam Shimray for going through the draft report and providing valuable comments and suggestions.

We received valuable comments and suggestions from the participants of State level Workshop on Biodiversity Strategy and Action Plan of Nagaland held at Dimapur. We thank all the participants of the workshop for their active participation, presentations and discussion. We express our gratitude to Shri Temsuati Ao, CF and Shri Amemba Yaden, DCF, Government of Nagaland for successfully organising the workshop.

We are also thankful to the members of the State Steering Committee, BSAP Nagaland for suggesting necessary amendments in the draft report.

Figure No. 6.1 of this report has been directly taken from the book, "Biodiversity Characterization at Landscape Level in North-East India using Satellite Remote sensing and Geographic Information System". We gratefully acknowledge the Indian Institute of Remote Sensing (IIRS), Dehra Dun, for granting us permission to use this figure.

We also thank Ms. Koseno and Mr. S. M. Syiemlieh for their all round help in the preparation of this report.

Further, we are indebted to all stakeholders of Biodiversity, in particular and the people of Nagaland, in general for their overall support.

Finally, we would like to thank the Vice-Chancellor, North-Eastern Hill University, Shillong for allowing us to undertake this work and other officials of the University for providing necessary administrative and infrastructural support.

O. P. Singh
B. K. Tiwari

Dated: July 2003
Shillong

Centre for Environmental Studies
North-Eastern Hill University
Shillong- 793014

CONTENTS

		Page
1. Introduction	-----	1
1.1 A brief background of NBSAP	-----	1
1.2 Biodiversity in general	-----	2
1.3 Significance of biodiversity	-----	3
2. Methods and Processes	-----	5
2.1 Primary data collection	-----	6
2.2 Secondary data collection	-----	7
3. Nagaland at a glance	-----	10
3.1 Geographical profile of Nagaland	-----	10
3.2 Rocks and soil	-----	12
3.3 Minerals	-----	12
3.4 Climate	-----	12
3.5 Rivers & streams	-----	13
3.6 Population	-----	13
3.7 Districts of Nagaland	-----	13
3.8.1 Kohima	-----	13
3.8.2 Phek	-----	14
3.8.3 Wokha	-----	14
3.8.4 Zunheboto	-----	14
3.8.5 Mokukchung	-----	16
3.8.6 Tuensang	-----	16
3.8.7 Mon	-----	16
3.8.8 Dimapur	-----	17
4. People of Nagaland	-----	18
4.1 Tribes of Nagaland	-----	18
4.1.1 Angami	-----	19
4.1.2 Ao	-----	20
4.1.3 Lotha	-----	21
4.1.4 Sema	-----	21
4.1.5 Rengma	-----	23
4.1.6 Phom	-----	24
4.1.7 Pochury	-----	25
4.1.8 Sangtam	-----	26
4.1.9 Chakesang	-----	26
4.1.10 Zeliang	-----	27

4.1.11 Yimchunger ----- 28
4.1.12 Khiamnuingan ----- 28
4.1.13 Chang ----- 29
4.1.14 Konyak ----- 31

5. Political Profile of Nagaland ----- 32

5.1 Village Council ----- 32
5.2 Village Development Board ----- 33

6. Ecological Profile of Nagaland ----- 36

6.1 Forest cover ----- 36
6.2 Forest types ----- 36

6.2.1 Northern Tropical Wet Evergreen Forests ----- 37
6.2.2 Northern Tropical Semi Evergreen Forests ----- 37
6.2.3 Northern Sub-Tropical Broad-leaved Wet Hill Forests ----- 38
6.2.4 Northern Sub-Tropical Pine Forests ----- 38
6.2.5 Northern Montane Wet Temperate Forests ----- 38
6.2.6 Temperate Forests ----- 38

6.3 Joint Forest Management ----- 39

7. Land Based Activities and Biodiversity ----- 40

7.1 Agriculture ----- 40

7.1.1 Zabu Farming System ----- 40
7.1.2 Agriculture with Alder trees ----- 42

7.1.2.1 The life cycle of an alder tree ----- 43

7.1.3 Irrigated bench terraced paddy cultivation ----- 44
7.1.4 Home Garden ----- 44
7.1.5 Soumni/Yokya agroforestry system ----- 45
7.1.6 Jhum/Shifting Cultivation ----- 45

7.1.6.1 Agro - biodiversity in jhum ----- 46
7.1.6.2 Crops grown in jhum fields ----- 47

7.2 Horticulture ----- 48

7.2.1 Some backyard horticultural crops of Nagaland ----- 48
7.2.2 Shade loving economic plants for agroforestry ----- 49
7.2.3 Some important wild fruits of Nagaland ----- 51
7.2.4 Some economically important indigenous plants of Nagaland ----- 53

7.2.5 Some important medicinal plants of Nagaland ----- 55

7.3 Veterinary and Animal Husbandry ----- 57
7.4 Fishery Resources of Nagaland ----- 57

7.4.1 Production and demand ----- 58
7.4.2 Constraints for fishery development ----- 59
7.4.3 Suggested development approach ----- 60

7.5 Sericulture ----- 61
7.6 Agroforestry & Plantation ----- 62

7.6.1 Commonly planted tree species in Nagaland ----- 62

7.7 Wastelands Development ----- 64

7.7.1 Agro-forestry for wasteland development ----- 65
7.7.2 Rubber plantation development ----- 66
7.7.3 Wetlands development ----- 66
7.7.4 Integrated wastelands development project ----- 67

7.8 Industry ----- 67

7.8.1 Mini cement plant, Wazeho ----- 67
7.8.2 Approved industrial areas ----- 68
7.8.3 Potential areas for industrial development ----- 68

8. Status of Biodiversity in Nagaland ----- 71

8.1 Flora of Nagaland ----- 71

8.1.1 Germplasm of Nagaland ----- 72
8.1.2 Agrobiodiversity ----- 73
8.1.3 Tables listing the various plants and animals utilized in day-to-day life by the Nagas ----- 74

8.2 Wildlife of Nagaland ----- 84
8.3 Fish fauna of Nagaland ----- 91
8.4 Community Initiatives for conservation of biodiversity in NAGALAND ----- 92

8.4.1 Nagaland village declares itself a no-hunting zone ----- 92

8.5 Biodiversity hot spots in Nagaland ----- 92

9. Factors Affecting Biodiversity ----- 94

9.1 Common threats to Biodiversity in Nagaland ----- 94

9.1.1 Intensification of agriculture ----- 94
9.1.2 Shifting cultivation ----- 95
9.1.3 Privatisation of forests ----- 95
9.1.4 Deforestation ----- 95
9.1.5 Urbanization ----- 95
9.1.6 Industry ----- 96
9.1.7 Trade ----- 96
9.1.8 Aqua culture ----- 96
9.1.9 Hunting and poaching ----- 96
9.1.10 Wild fire ----- 96
9.1.11 Water use ----- 97
9.1.12 Hydel projects ----- 97
9.1.13 Over-exploitation of medicinal plants ----- 97
9.1.14 Animal husbandry ----- 97
9.1.15 Forestry and plantations ----- 98
9.1.16 Rise in population ----- 98
9.1.17 Use of explosives and poisons for fishing ----- 98
9.1.18 Lack of awareness ----- 98
9.1.19 Use of pesticides ----- 98
9.1.20 Unemployment ----- 98
9.1.21 Lack of biodiversity concerns in infrastructure development ----- 99

10. Project Proposals ----- 100

10.1 District Level Training Workshops for Officials of Village Development Board, Village Councils etc. ----- 100
10.2 Inventorization of biodiversity and identification of hotspots of Biodiversity in Nagaland ----- 101
10.3 Documentation of Medicinal Plants (MPs) and Non-Timber Forest Products (NTFPs) of Nagaland ----- 102
10.4 Documentation of Indigenous Ecological Knowledge (IEK) of Nagaland ----- 102

11. Biodiversity Strategy and Action Plan ----- 104

Strategy I: Incorporating biodiversity concerns in state policies and laws ----- 104
Strategy II: Involving people in biodiversity conservation ----- 104
Strategy III: Involving Socio-Political Institutions (SPIs) and Religious Institutions (RIs) e.g. churches and NGOs in promotion of sustainable use of biodiversity. ----- 105
Strategy IV: Reviving and documenting traditional biodiversity conservation practices and Indigenous Knowledge Systems (IKS) ----- 106
Strategy V: Motivating individual landowners to adopt biodiversity conservation measures ----- 107

Strategy VI:	Controlling spread of agriculture and human habitations in areas covered by natural forests and other biodiversity rich habitats	-----	107
Strategy VII:	Reducing dependence on biomass for household energy and construction materials	-----	108
Strategy VIII:	Checking degradation of land and water resources	-----	109
Strategy IX:	Involving youth and students in biodiversity conservation	-----	109
Strategy X:	Reducing adverse impacts of industries on biodiversity	-----	110
Strategy XI:	Improving availability of timber and fuel wood in the vicinity of human habitations	-----	110
Strategy XII:	Increasing area under protected area network	-----	111
Strategy XIII:	Ensuring equitable sharing of benefits of biodiversity	-----	111
Strategy XIV:	Building new institutions for biodiversity conservation	-----	112
Strategy XV:	Incorporating biodiversity concerns in planning and project implementation	-----	113
Strategy XVI:	Promoting interdepartmental cooperation for biodiversity conservation	-----	113
Strategy XVII:	Taking appropriate steps to use market forces for the benefit of biodiversity and to mitigate their adverse impacts	-----	114
Strategy XVIII:	Promoting organic farming	-----	115
Strategy XIX:	Protecting wild animals from game and hunting	-----	115
Strategy XX:	Developing eco-tourism for biodiversity conservation	-----	116
Strategy XXI:	Involving defence personnel in biodiversity Conservation	-----	116
Strategy XXII:	Discouraging monoculture tree/commercial plantation	-----	117
Strategy XXIII:	Promoting community conservation practices by taking into account measures for their continued existence	-----	117

References / Bibliography ----- 119

Appendices

LIST OF TABLES

Table 2.1: List of participants at the State level workshop on Biodiversity Strategy and Action Plan of Nagaland - 8
Table 6.1: District - wise forest cover (1999 Assessment) - 36
Table 6.2: Legal status of forests in Nagaland - 37
Table 6.3: Ownership of forests in Nagaland - 37
Table 7.1: Livestock population of Nagaland - 57
Table 7.2: Category of wastelands in Nagaland - 64
Table 7.3: Category-wise wastelands of Nagaland - 64
Table 7.4: Details of industries in Nagaland - 68
Table 8.1: A list of some economically important plants of Nagaland - 71
Table 8.2: A list of species endemic to Nagaland - 72
Table 8.3: Germplasm diversity in different crops recorded from Nagaland - 73
Table 8.4: Medicinal plants - 74
Table 8.5: Plants used as vegetables - 75
Table 8.6: Wild edible fruits - 75
Table 8.7: Plants utilized for the construction of houses and handy crafts - 76
Table 8.8: Plants used for broom/brushes - 76
Table 8.9: Common timber plants - 77
Table 8.10: Ornamental plants - 77
Table 8.11: Rope making plants - 77
Table 8.12: Soil fertilizer plants - 78
Table 8.13: Soil quality indicator plants - 78
Table 8.14: Time indicator plants - 78
Table 8.15: Sacred/worshipping plants - 78
Table 8.16: Plants used for making fire - 79
Table 8.17: Plants used for playing Indigenous games - 79
Table 8.18: Plants suitable for wood carvings - 79
Table 8.19: Plants utilized for flavouring/Condiments - 79
Table 8.20: Soap yielding plants - 80
Table 8.21: Fencing plants - 80
Table 8.22: Plants used in preparation of local wine/liquor - 80
Table 8.23: Poisonous plants - 80
Table 8.24: Fish poisoning plants - 81
Table 8.25: Dye yielding plants - 81
Table 8.26: Plants yielding insect repellent oils - 81
Table 8.27: Plants for trapping/catching animals - 81
Table 8.28: Plants used as spices - 82
Table 8.29: Some important tree species of Nagaland - 82
Table 8.30: Rare and threatened plants of Nagaland - 83
Table 3.31: Protected areas in Nagaland - 84
Table 8.32: Some important wildlife of Nagaland - 85
Table 8.33: Some threatened animals (higher vertebrates) of Nagaland - 87
Table 8.34: Animals used in Nagaland - 90
Table 8.35: A list of fishes found in Nagaland - 91

LIST OF BOXES

Box 5.1: Relevant section of the Constitution of India with respect to Nagaland (*Article 371A of the Constitution of India*) - 34
Box 7.1: Activities and achievements of NEPED - 48
Box 7.2: Some backyard horticultural crops of Nagaland - 49
Box 7.3: Important shade loving plants of Nagaland - 50
Box 7.4: Some important wild fruits of Nagaland - 51
Box 7.5: Some economically important indigenous plants of Nagaland - 53
Box 7.6: Some important medicinal plants of Nagaland - 55
Box 7.7: Introduction of exotic species - 59
Box 7.8: Ten commonly planted tree species in Nagaland - 62
Box 8.1: Tragopan - 88
Box 8.2: Hornbill - 88
Box 8.3: Mithun - 89

LIST OF FIGURES

Fig 2.1: Deliberations by some participants during the Workshop on State Level Biodiversity Strategy and Action Plan of Nagaland held on 27 February 2002 at Dimapur, Nagaland. - 9
Fig 3.1: Physical map of Nagaland - 11
Fig 3.2: District map of Nagaland. - 15
Fig 6.1: Vegetation type/land use map of Nagaland - 39
Fig 7.1: Alder plantation - 42
Fig 7.2: Terraced cultivation - 44
Fig 8.1: Blyth's Tragopan - 90
Fig 8.2: Male Assam Wreathed Hornbill - 90
Fig 8.3: Mithun - 91
Fig 8.4: Map showing biodiversity hot spots map of Nagaland - 94

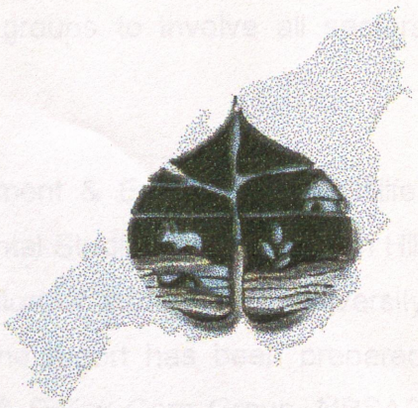
LIST OF APPENDICES

Appendix I : A list of the lesser known foods of Nagaland - i - ii
Appendix II : Some folklore medicinal plants used by the Nagas - iii - iv
Appendix III : Animals used in the treatment of diseases by the Nagas - v - vi
Appendix IV : Orchids of Nagaland - vii - xxiii

LIST OF ABBREVIATIONS

ACF: Assistant Conservator of Forests
ASI: Anthropological Survey of India
BDO: Block Development Officer
BSAP: Biodiversity Strategy and Action Plan
BSI: Botanical Survey of India
CAPART: Council for Advancement of Peoples Action and Rural Technology
CBD: Convention on Biological Diversity
CCF: Chief Conservator of Forests
CF: Conservator of Forests
CMD: Chairman and Managing Director
CPR: Common Property Resource
DCF: Deputy Conservator of Forests
DD: Deputy Director
DFO: Divisional Forest Officer
DRDA: District Rural Development Agency
EIA: Environmental Impact Assessment
FDA: Forest Development Agency
GEF: Global Environment Facility
GoI: Government of India
ICAR: Indian Council for Agricultural Research
IIRS: Indian Institute of Remote Sensing
IKS: Indigenous Knowledge System
IWDP: Integrated Wastelands Development Project
JFM: Joint Forest Management
MNES: Ministry of Non-conventional Energy Sources
MoEF: Ministry of Environment and Forests
NABARD: National Bank for Agriculture and Rural Development
NAEB: National Afforestation and Ecodevelopment Board
NBPGR: National Bureau of Plant Genetic Resources
NBSAP: National Biodiversity Strategy and Action Plan
NEC: North Eastern Council
NEHU: North-Eastern Hill University
NEPED: Nagaland Empowerment of People through Economic Development
NGO: Non Governmental Organisation
NMA: Naga Mothers' Association
NSF: Naga Students Federation
NSU: Naga Students Union
NU: Nagaland University
NWDB: National Wastelands Development Board
PCCF: Principal Chief Conservator of Forests
PHE: Public Health Engineering
RI: Religious Institution
SASRD: School of Agricultural Sciences and Rural Development
SCERT: State Council for Educational Research and Training
SDO: Sub Divisional Officer
SPCB: State Pollution Control Board
SPI: Socio Political Institution
TPCG: Technical and Policy Core Group
TRIFED: Tribal Cooperative Marketing Federation
VC: Village Council
VDB: Village Development Board
ZSI: Zoological Survey of India

1. Introduction



1.1 A brief background of NBSAP

India is one of the 175 countries that are signatories to the United Nations Convention on Biological Diversity (CBD). CBD requires that the signatories prepare action plans for the conservation and sustainable management of their respective biological resources. Consequently, in 1999 the Ministry of Environment and Forests, Government of India, which is the nodal agency for the effective implementation of CBD, prepared a National Policy and Macro-level Action Strategy on Biodiversity. This document identified and projected broad policies, gaps and strategies needed for the conservation and sustainable use of India's biodiversity.

As a follow up act of the Macro-level Action Strategy on Biodiversity, the need was felt for the preparation of detailed action plans on Biodiversity, at sub-state, state, regional and national levels. To this end, the Ministry of Environment and Forests has accessed funding from the Global Environment Facility (GEF) to prepare a National Biodiversity Strategy and Action Plan (NBSAP) during the year 2000-2002. Amongst other things, 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. A key feature of NBSAP includes an emphasis on gender/sensitive decentralized

planning and the use of interdisciplinary working groups to involve all sectors concerned with biodiversity conservation.

On behalf of the Department of Forests, Environment & Ecology and Wildlife, Government of Nagaland, the Centre for Environmental Studies, North-Eastern Hill University, Shillong undertook the task of preparation of state level Biodiversity Strategy and Action Plan (BSAP) of Nagaland. The report has been prepared following the guidelines supplied by the Technical & Policy Core Group, NBSAP and consulting people, experts, Govt. Departments, NGOs and major stakeholders of Biodiversity in Nagaland. The report includes important aspects of Biodiversity of Nagaland and suggests strategies and action plans for its conservation.

1.2 Biodiversity in general

The term Biodiversity is often defined as the variety and variability among living organisms and the ecological complexes in which they occur. Such ecological complexes can be a component of landscape; e.g., a natural forest, a mountain, grassland, a savannah, an agricultural field, a desert, a human habitation or it can be a component of waterscape; e.g. rivers and wetlands, deltas and marshy areas, and oceans. Ecosystems can be of numerous types varying in size and structure as well as function such as terrestrial, freshwater, marine, man-made and natural. This variability has created numerous ecological niches and habitat types making possible the survival of millions of different kinds of animals and plants, both domestic and wild, over the surface of the earth. Thus, when we talk about biodiversity, we address all those numerous animals, plants and microorganisms including their races and breeds that are found on the planet earth. Hence, biodiversity is essentially sum total of all life forms on the earth. Biodiversity is usually considered at three different levels:

Genetic diversity refers to the variations in genetic information contained in the genetic materials of individuals of plants, animals and microorganisms that inhabit the earth. Genetic diversity is needed by any species in order to maintain

reproductive vitality, resistance to diseases and the ability to adapt to a changing environment.

Species diversity represents the diversity of species and sub-species on the surface of earth. Species diversity has been estimated to be between 5 and 50 million or more, though only about 1.4 million have actually been recorded.

Community-level diversity relates to species occupying a particular locality and the interactions between them. A biological community together with its associated physical environment with which it interacts by way of transfer of energy and cycling of matter, is termed as an ecosystem. Thus, community level diversity represents the collective response of species to different environmental conditions. It is expressed by the variety of habitats, biotic communities and ecological processes that are found in forests, deserts, grasslands, wetlands etc.

1.3 Significance of Biodiversity

Biological resources provide the basis for life on earth, including that of humans. Human society depends on biological diversity for almost all the food supply, half of its medicines, much of its clothing and in some region virtually all of its fuel and building material and an important part of its mental and spiritual welfare. Hence, biological diversity is essential for human survival.

Most of our medicines came originally from the wild, including major painkillers, birth-control agents, and malaria drugs. While many are now produced synthetically, medicinal plants are still important in many parts of the world. In India, traditional doctors use about 2,500 plants. Rubber, paper, wood, pesticides and many other natural products support our industries, and forests and wetlands help clean up the pollutants afterwards. The food we eat is the result of the domestication of wild species over a long period of time.

Agricultural biodiversity and indigenous knowledge of local communities on the uses of flora and fauna is another important area that can be exploited to improve the living condition of the people. The domesticated and wild genetic resources are the key for the future of agricultural production, and so conservation and management of such resources on the farms and by farmers will help ensure the maintenance of agro-biodiversity.

Unfortunately, instead of nurturing these resources to provide sustainable benefits, much is being lost in the process of development: abusing nature to provide excessive benefit for a generation or two of humans. The symptoms of this abuse are all around us, from local deforestation to global climate change. Therefore, to conserve the world's biological diversity should be a mission for all who would like to turn the tide of destruction into a new, positive relationship between people and nature. Thus, the policy and planning mechanisms in every sphere of development should accommodate the concept of biodiversity conservation.

2. Methodology and Processes



The Department of Forests, Environment & Ecology and Wildlife, Government of Nagaland, Kohima, was assigned the task of preparation of a State Level Biodiversity Strategy and Action Plan of Nagaland by the NBSAP, New Delhi. The Department of Forests, Environment & Ecology and Wildlife, Government of Nagaland constituted a Steering Committee consisting of:

1. Principal Chief Conservator of Forests, Government of Nagaland - Convener & Chairman.
2. Chief Conservator of Forests (Headquarters) - Member Secretary.
3. Chief Wildlife Warden, Dimapur - Member.
4. Director, Department of Agriculture, Government of Nagaland – Member.
5. Director, Department of Soil Conservation, Government of Nagaland – Member.
6. Advisor (Forest & Environment), North Eastern Council – Member.
7. Shri. K. Sohe, Coordinator, People's Group – Member.

The first meeting of the Steering Committee was held on June 11th, 2001 to discuss the formulation of State Level Biodiversity Strategy and Action Plan of Nagaland. The second meeting of the Steering Committee was held on August 7th, 2001. Subsequently, the State Forest Department decided to appoint the Centre for Environmental Studies, North-Eastern Hill University, Shillong as the Executive

for Environmental Studies, North-Eastern Hill University, Shillong as the Executive Agency. Accordingly, the Centre for Environmental Studies initiated steps to prepare the State Level Biodiversity Strategy and Action Plan of Nagaland.

The Centre for Environmental Studies prepared the BSAP of Nagaland and submitted the same to the Department of Forests, Environment & Ecology and Wildlife. The final BSAP was discussed by the **Steering Committee** in it's meeting held on July 16, 2002 in the office chamber of the Principal Chief Conservator of Forests, Government of Nagaland, Kohima. The Committee accepted the BSAP of Nagaland with some minor amendments.

The relevant data and information for the preparation of this report was collected by various possible means as suggested in the Guidelines and Concept papers of NBSAP.

2.1 Primary data collection

Primary data were collected by the following methods

- Meetings, discussions and interviews were held with officials and representatives of various Governmental Departments, Academic Institutions, NGO's and knowledgeable local people.

- A State Level Workshop was organized to invite opinions and ideas of officials and representatives of various Governmental Departments, Academic Institutions, NGOs and knowledgeable local people of Nagaland. More than fifty participants attended the Workshop from different Government Departments, Academic and Research Institutions, NGOs, Press and Media and people from different walks of life.

- The Draft report of BSAP was presented and discussed at the North Eastern Regional Workshop of NBSAP held at Guwahati. The relevant

recommendations of the Workshop were incorporated into the BSAP of Nagaland.

2.2 Secondary data collection

- Published and unpublished literature available in different libraries and obtained through personal communication with experts of relevant R&D bodies and Government Departments was reviewed. This included books, reports, and journals, published and unpublished papers, departmental files, Working Plans, Administrative orders and communications, recommendation of Technical Committees, etc. Information was also culled out from Ph.D., M.Phil. & M.Sc. Theses. The following Institutions/Departments of the Government of Nagaland, Kohima and experts/academicians were consulted in order to gather relevant information on the subject.

1. *Department of Forests, Environment & Ecology and Wildlife, Government of Nagaland, Kohima.*
2. *Department of Agriculture, Government of Nagaland, Kohima.*
3. *Department of Soil Conservation, Government of Nagaland, Kohima.*
4. *Department of Fisheries, Government of Nagaland, Kohima.*
5. *Department of Horticulture, Government of Nagaland, Kohima.*
6. *Department of Sericulture, Government of Nagaland, Kohima.*
7. *Department of Veterinary & Animal Husbandry, Government of Nagaland, Kohima..*
8. *Department of Geology & Mining, Government of Nagaland, Kohima.*
9. *Department of Industries & Commerce, Government of Nagaland, Kohima.*
10. *State Council of Science & Technology, Kohima.*
11. *Department of Animal Science, SASRD, Nagaland University, Medziphema.*
12. *Department of Entomology, SASRD, Nagaland University, Medziphem.*
13. *Department of Horticulture, SASRD, Nagaland University, Medziphema.*
14. *Department of Plant Pathology, SASRD, Nagaland University, Medziphema.*
15. *All India Coordinating Forum of the Adivasi/Indigenous Peoples, Gulmohar Park, New Delhi.*
16. *NEPED, Kohima.*
17. *Agronomy Division, ICAR Research Complex for NEH region, Umiam, Meghalaya.*
18. *NBPGR Regional Station, Shillong (Meghalaya).*
19. *North East Network, Shillong.*
20. *ICAR Research Complex for NEH Region, Umiam, Meghalaya.*
21. *ICAR Research Complex for NEH Region, Jharnapani, Nagaland.*
22. *Botanical Survey of India, Shillong.*

23. *Zoological Survey of India, Shillong.*
24. *NEHU Library, North-Eastern Hill University, Shillong.*
25. *NEC Library, Shillong.*
26. *Library, Regional Centre, NAEB, NEHU, Shillong.*

Table 2.1: List of participants of the State Level Workshop on Biodiversity Strategy and Action Plan of Nagaland held on February 27th, 2002 at Dimapur, Nagaland.

Sl. No.	Name	Address
1	A. R. Wati Ao	Chief Wildlife Warden, Nagaland, Dimapur.
2	Alemla Ao	SASRD, NU, Medziphema.
3	Amemba Yaden	DFO, Kohima.
4	Amod Sharma	SASRD, NU, Medziphema.
5	Ashish Kothari	Coordinator, TPCG, Kalpavriksh, Pune.
6	B. K. Tiwari	Centre for Environmental Studies, NEHU, Shillong.
7	Blooming Ao	DFO, Mokokchung.
8	C. Kapfu	DDF, Fisheries, Kohima.
9	C. Toshi Longchar	DFO, Wokha.
10	Deepak Jain	Studio Sea Rock, Dimapur.
11	K. Hoeto Sema	DFO, Tuensang.
12	K. R. Lyngdoh	CF, Wildlife, Dimapur.
13	K. Seyie	SASRD, NU, Medziphema.
14	Khekiye K. Sema	Secretary and Commissioner, Agriculture, Nagaland, Kohima.
15	Koseno	NEHU, Shillong.
16	L. Kire	DFO, Kohima.
17	L. S. Moses	D.D. (Vety & A.H.), Kohima.
18	M. L. Rao	CF, (Headquarters), Kohima.
19	Moatemzen	Correspondent, Nagaland Page
20	Moil	Correspondent, Nagaland Post, Dimapur.
21	Moze Myekha	Phek Town.
22	Ms. Anamika Sharma	ICAR, Jharnapani.
23	N. L. Ao	PCCF, Nagaland, Kohima.
24	O. P Singh	Centre for Environmental Studies, NEHU, Shillong.
25	Panger Jamir	CF, Kohima.
26	R. C. Verma	ICAR, Jharnapani.
27	R. John	State Pollution Control Board, Nagaland.
28	Rajat S. Pal	Silviculturist, Nagaland.
29	Rongsén Temzen	Director of soil conservation, Kohima.
30	Rusovil	Member Secretary, SPCB, Nagaland.
31	S. K. Sharma	SASRD, NU, Medziphema.
32	Sapu Changkija	SASRD, NU, Medziphema.
33	T. Lotha	Wildlife Warden, Dimapur.
34	T. Wati Ao	Dy. Director, Industries and Commerce, Nagaland, Kohima.
35	Tongpang	ACF (I/C WL Division) Khipire.
36	Tsilie Sakhrie	CMD, 'KNCTS', Kohima.
37	V. B. Singh	SASRD, NU, Medziphema.
38	Vedpal Singh	DFO, Mon.
39	Vekhoyo	Village Pfutsero.
40	Wepretso	DFO, Phek.
41	Wozamo Lotha	Joint Director, Soil & Water Conservation, Kohima.
42	Yashi Jamir	ACF (Peren forest division).



Fig: 2.1: Deliberations by some participants during the Workshop on State Level Biodiversity Strategy and Action Plan of Nagaland held on 27th February, 2002 at Dimapur, Nagaland.

3. Nagaland at a Glance



3.1 Geographical Profile of Nagaland

Nagaland, the 16th state of the Indian Union, came into being on 1st December, 1963. Nagaland is situated between 25°06'N and 27°04'N latitude and 93°20'E and 95°15'E longitude and covers an area of 16,579 sq. km. The diversity of the State essentially stems from its unique geographical location, which borders with the states of Assam and Arunachal Pradesh on one side, Manipur on the other and also has a vast international border with Myanmar. The altitude varies between 194 m. and 3048 m. Most of the thousand and odd villages stand up to an altitude of 2000 m. It is very typical of the Nagas to build their houses on the hilltop and at higher elevations. The highest peak in the state, **Saramati** in Tuensang district is 3840 m. high.

The topography is very dissected, full of hill ranges, which break into a wide chaos of spurs and ridges. Nagaland harbours rich biodiversity and hence can be termed as a state of true Mega bio-diversity. The state houses the confluence of flora and fauna of the neighboring regions. Geographically, the state largely has vast undulating terrain and hilly landscape and some low lying areas giving rise to a very conducive climate with presence of perennial water and moisture for truly rich variety of flora and fauna. The state also has abundant resources of mineral wealth in the form of vast deposits of Oil, Coal, Peat, Gold, Uranium and various other

minerals. The potential of this state in terms of the sheer variety of Agro and Horticultural produce including Fiber, Tea, Coffee, Pineapple, Orange etc. is also immense.

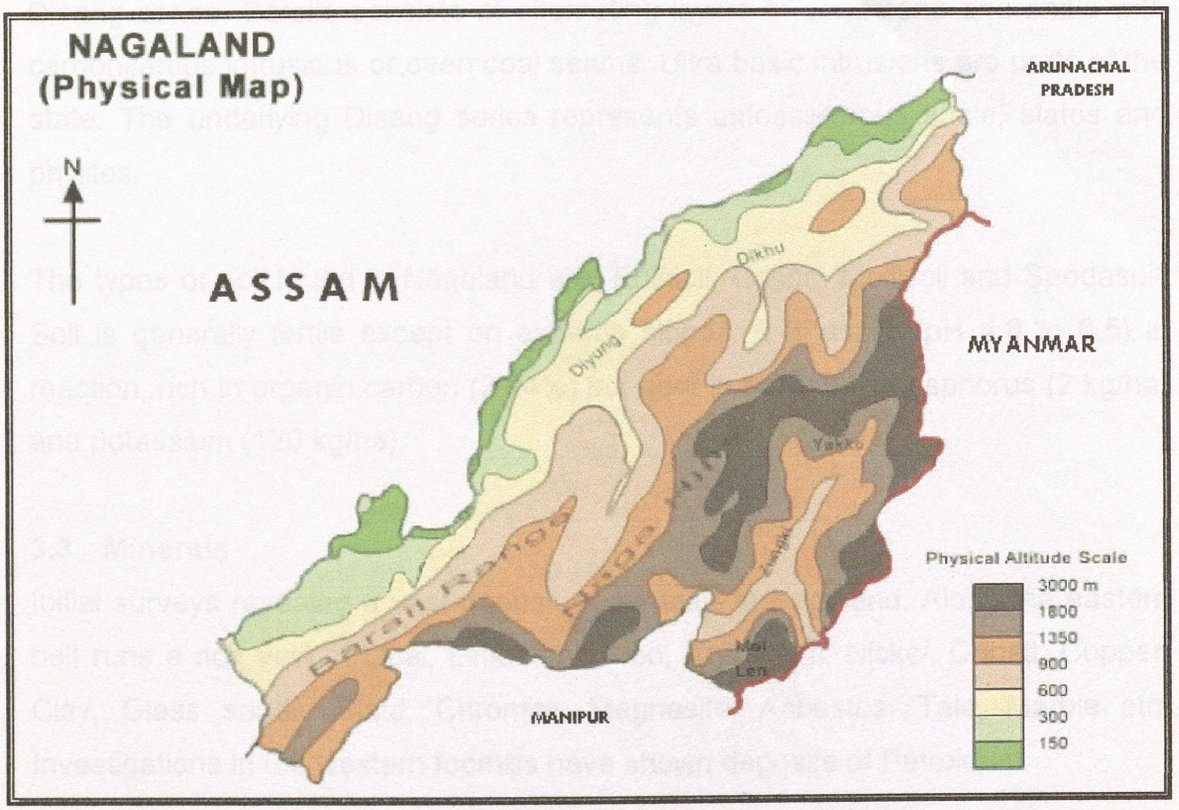


Fig 3.1: Physical map of Nagaland

In spite of this inherent potential, the State has not developed. The current practice of agriculture is largely unsustainable owing to the traditional Jhum (*Shifting cultivation*) cycle mode of operation. Though some dynamic initiatives [e.g., by various Govt. Depts. NGOs etc.] are in action to mitigate the detrimental effects of Jhum, a lot still needs to be done on various fronts including efforts on checking deforestation, control of wild fire, conservation of biodiversity, proper water harvesting, use of non-conventional energy sources etc. The state also lacks infrastructure development in terms of networking with the rest of the country, lack of proper communication in terms of roads and information technology.

3.2 Rocks and Soils

The soils of Nagaland are derived from tertiary rocks belonging to Barails and Disang series. Barails consists of alternating layers of sandstone and shale with carboniferous intrusions or even coal seams. Ultra basic intrusions are parts of the state. The underlying Disang series represents unfossiliferous shale, slates and phylites.

The types of soil found in Nagaland are: Entisoil, Orison, Mollisoil and Spodasoil. Soil is generally fertile except on extreme slopes. It is acidic (pH 4.8 to 6.5) in reaction, rich in organic carbon (2.94%) but poor in available phosphorus (2 kg/ha) and potassium (120 kg/ha).

3.3 Minerals

Initial surveys revealed a vast deposit of minerals in Nagaland. Along the eastern belt runs a rich vein of Coal, Limestone, Iron, Chromium, Nickel, Cobalt, Copper, Clay, Glass sands, Slate, Chromite, Magnesite, Asbestos, Talc, Marble etc. Investigations in the western foothills have shown deposits of Petroleum.

3.4 Climate

Nagaland has a typical monsoonic climate with variants ranging from tropical to temperate conditions. The foothill plains, sheltered valleys and the ranges are marked with climatic contrasts. The year is divided into four seasons viz., winter (December to February), pre-monsoon (March and April), monsoon (May to September) and retreating monsoon (October and November).

The beginning of winter is marked by a steep fall in temperature during December. January is the coldest month. In February the temperature starts rising gradually. The winter winds are generally weak and variable. The monsoon lasts for five months from May to September with June, July and May being the wettest months. The annual rainfall varies from 100 cm to over 300 cm. The variations in altitude, latitude, climate and soil have given rise to a diversity of forest types, ranging from the tropical evergreen to temperate evergreen and the coniferous.

3.5 Rivers and streams

The hills of Nagaland exhibit a remarkable topographic diversity and are dissected by a number of seasonal and perennial rivers with more or less 'V' shaped valleys in between. There are 4 major river systems in the state, namely Doyang, Dhansiri, Dikhu and Tizu. Of these, the first three flow towards the west through the Assam plains to join the mighty Brahmaputra; while the Tizu river system flows towards the east and southeast and pours into the Irrawadi in Myanmar.

The Dhansiri river in the southwest corner of Nagaland flows a northwesterly course and then turns at right angle to the northeast and forms the northern boundary of the State. The Doyang river rises near Mao Thana and flows along a northeasterly course for about 70 km and abruptly turns to the northwest and pierces the main chain of hills. The largest tributary to this river is Rengmapani. The important river in the northern frontier of the state is Dikhu. All these rivers receive a number of tributaries, which are all very short and run for only a few kilometers.

3.6 Population

The population of Nagaland according to the 2001 Census is 19,88,636. Out of this, 16,35,815 persons live in rural areas, whereas the urban population is only 3,52,821. The literacy rate of Nagaland is 67.11% where the male literacy is 71.77% and female literacy is 61.92%. The population density of the state is 120 persons per sq. km.

3.7 Districts of Nagaland

Nagaland consists of eight districts viz., ***Kohima, Phek, Wokha, Zunheboto, Mokokchung, Tuensang, Mon and Dimapur.*** However boundaries of only seven districts are incorporated in the Survey of India Maps (Fig 3.2).

3.7.1 Kohima: Kohima district lies approximately between $25^{0}11'$N and 26^{0}N latitude and $93^{0}20'$E and $94^{0}55'$E longitude. It covers an approximate area of 4,041 sq. km. i.e., 24.37% of the total geographical area of the state. Kohima is the

capital of Nagaland. It is the home of the Angami tribe. The district is strategically located as the gateway to the state of Manipur, and Phek and Wokha districts in Nagaland, a factor that has further enhanced its importance in the commercial and administrative spheres. The people practice terraced cultivation and double cropping on large scale.

3.7.2 Phek: Phek district, carved out of Kohima in December 1973, is the home of the Chakhesang and Porchury tribes. Phek is situated at about 1,444 m. above the sea level with an area of 2,026 sq. km. Meluri and Pfutsero are the two sub-divisions, with eight town circles and 96 villages. Terraced cultivation and double cropping is quite prevalent in this district.

3.7.3 Wokha: Wokha district was carved out of Mokokchung and Zunheboto districts in December 1973. It is the home of the Lotha tribe. It is situated at about 1,500 m. above sea level. The area of Wokha district is 1,628 sq. km. The people of the district mainly practice *Jhum* cultivation.

3.7.4 Zunheboto: Zunheboto district is the home of the Sema tribe. The people mainly practice *Jhum* cultivation. Zunheboto was a sub-division until 1973. The district lies approximately between $94^0$20'E to $90^0$45'E longitude and 25°45'N to 26°15'N latitude. The total geographical area of the district is 1,255 sq. km., which accounts for 7.57 per cent of the total area of the state. The district borders Mokokchung district in the north, Tuensang in the east, Phek in the south and Wokha and Kohima districts in the west. Zunheboto town, the district headquarters is located at an altitude of 1,875 m. above the mean sea level. The town is 170 km. away from Mokokchung and 150 km. from Kohima. The name of the district has been derived from the name of a flower "Zunheboto". The terrain of the district is predominantly hilly and mountainous with inter-mountain river valleys. The altitude of the hills varies from 1,000 m. to 25,00 m., the average being 1,800 m. The most important river of Zunheboto district is Doyang, which drains the northern part while the other two rivers viz; Tizu and Tita drain the southern and eastern parts of the district. The soils of Zunheboto district are derived from Tertiary rocks.

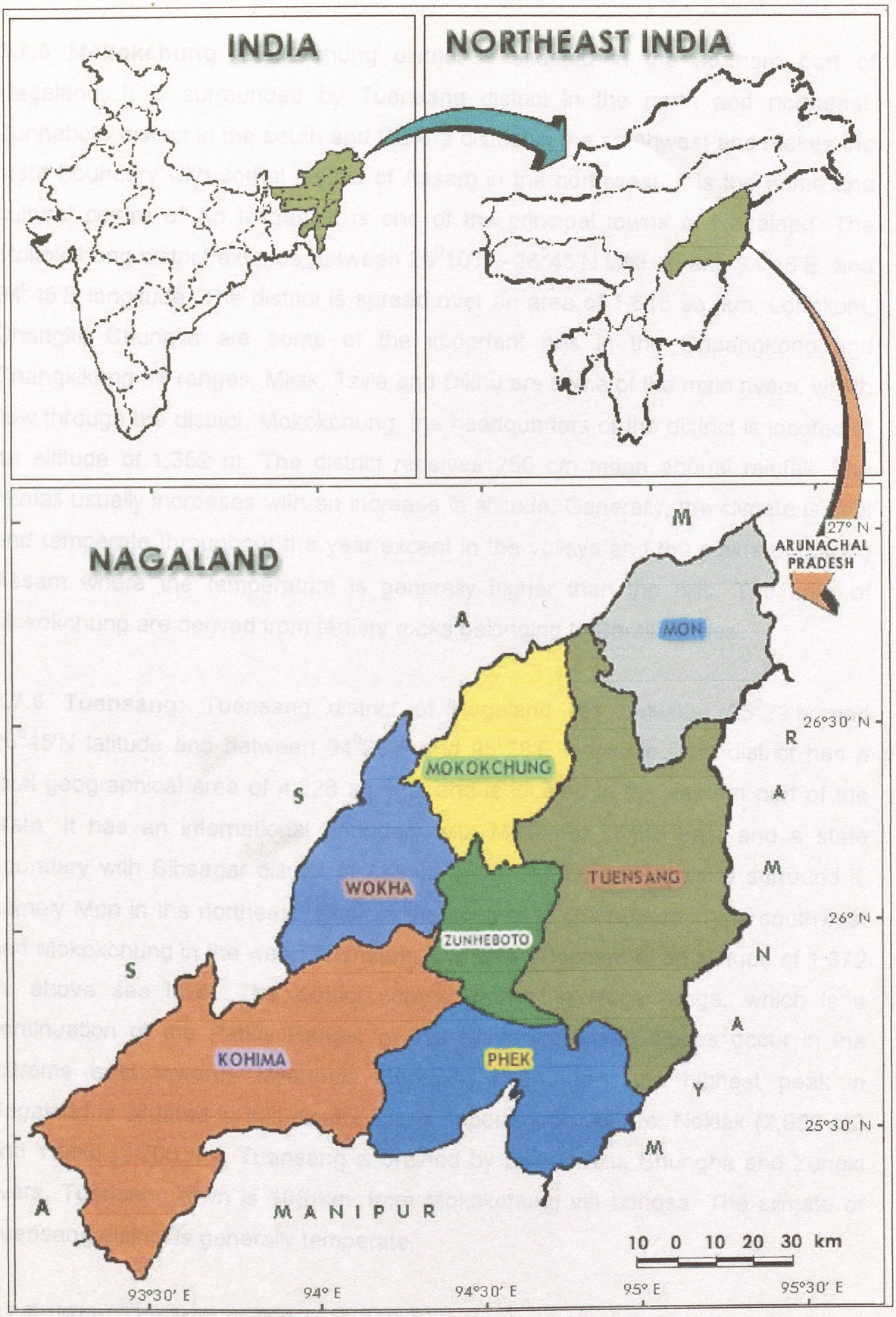


Fig 3.2: District map of Nagaland.

3.7.5 Mokokchung: Mokokchung district is situated in the northern part of Nagaland. It is surrounded by Tuensang district in the north and northeast, Zunheboto district in the south and Wokha district in the southwest and makes the state boundary with Jorhat district of Assam in the northwest. It is the home and cultural centre of Ao Nagas. It is one of the principal towns of Nagaland. The Mokokchung district extends between $26^0$10'N - $26^0$45'N latitude and $94^0$15'E and $94^0$45'E longitude. The district is spread over an area of 1,615 sq. km. Longkum, Changki, Chungtia are some of the important hills in the Onpangkong and Changkikong hill ranges. Milak, Tziila and Dikhu are some of the main rivers, which flow through the district. Mokokchung, the headquarters of the district is located at an altitude of 1,352 m. The district receives 250 cm mean annual rainfall. The rainfall usually increases with an increase in altitude. Generally, the climate is cool and temperate throughout the year except in the valleys and the plains bordering Assam where the temperature is generally higher than the hills. The soils of Mokokchung are derived from tertiary rocks belonging to Barails series.

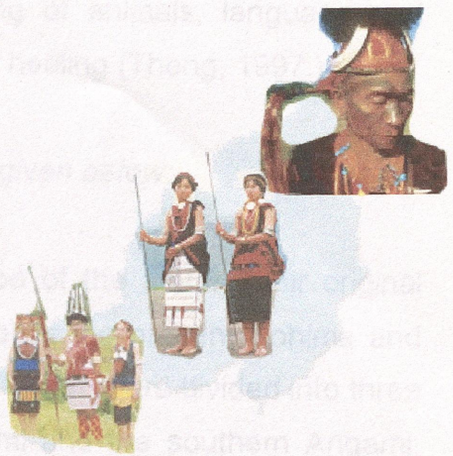
3.7.6 Tuensang: Tuensang district of Nagaland lies between $25^0$22'N and $26^0$45'N latitude and between $94^0$28'E and $95^0$28'E longitude. The district has a total geographical area of 4,228 sq. km. and is located in the eastern part of the state. It has an international boundary with Myanmar in the east and a state boundary with Sibsagar district of Assam. Four districts of Nagaland surround it, namely Mon in the northeast, Phek in the southeast, Zunheboto in the southwest and Mokokchung in the west. Tuensang township is located at an altitude of 1,372 m. above sea level. The district comes under the Naga range, which is a continuation of the Patkai Range. In this hill range, steep slopes occur in the extreme east towards Myanmar. Saramati (3,840 m.), the highest peak in Nagaland is situated in this district. Other important peaks are: Noklak (2,999 m.) and Yakko (2,700 m.). Tuensang is drained by Dikhu, Tizu, Shungha and Zungki rivers. Tuensang town is 108 km. from Mokokchung via Longsa. The climate of Tuensang district is generally temperate.

3.7.7 Mon: The Mon district of Nagaland is located on the northeastern border of the state. It lies between $26^0$34'N and $26^0$45'N latitude and between $94^0$45'E and

$95^0$15'E longitudes. The district makes an international boundary with Myanmar in the east and a state boundary with Sibsagar district of Assam in the west and Tirap district of Arunachal Pradesh in the north. It covers an area of 1,786 sq. km. The Mon town, the district headquarters, is situated at an altitude of 898 m. The Mon town is connected by road from Tuensang (Nagaland), Sonari (Assam) and Simaluguri (Assam). The district has hilly as well as plain areas and due to this variation in altitude and topography, climate conditions vary a great deal. The district receives 150 cm mean annual rainfall. Laterite and red soils predominate this district. The laterite soils are found in the hilly areas and the red soils are found mostly in the plains bordering the Sibsagar district of Assam.

3.7.8 Dimapur: The district of Dimapur has recently been created by carving out the southwestern part of the Kohima district. The Headquarters of this district is located at Chumukedima. Dimapur is the gateway to Nagaland and Manipur. It is the only town connected by rail and air from the other parts of the country. Located in the plains at the border of Assam, Dimapur is an important commercial centre of Nagaland, Population of Dimapur comprises of people belonging to various naga tribes and nontribals.

4. People of Nagaland



The Nagas bear mongoloid features. Their complexion are yellowish tinge, light brown, brownish yellow, rich brown and dark brown. They have black, straight, wavy, and in rare cases wooly and curly hair. They have a broad mesopholic head, flat face, round face, high-cheeked bones and fine to broad and flat nose. They have oblique, mongoloid eye where the fold is remarkably absent. They have short or below average to medium stature. Most writers on the Nagas are of the opinion that the Nagas have come from South East Asian countries and islands, at different times. This has been deduced on the basis of their similarities in cultural and physical features.

4.1 Tribes of Nagaland: The major tribes of Nagaland are Angami, Ao, Lotha, Sema, Rengma, Phom, Pochury, Sangtam, Chakhesang, Zeliang, Yimchunger, Khiamungan, Chang and Konyak. In addition, Kuki, Tanhkul, Garos, Kacharis and several other tribal groups also live in Nagaland.

The Nagas past cultural practices included head hunting, feast of merit, log drum beating, skull tree housing. The Naga culture is best reflected in their food and drinks, dress and ornaments, implements, tools, weapons, utensils and furniture, stone monuments, festivals, rituals and ceremonies, wood carvings, songs and dances, village level governance, chieftainship, customary laws and adjudication, marriage and hunting, food gathering, weaving of cloths and bamboo works,

earthen pot making, shifting cultivation and rearing of animals, language and dialects, herbal medicines and indigenous method of healing (Thong, 1997.)

A brief description of the major tribes of Nagaland is given below:

4.1.1 Angami: Angamis are a dominant Naga tribe of the state. Their original name was Tenyimia. The Angami tribe broadly inhabits the present Kohima and Chumukedima districts of Nagaland. At present, the Angamis are divided into three territories, the western Angami, the northern Angami and the southern Angami. The Angami inhabited lands comprise of irregular plateau with elevated ridges and peaks. Kohima, the district headquarters and the capital, is situated on a saddle, north of Japfu-Barrial intersection. Japfu and Ezupu are eminent peaks of the Angami area. The gentle slopes along streams are used for terrace cultivation by all sections of the Angami Naga. Rainfall in the area ranges from 200 cm to 250 cm. The three different sections of the Angamis speak their own dialect at home, but the common Angami language in which a vast printed literature has been produced, is based on the Tenyimia dialect.

Among all Naga tribes, the traditional dress material and costume of the men are kilt and wrapper, while the women use skirt, shawl and apron. A conshell worn with a chain of beads implies a high social status. Among the southern Angamis, rich men wear specially designed shawls. Among the non-Christians, growing hair long is taboo for a woman or a girl, before her marriage. The Angamis are by and large non-vegetarian and take beef, pork, buffalo meat, and other meat. The staple food of the Angami is rice. All kinds of fish and meat are eaten with a liberal addition of chillies and grated ginger. A wide variety of tubers and roots are consumed along with taro or kachu, millet and bamboo shoot. The *naga dal* is commonly eaten by the Angamis. A variety of jungle fruits and leafy vegetables are also consumed. Rice beer, prepared in almost every family, is drunk in good quantity by the Angamis of all ages. After the Independence of India, milk has become an additional food item. Eating the flesh of a monkey is a taboo among the western Angamis. Betel-leaves and nut are chewed immensely. Smoking of cigarettes is common among men. Major change in the area of food habits is popularization of

cauliflower, peas and tomatoes. In foothills, pineapple, mango, guava, papaya and other tropical fruits are grown. These are for their own consumption as well as for sale in local markets. Coffee plantation has been adopted by the Angamis in recent years along with development of orchards on commercial basis. Hunting, fishing, animal husbandry, weaving, and trade of local produce have been important subsidiary occupations of the Angamis. Angami families rear a variety of animals, both for self-consumption as well as for sale.

The **sekrenyi** and **theranyi** are the most important festivals of the Angamis. Sekrenyi is celebrated in the month of December among the southern Angamis while northern and southern Angamis celebrate it in February. This is the most colourful and important of all festivals.

4.1.2 Ao: Ao is one of the major tribes of Nagaland. The Aos call themselves Aor, meaning those who came crossing over the Dikhu River. Based on dialectical differences, the Aos can be divided into three main sub-groups: *Chongli, Mongsen* and *Changki*. The Dikhu River on the southeast, the plains of Assam on the northwest, the Konyak territory on the northeast, and the Sema-Lotha areas on the southwest bound of the region inhabited by Aos. The Ao territory consists of four major unbroken parallel hill ranges, such as Langbangkong, Asukong, Chagkikong and Chaprikong. These are areas with huge belts of forest lying between the foothills and the cultivated portion of the plains. A large number of streams and rivers are found in the Ao territory, important among them being Dikhu, Melak and Tsurong. The Ao language belongs to the Tibeto-Burman sub-family of languages, which is used among the kinsmen and is written in the Roman script.

The Aos are strictly non-vegetarian. The **Mithun** has traditionally been the significant non-vegetarian food item consumed by Aos. The cow, buffalo, pig and large varieties of wild animals and fish are eaten. Rice is the staple food of the Aos. Naga dal remains an important food item. They consume a large variety of jungle fruits and leafy vegetables. Tubers and roots are also collected from the jungle for self-consumption. Among the major festivals and ceremonies, a festival called **Moatsu** is celebrated in the month of May every year after sowing the paddy

seeds. The festival is intended to appease the deities and to get their blessings for good harvest.

4.1.3. Lotha: Lotha is a major Naga tribe. The etymology of the word 'Lotha' is clearly not known. However, they call themselves 'Kyong' meaning man. The Lothas live in Wokha district. The Lothas are non-vegetarian. Their staple food is rice. The flesh of bear, deer, elephant and boars are obtained through hunting. They consume almost all the animal species except tiger. The bamboo shoot and cachu and taro are also eaten. Pulses of various kinds, except the naga dal, are recent introductions as food items. Chilli is consumed liberally. They take banana and orange, but fruit consumption is generally moderate. The potato, roots and tubers of wild variety are also taken in ample quantity (Singh, 1994). The land, forest and water bodies are the main economic resourses of the Lothas. Land is important for the cultivation of paddy and other crops through jhum, wet cultivation or terrace cultivation.

The Lothas perform divination by cutting a strong tree in a single stroke with a Dao, during jungle clearing. In the **Rhode** festival, the village chief cum Priest called '**Putti**' at the village sacrificial site, where a sort of an altar is raised, performs the inauguration of sowing in a spot marked with four bamboo strips. The contents of the offering are: straw, ginger, meat of fowl, which is killed for that purpose, and some grains of rice. On completion of this ceremony, the Priest starts sowing followed by the others. The southern Lothas further perform a ceremony called **'Mothanratsen Emung'**, when the crops have germinated. In this festival, a pig is killed and the sacrificial offering of meat pieces and ginger is made to appease the deity (Thong, 1997).

4.1.4 Sema: Sema is a major Naga tribe. Though Semas are distributed all over the state, they are mainly concentrated in the Zunheboto district. The Sema area is mostly hilly and the average altitude is 1,800 m. though some ranges rise up to 2,500 m. The main habitation is concentrated between 1,500 m. and 2000 m. Doyang is the main river, which flows in the area. The average rainfall in the area is 200 cm. and the temperature remains quite low, and cold in winter. The

language spoken by the community is known as 'Sema', which belongs to one of the subgroups of the Tibeto-Burman family. The Semas have unique designs of shawls, hair-cutting styles, spears and daos, knives and necklaces. They are purely non-vegetarian. Their staple food is rice. Meat and taro also supplement their food. They also take some pulses and vegetables and all types of animal flesh. However, the meat of buffalo, mithun and bison are considered a delicacy. They chew betel nut and betel leaves.

Land and forest are the main economic resources of the Semas. They are mainly agriculturists. They obtain fuel, fodder, animal flesh, housing materials, materials for agricultural implements and weapons from the forests. They catch fish from rivers and rivulets. The village chiefs select the land for jhuming and distribute it for cultivation to individual families. In return, the villagers pay tribute by giving them a share of their harvest, hunting and fishing. A family owns a particular plot of land for one or two crops on rotation. Terrace cultivation in the river valleys has recently started. Among Semas, the whole village holds rights for hunting in the jungle and fishing in the rivers. There also exists some common land belonging to the clan (khel), or community. Besides paddy, millets and maize are also grown in jhum fields. Kachu is widely produced. Various types of beans, cucumber and gourd are grown along with the paddy. In the terrace fields, paddy is the only crop grown. As Semas are meat eaters, each family rears cows, bulls, pigs and goats. Fowls and ducks are also kept. In the fields of art and handicraft, weaving is the traditional occupation exclusively managed by Sema womenfolk. They weave shawls, male and female garments and bags. Shawls and bags are now exported also. They prepare *daos*, knives, spears, hoes, etc., of local variety. In woodwork, they carve figures of animals, crocodile, mithun, tigers and birds. However, the making of earthen pots is an exclusive job of the womenfolk.

The Sema festivals are generally, connected with agriculture and are celebrated for the prosperity of the people. The millet sowing ceremony (**Suphpu**) is observed in February. Deities are worshipped and a feast with drinks and dances are arranged. **Tuluni** is the biggest festival, which falls in the month of August and lasts for three days.

4.1.5 Rengma: The Rengmas of Nagaland are divided into two major social and territorial groups, the Ntenye and the Nzong, or the northern and southern groups, respectively. The Rengmas are concentrated in the Tseminyu sub-division of Kohima district. They occupy the spur of the ridge running from Nidzukru hill. The Rengmas speak the Rengma dialect, which is written in Roman. The Rengmas could be distinctly identified through the designs and colour combinations of their garments and shawls. The shape and decoration of the Rengma spear and knife (*dao*), their colourful dresses and ornaments can easily be differentiated from that of the other communities. The Rengmas are non-vegetarian and their staple food consists of rice and meat. Other items, which supplement their diet, are green vegetables, taro, bamboo-shoots, sweet-potato, wild tubers, potato, millet and jobstear. They also consume meat of all types of animals and birds. During the taboo (genna), meat and salt are not allowed, but the Christian Rengma are free from this restriction.

The land, forest and water are the main economic resources of the Rengma. A majority of them are agriculturists. They cultivate paddy through jhuming or the slash and burn method. Each family in the village owns land. In the southern Rengma region terrace cultivation is also popular. The land belongs to the clan or to the village. However, individual families cultivate small pieces of village or clan land. They own particular plots of land in rotation. The village head or the clan head selects the land and allots it to the individual families. The Rengmas mainly produce paddy. A small quantity of millet, jobstear, cotton, chilli, ginger and taro is also grown. During recent years, the maize cultivation has decreased because of various reasons. Weaving is another occupation, which is exclusively done by the womenfolk. They used to produce cotton in their own fields earlier, but now they depend on mill-made colourful yarns. The Rengmas prepare various types of baskets, suitcases and containers with bamboo and cane. Black smithy is also done. They rear cows, mithuns, goats, sheep, pigs, chicken and duck. Agriculture is the primary and traditional occupation of the Rengmas. The Rengmas go for hunting and fishing in groups.

The main festival of Rengmas is **Ngadah**, which is celebrated for eight days at the end of November, just after harvest. It is the festival of thanksgiving, merry making and rejoicing. This festival also marks the end of the agricultural year.

4.1.6 Phom: The Phom is another notified tribal community of Nagaland. The tribe is also called Kahha. The Phom area always remains enveloped by clouds. The cloud in the local dialect is called Phom. Mostly, they are non-vegetarians and their staple diet comprises of rice and meat. They consume the meat of most of the animals. A little amount of millet, maize, vegetables, yam, fish, chicken and a few wild roots supplement their diet. The area inhabited by Phoms comprises of hilly terrain along with deep valleys, ranging from 650 to 2,000 m. The Dikhu and the Yangnon rivers approximately make the western and the eastern boundaries of the area, which is densely covered with sub-tropical vegetation. The Phoms speak the Phom dialect, which is one of the Naga-dialects of Tibeto-Burman groups.

Forest and land are the major economic resources of the community. The forest provides food, firewood, manure and raw materials for basketry and weaving. The hunting and fishing are the traditional occupations of Phoms, in addition to primary occupation of agriculture. Individual families own their respective landed property. A jhum cycle is completed between six and ten years time, depending upon the fertility of the soil, total land area and man power available. Paddy is the main crop, but yam, millet, maize, chilli and vegetables are also grown. Orange and banana are also grown in the kitchen gardens. The production of paddy however, is not sufficient in general. Weaving is secondary occupation. Each family makes baskets according to its requirements. Hunting of tiger, deer and birds are done with the help of spears, daos, locally made guns and also by traditional trapping method. Fishing is done with the help of modern huck and nets and also through the traditional method of using poisonous plant juices. The making of bamboo baskets, wooden utensils, daos, spears for hunting and cutting, horns as musical instruments, bamboo and wooden ornaments and looms for weaving are commonly practiced by the Phoms.

Monyu is a major festival of the Phom tribe, which is celebrated for twelve days in the month of April right after sowing. It is a festival for worshipping the supreme spirit, whose blessings are sought for protection of crops (Thong, 1997).

4.1.7 Pochury: The Pochury is one of the least known Naga communities. It is an acronym formed by the amalgamation of letters derived from the names of three places, Sap, Kechuri, and Khury, which have been the places of origin of the Pochury. The entire Pochury area forms the present Meluri sub-division of the district Phek. In the east of this area lies Burma, on the west lies Phek sub-division, in the north lies Kiphire sub-division and in the south lies the Manipur state. Rainfall in the area varies between 200 cm and 250 cm, the bulk of which is received during the period from May to October. There are numerous hill streams in the Pochury area. The important rivers are Tizu, Chidwin, Arachu and Loyaokdi. Lutsam is an important lake of the area. The Pochury language belongs to Tibeto-Burman family, which is spoken by all the members of the community. The Pochuries have their own distinct patterns of designs, which they use in their shawls and other garments. The staple food of the Pochury is rice. All kinds of flesh and meat (except that of snakes) are eaten by them. The traditional economy of the Pochury community has been based on jhum cultivation, limited terrace cultivation, and animal husbandry. There are several stretches of lowland areas, which are watered by Tizu and Chichi rivers. The climate of the Pochury area also helps them to rear a variety of cattle.

Hunting, jungle produce collection and fishing are their subsidiary occupations, for which they use indigenously developed techniques. They are skillful craftsmen. Spinning, weaving, basketry, woodwork and pot making are still pursued by the villagers although it is alleged that younger generation seems to be disinterested in these crafts. Weaving and basket making are however widely practiced. Their main festival is called **Nazhu**, which is connected with offering of food and drinks to the deceased ancestors and other dead persons. It also includes community works like construction of resting sheds by the side of village paths, for the weary-farmers returning from their field and is also a festival of games and sports.

4.1.8 Sangtam: The Sangtams are one of the major Naga tribes of Nagaland. All the Sangtam villages fall within the Tuensang district of Nagaland. The Sangtam villages are located on several hill-ranges of the Tuensang district. Rainfall in the area varies between 200 cm 250 cm with maximum rainfall occurring between May and October. There are countless hill-streams in the Sangtam territory. The Dikhu is a major river of the area. Although dialectical variations are not uncommon in different villages, all Sangtams understand the standard Sangtam language. Their language belongs to the Tibeto-Burman family of languages, which is spoken by the people at home and among kinsmen. The Sangtam are non-vegetarian and take all kinds of meat. Their staple food is rice. A local variety of pulse called Naga dal is an important food item. Several types of roots and tubers are also eaten, along with jungle vegetables. Banana, which is grown locally, is the most popular fruit.

Sangtam economy is based on shifting cultivation, collection of forest produce and animal husbandry. Land and forest are major economic resources, which are owned both individually and collectively. People from villages close to Dikhu and other rivers practice terrace cultivation on a limited scale. Individuals, lineages, clans and villages control ownership and management of the land and forest areas. They are also skillful craftsmen. Woodwork and woodcarving had been a developed art found among the Sangtams, but it is not being practiced much at present. Their main festival is called **Amongmong**, which falls sometime in September, when the paddy is ready for harvest.

4.1.9 Chakhesang: The word Chakhesang is an acronym formed by a combination of letters derived from the names of three tribes. The word 'Cha' is derived from Chakhru, 'Khe' from kheza and 'Sang' from Sangtam. The Chakhru and Kheza, who form the main ethnic segments within the Chakhesang, are very close to the Angami Naga in culture, language, customs, festivals, folk songs, folktales, appearance, as well as in their practice of wet-rice terrace cultivation. The Chakhesangs have developed new designs of shawls. Ivory armlets are important male ornaments. They have epicanthic fold, straight and black hair,

yellowish body colour, medium prognatheism and medium stature. Rice, maize and millet are their staple food, supplemented by *naga dal*, peas and beans.

Land, forest and water are the main economic resources of the Chakhesangs, which are owned and managed by the individuals as well as by social groupings, such as lineages and clans. Hunting, gathering, fishing, horticulture, animal husbandry and shifting cultivation supplement their economy. The main economy is however based on wet terrace cultivation. The Chakhesangs are well known for their woodcarving and engraving. They draw on shawls and their artistic talents may be seen in their colourful ceremonial dresses, ornaments, bamboo crafts, basket making and house construction. Their main festival is **Khilunyie**, which is an eight daylong harvest festival celebrated towards the last week of November.

4.1.10 Zeliang: The term Zeliang is coined by combining two words 'Ze' and 'Liang', representing two tribal names, 'Zemei' or Zemi' and 'Liangmei'. The Zeliang Nagas live primarily in the southwestern part of Kohima district. Majority of the Zeliang villages are spread over Jhalube, Peren and Medziphema blocks of Kohima district. The landscape consists of the rolling mountain in the central and the southwestern portions that gradually descends to merge with the plains of Dhansiri Valley of Assam. The altitude varies from 100 m to 2,700 m. and the climate ranges from cold to sub-tropical depending on the seasons. The Zeliangs speak a dialect, which comes under the Naga-Bodo group of languages. They are primarily non-vegetation and they consume all kinds of meat, fish and eggs. Though they prefer beef and pork, vegetables, pulses, potato and maize, they also commonly consume all kinds of roots. Rice is their staple food.

Land, water and forest are the main economic resources of the Zeliang people. Agriculture based on jhum cultivation and terrace cultivation is the primary occupation of the people. A small section of the population is engaged in non-agricultural occupations, such as government service, private business, livestock rearing, weaving, basket making, smith work, construction work, mining, transport, horticulture and plantation. They mainly grow rice, pulses, millet, ginger and maize. Some of them also grow soybean, oilseeds, vegetables, fruits and cotton. They are

mainly a land owning community and three types of ownership of land, at family, clan and village levels are found. Individual families do Jhum cultivation. Where wet terrace cultivation is practiced, it is done on a share basis. The Zeliang's main festival is **Meleingi** or the paddy husking celebration.

4.1.11 Yimchunger: The word Yimchunger is a self-name, which means 'reaching a place of choice'. The Yimchunger villages are scattered in nine circles of Tuensang district, where the landscape is hill-rugged and precipitous and the altitude varies from 800 m to 3,840 m. A common language for all sub-tribes within the Yimchunger has been evolved which belong to the Tibeto-Burman family. They are non-vegetarian and they eat beef and fish. Rice and millet form the staple food. They also consume eggs, leafy vegetables, potatoes, pulses and various fruits. In the Yimchunger community, shifting cultivation provides the primary source of subsistence. The other subsidiary occupations of people are livestock rearing, weaving, basket making, woodcarving, horticulture, hunting, fishing and gathering. Land is owned and managed at clan and village levels. Every family has its own land and all families are self-sufficient. Majority of the houses are thatched by straw and leaves collected from the jungle.

The Yimchunger tribe celebrates five days **Metemneo** festival after harvesting millet. During the festival, community works, like clearing of the village, inter-village footpath, village ponds, etc are performed. Agricultural implements like spade, hoe, dao, etc., are cleaned, sharpened and then worshiped.

4.1.12 Khiamniungan: The Khiamniungan happens to be one of the lesser-known communities of Nagaland. Etymologically the word means 'source of water' (***Khiam*** = *water* and ***Ngan*** = *source*). The water source from which their community is believed to have emerged is located within their territory. Khiamniungan villages are located in the eastern part of Tuensang district of Nagaland.

Almost the entire Khiamniungan area is hilly. The altitude of the area varies between 3,000 m. and 3,900 m. above sea level. Rainfall in the area varies from

200 to 250 cm. The bulk of rainfall is received between May and October. Hill streams are numerous in the Khiamniungan area. The important rivers are Laang, Zanks and Lenguyu. The Khiamniungan language belongs to the Tibeto-Burman group. Their unique shawl designs, headgear, war dance costume and ornaments lends a distinct identity to the community. The staple food of the Khiamniungan is rice. All kinds of fish and meat, such as beef, pork and meat of buffalo are eaten with a liberal addition of chili and grated ginger. Like the other Naga tribes, the Khiamniungans depend on jhum or shifting cultivation. The main economic resource is cultivation, supplemented by forest produce collection, hunting and animal husbandry to a limited scale. Other traditional subsidiary occupations are fishing, basket making and weaving of special clothes. Normally, the heads of the families own their respective plots of land for shifting cultivation (jhumming). Some families that belong to the original stock of settlers generally possess large portions of agricultural plots. Natural resources such forests and water sources, are generally owned by the community, and the elders of the clans or lineages decide the nature of use of such property resources. It is mainly a land owning community. Their art and craftsmanship is apparent in their woodcarvings seen in the Murong or the clubhouses, in pottery making and in their skillful weaving of shawls.

The Khiamniungan tribe celebrates the **Tsokum** festival in October, after harvesting the crops, to offer prayer of thanks to the supreme spirit for the bountiful returns of their hard labour.

4.1.13 Chang: The Changs are a less known tribe of Nagaland. The Chang is a self-name of the community. According to one belief, the word Chang is derived from the word Chongnu meaning the banyan tree. The Central part of the hilly Tuensang district of Nagaland is the home of the Changs. The thirty-six Chang villages are located in three mountain ranges of the district. The Changs live at an altitude of 1,500 m. Rainfall in the area ranges from 200 to 250 cm., the bulk of which is received during May to October. Hill streams are countless in the Chang territory. The people speak the Chang language, which belongs to Tibeto-Burman family, at home and with the kinsmen. Although dialectical variations in the villages of different mountain ranges are great, the standard Chang language however,

based mostly on the language spoken in Tuensang village, is intelligible to all the Chang.

The main identifying marks of the Changs are their distinctive shawl designs and their headgear worn during dances. They are strictly non-vegetarian, and beef, buffalo, pork and goat meat are the main food items. The staple food of the Chang is rice. All kinds of fish and meat are eaten with liberal addition of chilies. A variety of roots and tubers and the local pulse (*Naga dal*), are necessary items of Chang food. Poor families depend on these food items for several months in a year. Leafy vegetables are also eaten in plenty. The economy of the Chang has been based on jhum cultivation, and animal husbandry. Land and forest form the major economic resources of the community. Control over these economic resources is exercised both by individuals, and the lineages or the clans. In some cases, the village as a whole controls the forest areas or big water resources. Private economic resources, such as jhum fields, forest plots and domestic animals are managed, operated and controlled by individual families. In fact, it is the senior most male head of the family, who judicially controls all economic resources. Traditionally, agriculture remained the primary occupation of the Changs. Trade and business were the subsidiary occupations under which, cattle, earthen pots, cloth, salt and iron pieces were exchanged between the Chang and different communities, such as the Khiamniungan, Ao and Konyak. The Changs are skilful craftsmen. Woodcarving is a highly developed art form among the Changs. Posts of house-doors of rich men, and of youth clubs (Murong) show a variety of woodcarving patterns. Spinning, weaving, pottery and basketry are still largely pursued by Chang villagers. Weaving is a must for women, and it provides economic means to many of them now. Among the distinguishing features of the life and culture of the Changs, mention may be made of their deft craftsmanship. The Changs are very skilful in hunting and fishing. They are famous for the beautiful way in which they decorate their *daos* or knife. The Chang *dao*-belt covered with *cowries* is very noticeable. *Cowries* are also stitched in their clothes (Singh, 1994). The Chang's **Nakmyulum** festival falls in the month of August, before the harvest. It lasts for six days. During this festival, the departed souls are remembered.

4.1.14 Konyak: Konyaks are one of the major Naga tribes of Nagaland. The word Konyak is derived from two root words (***Khau*** = *head* and ***Nyak*** = *black*). This name thus has a connection with the habit of using black colour in their teeth and faces, by the people during the earlier days. The Konyak are mainly concentrated in the Mon district of Nagaland, but a considerable number of Konyaks are also found in the Tuensang district. The landscape of the upper Konyak area is hilly and rugged and the lower Konyak area is more or less a plain, touching the alluvial landscape of the Brahmaputra valley. Linguistically, the Konyaks come under the Naga Kuki group of the Tibeto-Burman family. They use their own dialect at home and in the village. Now a common dialect has evolved among them, based on the Konyak wakching dialect. They are primarily non-vegetarian. They take all kinds of meat, including pork, beef and meat of dog and monkey. Rice is their staple food. Job's tear, maize, *naga dal* and a variety of vegetables/fruits and tubers are taken commonly. Potato, pulse and milk are taken rarely.

The land and forest are the major economic resources of the Konyak. The *Ang* had traditionally controlled all the resources. He distributes land to the respective family. They are the land owning community, and are now able to purchase land or property anywhere in the state. Agriculture in the form of shifting cultivation, small-scale business, service and contract works are their main subsidiary occupations. The artistic and aesthetic expressions of the Konyak are displayed in their varied and colourful ceremonial dresses, ornaments, house architectural designs, wood carving, tattoo paintings engravings, weaving, bamboo and cane crafts. The Ang's residence is a magnificent construction in the traditional form; the roofs are made up of thick layers of palm leaves, which slope down almost touching the ground. **Aoling Monyer** is the most important festival of the Konyak tribe. Having completed the sowing in March, they relax to enjoy the beginning of their New Year spring season.

5. Political profile of Nagaland



Nagaland is a special category state of the Indian union created on 1st December, 1963. The people of Nagaland have certain special previleges through the special provisions made in the Indian Constitution. The regulation of 1945 gives powers to the Tribal Councils to try Criminal as well as Civil cases and to impose fines. So long as the parties belong to same tract, all civil suits are tried by the councils. The punishment inflicted by the Council is according to their customary law, though a limit has been put to avoid heavy punishment. The details of the *Article 371A of The Constitution of India* regarding special staus of Nagaland are given in Box 5.1.

Nagaland has a single chamber legislative assembly with 60 seats. The state sends two members to the Indian Parliament, one to the Rajya Sabha and one to the Lok Sabha. There are 8 districts headed by Deputy Commissioners, 17 sub-divisons and 32 Blocks headed by SDOs and BDOs, respectively. Nagaland has a total of 1,225 villages, which are locally administered by Village Councils (VCs) and Village Development Boards (VDBs).

5.1 Village Council (VC): Every Naga village has a self-contained traditional institution, which handles the administration of the judicial matters called Village Council. It is a government recognized body that has been evolved from the traditional village Chieftain set up of the Nagas. The Council is composed of village elders, which is the supreme authority in the village. The adult males of the village

elders, which is the supreme authority in the village. The adult males of the village elect the village elders. No female can become a member of the council. Ordinarily, these village elders continue to function as council members throughout their life unless they are removed by the villagers for any default on their part. They should be senior citizens and men of character and health, competent to command the respect of the villagers. The council members need not necessarily come from the line of former office bearers in the council and enjoy no prerogatives. The council functions under the guidance of a chairman who is elected by the members from among themselves. The office of the council member is honorary. There is no hard and fast set of rules laid down relating to the duties and functions of the members of the council of elders. It is the duty of the council of elders to take initiative in cleaning the village path, planting, jungle clearing and cleanng the water source or tank. The council of elders may be considered as the supreme lawgiver and judge of the community.

5.2 Village Development Board (VDB): Under each recognized Village Council exists the Village Development Board; primarily a body to meet the infrastructural and developmental needs of the village. The VDBs have evolved through a successful experiment in self-governance conceptualized in Nagaland. Introduced in 1980s, it attained wide spread popularity, and soon established itself as a front line institution responsible for the village administration. The VDB functions as an organ of the Naga system of village democracy. Annual funds are placed with the VDBs, who prioritise the needs of the village and implement the developmental schemes.

The VCs and VDBs are the most valuable asset Nagaland could have. Being tailor made and readily available grassroots level social organizations, totally acceptable without exception, they act as a linkage between the people and the government.

RELEVANT SECTION OF THE INDIAN CONSTITUTION WITH RESPECT TO NAGALAND **Box 6.1**

[371A. Special provision with respect to the State of Nagaland--(1) Notwithstanding anything in this Constitution,

(a) no Act of Parliament in respect of

(i) religious or social practices of the Nagas,

(ii) Naga customary law and procedure,

(iii) Administration of civil and criminal justice involving decisions according to Naga customary law,

(iv) Ownership and transfer of land and it's resources,

Shall apply to the State of Nagaland unless the Legislative Assembly of Nagaland by a resolution so decides;

(b) the Governor of Nagaland shall have special responsibility with respect to law and order in the State of Nagaland for so long as in his opinion internal disturbances ocuring in the Naga Hills – Tuensang Area immediately before the formation of that State continue therein or in any part thereof and in the discharge of his functions in relation thereto the Governor shall, after consulting the council of Ministers, exercise his individual judgement as to the action to be taken:

Provided that if any question arises whether any matter is or is not a matter as respects which the Governor is under this sub-clause required to act in the exercise of his individual judgement, the decision of the Governor in his discretion shall be final, and the validity of anything done by the Governor shall not be called in question on the ground that he ought or ought not to have acted in the exercise of his individual judgement:

Provided further that if the President on receipt of a report from the Governor or otherwise is satisfied that it is no longer necessary for the Governor to have soecial responsibility with respect to law and order in the State of Nagaland, he may by order direct that the Governor shall cease to have such responsibility with effect from such date as may be specified in the order;

(c) in making his recommendation with respect to any demand for a grant, the Governor of Nagaland shall ensure that any money provided by the Government of India out of the Consolidated Fund of India for any specific service or purpose is included in the demand for a grant relating to that service or purpose and not in any other demand;

(d) as from such date as the Governor of Nagaland may by public notification in this behalf specify, there shall be established a regional council for the Tuensang district consisting of thirty-five members and the Governor shall in his discretion make rules providing for

(i) the composition of the regional council and the manner in which the members of the regional council shall be chosen;

Provided that the Deputy Commissioner of the Tuensang district shall be Chairman *ex-officio* of the regional council and the Vice-Chairman of the regional council shall be elected by the members thereof from amongst themselves;

(ii) the qualifications for being chosen as, and for being, members of the regional council;

(iii) the term of office of, and the salaries and allowances, if any, to be paid to members of, the regional council;

(iv) the procedure and conduct of business of the regional council;

(v) the appointment of officers and staff of the regional council and their conditions of services; and

(vi) any other matter in respect of which it is necessary to make rules for the constitution and proper functioning of the regional council.

(2) Notwithstanding anything in this Constitution, for a period of ten years from the date of the formation of the State of Nagaland or for such further period a the Governor may, on the recommendation of the regional council, by public notification specify in this behalf –

(a) the administration of the Tuensang district shall be carried on by the Governor;

(b) where any money is provided by the Government of India to the Government of Nagaland to meet the requirements of the State of Nagaland as a whole, the Governor shall in his discretion for an equitable allocation of that money between the Tuensang district and the rest of the State;

(c) no Act of the Legislature of Nagaland shall apply to the Tuensang district unless the Governor, on the recommencation of the regional council, by public notification specify so directs and the Governor in giving such direction with respect to any such Act may direct that the Act in it's application to the Tuensang district or any part thereof have effect subject to such exceptions or modifications as the Governor may specify on the recommendation of he regional council;

Provided that any such direction given under this sub-clause may be given so as to have retrospective effect;

(d) the Governor may make regulations for the peace, progress and good government of the Tuensang district and any regulations so made may repeal or amend with retrospective effect, if necessary, any Act of Parliament of any other law which is for the time being appplicable to that district;

(e) (i) one of the members representing the Tuensang district in the Legislative Assembly of Nagaland shall be appointed Minister for the Tuensang affairs by the Governor on the advice of the Chief Minister and the Chief Ministerin tendering his advice shall act on the recommendation of the majority of the members as aforesaid;

(ii) the Minister fo Tuensang affairs shall deal with, and have direct access to the Governor on all matters relating to the Tuensang district but he shall keep the Chief Minister informed about the same;

(f) notwithstanding anything in the foregoing provisions of this clause, the final decision on all matters relation to the Tuensang district shall be made by the Governor in his discretion;

(g) in articles 54 and 55 and clause (4) of article 80, references to the elected members of the Legislative Assembly of a State to each such member shall include references to the members or member of the Legislative Assembly of Nagaland elected by the regional council established under this article;

(h) in article 170

(i) clause (1) shall, in relation to the Legislative Assembly of Nagaland, have effect as if for the word 'sixty' the words 'forty-six' had been substituted:

(ii) in the said clause, the reference to direct election from territorial constituencies shall mean in the State shall include election by the members of the regional council established under this article;

(iii) in clauses (2) and (3), the references to territorial constituencies shall mean references to territorial constituencies in the Kohima and Mokukchung districts.

(3) If any difficulty arises in giving effect to any of the foregoing provisions of the article, the President may by order do anything (including any adaption or modification of any other article) which appears to him to be necessary for the purpose of removing that difficulty:

Provided that no such order shall be made after the expiration of three years from the date of the formation of the State of Nagaland.

Explanation – In this article, the Kohima, Mokukchung and Tuensang districts shall have the same meaning as in the State of Nagaland Act, 1962.]

6. Ecological profile of Nagaland



6.1 Forest Cover

The forest cover, based on interpretation of satellite data of December 1998, is 14,164 sq. km., which is 85.43% of the geographical area of the State. The extent of dense and open forests has been assessed as 5,137 sq. km. and 9,027 sq. km. respectively. The district-wise extents of open and dense forests are given in Table 6.1.

Table 6.1: District – wise forest cover (1999 Assessment)

(Sq. km)

District	Geog. Area	Dense forest	Open forest	Total
Kohima	4,041	1,775	1,797	3,572
Mokokchung	1,615	197	1,140	1,337
Mon	1,786	651	857	1,508
Phek	2,026	542	1,154	1,696
Tuensang	4,228	1,247	2,110	3,357
Wokha	1,628	390	1,189	1,579
Zunheboto	1,255	335	780	1,115
Total	**16,579**	**5,137**	**9,027**	**14,164**

Source: State of Forest Report – 1999, Forest Survey of India (MoEF, Dehra Dun)

6.2 Forest Types

Despite the fact that Nagaland is a small state, it possesses a variety of forest types distributed throughout the state. The forest cover in the state is about 52% (8,62,930 ha) of the total geographical area of 16,57,583 ha. This includes 1,00,823 ha of government and 7,62,107 ha of private forests.

(8,62,930 ha) of the total geographical area of 16,57,583 ha. This includes 1,00,823 ha of government and 7,62,107 ha of private forests.

Table 6.2: Legal Status of Forests in Nagaland

Sl. No.	Legal Status of Forests	Area (ha)	% of total forest area
1.	Reserved Forests	8583	1
2.	Purchased Forests	19247	2.3
3.	Protected Forests	50756	5.9
4.	Wildlife Sanctuary	22237	2.6
5.	Village Forests		
	i. Virgin Forests	477827	55.4
	ii. Degraded Forests	284280	32.9
	Total	862930	100

Table 6.3: Ownership of forests of Nagaland

Sl. No.	Ownership	Area (ha)	% of total forest area
1.	State owned	100823	11.7
2.	Private	762107	88.3

Source: Annual Report, Nagaland, 2000

The different types of forests found in Nagaland are discussed below:

6.2.1 Northern Tropical Wet Evergreen Forests: These forests once covered the Namsa - Tizit area but now only a small vestige is found in the Zankam area. It is found in Mon district.

The main tree species found are: Hollong, Makai, Sam, Helika, Paroli, Phulogamari, Dhuma, Jutuli, Gahori, Sopa, Bhelu, Nahar and Uriam.

6.2.2 Northern Tropical Semi Evergreen Forests: This type of forest is found in the foothills on Assam-Nagaland Border in Mokokchung, Wokha, and Kohima districts. The species are similar to those of the Northern Tropical Wet Evergreen forests; the only difference being that in the former case, the evergreen species dominate though these are deciduous species like Bhelu, Paroli, Jutuli etc.,

whereas in the present case, the number of evergreen species decreases and the deciduous species increases.

6.2.3 Northern Sub-Tropical Broad-leaf Wet Hill Forests: This type of forests is found in the hill areas below 1,800 m. and above 500 m. in all the districts of Nagaland. The wet evergreen species are conspicuous by their absence and the dominant species are mostly semi-deciduous. Some important timber species are: Koroi, Poma, Sopas, Gomari, Gogra, Khonkon, Hollock, Sam, Am, Badam and Betula.

6.2.4 Northern Sub-Tropical Pine Forests: This type of forests is found between the elevations of 1,000 m. to 1,500 m. in Phek and Tuensang districts of Nagaland. Pine is the dominant species and is found mixed with *Quercus, Schima, Prunus, Betula and Rhododendron.*

***6.2.5* Northern Montane Wet Temperate Forests:** This type of forests is found on the higher reaches above 2,000 m. in Japfu, Saramati, Satoi and Chentang mountain ranges. The species are tropical evergreen including *Quercus, Michelia, Magnolia, Prunus, Schima, Alnus and Betula.*

6.2.6 Temperate Forests: This type of forest is found on the peaks of the tallest mountains like Saramati and Dzukou area. The species that dominate are: *Rhododendron,* patches of *Juniperus,* and Birch.

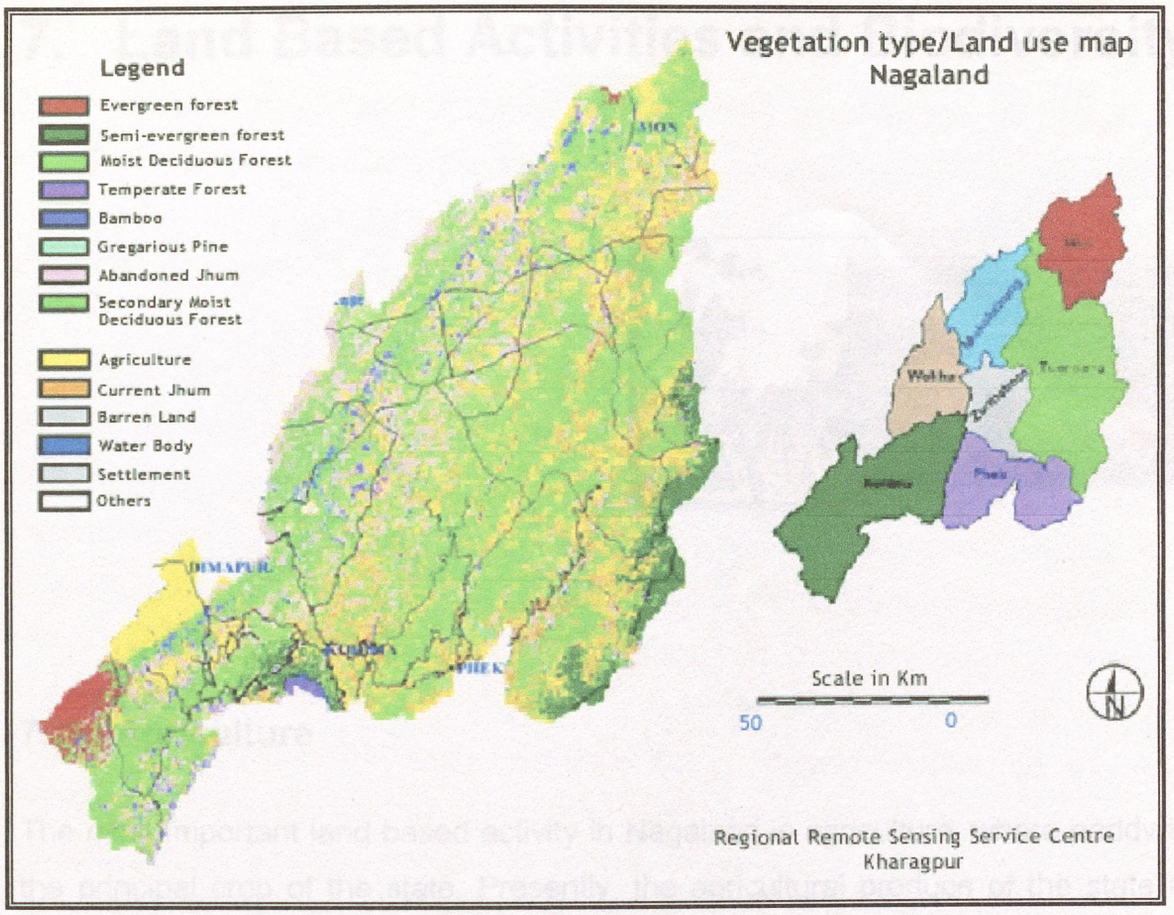
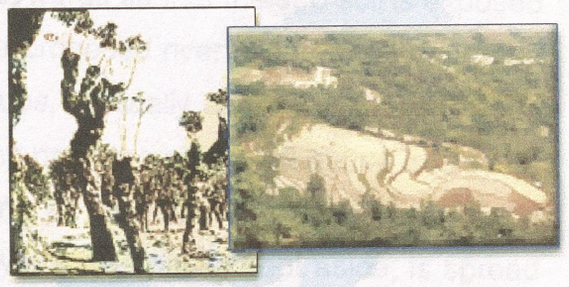


Fig 6.1: Vegetation type/Land Use map of Nagaland (*Source: IIRS, Dehra Dun*)

6.3 Joint Forest Management

The Govt. of Nagaland adopted Joint Forest Management in 1997 to solicit the active participation of villagers in the creation, management and protection of plantations in order to achieve ecological needs in consonance with sustainable productive forestry and to create a wood based economy for the people. According to the Govt. resolution, JFM shall be implemented in the private forests as well as in Govt. forests. In private forests the forest department shall be the funding agency and shall realise royalty at the time of harvest. In Govt. forests, the forest department shall be the funding agency for all forestry works and shall share 80% of the forest produce at the time of harvest remaining 20% shall be given to the participating communites. At present, 55 forest committees are managing an area of 650 ha of forest.

7. Land Based Activities and Biodiversity



7.1 Agriculture

The most important land based activity in Nagaland is agriculture, where paddy is the principal crop of the state. Presently, the agricultural produce of the state is confined to consumption and not for commercial purpose. The soil and climatic conditions are suitable for producing various types of agricultural products. The agriculture and allied sectors in Nagaland offer good inputs for development of a host of industries which could include: Floriculture, Horticulture, Sericulture, Tea cultivation and processing, Bamboo shoot preservation, Mushroom cultivation and processing, Pigery, Poultry etc. Market outlets if made available will function as an excellent incentive for local farmers to go in for bulk production of diversified agricultural produce.

In Nagaland different types of farming systems are practised in different areas that vary from irrigated terraced cultivation to dry farming. Some of the prominent farming practices are described below:

7.1.1 Zabu Farming System:

Zabu is an indigenous farming system practiced by the Naga farmers mostly by the Chakesang tribe. This farming system has a combination of forest and agriculture

incorporating livestock and fishery, with is a well-founded soil and water conservation base. In this system, the terraces are constructed by cutting the contour lines drawn by scraping the topsoil upwards so that the sub-soil is exposed for a firm foundation. The sub-soil below the proposed river is dug and heaped up for compaction with wooden or bamboo clubs, vertically and horizontally to form the riser and the side bound. After making the riser, the space left above is filled up with stones, removed while digging. Leveling of the terrace is done by pressing and compacting the soil. Then the topsoil, which was earlier kept aside, is spread uniformly over the surface of the terrace. Weathered shale and biomass of *Mikenea, Eupatorium, Alnus, Albizia* etc. are collected from nearby areas and spread over the terrace. Normally, construction of the terrace starts from the bottom of the slope so that the top fertile soil from the upper reaches is utilized to fill the terraces below. The added withered shale biomass of trash/garbage is added and left for decomposition along with water, which builds up the soil fertility.

In the Zabu farming system, the forest lands are at the top of the hill, water harvesting cum fishery below the forest and livestock yard and paddy cum short duration fishery field at the foothills. In some cases when a proper source is not available for water storage, the run-off water from the upper catchment area is taken directly to the paddy fields. Water loss through percolation is controlled through puddling using various materials like straw, stones, etc. This system of farming is generally practiced by growers having a minimum land area of 2.0 to 2.5 ha., in which the total available water can be utilized very efficiently and soil loss by erosion is reduced to a minimum. If the site permits, often a small vegetable garden is also maintained where brassica, potatoes, chilly, cauliflower, cabbage, radish, soybean etc. are grown. Farmers do not use any artificial/chemical fertilizer. They manage the soil fertility indigenously, which has sustained their farming through centuries. In this farming system agriculture and forestry land-use is in-built with water harvesting, soil conservation and fertility management.

7.1.2 Agriculture with Alder trees



Fig 7.1: Alder plantation

In Nagaland, there are areas where alder trees (***Alnus nepalensis***) are used for agriculture. Different types of crops are grown along with alder trees. Alder is a multipurpose tree that provides nitrogen to the soil by harbouring nitrogen-fixing bacteria (***Frankia*** species) The branches are also cut and used as firewood. The alder agriculture fields are generally located at altitudes varying between 1,000 m and 2,000 m.

While the roots of the tree develop nodules (colonies of bacteria) responsible for fixing nitrogen, the leaves and the twigs are burnt and the ashes mixed with the soil to prepare it for agriculture. The fields are used for raising the primary crops of maize, Job's tears, millet, potato barley and wheat, and the secondary crops of chilli, pumpkin and taro. The alder wood is used primarily as a fuel wood. This is because the branches are easy to split and burn even when they are not fully dry. An alder tree is pollarded horizontally at a height of about two meters from the ground, at the age of six to ten years, during the months of December and January. Subsequently, it is pollarded only once every four to six years. If the tree is not very old or is in areas where frost is common, then the fresh cut is covered by a scab of stone to protect it from frost. Generally all the shoots may be pollarded and sometimes the one-year-old shoots may be left to grow up. Only the young shoots at the top end of the trunk should be left uncut. These should be stripped of most of the leaves and sub-branches, leaving just a few leaves at the tip. The felled shoots are further stripped and cut down to a convenient size, collected in stacks nearby and then carried away to the village. The leaves that are left on the ground are gathered and burnt at a safe distance from the trunks. The ashes are then spread over the ground and the soil is cultured for receiving the

February to April, the seeds of the intended crop are sown. In addition the seeds of chilies, pumpkin or taro are also sown between rows of the main crop. The tree, thereafter, is left alone to let the coppices attain heights of about six meters and diameters of about 15 centimeters in two to four years when it is pollarded again.

7.1.2.1 The life cycle of an alder tree

The alder tree is a monoecious plant. Both the male and female flowers bloom on the same tree during the months of September and October. The colour of the female flower, during the pollination, changes to fruit green, dark brown and black. While the catkins (pendant clusters of unisexual flowers) mature by the month of December, the life of the seeds expires by the end of April. Well adopted to wind pollination, a kilogram of catkins yields about 125 g of seeds with one gram containing about 570 seeds. The seedlings, if transplanted when they are about a year old, grow into healthy trees. The roots of the alder tree develop nodules responsible for fertilizing the soil for agriculture by increasing its organic matter and nitrogen content, while their spread, on the other hand, prevents its erosion.

The alder tree grows fast and yields good quantities of firewood. People's experience shows that the alder used in kitchen construction becomes stronger with age. When mature, it is good for furniture. Available information indicates that about 120 ha of alder plantation can meet the fuel wood requirement of one hundred Naga families.

The tree sheds leaves profusely. The leaves, as they dry while lying on the ground curl up. The curled up leaves trap and retain moisture from dew or rain. The leaves thus make a natural mulch and this helps to develop the soil and make it fit for other organisms to grow. It provides good conditions for building up the soil. The roots of the alder do not go very deep into the soil. They tend to spread side ways. The roots quickly develop nodules. The nodules harbour bacteria that are responsible for nitrogen fixing.

The alder trees give the right shade to coffee at lower altitudes and large cardamom at higher altitudes. The ability of the alder tree to develop and retain

fertility of the soil has been fully utilized by farmers in the Angami, Chakhesang, Chang, Yimchunger, and Konyak areas. Unfortunately, some Angami villages have, in the past fifteen to twenty years removed the alder trunks for immediate gains. However, the alder plantation is still fully intact in Khonoma village. Here the people have resorted to even terracing the alder fields to further reduce soil erosion and to retain fertility. In the Konyak area the trunks of alder trees are laid across the slopes to slow down water runoff.

7.1.3 Irrigated bench terraced paddy cultivation

This type of cultivation system is practiced in the hill slopes wherever suficient water is available. These are not rain fed but irrigated using local methods. Terraces are cut into the slopes and flooded carefully using bamboo and other local material as water conduits.



Fig 7.2: Terraced cultivation

The Angami, Zeliarong and Chakesang tribes of Nagaland practice this system of irrigated terraced cultivation in the hills. In this type of cultivation, suitable terraces are located and short-term fish and snail farming in combination with paddy cultivation is practiced during the monsoon.

7.1.4 Home Garden

Home gardens are small farms being practiced and managed by the farmers in their respective homestead as an indigenous fertility management system. In these simple and small farms in the homestead, various vegetables, condiments, fruits, medicinal herbs, flowers and fodder are grown. The home gardens have become significant commercial enterprises for supplying high value goods to the market.

garden to the homesteads. Waste drainage water from the kitchen can be used to start seedling or irrigate annual crops. Ashes and sweeps from the households and domestic animal bedding are normally spread in the garden and it is not surprising that the home gardens, though small in total area, are important in the overall production system. It also helps maintaining biodiversity at a small scale.

7.1.5 Soumni/Yokya agroforestry system

This is an agroforestry farming system indigenously practiced by the Naga farmers in their private lands often maintained as private reserved forests. Farmers plant timber trees like bamboo, palm tree and cane for their constructional purposes; some wild fruit trees, shrubs and herbs for medicine and vegetable. Some creepers and tuberous plants are also grown for fibre, food and cash income generation as well as to hold the soil.

7.1.6 Jhum/Shifting Cultivation

Jhum or shifting cultivation is a common practice of agriculture in the state of Nagaland and provides food security to a large chunk of the population. Traditionally, the Village Council functions as the regulatory body in the village and decides on and pronounces the calendar of events involved in Jhum. It also assignes roles, regulates and coordinates various groups of the village in jhum related activities starting from the selection of a site to carrying the harvest from the fields to the village granaries. Women are involved in almost all important activities in Jhum. They identify and set aside the viable seed stock that shall be used for planting crops in the following year. This is usually done before the main crops are harvested.

Jhum cultivation is a well-organised and regulated social system of cultivation in Nagaland. The intensive year round activities of Jhum have ensured its assimilation into the social structure of the Nagas. Besides involving the entire village community in a participatory manner, it has built a bond that has blended various societal groups to create a social cohesion that has withstood the ravages of time and modernism.

7.1.6.1 Agro – biodiversity in Jhum

Agro-biodiversity in jhum under Nagaland conditions constitutes agricultural crops sown by farming families amidst naturally regenerated plants preserved in jhum cycle. Agro-biodiversity in jhum-based cropping systems has been the basis of subsistence for Naga farming families. It has been a key factor in sustaining village life over several millennia providing jhum communities with an enormous range of food, medicine, construction materials and other products. The biodiversity of Jhum fields vary according to altitude/temperature gradient. A brief description of altitude wise variation in crop diversity is given below:

- **Cold region, near cloud-line:** The field adjacent to a forest area or new area of primary forest is brought under jhum. Cold region crops viz., green leafy vegetables – cabbage and mustard, beans, onions, garlic, leek, maize and jobs tear are commonly cultivated. In cold regions, rice is usually not grown but the Sema tribe grows a black variety called *Ailachi.*

- **Regular Jhum area:** In warmer areas, cropping activity is quite intense. The main crop is rice or maize, while spices, vegetables, tubers, pigeon pea, soybean, ginger, chilli and a host of other economically important plants are also grown as mixed crops.

- **Intermediate:** This region is found between the cold region and the regular jhum area. Some of the regular jhum crops are also grown here. Rice is the main crop while maize, field pea, pigeon pea, soybean, ginger and chilli are grown in inter crops. Some green leafy vegetables like *Hibiscus* species and spices are also grown. This zone has the highest agro-biodiversity.

7.1.6.2 Crops grown in Jhum Fields

- **Contour bund crops:** Crops are planted on the contour bunds where wooden poles are laid along the contour for soil conservation. They are usually short-duration crops grown to provide food for immediate needs (e.g., beans and

mustard); and biennial root crops (e.g., yam and ginger) that serve as vegetative barriers for soil conservation for the second year of cropping.

- **Main crops:** The main crops are rice and maize. Area under rice depends on the availability of terraced fields. Perilla, soyabean, foxtail millet and job's tears are grown as mixed crops. Mono cropping of main crops (rice and maize) is not practiced.

- **Special crops:** Crops that need some specific management practices are grown in a particular plot in the jhum field. These are crops that inhibit the growth of the main crops or those that cannot thrive as well as companion crops (e.g., garlic, chilli, brinjal, tomato, basil, onion, spices and cabbage).

- **Margin crops:** Usually, creepers are grown to demarcate field boundaries. It is considered that these crops inhibit the growth of the main crop; e.g., cucumber, pumpkin, gourds and beans.

- **Crops near the hut:** Almost all the crops that are planted in the field are also found in the vicinity of the field hut. They serve as a storehouse of vegetables for the preparation of mid-day meals in the field or for immediate collection for home consumption when farmers return home. *Hibiscus* spp., chilli, spices, leafy vegetables and fruits are commonly grown in these plots. Trial of new crops is carried out in the vicinity of the hut. Rice and Job's tears are not grown near the farm hut. A wide range of food products is obtained from the different crops grown near the hut. This contributes to food security, provides nutritionally balanced food and promotes maintenance of traditional and site-specific varieties. It also provides firewood and small timber, which are very important for Jhumias. The special crops sometimes serve as supplementary income or as the sole source of cash income.

Activities and Achievements of NEPED **Box 7.1**

The **Nagaland Empowerment of People through Economic Development (NEPED)** (formerly known as **Nagaland Environmental Protection and Economic Development)** project was started in 1994 with the goal of sustainable management of the land base by the intensification of slash and burn cultivation systems in Nagaland. The strategy chosen was farmer-led development, testing and demonstration of Agroforestry-based intensified systems. NEPED is jointly funded by the ***Government of Nagaland, India-Canada Environment Facility and International Development Research Centre.***

Farmers have actively participated in sharing their traditional knowledge with new concepts to bring about farmer-tested improvements.

Impacts & Achievements of NEPED

- The NEPED project has produced major changes in Agroforestry practices in Nagaland within a very short span of time, stemming from a growing awareness of the villagers of the need to save and renew forests, conserve soils, wildlife and biodiversity.
- The activities of NEPED have also led to a greater awareness of the importance of women in village life leading to a greater involvement of women in decision-making as well as financially profitable activities.
- NEPED has promoted the use of a range of local tree species to improve biodiversity in jhum lands and evidently farmers have started following the practice in their private jhum lands and have also encouraged others to do likewise.
- NEPED has broadly reached down to the grassroots level, with a large share of project benefits going directly to the farmers.
- NEPED has served as a catalyst to the Govt. of Nagaland, helping to encourage and spread new ideas for project management and implementation. The establishment of the Project Operations Unit as a special task force to implement NEPED has facilitated this.

7.2 Horticulture

7.2.1 Some Backyard Horticultural Crops of Nagaland

Growing horticultural crops in backyards/homesteads is a common practice amongst the Naga farming community. These crops are primarily grown for the family consumption. In recent years, certain local fruits have been identified according to market potential, better adaptability to the region and higher nutritional value. These crops are mostly consumed locally. If surplus, they also fetch good prices in the local markets, as well as outside the state. Some of the backyard horticultural crops of Nagaland are described in the Box 7.2 below:

Backyard Horticultural Crops of Nagaland **Box 7.2**

Cyphomandra betacea – Tree Tomato: It is an evergreen semi-woody shrub or small tree normally found in the hilly regions of Nagaland. In low-lying tropical areas, the growth is poor and the tree does not bear fruits. The plant propagates easily from seeds and cuttings within two to three years of planting; it bears reddish egg-shaped fruits with smooth skin, hanging in clusters on the branches. Although the tree bears fruits throughout the year, the peak season is from November to March. Tree tomato is used as a substitute for tomato and has a longer shelf life. A single tree can bear more than 100 fruits at a time. In local market, the fruit also fetches a good price. The fruit can be eaten raw or cooked as a vegetable. It is also used for making jams and jelly. It is a good source of protein, fat, carbohydrates, minerals and vitamin A. The woody stem yields fiber.

Passiflora edulis – Passion Fruit: This woody climber is chiefly cultivated for its edible fruit. The plant bears two types of fruits: purple colour in higher elevations and yellow colour in lower elevations. The plant is propagated from seed as well as from semi-hardwood cutting. A kilogram of passion fruit (about 30 fruits) sells for Rs.15 in the local market. The fruits have a long shelf – life and can be transported for long distances without damage. A kilogram of passion fruit yields 300 ml of pure juice extract, which is normally used to prepare squash, syrups, jellies, etc. A litre of squash sells at a price of Rs.60 to Rs.70 in the local market. Ripe fruits are edible and used for flavoring candy, ice creams, cake fillings and frosting. Peels and seed cake are used as feed for livestock. Seeds yield oils used in paints and varnishes. The leaves are bitter and eaten as a vegetable. It possesses medicinal properties and is used to cure high blood pressure problems and diarrhoea.

Sechium edule – Chow-chow: It is a climbing herb with tuberous roots. Chow-chow is cultivated on a large scale and is grown throughout the hilly regions of Nagaland. Sprouted fruits are used to propagate the plant. The seed begins to sprout inside the fruit while still on the parent vine. The plant requires a large quantity of water for its growth and the fruit matures in about 30 days after flowering. The fruits are eaten as vegetable. Roots are a source of starch and can be used as substitute for arrowroot starch. Seeds are cooked or roasted before eaten. Tender shoots, leaves and tubers are eaten as vegetables. Fruits, stems and tubers are used as fodder. The woody stem yields fiber.

Parkia roxburghii – Yongchak: It is a medium-sized tree, grown for its pods and used as a park tree for shade. It flowers in December and the flowers are yellow and white in colour. The plant propagates from seeds. The fruits or pods are borne in clusters, each measuring as long as 50 cm. A cluster of pods sells for Rs.10 in the local market. Tender shoots and pods are eaten as vegetables. Pods and seeds are used for stomach disorders. Lotion from the bark and leaves is used to treat sores and skin infections. The wood is used for fuel wood, temporary constructions, boxes, shoe heels, etc.

7.2.2 Important Shade – Loving Plants of Nagaland

Although all green plants require sunlight for synthesis of food, their degree of requirement, exposure and tolerance to sunshine hours varies from one species to another. Shade-loving plants grow and develop better when planted in shade. For their photosynthesis, defused sunlight is enough. Some important shade-loving plants, known to local farmers and which can be used for agro forestry, are described in the Box 7.3:

7.2.3 Important Shade – Loving Plants of Nagaland Box 7.:

Curcuma aromatica L.- Turmeric: The plant is an herbaceous perennial tropical crop with thick underground rhizomes. It is cultivated up to 1,400 m elevation. It is grown in many types of soil but grows best in loamy soil rich in organic matter. It is cultivated from April to July. The seed production capacity is 1,000 kg/ha. The space where it is grown should be 45 x 15 cm and deeper than 7.5 cm. It yields 14,000 to 32,000 kg rhizomes/ha.
It is used for cosmetic preparations, spices, dyes and medicinal purposes due to its anti-microbial and antiseptic properties. It is also used as a stomach tonic and blood purifier.

Zingiber officinale – Ginger: It is an herbaceous perennial plant having underground rhizomes. It is a tropical crop, which is cultivated up to 1,600 m elevation. It grows best in sandy soil with high organic matter content. The planting is done from March to April before the onset of the monsoon. The seed production capacity is 800 to 1,200 kg/ha. The spacing should be 45 x 18 cm. It yields 10,000 kg of rhizome/ha.
It is used as spice, medicine, flavoring agent in confectionery and also for making ginger beer, etc.

Elettaria cardamomum L. - Cardamom: It is an herbaceous perennial plant. It has underground rhizomes, which gives rise to aerial leafy shoots and panicles.
It thrives best in tropical forests, which grows in altitudes ranging from 600 m to 1,600 m It is propagated through rhizomes and suckers. It is planted from April to May. The seed production capacity is 800 to 1,000 kg/ha (Rhizomes).
It is used as medicine, flavoring agent in confectionery, spices and curry powder preparations.

Piper nigrum – Pepper: Pepper is an evergreen climber with jointed stems. Its leaves are dark green and the stems are normally green and reddish when ripe.
It requires humid tropical climate with good rain. It best thrives in well-drained clay to loam soil. The plant is propagated through cuttings of runner shoots. It is planted from May to June. The number of planting materials required depends on the system of farming or type of garden. It yields 2,000 to 2,500kg/ha/year.
It is used as spice, medicine for curing stomach trouble, lowering blood sugar, etc.

Cymbopogon citratus and ***Cymbopogon spp.***- Lemon Grass and citronella: Both the plants are stem less perennial grasses. Their leaves yield aromatic oil containing a high percentage of citral oil. Both plants can be grown in most types of soils. They are largely grown in sub-tropical areas. Lemon grass is propagated through seed raised in nursery. Citronella grass, on the other hand, is propagated by rooted slips. The oil is used in soaps, cosmetics, deodorants and perfumery formulation.

Coffea arabica, Coffea robusta – Coffee: Coffee plant is an evergreen shrub or a small tree. The leaves are opposite and simple. The fruit is commercially known as a cherry or berry.
Coffee arabica grows best at elevations ranging from 500 to 2,000 m *Coffea robusta* grows best between 150 and 500 m Coffee plant is directly propagated from seeds and seedlings, which are raised and transplanted from nurseries. The spacing should be 1.75 x 2.75 m for Coffea arabica and 3 x 4 m for *Coffea robusta*. The yield is about 600 to 700 kg-dried bean/ha. Coffee is used as a non-alcoholic beverage. It helps in stimulation and diuretic action.

Camellia sinensis – Tea: Tea plant is an evergreen tree under natural conditions. The leaves are alternate and simple the stem is profusely branched.
Tea plants can be grown under a wide range of environmental conditions. It grows well from sea level to 2,400 m It is best grown in well-drained fertile soils with high organic matters. Tea plants are propagated from seed, through cutting, grafting and layering. About 20 kg of seed is enough for one hectare while 8,000 to 10,000 saplings are required for the same area. The pits should have at least 45 cm diameter and 60 cm depth. The spacing should be 1 x 1 m.
It is used as non-alcoholic beverage. It has diuretic property and is useful in cardiac therapy.

Colocasia spp.- Taro: Taro is a tuber crop. It is an herbaceous annual plant. Taro is grown in many Asian countries in the tropics and sub-tropics; Taro thrives well in soil rich in organic matter. Planting is done through tubers/rhizomes. About 1,000 to 1,500 kg of tuber is needed for planting in one hectare. The yield is about 12,000 kg per hectare. Taro is used as food crop.

Dioscorea spp.- Yam: It is a tuberous root crop. The plant is a tuberiferous species with the vines twining up on trees and other supports. Yam is cultivated in most parts of Nagaland during the rainy season. It thrives best in well-drained sandy loam soil rich in organic matters. Pre-sprouted tubers are used for planting. Yams are normally grown in jhum fields mixed with rice. It is used as a food crop.

Passiflora edulis – Passion fruit: Passion fruit is a climber cultivated for its edible fruit. The vines are woody and hard. This crop is cultivated all over Nagaland. There are two types of passion fruit one bears purple fruits and the other bears yellow fruits. The plant is propagated from seeds, and through vegetative cutting in April and May. The plant profusely bears fruits even up to two times a year. The fruits are edible and the juice is used for making squash.

7.2.3 Some Important Wild Fruits of Nagaland

Wild fruits make an important contribution to the nutrition of the rural people in Nagaland. They also play a significant role in income and survival strategies for jhum cultivators, small landholders and landless families living near forests. They are a food supplement especially during times of shortage. Some wild fruits, e.g., gooseberry and crab apple, are processed into different forms and are sold in local markets.

Wild fruits are common in tropical and subtropical rain forests of Nagaland. Many wild fruit species are vanishing due to deforestation and wild fire. For example, when wild fig varieties get burnt by wild fire, the plant may survive, but the fruits become non-edible. Efforts are needed to reintroduce wild fruits and conserve wild biodiversity in Nagaland. Some of the important wild fruits of Nagaland are described in the Box 7.4 below:

Some Important Wild Fruits of Nagaland **Box 7.4**

Malus spp.- Crab apple: This is a medium-sized tree. It bears clusters of white, long-stalked flowers during April - May. Fruits are pear-shaped with 3 - 5 seeds. Propagation is done by seed. It is used in preparation of squash. The dried fruit is eaten.

Emblica officinalis – Gooseberry (aonla): It is a small or medium-sized deciduous tree and is sensitive to frost. Fruits, bark and leaves are rich in tannin. The wood is red and hard. Flowering occurs in summer. Fruits ripen during winter. It is green when tender and becomes yellow or brick red when mature. It is the richest source of vitamin C. It is eaten raw as well as pickled and also used as fodder. Dried fruit is edible and used in the treatment of diarrhoea and dysentery

and also as detergent and shampoo. Leaves are used as fodder and manure. Wood is used in making agricultural implements and poles.

Ficus cunia – Fig: This is common on the banks of streams or in ravines. It is a tree, which is moderate in size, and usually it is evergreen. Fruits are borne underground and on the scaly, long leafless branches and from the trunk near the base. Fruits are globose or pyriform, in pairs or in clusters and ripen during May - September. The fruits are edible and used in preparation of jams. Leaves are used as fodder and bark yields fiber used for making ropes. Wood is used for fuel and the root juice is used for treating bladder ailments.

Ficus auriculata – Fig: This is found abundantly along streams and damp valleys. It is a low-spreading tree with large leaves. Secondary branches are hollow and young shoots and stipules are spongy. A milky juice oozes when petioles and branches are plucked. Fruits are borne on the trunk and leafless branches, often in clusters and ripen during April - June. Fruits are large, brown or purple when ripe. The fruits are eaten raw and used in the preparation of jams. The leaves are used as fodder and for wrapping vegetables. Young leaves are eaten as vegetables.

Juglans regia – Walnut: This is a large deciduous tree. The tree starts bearing fruit after 8 - 10 years. Flowers are yellowish-green, forming a long, chain-like structure called a catkin, which hangs down from the branches. Male flowers are borne on old branches while female flowers are borne on new ones. Fruits are green with a leathery nutshell. The seed is indehiscent, corrugated, oily and edible. The endocarp is hard, woody and wrinkled with two valves. The seed is edible and the green hull is used in fishing to intoxicate the fish. The bark, leaves and fruits are used as medicines. The wood is used for furniture, carving gunstocks, veneers, plywood, cabinets, musical instruments, and handloom shafts and frames.

Rhus semialata – Naga tenga: It is a small or medium sized deciduous tree whose secondary branches, petioles, undersurfaces of leaves and inflorescence are covered with short, soft, brownish hair. The bark is grey and rough with deep vertical furrows having resin canals filled with sticky milk. The leaves turn red before they fall. Profuse flowering occurs during April – September. The flowers are white or pale yellow, produced in large, terminal panicles. The fruits are small and reddish brown and edible, sour in taste and are used in the treatment of dysentry, diarrhoea and food poisoning.

Fermiana colorata – Naga peanut: This is a medium or large deciduous tree and mostly grows wild but sometimes grown in gardens. The stem often has vertical grooves. Young shoots are pubescent. The bark is ash-grey. Profuse flowering occurs in spring (March - April). Leaves are large, often lobed and crowded at the end of branches. Leaves fall during winter and new leaves develop after flowering. Flowers are bright orange. Fruits are formed on leaf like structures and ripen during June - July. The fruits are eaten raw or after roasting. Leaves and twigs are used as fodder and the bark yields fiber, which is used for making ropes. The wood is used for timber and the root tuber is edible.

Rubus ellipticus – Raspberry: It is a large shrub with long, trailing branches covered with dense, long soft, brown bristles. Stout thorns are also present in the branches, petioles and midrib of leaves. Flowering occurs during March - May. Flowers are white. Fruits are yellow and in clusters and are edible and have a good flavour and taste. Roots and young shoots are used in the treatment of colic pains and dysentery.

Artocarpus chaplasha – Wild Jackfruit (sam): This tree grows well in partial shade and hence is recommended for under planting in timber plantations. Fruiting occurs during May to June. Fruit is 7 – 10 cm in diameter, fleshy, globose and pubescent. The fruit is eaten raw, the leaves are used as fodder and the wood is utilized as timber and for making plywood.

7.2.4 Some Economically important Indigenous Plants of Nagaland

Many indigenous plants that grow in Nagaland have multiple uses: medicine, food, fodder, manure, fuel, timber, handicrafts and fiber. Some of these uses are confined to Nagaland while others occurring widely outside Nagaland. As Nagaland is a hilly state, only the upper limit of the altitude for optimal distribution of plants is mentioned. Some economically important plants of Nagaland are described in the Box 7.5 below:

Some Economically important Indigenous Plants of Nagaland **Box 7.5**

Acrocarpus fraxinifolius – Mundani: It is a fast growing timber tree found in Nagaland up to 1,500 m elevation. It is propagated by seeds, naked saplings and stumps. Saplings can be transplanted in partially shaded fields as well as in jhum fields. Cattle do not browse the plant. Flowering occurs during January - February. Seeds are collected in May - July.
The wood is used for timber, veneers and plywood. It is also suitable for making packing cases for heavy machinery.

Albizia lebbeck – Black Siris: It is a large deciduous tree that grows on various soils in areas up to 1,200 m above sea level. The sapwood is white or yellow and the heartwood is dark brown. Propagation is done by seeds and saplings.
The wood is used for high-quality furniture, internal decoration, paneling, flooring, construction and carving. In Nagaland, it is used as a joint post as it withstands moisture and termite attacks for long periods.

Michelia champaca – Tita Chapa: This is a tall evergreen timber tree and grows best in damp climates with deep moist soil. It is sensitive to frost. Flowering occurs during summer and rainy seasons. The wood is somewhat lustrous, medium texture, and takes good polish. Propagation is done by seed. However, seed viability is low.
The wood is used for making posts, boards, veneers, furniture, decorative fittings and carriages. Flowers are used in the preparation of perfumes and hair oils. The flower also yields a yellow dye for textiles.

Hovenia dulcis – Coral Tree: It is a medium to large-sized tree and grows well up to an altitude of 2,000 m above sea level. It usually grows in moist, shady places. It flowers from May - June. Propagation is done through seed. The wood is used as timber and fuel and the fruits are eaten.

Morus laevigata – Bhola: It is a large tree, which is found at higher altitudes up to 2,700 m above sea level. The tree yields tough timber, which is heavy and durable under cover. The wood seasons well and gives a good finish. Propagation is by seed and cuttings. It flowers during February - March. The wood is used for furniture, sports equipment, agricultural implements, ornamental paneling. Lopped branches are used as fodder.

Phoebe goalparensis – Bonsum: This is a large tree that grows well in shade and cannot withstand direct sunlight during early stage of growth. Seedlings can be raised artificially in shaded beds. The wood is light, easy to season, easy to work and gives a good finish. Propagation is by seed. The wood is used for construction of buildings, planks, furniture, tea chests, plywood, bobbins and occasionally for pattern-making.

Schima wallichii – Needle Tree: This is a large evergreen tree. The wood is used as timber and easy to saw. However, it causes irritation of the hands when handled and is difficult to season. Propagation is by seed. The wood is used for construction of buildings, planks, canoes, agricultural implements and poles. It is a good source of fuelwood. The bark is used in the

dyeing and processing of leather. The bark is also mixed in feed and used to expel tapeworms in livestock.

Calamus tenuis – Rattan cane: It is a very long slender climber found in damp places and grows up to 9 m in height. The stem has no leaf-sheaths. Fruits are straw-coloured and sour in taste. Propagation is by seed and suckers. Fruits are eaten raw. The cane is used for making baskets, furniture frames, walking sticks and polo sticks. It is also used as substitute for ropes and cables for suspension bridges.

Cinnamomum zeylanicum – Dalchini: It is a medium-sized evergreen tree and grows in the wild and is found abundantly in the plains as well as hilly regions. The bark is the principal source of cinnamon and is more valued that the wood. The bark is used as spice in preparation of chocolates, candy, gum, incense and perfumes, and to check nausea and vomiting. It yields an essential oil used in flavoring confectionery, pharmaceuticals and soaps and to treat gastric disorders.

Cephalotaxus griffithii – Yaw: it is a small to medium-sized tree found in the hills. Propagation is by seed and cuttings. It is grown as an ornamental plant. The leaf extract contains 'cephalotaxine' which has antitumour properties.

Adhatoda vasica – Adhatoda: It is an evergreen shrub, found up to 1,500 m above sea level. It grows on various soils and cultivated as hedge plant. Propagation is by seed and cuttings. The extracts of both fresh and dried leaves are used in treatment of bronchitis, diarrhoea, dysentery and glandular tumours. Leaves, flowers, fruits and roots are used in treatment of cold, cough, chronic bronchitis and asthma. The plant is a rich source of nitrogen and is used as green manure. It is also used in rituals.

Bauhinia variegata – Bauhinia: It is a medium-sized tree, which grows well up to an elevation of 1,800 m. It can withstand frost. Propagation is by seed. Leaves are used as fodder. Flowers and pods are eaten as vegetables. The bark is used in dyeing. The wood is used for making various agricultural implements.

Litsea citrata – Mejankosi: This is a deciduous and aromatic small or medium tree found up to 2,700 m above sea level. The tree has a delightful lemon like fragrance. Most parts of the plant yield aromatic, volatile oil. Propagation is done by seed. The oil from the flowers and fruits is used in perfumes. The fruit is eaten raw or mixed in pickle after roasting. The fruit extract is also used in the treatment of dizziness, headache, hysteria, paralysis and amnesia. It is also used as an insect repellent. The seeds, which yield fat, are used as an illuminant.

Kydia calycina – Pula: This is a medium-sized deciduous tree, which is resistant to frost, and drought. Propagation is by seed. The leaves are used as folder. Paste made from the leaves is used for treating body ache and skin diseases. The bark is used as shampoo and yields fiber used for making ropes. Wood is used for handles of implements and yields pulp, which is used togrther with bamboo pulp in the manufacture of paper.

Laportea crenulata – Devil Nettle: This is a large, stout shrub found growing wild in evergreen forests. The plant is covered with small, highly irritant hair. The sting of the hair causes dermatitis and acute burning pain. The effect of the sting lasts for several days and is aggravated when water is applied to the affected area. It is particularly powerful during the flowering season. Propagation is by seed. The bark yields a strong fiber, which is used for making cordage and coarse cloth. Flowers are used in curries, seeds are used as medicine. Root extract is used in treating chronic fevers.

Debregesia longifolia – Wild Rhea: This is an ornamental shrub or small tree that grows wild in the hilly regions. Propagation is by seed and cuttings. The fruits are edible and the wood is used for making charcoal. Fiber is valued for making ropes and cordage. Bark is used to make a local shampoo.

Sterculia villosa – Udal: This is a moderate-sized tree found up to 1,000 m above sea level.

Propagation is by seed. The wood is used for making tea boxes and light packing cases. Bark yields coarse, strong fiber used for cordage and rough bag. Fiber is specially valued for breast bands of elephants for dragging timber and for tying cattle. Seeds are eaten after roasting or cooking. Pericarp yields a dye and the bark yields a gum used in veterinary medicine.

Wrightia tomentosa – Dudhi: This is a small tree up to 12 m in height found up to an altitude of 1,200 m above sea level. It grows wild but is also planted as an ornamental tree. The wood is uniformly white and lustrous but turns yellow with age. It is straight, even-textured and easy to saw and can be easily worked. Propagation is by seed. The wood is used in making cups, plates, combs and frames and wood carvings. Bark yields latex from which a yellow dye is obtained and is used for stuffing. The seeds yield a thick red medicinal oil.

Zanthoxylum acanthopodium – Mechinga: It is a thorny, small tree or shrub with dense leaves and prickly trunk and branches. It is found in higher altitudes up to 1,800 m above sea level. The plant has a pungent taste and smell. Propagation is by seed. The plant is used as spice and also in medicine for stomach disorders. Young leaves, shoots and seeds are eaten as vegetables. Dried flowers yield an essential oil that is used in perfumes. Wood is used for making sticks and clubs.

7.2.5 Some Important Medicinal Plants of Nagaland

The use of herbal medicines has always been a part of daily life for the Nagas. A wide variety of these medicinal plants are grown as crops in the jhum fields and in the home gardens of Nagaland but many are also collected from the wild. Some local medicinal plants of Nagaland and their uses and domestication are described in Box 7.6 below:

Some Important Medicinal Plants of Nagaland **Box 7.6**

Butea minor: Belonging to the Leguminaceae family, this is a perennial plant with thick pith and hairy stem; growing to a height of about 1.5 m. The flower is red, terminal and the fruit is podded and pubescent. It is found in abundance at altitudes between 1,000 – 1,400 m above sea level. The mature pods are collected during december – January. The beans are burnt in hot ash and those that burst with a crackle are given to patients to induce vomiting. This is helpful in the treatment of food poisoning and deworming.

Centella asiatica: This plant belongs to umbellifereae family. The leaves are orbicular, reniform, serrate and basal nerved. It is found in clayey soil in open spaces. The whole part can be collected throughout the year. It is used to cure cholera, tuberculosis, dysentery and high blood pressure. The decoction made from the plant is taken and its regular use has a restorative effect.

Curculigo capitulata: This plant belongs to Amaryllidaceae family. It is an herbaceous perennial plant with tuberous, fleshy, rhizome-bearing lateral roots. Leaves are folded and curly and flowers grow near the ground on a short stalk. It is widely available in the open spaces or in the undergrowth at high altitudes. Rhizomes can be collected throughout the year. It is used for stomach disorders and gastritis. Before using, the rhizome has to be cleaned first, then sliced and soaked overnight in water. The slimy jelly that forms is scooped out and eaten.

Fagopyrum esculentum – Common Buckwheat: This plant belongs to polygonaceae family. It is an erect herb with triangular leaves having acute cordate and red nerve base. It has a long petiole that is often red. The flowers are white in colour. It is found abundantly in the cultivated

land. The roots can be collected throughout the year. Roots of plants that are about a year old are preferred. It is used for de-worming. Decoction of the root is taken.

Houttynia cordata: This plant belongs to Saurauraceae family. It is a perennial herb having a pungent smell. The undersides of the leaves turn bright red in autumn. The flowers have no petals. It is commonly found in the open fields and exposed sub-soil. The whole plant can be collected throughout the year. It is used in the treatment of stomachache, cholera, dysentery, arthritis and body ache. The patient takes the decoction to treat such diseases.

Litsea citrata – Mejanker: This is a tall shrub with a green bark, which turns black when dried. The surface of the leaves is bright green. It is found in abundantly in cultivated areas after the cultivation period is over. The fruits can be collected during May and June. It is used for curing cholera, diarrhea, constipation, headache, fever, vomiting, food poisoning and suppressing the effects of alcohol. The fruits may be eaten raw or in a dried powdery form. Decoction is also taken.

Rhus semialata – Naga-tenga: This is a small tree and leaves are alternate and compound. A leaflet consists of 4-6 pairs, which are sessile-toothed, pale reddish beneath and acuminate. The panicle is large with a stout peduncle and the flower is pale, yellowish green, drupe orbicular, and red. Panicles are coated with white crystals during winter. It is abundant in open fields. The fruit is collected from November to January. It is used for treating fever, headache, indigestion, stomachache, allergy and antidote to poisoning. Decoction or curry of the powdered fruit is taken. In case of snakebite, the crystals coating the fruit are applied over the bitten area.

Rubus ellipticus – Raspberry: This plant belongs to Rosaceae family. It is an evergreen shrub covered with rufous bristles and recurved spines. The leaves trifoliate and the leaflets are leathery, elliptic, toothed gray and wooly beneath. The flower is white and borne in clusters. The fruit is red or yellow and globular. It is abundant in scrub forests. The roots, bark and young shoots are collected throughout the year. It is used in the treatment of stomachache, loose motion, de-worming, malaria and fever. Decoction of any part of the plant is taken for stomachache. For other ailments mentioned, a decoction of the root is taken.

Swertia chirayita – Lhinetta: This plant belongs to Gentianaceae family. The calyx and corolla are both with very short tubes and with 4-5 lobes free almost to the base. The corolla lobes each have one or two usually fringed nectaries at their base. The stigma is bilobed and capsules are oblong. It is found in exposed soils in open spaces. The whole plant is collected during summer. It is used for treating fever, tuberculosis, gastritis and high blood pressure. The decoction is taken.

Thalictrum Sp.: This plant belongs to Ranunculaceae family. It is a large herb with yellow roots that resemble a tuber. It is commonly found in the undergrowth. The roots are collected throughout the year. It is used for treating gastritis, stomachache, fever, malaria, dysentery, diarrhoea and chest pains. The decoction is taken. The doses, duration of treatment and degree of concentration are determined by the seriousness of the ailment.

Zanthoxylum alatum – Darmar: This plant belongs to Rutaceae family. It is a shrub with prickly branches. It is commonly found in the forests. The leaves and roots are collected throughout the year. It is used to treat cholera, stomachache, fever and de-worming. Decoction of leaves and roots is taken for treating cholera. The infusion of leaves is taken for expelling worms. In all other ailments, the decoction of leaves is taken.

7.3 Veterinary and Animal Husbandry

The people of Nagaland are mostly non-vegetarians, and meat is one of the essential food components of their daily diet. Nagaland has a large population of Livestock (Table-6.1). The per capita consumption of meat in Nagaland (38 g per head per day) is about four times higher than the average consumption in India. Hence, Veterinary and Animal Husbandry in Nagaland is of immense importance. The State Veterinary and Animal Husbandry Department is taking a number of programmes for cattle, dairy and piggery development. In year 1999-2000, the Department spent about Rs. 15 Crores in this sector. The added impetuous needs to be given to livestock production so as to meet the meat requirement of the state from the domesticated animals. This will help in reducing the hunting and consumption of wild meat.

Table 7.1: Livestock Population in Nagaland

Sl. No.	Animal	Population
1.	Cattle	3,83,308
2.	Buffalo	36,131
3.	Mithun	33,345
4.	Sheep	2,339
5.	Goat	1,60,761
6.	Dog	90,986
7.	Rabbit	20,207
8.	Pig	5,71,176
9.	Horses & Ponies	1,133
10.	Ducks	80,467
11.	Poultry birds	23,63,058

Source: Nagaland Annual 2000, Published by DIPR, Kohima, Nagaland.

7.4 Fishery Resources of Nagaland

The fisheries resources of the Nagaland are meager comprising of about 50,000 ha of lentic and 1,600 km. of lotic surface. Of these also the utilization percentage is low, being about 4.5% of lentic resource. The state is also bestowed with a number of hill streams/rivers but their fish population is less resulting in meager production. The upper reaches of most of these rivers/streams are suitable for culture of trout and other coldwater fishes.

The state, having a potential of developing more reservoirs in the future, will give a boost to fish cultrure and production in the state. Beel/Lakes in the state are mostly located at unapproachable terrain and are thus lying in derelict condition and contribute almost nothing to the state's fish production. Ponds/Tanks are the main resource for fish production presently in the state, but their average production is very low with traditional system of culture in most cases.

Paddy-cum-Fish culture is the second major source for fish production in the state and is being practiced in considerable areas. There is a vast scope to integrate this cultural practice and more areas under the system can be taken up through application of scientific methods for increasing fish production.

7.4.1 Production and Demand

The production of fish during 2000-2001 in the state was 5,300.00 metric tonnes, which is sufficient to supply just 4.00 kg/capita to its fish eating population. The per capita availability of fish is one of the lowest within the Northeastern region. The present day demand has as per nutritional standard been placed at 20,000 metric tones. The present production of fingerlings is 50.00 millions.

Considering the gap of production and demand of fish in the state the Department of Fisheries proposes to undertake following activities in 10th Five-Year Plan period:

1. Consolidate the gains achieved and to fully utilize the infrastructure build up during the preceding Plan periods,
2. Improve the nutritional status, build up the rural economy and generate employment for the farmers.
3. To give major emphasis on production oriented programme by involvement of farmers
4. To provide adequate technical service to farmers by extension/training service etc.

(a) To bring greater water area under aquaculture through excavation of new ponds.

(b) Increase fish seed production within the state by giving greater attention to private entrepreneurs.

(c) To increase and accelerate the programme for integrated fish farming development.

7.4.2 Constraints for Fishery Development: Lack of adequate survey of existing water resources, trained manpower and availability of required funds are the important constraints for fishery development in the state. Aquaculture is not a tradition of the Nagas, but a marked change has taken place in the state during the last decades wherein local people are coming forward to take up aquaculture. The majority of farmers are part time fish farmers and there are no professional fishermen in the state. Lack of conservation measures and prevalence of destructive methods of fishing in the state as a whole are the other constraints for the development of riverine fishery.

Introduction of exotic species **Box 7.7**

Presently a few species of exotic catfish have been introduced into Indian waters. These include *Pungasius sutchi* (this species is endemic to Thailand and had been introduced in a large scale into Indian waters clandestinely without the approval of the National Committee on Exotic species) and *Clarius gariepinus*. When introduced into Indian waters, it was observed that the exotic species were carnivorous therefore competing with the native species *Clarius batrachus* and was a threat to the ecosystem in the long run and can cause economic losses. Farmers in Uttar Pradesh have also experienced problems in culturing the exotic species with **carp** due to their carnivorous nature since it is inimical to carps in a mixed culture and also compete for the food available. Instances of cannibalism have also been reported in some ponds. There is also the distinct possibility of the exotics being carriers of exotic diseases as well. Indiscriminate stocking of exotic *magurs* has also drastically affected *catla* production. Although the exotic *magurs* grow faster they have a low survival rate.

In a landmark ruling of the Kerela High Court, it has been ruled that a decision on the introduction of exotic species into the culture system cannot be taken in isolation based on factors such as high yielding capacity or market value alone. Due attention to other factors such as impact on native species and on the ecosystem must also be paid. Following the meeting of the National Committee to oversee and regulate the introduction of exotic aquatic species in Indian waters held on the 22nd of January, 2001, it was observed that a "Precautionary Principle" must be adopted for the purpose since such exotic species have the capacity to breed and establish in natural systems. In addition, these species are carnivorous and their long-term impact on the native Indian species will be severe. It was therefore felt that there is a need to study and monitor the hatcheries of such species over a period of time, in order to consider suitable follow-up action to prevent their introduction through suitable legislative measures etc. The introduction of exotic species therefore must be approved by the National committee on Exotic species along with the recommendation of the concerned State Government.

In the light of the above, the Department of Fisheries, Govt. of Nagaland, has issued necessary notifications for prevention of introduction of exotic species in the waters of Nagaland.

7.4.3 Suggested Development Approach

The land scarce state of Nagaland should lay more emphasis on development of potential Fishery resources as well as their proper utilization. Besides enforcement of conservation measures for the fishery resources, the communities/villages that owned the streams/rivers need training and motivation for adopting the conservation measures. The tanks/ponds and irrigated paddy fields would remain ideal areas for expansion and augmentation of Fisheries. Popularization of fishery in the state would require focus upon the following points.

- **Riverine Fisheries**: The river system in the state with special mention to (i) Tizu-Zungki flowing into Irrawadi in Myanmar and (ii) Tsulaki flowing into Barrak are having distinct character of fish species of two regions which needs to be studied. If I.C.A.R can come forward by taking up a research project for the study of ecological status and fishery potential of these riverine fishery resources of the river system with special reference to Mahseer culture, this may help boost fishery in the state.

- **Beel/Lake Fishery**: The Beels/Lakes available in the state are small and these need to be converted into intensive aquaculture without adversely affecting the structure and function of these aquatic ecosystems.

- **Pond/Tank Fishery**: The ponds and tanks of the state need proper development programmes and be brought under intensive fish farming. Integration of poultry/piggery/duckery is desirable and possible. It would result in economizing the aquaculture practice and increased fish production.

- **Paddy-cum-Fish culture**: The presently available area of paddy field is more than 56,000 ha in the state, which can be brought under scientific integration with fish culture. The annual fish production can be expected to be 300 kg and 600 kg /ha. in hill and plain area respectively.

- **Reservoir Fishery:** The Doyang reservoir, which has 2,258 ha. water area falls under the medium altitude cold-water regime. Post impoundment management and fisheries development aspects must be undertaken for project formulation and funding.

- **Cold Water Fishery:** There is scope for typical high altitude Fishery in the state in Japfu and Saramati Ranges. This resource development is desirable more from the point of view of sports/tourism than production. Proper conservation of these hill streams is to be assured while initiating any development programmes.

7.5 Sericulture

Sericulture is an agrobased rural industry and one of the important components of farming system for subsidiary income. Sericulture requires less investment, gives good and quick return and provides employment opportunities. Being labour intensive, it is ideally suited to the under developed areas. All four commercially exploited species namely Mulberry, Eri, Tasar and Muga are reared in Nagaland. The State Sericulture Department with the assistance from the Central Silk Board has tried to provide necessary research and development schemes to increase the production of silk in Nagaland. Central Silk Board of India has established two units to assist the State Department for production and multiplication of disease free Silkworm seeds, supply of high yielding improved variety of cuttings and saplings and also to render required technical guidance and assistance. The units are:

(1) Mulberry Research Centre at Dimapur

(2) Oak Tasar Research Centre at Kikruma, Phek.

The silk industry is a chain of processes and the ultimate product is quality silk of high value. To produce standard silk, rearing of quality silkworm seeds on quality leaves followed by reeling, spinning of cocoon, weaving of fabrics and marketing of silk products are required. Any neglect in one of the intermediate processes may lead to poor yield. It is therefore necessary to evolve hardy races of silkworms and improved variety of food plants suitable to the state. Development of better and

more reliable method of prevention and control of silkworm diseases, market facilities, and recycling of by-products of sericulture industry should be given top priority.

7.6 Agro-Forestry and Plantation

7.6.1 Commonly planted tree species in Nagaland:

Naga farmers plant many tree species in their fields. But some are more commonly grown than others. Appropriate agro-forestry systems have the potential to check soil erosion, maintain soil organic matters and physical characteristics, augment nitrogen buildup through nitrogen fixing trees and promote efficient nutrient cycling, where trees are integrated extensively with crop and livestock production. In a NEPED evaluation, the most popular four species accounted for 61% of all trees planted and the top ten species accounted for more that 80%. The ten most commonly planted trees in Nagaland (in descending order) are described in Box 7.8 below: -

Ten most commonly planted tree species in Nagaland **Box 7.8**

Gmelina arborea – Gomari: It grows on various types of soils, scattered in deciduous forests. Its size ranges from moderate to large deciduous tree, with numerous spreading branches of about 20 - 30 meters tall and a girth of 2.4 - 4.5 m The leaves fall during January - February. New leaves appear during March - April and panicles of flowers appear during February - March. Seedlings are raised in the nursery in June – September. The wood is used for furniture, planks, carriages, printing blocks, carving, musical instruments and artificial slims. Fruits, flowers, root and bark are used as medicine and leaves as fodder.

Alnus nepalensis - Alder: It is one of the most widely distributed trees in South Asia. It spreads from Pakistan to North India, Nepal, Bhutan, North East India, Myanmar and China. It grows well at altitudes of 1,000 – 2,000 m above sea level. In Nagaland it is mostly found in the hills. It thrives well in shady ravines and hillslopes. It is a sparsely branched, deciduous tree, which grows up to a height of 24 - 30 m The bark becomes fissured and brown in colour when the plant is 4 - 6 years old. The leaf is simple with two-small, rounded leaflet like structures, at the base of the slender petioles. The male flower thickens into chain like structures called catkins. The wood is light and hardens by seasoning. The cones mature in December and seeds are dispersed by wind. The seeds remain viable for 4 - 8 months. Seedlings can also be raised in nurseries. The optimum time of sowing is in February and the saplings can be planted in the same year. This wood is used for construction work and furniture. Profuse leaf falls and decomposition improves soil fertility. Wood provides a good source of fuel. The roots have nodules, which fix atmospheric nitrogen in the soil. Bark contains tannin used for dyeing. The roots spread laterally helping to bind the soil and thus preventing erosion. Leaf sap has coagulant properties and is used for acute dysentery and external injuries. Farmers are aware of the beneficial effect, particularly the use of wood as fuel.

Tectona grandis - Teak: This tree is common in Myanmar, central and south India and Thailand.

Teak grows on various soils but requires good soil and a suitable climate. It has exceedingly rapid growth while young and coppices well. It needs bright sunlight and is resistant to fire. The stumps are planted during April - May. The stumps are 1 - 2 cm in diameter with 15 - 30 cm long roots. Some farmers in Nagaland obtain pieces of cuttings from a single root and these have successfully sprouted. It's growth is optimum during the first four years.

Melia composita - Ghora neem: It is found in the sub Himalayan tracts of India. It is also common in Myanmar, China and Persia. It is of medium size and grows upto a height of 20 – 30 m. It's leaves are beautiful and fern like, compound, bearing 5 - 7 leaflets. Each fruit contains 5 seeds having natural percolation through the center. The seeds are collected in October - January. Propagation is done by direct sowing. It is difficult to grow the plant in the first year unless the seed is first eaten by cattle and ruminated, or the seed is burnt to remove the seat coat for easy germination. This tree yields valuable timber. The wood is used for making toys, cigar boxes, tea boxes, and packing cases. It is also use for agricultural implements, sports ware, musical instruments, furniture and plywood. Seeds yield a drying oil use for making soap and hair oil. A gum collected from the tree is used in the control of spleen enlargement. Leaves, bark, and fruits have insect repellent properties. The seeds of fruits are used as beads in necklaces and rosaries. A few insects, pests and diseases affect this tree. Termites and borers do not easily attack the timber. Cattle relish the shoot; so the stem should be swabbed with cow dung (repellent). Wood requires proper seasoning to avoid warping and twisting. Some farmers break the nut, collect the seeds and sow during the first year.

Terminalia myriocarpa - Hollock: It grows at an altitude ranging from sea level to 1,500 m about sea level. It is a tall evergreen tree. It's trunk is bent and grows in one direction. However, it is not advisable to lop the lower branches to straighten the bole. It is propagated by saplings kept in polythene bags. This wood is used for house building, transmission poles, heavy packing cases and furniture. It is also used for plywood, matchboxes, jute mill rollers, trucks, dugouts, oars, and manufacture of paper. It is easy to maintain a hollock plantation. But occasionally, insects attack the terminal shoots. Some farmers have successfully raised plantations from stumps.

Cedrela serrata - Hill toona: It grows in the sub-Himalayan tracks and in India (Assam, West Bengal and Nagaland). It is found at higher attitudes up to 2,500 m. It is a large tree, which usually can attain a height of 30 m and a girth of 3 m. Its flower is white and dangles in clusters of panicles reaching 1 m in length. Its seeds are dispersed by wind during mid-summer. It is normally planted bare-rooted. The saplings can also be stump planted; even the root-shoot cuttings are planted. The wood is used for furniture, bridges, poles, packing cases and plywood manufacture. The bark is used for treating chronic dysentry. Its fruits are used as decoration. The flowers are used as a dye for cotton and woolen clothes. The tree is resistant to termites and other insects. It grows rapidly during the first 6 - 8 years and attains maximum size in about 15 - 20 years.

Spondias axillaris - Hog-plum: It is commonly found in Nepal and northeastern India (Assam and Nagaland) upto an altitude of 1,700 m. It is a tall and a fast-growing tree. It can remain submerged in the soil for a long period. Its seeds are collected in October to January. Fresh fruits are collected and the pulp is removed by rubbing with ash or sand. The eyes of the seed are placed upright while dibbling. The seeds germinate in three weeks. About 5 shoots sprout from each seed. Of these the best one is retained and allowed to grow. The wood is easy to split and is used as light constructional timber. It is easy to propagate and is cost effective. The villagers use the split timber for construction of farms houses because the wood can withstand moisture and remain in the soil for a long period.

Aquilaria agallocha - Agar-Wood: In Nagaland, it is mostly found in warmer places below 1000 m. It is a medium-sized evergreen tree about 18 – 20 m tall with 1.5 - 1.8 m girth and moderately straight. The wood is soft, light and elastic. It requires shade in early stages of growth. If a fungus infects the wood, a dark, resinous, fragrant mass called **agar** is formed. 4 - 5 old trees are also sold as grade IV category for extraction of "Agar" oil. This oil is used as a fixative in perfumes, and also in the treatment of asthma, diarrhoea, dysentry and paralysis; and as an aphrodisiac. It is also used in the prevention of fleas and lice.

Duabanga grandiflora – Khokon: In India, this tree is widely distributed in the Himalayan foothills, West Bengal, Sikkim and Andaman Islands, up to 1,200 m. However, the best density is observed up to 500 m. It is an elegant, tall tree with horizontal and long drooping branches about 30 – 40 m tall and with a girth of 25 m. Its seeds are minute and should be sown carefully. Germination rates reach 80% if proper conditions are provided in the nursery. It also regenerates naturally in cleared areas of the first year jhum fields. The wood is suitable for plank, light rafters, match splints, canoes, boats, tea-boxes and house construction. Fruits are sour and edible. Timber houses in many parts of Nagaland are attacked by woodborers. Khokan wood is preferred for house construction, as insects do not attack it.

Anthocephalus chinensis – Kadam: This is common in moist deciduous and semi- evergreen forests in Northeast India and Western Ghats. It occurs in the tropical semi-evergreen and evergreen forests up to an elevation of 1,000 m. The tree thrives in well-drained alluvial soil. It occurs naturally in the fresh clearings of jhum fields after burning. It is a large, graceful deciduous tree with a straight bole about 20 m in height having a girth of 1.5 – 2 m. The spreading crown bears drooping branches and ball-like flowers. Fruits are large, orange in colour, fleshy of 5 – 7 cm in diameter. The seeds are collected during August - November. Prior to sowing the seeds are soaked in water for 36 hours to enhance germination. Germination is at it's maximum during the 18th - 20th day. Small seedlings are transferred into polythene bags. Frequent watering is required. The saplings are ready for transplanting after three months. This wood is generally used for boards, packing cases, tea-boxes, match splints and manufacture of cheap paper. It is also used for beams and rafters. The wood has a peculiar smell. To ensure its durability, the bark is kept intact in the portion of the pole that is embedded into the ground.

7.7 Wastelands Development

Table 7.2: Category of Wastelands in Nagaland

Total Geographical area = 16,57,900 ha.

Sl. No	Category of Wastelands	Area in Ha.	% of total Geographical area
1.	Shifting Cultivation: a) Current Jhum b) Jhum Regrowth (Fallow)	 1,01,400 5,31,600	 6.11 32.06
2.	Degraded Forests	2,84,280	17.14
3.	Cultivable Wastelands (Gullied and/or ravenous land with or without scrub, Marshy/Swampy/Waterlogged, degrade pasture/grazing land, etc.)	96,092	5.79
	Total	**10,13,372**	**61.10**

Source: Nagaland Forest Stat. Handbook, 1994.

Table 7.3: Types of wastelands of Nagaland

Sl. No.	Category	Area in Ha.	% age of total
1	Land with or without scrub	1596.46	9.63
2	Shifting cultivation area	5224.65	31.51
3	Degraded forest land	1582.99	9.55
	Total Wasteland Area	**8404.10**	**50.69**

Source: Wastelands maps prepared from Landsat Thematic Mapper/IRS LISS II/III Data (Wastelands Atlas of India, 2000).

It is therefore evident from the tables 7.2 and 7.3 that shifting cultivation is the major cause of formation of wastelands in Nagaland; therefore, there is a need to have serious introspection into jhum practice itself. This form of agriculture has become unsustainable under increasing population pressures mainly due to shortening of jhum cycles. Crop yields have successively declined over time and meets the food demand for only 6 - 8 months. It is estimated that about a generation ago, a 12 - 14 year shifting cycle maintained soil fertility. This cycle is now reduced to 6 - 8 years and previously uncultivated, and ever steeper land is being taken into the jhum system. This results in degeneration and depletion of vegetation; severe soil erosion causing permanent, irreversible damage; loss of natural bio-diversity; decrease in production per unit area; and contribution to global atmospheric pollution. This together leads to overall environmental and ecological degradation.

Besides the problem of jhum, the state has other inherent bio-physical and socio-economic constraints which affects the pace, quality and growth of development. The major constraints are:

- Physical isolation
- Poor infrastructural facilities
- Ecologically fragile natural systems
- Wide variation in agro-ecological conditions within very short distances due to altitude, slope and aspect conditions.
- Limited availability of good agricultural land, which places a natural barrier to increasing food production.

7.7.1 Agro-forestry for Wasteland Development

This concept essentially is in terms of a package comprising of planting trees as a jhum crop, land shaping to control soil erosion and cultivation of shade-tolerant commercial crops such as black pepper, betel vine, cardamom, ginger, turmeric etc. under the trees to bring income from the same jhum fields during the gestation period of the trees. By this, the income per unit area of jhum field per unit time can be increased manifold. Agro-forestry is therefore, proved to be the main tool for

sustainable economic development, which can transform the destructive force of jhum cultivation into a generative force of economic growth. Motivating farmers for adoption and large-scale implementation of this system of farming will thus form the main plank of the activity of the Department of Wastelands Development of Nagaland during the Tenth Five Year Plan.

7.7.2 Rubber Plantation Development

The state of Nagaland has favourable soil and agro-climatic conditions for rubber plantation with promising techno-economic feasibility. The yield obtained is almost as good as that in traditional areas. Apart from achieveing the major objective of increasing rubber production, rubber plantations also serve other interests such as social, economic and ecological. Rubber being labour intensive, can generate employment opportunities and ensure economic returns to the rural people thereby providing viable alternative to shifting cultivation. In Nagaland, large areas of rubber plantation can be taken up in the foothills where the land is denuded and left fallow due to jhumming.

Through the efforts of the Rubber Board, many Naga families are convinced of the advantages of rubber cultivation. However, due to high capital investments, Naga farmers who are generally poor cannot take up the plantation with the meager financial assistance extended by the Rubber Board. Keeping this in view, and to encourage small and marginal Naga farmers to take up rubber cultivation successfully, the Government of Nagaland has started a collaborative scheme with the Rubber Board with funding from NABARD.

7.7.3 Wetlands Development

The State has sizeable area of wetlands in the form of lakes/cut-off meanders, waterlogged areas (seasonal and man-made), swamps/marshes, and tanks, river margins and so on which could have been utilized for productive purposes but for lack of know-how and investment opportunities. Steps are needed to reclaim such lands for various fringe benefits such as sustained agriculture productivity, settlement, plantation, reservoir fishery, parks, etc. according to the need and suitability of the land.

7.7.4 Integrated Wastelands Development Project (IWDP)

The Integrated Wastelands Development Project (IWDP) is a Centrally sponsored scheme under which grant-in-aid is provided for development of wastelands on watershed basis. The basic objective of this scheme is to take up integrated wasteland development projects based on village/micro-watershed plans. These plans are prepared after taking into consideration the land capability, site conditions and local needs of the people. The salient features of the scheme are:

- Development of wastelands through people's participation
- Empowering rural masses in decision making
- Low cost locally available technology
- Active involvement of the Village Councils/Village Development Boards
- Greater role and active implementation of/by Self Help Groups, User Groups, Women Groups and Stake Holders.
- Post project maintenance through self contributed Wasteland Development Fund

7.8 Industry

Due to insurgency problems not much could be achieved in the industrial development till 1975-76. With the establishment of the Nagaland Sugar Mills Co., Ltd., in 1975, Nagaland first appeared on the industrial map of India. The process of industrial development has been very slow due to lack of adequate infrastructures like power, credit, technical manpower and general awareness of the industrial culture. Through efforts of the Government the following Public Sector units have been established. The industry-wise details are given in table 7.4:

7.8.1 Mini Cement Plant, Wazeho

This project was set up at an installed capacity of 50 Tonnes per day at Wazeho in Phek district, which has the highest limestone deposit in the State. The proposal for the expansion of production capacity is now underway.

Table 7.4: Details of Industries and their number in Nagaland

Industry	No. of SSI Units
Forest Based: Saw mill/Furniture/Handicraft/Bee-keeping	601
Agro-Processing: Bakery/Rice Mill/Food Preservation etc.	705
Mineral Based: Stone crusher/Brick/Tiles/Cement Craft etc.,	70
Chemical Based: Soap/Plastic/Tyre Retreading/Candle etc.	62
Mechanical/Metal-lurgy: Blackmithy/Steel Fabrication/Printing Press/ Trunk making etc.	350
Electrical/Electronic: Repair/Manufacturing Units.	14
Textiles Based: Weaving & Knitting/Readymade Garments.	955
Leather Based: Leather Shoes, Bags.	5
Service Based: Motor workshop/Hotel Photocopier/Beauty Parlour/Repair Centre etc.	245
Total	**3007**

7.8.2 Approved Industrial Areas

- Industrial Growth Centre, Ganeshnagar
- Bhandari
- Ghathashi
- Viswema
- Chuchuyimiang
- Saring
- Tizit
- Wazeho
- Tuli
- Longnak
- Longtho
- Longleng
- Noklak

7.8.3 Potential Areas for Industrial Development

Agriculture and Allied Sector

Nagaland has been identified as highly potential for development of Food Processing Industry due to its climatic conditions. Prospective industries in the Agriculture and Allied Sectors include the following:

- Food Processing of Organic fruits and Vegetables
- Floriculture
- Rubber processing
- Sericulture and silk
- Tea cultivation and processing

- Bamboo shoot processing and preservation
- Mushroom cultivation and processing
- Bamboo based pulp land paper products
- Bagasse based paper
- Bamboo ply industries
- Organic pesticide
- Oleoresins and Spice
- Poultry and Dairy

Mineral Based Industries

The State of Nagaland with its mineral resources established so far, offer possibilities for both domestic and foreign investments for the mineral development. Such investment opportunities can be broadly categorized into seven potential areas of exploration and exploitation, on continuous basis from concept to construction to commissioning in Eco-friendly manner.

- Multi-disciplinary explorations for base metals (copper, molybdenum) and precious metals (platinum group of metals, gold, silver etc.) in the ophiolites and meta-sedimentaries and their subsequent exploitation in case economic deposits are proved.

- Exploration for oil and natural gas followed by their commercial production in the foothill regions of Nagaland.

- R & D for evolving a matallurgical knowhow for commercial utilization of nickel-cobalt-chromium bearing magnetite followed by setting up of Ferronickel alloy plant.
- Setting up of medium capacity industries based on high-grade lime stone/marble requiring comparatively low capital investment.

- Large integrated limestone based industry comprising of a 1,200 Tonnes per day Cement Plant and other lime based chemical industries with export potentialities to Myanmar.

- Oil refinery and other downstream petro-chemical industries based on oil and gas reserves within the state.

- Natural Gas power generation (preferably mobile gas turbines)

TOURISM

The State Government is according high priority to the development of Tourism in the state. Investment opportunities for the Travel Industry exist in the following areas:-

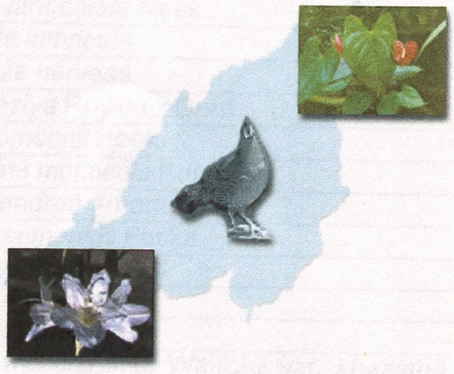
- Setting up of Tourist Resorts, which are environmentally and ethnically suited to the place and appealing to the visitors. These resorts can be set up in Government land on long-term lease basis.

- Setting up of Private Air Services (eg. Helicopter Service) for transportation of Tourist, since long distance road travel is the only means of transportation in the state at present.

POWER

The huge potential for developing Large, Mini, and Micro Hydel Projects offer excellent opportunity for private investments. The surplus power from such projects can be sold to national Grid or to neighbouring countries to earn capital for the development of the state.

8. Status of Biodiversity in Nagaland



No comprehensive inventory of the flora and fauna of Nagaland is available. Although Nagaland along with the neighbouring regions once formed a famous hunting ground for a number of British botanists from time to time, the only regional account of the flora of northeast India is that of Kanjilal et. al., (1934-40) which deals with the dicotyledonous species (except, for Poaceae by N. L. Bor). Other floristic and faunal studies are either for a part of Nagaland or deal with a particular group of plant or animal. There is therefore an urgent need for undertaking a systematic study leading to inventorisation of total biodiversity of Nagaland. Based on available literature, an account of the status of biodiversity of Nagaland is given below:

8.1 Flora of Nagaland

The state of Nagaland harbours a very rich floristic diversity. The angiospermic flora is represented by 2,431 species belonging to 963 genera and 186 families. In this, the share of dicots is 1,688 species, 724 genera from 158 families and monocots by 743 species under 239 genera from 28 families. Gymnosperms also register their presence with 9 species, under 6 genera from 5 families. Nagaland harbours a large number of plant species which are endemic to the State or the northeastern part of India.

Table 8.1: A list of some economically important plant species of Nagaland

Antidesma acuminatum Wight	*Lithocarpus dealbata* (Miq.) ehder
Ardisia paniculata Roxb.	*Lithocarpus pachyphylla* (Kurz) Rehder
Areca nagensis	*Litsea salicifolia* (Roxb. ex. Nees) Hook. F.
Artemesia indica Willd.	*Macaranga pustulata* King ex. Hook. f.
Brassaiopsis mitis C. B. Clark	*Maesa macrophylla var. magnidentata*
Carex asraoi	*Magnolia baillonii* Pierre

Casearia kurzii Cl.	*Michelia oblonga* Wall.
Castanopsis indica A. DC.	*Musa velutina* Wendl. & Drude
Castanopsis tribuloides A. DC.	*Phoebe goalparensis* Hutchinson
Cinnamomum tamala Fr. Nees	*Phoebe lanceolata* Nees
Clematis meyeniana	*Pholidota imbricata*
Clematis meyeniana var. insularis	*Pimpinella nervosa*
Cocculus prainianus	*Pinus kesiya* Royle ex Gord.
Corydalis borii	*Piper thomsonii* Hook. f.
Cotoneaster nagensis	*Psychotria monticola* Kurz
Crotolaris meeboldii	*Rhododendron arboreum* Sm.
Cycas pectinata Griff.	*Rhus assamensis* Focke
Deyeuxia borii	*Rhynchosia meeboldii*
Deyeuxia nagarum	*Rubus lucens* Focke
Elaeocarpus acuminatus Wall.	*Saussurea nagensis*
Erythrina arborescens Roxb.	*Schima wallichii* ssp. Wallichii var. *khasiana* (Dyer) Bloembergen
Ficus elmeri Merr.	
Gmelina oblongifolia Roxb.	*Senecio rhabdos*
Nedychium marginatum	*Silene vagans*
Impatiens cupsidifera	*Sunipia jainii*
Leptodermis griffithii Hook. F.	*Terminalia myriocarpa* Heurck. & Muell-Arg.
Macropanax dispermus (Bl.) Kuntze	*Tetragoga nagensis*
Macropanax undulatum Seem.	*Trichosanthes tomentosa*
Leucosceptrum cannum Smith	*Wendlandia grandis* (Hook. f.) Cowan

(Source – Biodiversity Characterisation at Landscape Level in North-East India using satellite Remote Sensing and Geographic Information System, Indian Institute of Remots Sensing, Dehra Dun, 2002, Plant Diversity and Conservation in India – An Overview; Hot Spots of Endemic plants of India, Nepal and Bhutan; Floristic Diversity and Conservation Strategies in India (Vol. III: In the Context of States and Union Territories), Botanical Survey of India, Calcutta.)

Table 8.2: A list of plant species endemic to Nagaland and northeast India

Family	Name of the Species
Apiaceae	*Chaerophyllum orientalis, Pimpinella evoluta and P. flaccida*
Begoniaceae	*Begonia wattii*
Berberidaceae	*Berberis micropetala and B. wardii*
Fumariaceae	*Corydalis boweri*
Menispermaceae	*Cyclea wattii*
Orchidaceae	*Coelogyne hitendrae*
Poaceae	*Calamagrostis nagensis, Capillipedium nagense, C. pteropechys, Sinobambusa elegans and Themeda huttonensis*

(Source – T. M. Hynniewta, Nagaland, BSI Publication)

8.1.1 Germplasm Resources of Nagaland:

Preliminary surveys undertaken in Nagaland by the National Bureau of Plant Genetic Resources (NBPGR), Regional Station, Shillong, has revealed a remarkable diversity in different cultivated crops and other important economic plants. Three exploration trips undertaken during the winter season of the year 1986, 1988 and 1992 yielded a total of 1014 accessions belonging to different crops (Hore and Sharma, 1993). Diversity of crop genetic resources collected from Nagaland is given below:

Table 8.3: Germplasm diversity in different crops recorded from Nagaland

Groups	Crops	Total Germplasm collected
Cereals	Paddy, Maize	372
Pseudocereals	*Sorghum*, Amaranth, *Chenopodium*	15
Millets	*Pennisetum, Eleusine, Setaria, Coix*	88
Oilseeds	*Brassicae, Sesame, Perilla,* Groundnut	74
Legumes	Cowpea, Sembean, Soybean, Ricebean, French bean, Pigeon pea, pea, Winged bean	193
Tuber Crops	*Colocasia, Dioscorea,* Sweet potato	46
Vegetable	Cucurbits *(Cucurbita, Cucumis, Lagenaria, Citrullus, Momordica, Benincasa, Sechium, Luffa, (Trichosanthes), Solanum* spp., Tree tomato,	124
Spices and Condiments	Okra, Onion, Garlic, Chilies, Ginger, Turmeric, wild Cardamom, Black pepper, Coriander, Leafy species.	68
Beverages anc Narcotics	Tee, Coffee, Tobacco	06
Fruits	Orange, Jackfruit, Banaba, Guava, Papaya	15
Others	Cotton, Sugarcane and wild medicinal plants.	13
	Total Germplasm collected:	**1014**

(Source: Hore and Sharma, 1993)

(This list is only indicative of the rich germplasm diversity in Nagaland. Further systematic investigations are required to reveal the true picture of the germplasm diversity of fruits, vegetables and other edible plant species in Nagaland.)

8.1.2 Agro-biodiversity

Agro-biodiversity provides a wide range of food products and contributes towards food security and promotes maintenance of traditional and site-specific varieties. Farmers of Nagaland maintain a rich diversity of agricultural crops in their fields. A study conducted by NEPED in Chetheba area of Phek district revealed that at least 167 crops are cultivated in a typical jhum field. A total of 360 different varieties of rice are cultivated in Nagaland. Out of which 50 varieties have been found to be economically viable. Similarly, there exists rich agro-biodiversity of other agricultural crops such as Maize, Soyabean, Pigeonpea, Cowpea, Sesamum, Tapioka, Pineapple, Lemon and Orange, Papaya, Brinjal, Chilli, Ginger, Lahipatta, Potato, Tomato, Lentil, Guava, Banana etc. in Nagaland.

8.1.3 Plants and animals used in day-to-day life by the Nagas

People in Nagaland live very close to Nature. They use a wide variety of plants and animals in their day-to-day life for different purposes ranging from food, medicine and rituals, some of which are listed in Tables 8.4 – 8.28:

Table 8.4: Medicinal plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilization
1.	*Adiantum philipinense*, Linn.	Adiantaceae		The leaf extract is used for curing fever, blood diseases, epileptic fits & Rabies. The rhizome extract is also taken for curing dysentery, ulcers and muscular pain
2.	*Aloe vera*, Linn.	Liliaceae	Alo-vira	Fleshly leaf is eaten raw to cure stomach problems. Leaf-juice is also applied in all kind of skin diseases
3.	*Angiopteris evecta*, (Forst) Hoffm.	Angiopteridaceae		Rhizome is eaten after cooking. The base of the stipe is crushed and applied to cure leprosy and rib pain
4.	*Asplenium falcatum*, Lam	Aspleniaceae		The plant is used to cure spleen problems, jaundice, malaria and urinary bladder disorders
5.	*Blechnum orientale*, Linn.	Blechnaceae		Fresh frond is used as a poultice to cure boils, urinary bladder disorders and as a germicide
6.	*Cocos nucifera*, Linn	Arecaceae	Coconut	Dried coconut is chewed every morning and evening to kill germs in the stomach
7.	*Distemon indicum*, Wedd.	Urticaceae	Zaklo	The leaf juice is drunk after boiling with water to cure malaria
8.	*Hypoxis aurea*, Lour.	Hypoxidaceae	Tinulemba	Tuber used as antidote against snakebite
9.	*Lantana camara*, Linn.	Verbenaceae	Anitong	The tender leaf is ground into a paste and then eaten along with water for treatment of various diseases like allergic cough, asthma, diabetes, arthritis, rheumatism, eczema and leucoderma
10.	*Lygodium flexuosum*, Linn, SW,	Lygodiaceae		The rhizome is boiled with mustard oil and applied to cure rheumatism, sprains, scabies, ulcers, eczema and wounds
11.	*Morus indica*, Linn.	Moraceae	Mulberry	The root is cut into pieces and put on the patient's neck as a necklace. This is believed to automatically

				cure jaundice
12.	*Paederia foetida*, Benth	Rubiaceae	Tsumenemli	The leaf's juice mixed with 2 or 3 drops of honey is drunk to cure high fever and dysentery
13.	*Pnax pseudoginseng*, Wall	Araliaceae	Ginseng/ Miracle or wonder plant	Rhizome is used to cure liver diseases, diabetes, stomachache and general weakness as tonic
14.	*Taxus baccata*, Linn.	Taxaceae	Taxus	The bark is used to cure tumors and also for body pain as a massage lotion

Table 8.5: Plants used as vegetables:

Sl. No	Botanical name	Family	Local name	Mode of utilization
1.	*Allium ampeloprasum*, Linn.	Liliaceae	Alolasung	Whole plant is used as vegetable
2.	*Alpinea bracteata*, Roxt	Zingiberaceae	Doto	Young shoot is eaten after cooking
3.	*Basella rubra*	Chenopodia--ceae	Tarui	The leaves are used as vegetable.
4.	*Crataeva religiosa*, Fros	Capparaceae	Unkatong	Leaves are used as vegetable
5.	*Diplazium asculentum*, Retz.Sw.	Athyriaceae	Asang/Enchen	Leaves are used as vegetable
6.	*Distemon indicum*, Wedd.	Urticaceae	Askaklo/Zaklo	Tender leaves are eaten as tonic after boiling
7.	*Hodgsonia heteroclita*, HK. F&T.	Cocubitaceae	Asatong	Cotyledon tissue is eaten as vegetable
8.	*Maclura cochinchinensis*, Sprang	Moraceae	Bhat kerala	Fruits are eaten as vegetable after cooking
9.	*Parkeria roxburghii*, G. Dori	Papilionaceae	Yongjak	Young fruits & seeds are eaten as vegetable either raw or cooked. It is also used as a medicine to cure stomach problem
10.	*Passiflora edulis*, Sims.	Passifloraceae	Intsulasu	Tender leaf is eaten after cooking as vegetable
11.	*Promodica musa*, spp. Rozb.	Musaceae	Mongutong	Ripe or raw fruits and the middle portions of the plant shoot are eaten as vegetable
12.	*Rhynchotechum ellipiticum*, A.DC.	Gesneriaceae	Zopatong	The leaf is eaten either raw or after cooking

Table 8.6: Wild edible fruits:

Sl. No	Botanical name	Family	Local name	Mode of utilisation
1.	*Artocarpus chaplasha*, Roxb	Moraceae	Salijang	Fruits and seeds are eaten
2.	*Baccaurea sapida*, Muil Arg.	Euphorbiaceae	Tangsusu	Seed is eaten
3.	*Calamus erectus*, Roxb	Arecaceae	Injang Kirosu	Fleshy fruit is eaten

4.	*Docynia indica* (Wall) Decne.	Rosaceae	Arem-apple	Whole fruit is eaten
5.	*Elaeocarpus floribundus* Bl.	Elaeocarpacea	Majeblam	Whole fruit is eaten
6.	*Emblica officinalis*, Gacerth	Euphorbiaceae	Lolosu	Whole fruit is eaten
7.	*Garcinia tinctorea*, Roxt	Clusiaceae	Sungsulani	Fleshy part is eaten
8.	*Livistona jenkinsiana*, Griff	Arecaceae	Surajang	Fleshy fruit is eaten
9.	*Nephelium longana*, Buch-Bani ex. D. Don.	Sapindaceae	'Ajensu'	Fleshy fruit is eaten
10.	*Prunus nepalensis*, Steud.	Rosaceae	Mesusujang	Fleshy fruit is eaten
11.	*Roydsia suaveoden*, Roxb.	Capparidaceae	Dimetsulasu	Fruit is eaten
12.	*Spondias pinnata*, (Linn FF.) Kurz.Pegn.	Anacardiaceae	Kansu	Fleshy fruit is eaten.
13.	*Zalacca secunda*, Griff.	Palmae	Okti-jang	Fleshy portion of the fruit is eaten

Table 8.7: Plants utilized for the construction of houses and handy crafts:

Sl. No	Botanical name	Family	Local name	Mode of utilisation
1.	*Bambusa ballooa*, Roxb.	Poaceae	Warok	Mainly used as poles for construction of thatch or houses
2.	*Bambusa tulda*, Roxb.	Poaceae	Longmi	It is used mainly for fencing, house, and thatch construction
3.	*Calamus floribundus*, Griff	Arecaceae	Anu-o	The stem climbers are used mainly for handy crafts, like baskets, cages, chairs, tables, trays etc
4.	*Dendrocalamus hamiltonii*, Nees & Arn	Poaceae	Awah	Tender shoots are eaten as vegetable. Usually, this bamboo is used for making ropes and different types of handy crafts
5.	*Imperata cylindrica*, Beawb	Poaceae	Azu	Dried leaves are used for construction of roof in thatch house
6.	*Melocanna bambusoides*, Trim	Poaceae	Jaluki	Usually used for making bamboo walls and house construction
7.	*Livistona jenkensiana*, Griff	Arecaceae	Sura	Leaves are used for making roof in thatch house

Table 8.8: Plants used for broom/brushes:

Sl. No	Botanical name	Family	Local name	Mode of utilisation
1.	*Ficus cyrtophylla*, Wall	Moraceae	Rokratong	Leaves are used for cleaning utensils
2.	*Sida acuta*, Bwn.	Malvaceae		Whole plant is used for making broom

Table 8.9: Some common timber plants:

Sl. No.	Botanical name	Family	Local name
1.	*Gmelina arborea*, Linn.	Verbenaceae	Kamari
2.	*Largerstromia parviflora* Roxb.	Lythraceae	Arongtsubasung
3.	*Mesae ferrea*, Linn.	Guttiferae	Mangetong
4.	*Michelia champaca*, Linn.	Mangnoliaceae	Ripanglangkeptog
5.	*Tectona grandis*, Linn.	Verbenaceae	Tiksung

Table 8.10: Ornamental plants:

Sl. No.	Botanical name	Family	Local name	Common name
1.	*Cassia fistuda*, Linn.	Caesalpinacea		Golden showers
2.	*Cynthea brununiana*, (Wall) Clarks.	Cyatheaceae	Inchentong	
3.	*Dendrobium densiflorum*, (Wall)	Orchidaceae		Apple orchid
4.	*Renanthera imshootiana*, Rolfe.	Orchidaceae		Red orchid
5.	*Rhododendron arboreum*, Sm.	Ericaceae	Metsuben naro	Rhododendron
6.	*Rhyncostylis retusa*, Bl.	Orchidaceae		Fox-tail
7.	*Vanda coerulea*, Griff.	Orchidaceae		Blue-vanda

Table 8.11: Rope making plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Dendrocalamus hamiltonii*, Nees & Arn.	Poaceae	Awa	Young bamboo is used for making splints
2.	*Hygodium flexuosum, (Linn) Sw.*	Hygodiaceae		It is a climber fern. Stem is used as rope
3.	*Paederia foetida, Linn.*	Rubiaceae	Tsumenemla	Climber stem is used as rope
4.	*Sterculia villosa, Roxb.*	Sterculiaceae	Nemja	Bark is used for making rope

Table 8.12: Plants used for improving soil fertility:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Alnus nepalensis*, D. Don	Betulaceae	Intsusung	Leaves are used as soil fertilizer in terrace cultivation
2.	*Azolla pinnata*, R.Br.	Azollaceae	Azolla	Whole plant (fern) is used as soil fertilizer in paddy fields

Table 8.13: Soil quality indicator plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Dipteris wallachi*, (R.Br.) Moore,	Dipteridaceae	Longchari sera	Grows in less fertile soil
2.	*Entada scandens*, Benth.	Fabaceae	Atitong	This plant grows in fertilie soil

Table 8.14: Time indicator plants:

Sl. No.	Botanical name	Family	Local name	Common name	Uses
1.	*Helianthus anuus*, Wall	Compositae	Anu-naro	Sunflower	Flowers turn toward the sun
2.	*Mirabilis jalapa*, Linn.	Nyctaginaceae	'Jemjang naro'	4'O clock flower/ The marvel of Pero	This flower blooms in the evening only

Table 8.15: Sacred/worshipping plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Artemisia nilagirica*, Pamp. and *A. parviflora*, Roxb.	Asteraceae		Leaves are kept in front of the doors so as to drive out evil spirit
2.	*Ficus elastica*, Roxb.	Moraceae	Nisatong	This huge tree is used for worship
3.	*Elsholtzia blanda*, Benth	Lamiaceae	Tsungkum naro	This plant is used in all sorts of ceremonies. Sometimes the leaves are eaten so as to drive out evil spirits from patients

Table 8.16: Plants used for lighting fire:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Dendrocalamus hamiltonii,* Nees & Arn.	Poaceae	Awatong	Young bamboo is used as splints
2.	*Caryota urens, (Linn)*	Arecaceae	Asang	A cottony and hairy fibre is obtained at the basal portion of leaf
3.	*Rhus semialata, Murr.*	Anacardiaceae	Tangmotong	Dried wood is used for making fire by pulling bamboo splint by hands

Table 8.17: Plants used for playing Indigenous games:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Hodgsonia heteroclita,* HK. F & T	Cucurbitaceae	Asatong	Seed is used for playing game called "Asa sayiba"
2.	*Entada scandense, Benth.*	Fabaceae	Atitong	Seed is used for playing game called "Anti sayiba" and "Apang sayiba"

Table 8.18: Plants suitable for wood carvings:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Artocarapus integrifolia,* Linn.	Moraceae	Belongtong	Wood is used for making gunboat, agriculture implements etc.
2.	*Holarrhyna antidysentrica,* Wall	Apocynaceae		Wood is used for making spoon, plate, flower vase, shelf etc.
3.	*Alstonia scholaris,* Wall.	Apocynaceae	Lazarong-pang	Wood is used for making rings called 'Kumbang'. Local people use this Kumbang to wear during dancing and festival ceremonies

Table 8.19: Plants used for flavouring/condiments:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Allium anpeloplasum,* Linn.	Liliaceae	Alo-lasung	Bulb is eaten
2.	*Allium sativum,* Linn.	Liliaceae	Lasen	Bulb is eaten
3.	*Cinnamomum zeylanicum,* Breyn.	Lauraceae	Tes-pata	Dried leaf is used as a flavouring agent

Table 8.20: Soap yielding plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Entada Scandense*, Benth.	Fabaceae	Ati	The cotyledon is taken out and crushed into powder and is used as soap for washing hair and clothes
2.	*Sapindus Mukorossi*, Gaerth.	Sapindaceae	Charangsujang	The fleshy skin of the fruit is used for washing hair and clothes

Table 8.21: Fencing plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Aerua sanguinolenta*, B	Amaranthaceae		The whole plant is planted for fencing
2.	*Euphorbia neriifolia*, Linn.	Euphorbiaceae	Takratong	The whole plant is planted for fencing
3.	*Hisbiscus rosa-sinensis* Linn.	Malvaceae	Betjongnaro	The whole plant is used for fencing

Table 8.22: Plants used in preparation of local wine/liquor:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Mussaenda frondosa*, Linn.	Rubiaceae	Sapaklari	Root bark is used for the preparation of local wine, which gives a sweet taste
2.	*Solanum escülentum*, Clarke	Solanaceae	Longkoksura-sola	Fresh leaf is pounded with rice to make into powder; this powder is used for fermentation of local brew

Table 8.23: Poisonous plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Croton oblongifolius*, Roxb.	Euphorbiaceae	Chawaetong	Fruits and roots are poisonous and also used as antidote.
2.	*Datura fastuosa*, Linn.	Solanaceae	Metoksuben	Flower and seeds are poisonous. It induces sleep even up to two or more days if eaten in excess.
3.	*Rhus griffithii*, HK.F.	Anacardiaceae	Charaktong	Stem bark is poisonous. It cause skin diseases
4.	*Solanum khasianum*, Clarke.	Solanaceae	Akolongkokusu	Seed is poisonous and used as germicide

Table 8.24: Fish poisoning plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Amoora wallichii*, HK. F&TH	Meliaceae	Akawatong	Fresh leaf is crushed and poured into streams/rivers for killing fish
2.	*Millettia piscidia*, Weight	Fabaceae	Sulitong	Root's juice is used for fish poisoning
3.	*Diospyros variegata*, Kurz.	Ebenaceae	Ruja/Aru	The fruit is crushed and poured into the river for killing fish
4.	*Zanthoxyllum alatum*, Roxb.	Rutaceae	Mongret	The seed are crushed and poured into the river for killing fish

Table 8.25: Dye yielding plants:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Strobilanthes flacculifolius*, Nees.	Acanthaceae	Masaktong	Leaf is pounded and boiled with water, which produces a light to deep blue colour dye. This is mostly used by Ao tribe for dyeing
2.	*Rubia sikkimentensla*, Kurze.	Rubiaceae		This plant is used for producing red dye for fabric mostly practiced among Lotha tribe

Table 8.26: Plants yielding insect repellent oils:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Azadirachta indica*, Juss	Meliaceae	Neem sung	Dried leaf is burnt in fire as mosquito repellent
2.	*Eucalyptus* sp. L. Herit.	Myrtaceae	Eucalyptus	Dried leaf is used as mosquito repellent
3.	*Cymbopogon citratus*, Stapf.	Poaceae	Citronella	Oil is extracted from leaf
4.	*C. nardus*, Rendle.	Poaceae	Lemon grass	Oil is extracted from the fresh leaf

Table 8.27: Plants for trapping/catching animals:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Loranthus cordifolius*, Wall.	Loranthaceae	Maingnaro	A sticky substance is secreted from its inflorescence, which is used for catching birds
2.	*Eupatorium odoratum*, Linn	Asteraceae	Imkongjurung	Leaf juice is mixed with water. This mixture is used for catching earthworms from the soil

Table 8.28: Plants used as spices:

Sl. No.	Botanical name	Family	Local name	Mode of utilisation
1.	*Curcuma longa*, Linn.	Zingiberaceae	Haldi	The rhizome powder is used as spice
2.	*Zanthoxyllum acanthopodium*, DC.	Rutaceae	Jangpet	Seed powder is used as spice
3.	*Z. oxyphyllum*, Edgew.	Rutaceae	Mongmong. mongsu	Seed powder is used as spice

Table 8.29: Some important tree species of Nagaland

Scientific Name	Local Name
Adina eligocephala	Haldusopa
Albizzia procera	Koroi
Alnus Nepalensis	Alder
Altingia exelsa	Jutuli
Amoora Wallichii	Amari
Anthocephalus kadamba	Kadam
Artocarpus fraxinifolius	Mandhani
Artocarpus fraxinifolius	Sam
Azadirachta indica, Melia composita	Neem
Betula alnoides	Betula
Biscofia javanica	Uriam
Bombax ceiba	Simul
Canarium reseniferum	Dhuna
Caryota urens	Palm
Cassia fistula	Sonaru
Cedrela toona	Jatipoma
Chukrassia Tabularis	Bogipoma
Cinnamomum cecicodaphne	Gonsoroi
Cinnamomum obtusfolium	Naga Dalchini
Dipterocarpus macrocarpus	Hollong
Duabanga sonneratoides	Khokon
Endospermum chinensis	Phulgomari
Ficus nervosa	Robor
Gmelina arborea	Gomari
Juglans regia	Walnut
Lagerstroemia speciosa	Ajhar
Linsium anamalayanum	Naga neem
Magnolia species	Sopa
Mangifera indica	Am
Mansonia dipikae	Badam
Mesua ferrea	Nahar
Michelia champaca	Titasopa
Morus Laevigata	Bola
Nyssa sassiflora	Gahorisopa
Phoebe Goalparensis, P.Cooperiana, P. Attenuata	Bonsum
Pinus kesiya	Pine
Podocarpus nerifolia	Jinari
Quercus species	Oak

Rhododendron arborea	Rhododendron
Schima wallichii, Schima Khasyana	Gogra
Shorea assamica	Mekai
Stereospermum chelonoides	Paroli
Taxus baccata	Yew
Terminalia chebula	Hollock
Terminalia myricarpa	Hilika
Tetrameles nudiflora	Bhelu
Trewia nudiflora	Bhelkar

Table 8.30: Some rare and threatened plants of Nagaland

Name of the Species	Family	Status
Acranthera tomentosa	Rubiaceae	Vulnerable
Begonia watti	Begoniaceae	Endangered or possibly extinct
Chaerophyllum orientalis	Apiaceae	Indeterminate
Crotolaria meeboldii	Fabaceae	Indeterminate
Cyclea watti	Menispermaceae	Endangered or possibly extinct
Cymbidium eburneum	Orchidaceae	Vulnerable
C. tigrinum	Orchidaceae	Vulnerable
Gleditsia assamica	Fabaceae	Indeterminate
Kalanchoe roseus	Crassulaceae	Endangered
Livistona jenkinsiana	Arecaceae	Endangered
Michelia punduana	Magnoliaceae	Rare
Ophiorrhiza gracilis	Rubiaceae	Indeterminate
O. griffithii	Rubiaceae	Indeterminate
O. tingens	Rubiaceae	Vulnerable
O. watti	Rubiaceae	Endangered
Pimpinella evoluta	Apiaceae	Possibly extinct
P. flaccida	Apiaceae	Indeterminate
Pollia pentasperma	Apiaceae	Indeterminate
Renanthera imschootiana	Orchidaceae	Endangered
Senecio rhabdos	Asteraceae	Rare
Silene vagans	Caryophyllaceae	Indeterminate
Vanda coerulea	Orchidaceae	Rare

(Source: T. M. Hynniewta, Nagaland, BSI Publication (1999).)

8.2 Wildlife of Nagaland



Nagaland harbours a variety of wildlife distributed throughout the state. For management and preservation of wildlife in the State, the Department of Forests, Environment & Ecology and Wildlife has a full-fledged wildlife Wing under the Chief Wildlife Warden. The Wildlife Preservation Division (Headquarters at Dimapur) takes care of the following protected areas:

Table 8.31: Protected areas in Nagaland

Sl. No	Name of Area	Area in ha.
1.	Fakim Wildlife Sanctuary	642
2.	Intangki National Park	20202
3.	Rangapahar Wildlife Sanctuary	470
4.	Puliebadze Wildlife Sanctury	923
5.	Zoological Park, Kohima	

The **Fakim Wildlife Sanctuary** is located in Tuensang district. The important birds found in this Sanctuary are *Tragopan blythii,* Hill partridges, Green Pigeon, Jungle Fowl, Woodpecker, Owl etc. the sanctuary harbours a sizeable population of *Tragopan blythii and* Hill patridges.

The mammalian fauna of this sanctuary include Tiger, Leopar, Bear, Mithun, Jungle Cat, Civets, Monkeys, Wild Boar and Barking Deer etc. In addition to these, this sanctuary provides habitats to a large number of Reptiles, Amphibians and fishes and invertebrates.

The **Puliebadze Wildlife Sanctury** is located in Kohima district (1600 m – 2000 m.) Common species found in this Sanctuary are Tragopan, Barking Deer, Jungle Cat, Flying Squirrel, Monkeys, Mountain Quails, Snakes, Frogs, Toads and varieties of Butterflies and Moths.

Intangki National Park and **Rangapahar Wildlife Sanctuary** are located in Dimapur district. These protected areas are the home of Elephant, Bison, Sambar, Bear, Barking Deer, Wild Dog, Leopard, Hoolock, Langoor, Rhesus Monkey, Monitor Lizard, Jungle Fowl, Kaleej, Pheasants, Green Pigeon, Horn Bill etc.

Table 8.32: Some important wildlife of Nagaland

MAMMALS	
Panthera tigeris	Tiger
Hylobates hoolock	Hoolock
Panthera pardus	Leopard or Panther
Elephas maximus	Elephant
Bos frontalis	Mithun
Petuarista petuarista	Giant flying squirrel
Muntiacus muntjak	Barking Deer
Cervus unicolor	Sambar
Felis bengalensis	Leopard Cat
Manis crassicaudata	Pangolin
Nycticebus coucang	Slow lorris
Arctonyx collaris	Hog-badger
Duon alpinus	Wild Dog
Nemorhaedus goral	Goral
Malursus ursinus	Sloth Bear
Lepus nigricollis	Common Hare
Lutra Lutra	Common Otter
Felis chatus	Jungle Cat
Herpestes edwadsi	Mongoose
Macaca assamensis	Monkey, Assamese macaque
Canis aureus	Jackal
Vulpes bengalensis	Indian Fox
Hystrix indica	Porcupine
Sus cristata	Wild Boar
Martes foina intermedia, M. flavigula	Martins
Retufa indica, R. bicolor	Giant squirrel
Paradoxums hermophroditus	Tody Cat
Felis temmincki	Golden Cat
Bos gaurus	Gaur
Neofelis nebulosa	Clouded wildlife Sanctuary Leopard
	Tiger pangolin
	Boar
BIRDS	
Tragopan blythii	Tragopan
Lophura lecomenia	Kalij pheasant
Polyplectron bicalcaratum	Grey Peacock Pheasant
Buceros bicornis	Common Teal
Anas crecea	Red Jungle Fowl
Gallus gallus	Common Hill Partridge
Arborophila torqueola	Koel
Endynamy scolopacea	Burmese Cuckoo
Dendrocitta vagabundea	Red Billed Magpie
Urocissa erythrorhyncha	Paradise Flycatcher
Terpsiphone paradisi	Cattle Egret
Bubulus ibis	Grey Heron

Ardea cinerea	Night Heron
Nycticorax nycticorax	Dabchik
Pediceps ruficollis	Mountain Quail
Ophrysia supercilliosa	Serpent Eagle
Coturnix coturnix	Grey Quail
Gallinula chioropus	Indian Moorhen
Vanellus indicus	Red Wattled Lapwing
Tringa hypoleucus	Sandpiper
Tringa hypoleucus	Green Pigeon
Treron phoenicoptera	Crow Pheasant
Centropus sinensis	Spotted Dove
Streptopalia chinensis	Rose Ring Paraket
Psittacula Krameri	House swift
Apus affinis	Hoopoe
Upupa epops	Blue Jay
Coracias bengalensis	Blue Kingfisher
Alcedo atthis	Wood Pecker
Piceoides mahrattensis	Drongo
Dicrurus adsillis	Hill Myna
Graculia religiosa	House Crow
Carvus splendens	White Cheeked BulBul
Pycnonotus lencogenys	Babbler
Turoides caudatus	House sparrow
Passer domesticus	White wagtail
Motacilla alba	Night jar
Caprimulgus asiaticus	Yellow wagtail
Motacilla alba	Small green bee eater
Merops orientalis	Black bulbul
Hypsipetes madagascariensis	Malabar pied hornbill
Tockus birostris	Humes bar tailed pheasant
Syrmaticus humiae	Sibia
Heterophasia capistrata	Red cheek bulbul
Copsychus malabaricus	Red vented bulbul
Pycnonotus jocosus	Minivets
Pycnonotus cafer	Yellow backed sunbird
Perisrocotus species	Snipe
Aethopyga siparaja	Munias
Turdus merula	Himalayan barbet
Gallinago gallinago	Racket tailed drongo
Lonchura species	Orioles
Megalaima asiatica	Tits
Dirums pardisens	Trogon
Oriolus species	Royal pigeon
Parus species	Black eagle
	Fork tail
	Finches
	Green broadbill
	Fantail flycatcher
	Rufous back bulbul
	Indian Pied Hornbill
	Indian Tree Pie
	Shama
	Black bird
REPTILES	
Varanus bengalensis	Monitor Lizard
Python reticulatus	Reticulated Python
	King Cobra

	Common Krait Viper Common Cobra Python (diamond shaped) Flying Lizard Tortoise

TABLE 8.33: Some Threatened Animals (Higher vertebrates) of Nagaland

Sl. No.	Zoological Name	Common Name
1	*Nycticebus coucang* (Boddaert)	Slow loris
2	*Presbytis pileatus* (Blyth)	Capped langur
3	*Hylobates hoolock* (Harlan)	Hoolock gibbon
4	*Manis pentadactyla aurita* Hodgson	Chinese pangolin
5	*Herlactus malayanus* (Raffles)	Malayan sun bear
6	*Arctonix collaris* F. Cuvier	Hog badger
7	*Arctictis binturong* (Raffles)	Binturong
8	*Herpestes urva* (Hodgson)	Crabeating mongoose
9	*Felis temincki* Vigors & Horsfield	Golden cat
10	*Felis marmorata charltoni* Gray	Marbled cat
11	*Neofelis nebulosa* (Griffith)	Clouded leopard
12	*Panthera tigris* (Linnaeus)	Tiger
13	*Panthera pardus* (Linnaeus)	Leopard or Panther
14	*Bos gaurus* H. Smith	Gaur
15	*Hystrix hodgsoni* (Gray)	Crestless himalayan porcupine
16	*Ciconia iconia boyciana* Swinhoe	Eastern white stork
17	*Bambusicola fytchii hopkinsoni* Godwin-Austen	Assam bamboo patridge
18	*Tragopan blythii* (Jerdon)	Blyth's tragopan
19	*Syrmaticus humiae humiae* (Hume)	Hume's bartailed pheasant
20	*Polyplectron bicalcaratum* (Linnaeus)	Peacock pheasant
21	*Heliopais personata* (G. R. Gray)	Masked finfoot
22	*Batrachostomus hodgsoni hodgsoni* (G. R. Gray)	Hodgson's frogmouth
23	*Ptilolaemus tickelli austeni* (Jerdon)	Assam brownback hornbill
24	*Aceros nepalensis* (Hodgson)	Rufousnecked hornbill
25	*Rhyticeros undulatus ticehursti* Deignan	Assam wreathed hornbill
26	*Anthracoceros malabaricus malabaricus* Gmelin	Indian pied hornbill
27	*Buceros bicornis homrai* Hodgson	Great pied hornbill
28	*Python reticulatus* (Schneider)	Reticulated python

Source: Threatened animals of India, B. K. Tikader, Zoological Survey of India Publication (1983).

Tragopan

Box 8.1

Tragopan (*Tragopan blythii),* also known as Blyth's Tragopan and Crimson Horned Tragopan, is an enchanting bird found in higher reaches of Nagaland. These are quite shy and wary in wild. They are found singly or in pairs, rarely in larger family groups. Oak and Rhododendron forests on the steep hill slopes ranging from 2450-4250 mt. are the most favoured habitats of Blyth's Tragopan. In India, they are found in Arunachal Pradesh, Nagaland, Sikkim and Garhwal hills.



The species is now considered as "**near threatened**". More field surveys in natural distribution areas need to be undertaken in order to effectively protect the species. The species is still being hunted in many areas. It has the potential of being used as a flagship in biodiversity conservation campaigns. The species can also be used in development of Eco-tourism in Nagaland. The **IUCN** has classified this species as vulnerable. The species is on **appendix III** of **CITES**. Satyr Tragopan has already received the attention of wild life conservationists of Nagaland. However, much more need to be done.

Fig 8.1: *Tragopan blythii*

Hornbill:

Box 8.2

Hornbills are commonly found in Nagaland and other northeastern states. They are residents of decidous to tropical evegreen forests with tall trees. The bird is mainly arboreal in habit keeping in pairs or in small flocks of 4 – 10. They are rather noisy and emit a wide variety of loud roars, grunts, croaks and cackles. All hornbills are essentially frugivorous feeding on fruits, berries and drupes. The female bird is slightly smaller than the male. The breeding season is during the months of April to May and the nest is simply a natural hollow in a lofty tree trunk. In Nagaland the bird is highly sought after for its feathers, which are used in making tribal headgear. The population of the different species of hornbills is declining rapidly due to over exploitation and they are now considered as a threatened species.

There are 5 species of hornbill found in Nagaland. These are the Assam brownback hornbill (*Ptilolaemus tickelli austeni)*, the Rufousnecked hornbill (*Aceros nepalensis)*, the Assam wreathed hornbill (*Rhyticeros undulatus ticehursti)*, the Indian pied hornbill (*Anthracoceros malabaricus malabaricus)* and the Great pied hornbill (*Buceros bicornis homrai).*



Fig 8.2: Male Assam Wreathed Hornbill

Mithun:

Box 8.3

Mithun is a semi-domesticated free grazing bovine mammal. Taxonomically, it is classified as Class- Mammalia; Order- Artidactyla; Family- Bovidae; Sub-family- Bovinae; Genus- Bos; Species- frontalis. Mithun is a strongly built, large sized fleshy animal. In Naga society, mithun is considered a potential animal for draft power, meat and rituals. The graceful shape, beautiful blooming, white colour of feet and face, and majestic horn place the mithun as one of the most honounred animal in tribal customs and rituals. Mithun is intimately connected with tribal social life in Nagaland. Individuals, and groups or communities own mithun as asset. Mithun acquires highest value on barter table and is used to buy property in exchange. It is also distributed as prize and gift, and used as dowry in marriages. Besides, the skull and horn of the mithun are also sold at high price. The skull with horns is used for decoration purposes. Mithun being semi-domesticated and free grazing animal is important in the Naga society from economic and commercial point of view. Beside Nagaland, Mithuns are also found in Arunachal Pradesh, Manipur and Mizoram.

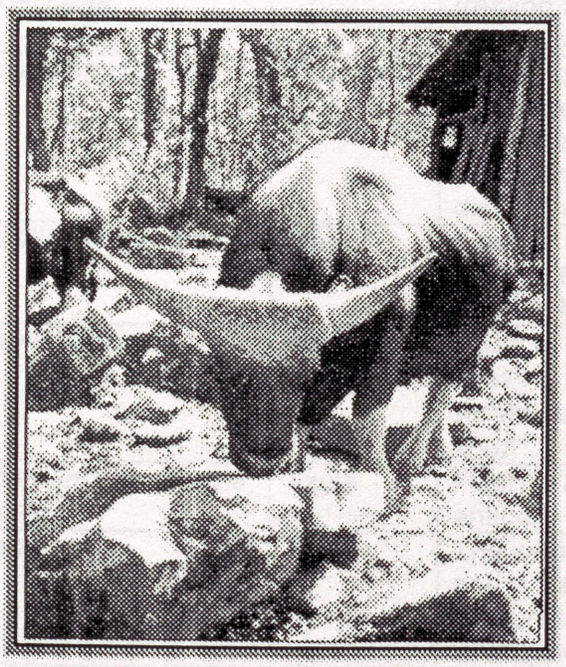


Fig 8.3: A Mithun

Mithuns are owned for meat, milk and draft power. The heavily built animal yields about 48% meat in terms of dressing percentage. For rearing, mithuns are first familiarized by feeding common salt, which is highly liked by the mithuns. Once mithun become strongly attached with its prospective owner, they are marked and driven out to the deep forest in the vicinity of the village. Mithun spends whole day grazing in the forest and on fall of the day returns to its owner's house where it is again fed with salt. Mithuns mostly feed on leaves on a variety of forest plant and lives in harmony with forest ecosystem without any disturbance. Mithun is strongly figured in the art and culture of the Naga people. The skull and horns are decorated in houses as well as at community places. Graceful mithuns are figured in public places such as panchayat houses, guesthouses. The horns are used for drinking local wine during festivals and celebrations.

Mithun appear to be a less cared species in northeast in general and Nagaland in particular. Every year a large number of mithuns are sacrificed to feed people on special occasions. Surveys have revealed a declining trend in its population due to over exploitation. There is an urgent need to take necessary actions to conserve this majestic animal and its habitat.

Table 8.34: Animals used by the Nagas:

Sl. No.	Common name	Scientific name	Local name	Mode of utilisation
1.	Bat	*Pteropus giganteus*	Lha	The meat is eaten after cooking as food and also for treating night blindness, asthma and male impotency
2.	Bear.	*Melursus ursinus*, Shaw	Shirem	Meat is eaten as food after cooking, Gall-bladder is used for treating stomach problems and as leech repellent
3.	Cow	*Bos indicus*, L.	Nashi	Meat is eaten, fat is rubbed externally for treating rheumatism and body pain
4.	Cockroach	*Periplanata americana*,	Leplo	The whole body is eaten for treating asthma and tuberculosis
5.	Crab	*Paratelphusa*, sp.	Tsungen	The whole body is crushed and boiled it with water and drunk for treating jaundice and asthma and for liver disorders
6.	Barking deer	*Muntiacus muntjak*	Mesu	Flesh is delicacy for local people. Fat is applied for treating burn and piles
7.	Dog	*Canis familiaris*	Azu	Flesh is eaten after proper cooking for treating general weakness. Flesh as food and soup
8.	Earthworm	*Pheretima posthuma*, Fn. Br.	Tzula	Flesh is also eaten as antidote for snakebite
9.	Frog	*Rana* sp.	Alu	The whole body is cooked and is eaten for treating bone fractures and also fresh skin is wrapped on burns
10.	Fowl	*Gallus gallus*	An	Flesh is eaten as food after cooking. Fat is applied on burns and massages for treating rheumatism and joint problems
11.	Jackal/Fox	*Canis aureus*, L.	Shirong	The flesh is a delicacy. Flesh is eaten for treating cholera, asthma, tuberculosis and chest problem
12.	Mithun	*Bos frontalis*	Su	Mithuns are sacrificed during important festivals, rites and also killed by wealthy men in the village
13.	Monkey	*Rhesus* sp.	Shingo	Flesh is taken as food after cooking
14.	Wild boar	*Sus scrofa*	Pongzu	Flesh is eaten after cooking.
15.	Porcupine	*Manis crassicaudata*, Grav	Tzukora	Flesh is eaten as food after cooking
16.	Sambar	*Cervus unicolor*, Kerr.	Tangsa	Flesh is eaten as food after cooking

17.	Scorpion	*Palamneus* spp.	Tsumerani	The whole body boiled in oil and massages for treating rheumatism
18.	Snake	*Python molurus*	Alisa	Flesh of this animal is eaten as food by some tribes
19.	Tiger	*Panthera tigris*, L.	Kuyi	Some tribes eat, its flesh as food after cooking. Milk is dropped into eyes for treating cataract and to relieve blindness
20.	Unio	*Lamellidens marginalis*, Lam	Jepra	Flesh is eaten after cooking for treating tuberculosis and asthma

8.3 Fish Fauna of Nagaland

Altogether 42 fish species belonging to 10 families and 24 genera have been reported from Nagaland. The interest of the Nagaland fish fauna lies in the fact that it contains representatives of the Assamese and the Burmese elements in almost equal proportion. There are 14 representatives, which are common to the Brahmaputra and the Chindwin drainage basin. Five representatives of the Indo Gangetic fauna are also present in Nagaland fauna. Five species are common between Nagaland, Eastern Himalayan fauna, Burmese and South East Asian fauna. The Nagaland fish fauna has three species common with Eastern Himalayan fauna respectively. Four species are representatives of the Assam Himalayan fauna. It shares four species with Manipur and two species (Ghosh and Lipton, 1982).

Table 8.35: A list of Fishes found in Nagaland

1. *Barilius barila* (Hamilton)
2. *Barilius bendelisis* (Hamilton)
3. *Barilius dogarsinghi* (Hora)
4. *Danio* (Danio) *aequipnnatus* (McClelland)
5. *Danio* (Danio) *dangila* (Hamilton)
6. *Danio* (Danio) *naganensis* (Chaudhuri)
7. *Rasbora rasbora* (Hamilton)
8. *Acrossocheilus hexagonolepis* (McClelland)
9. *Danio* (Brachydanio) *acuticephala* (Hora)
10. *Crossocheilus latius latius* (Hamilton)
11. *Garra kempi* (Hora)
12. *Garra lissorhynchus* (McClelland)
13. *Garra naganensis* (Hora)
14. *Garra rupecula* (McClelland);
15. *Puntius clavatus* (McClelland)
16. *Puntius conchonius* (Hamilton)
17. *Puntius ticto* (Hamilton)
18. *Schizothorax richardsonii* (Gray)
19. *Tor tor* (Hamilton)
20. *Psilorhynchus balitora* (Hamilton)
21. *Psilorhynchus homaloptera* (Hora & Mukerji)
22. *Acanthophthalmus pangia* (Hamilton)
23. *Lepidocephalus berdmorei* (Blyth)
24. *Lepidocephalus guntea* (Hamilton)
25. *Noemacheilus botia* (Hamilton)
26. *Noemacheilus kangjupkhulensis* (Hora)
27. *Noemacheilus manipurensis* (Chaudhuri)
28. *Noemacheilus prashadi* (Hora)
29. *Noemacheilus rupicola rupicola* (McClelland)
30. *Noemacheilus sikmajensis* (Hora)
31. *Noemacheilus zonalternans* (Blyth)
32. *Mystus bleekeri* (Day)
33. *Ompok bimaculatus* (Bloch)
34. *Amblyceps mangois* (Hamilton)
35. *Erethistes pussilus* (Muller & Troschel)
36. *Conta conta* (Hamilton)
37. *Exostoma labiatum* (McClelland)
38. *Pseudecheneis sulcatus* (McClelland)
39. *Channa orientalis* (Schneider)
40. *Channa punctatus* (Bloch)
41. *Badis badis* (Hamilton)
42. *Macrognathus aculeatus* (Bloch).

8.4 Community Initiatives for Conservation of Biodiversity in NAGALAND

8.4.1 Nagaland Village declares itself a no-hunting zone

The Village Council of Changtongya village in the Mokukchung district of Nagaland has declared the village as a no-hunting zone. The council resolved that no one will be allowed to kill wild animals or use poisons for fishing there and those found violating these rules will be penalised. It was also resolved to plant wild fruit trees in the forest and jhum areas. The council decided that the moratorium on hunting would be for five years initially, and would be extended further if animal and bird populations increase. It was also clarified that the ban was on hunting for commercial purposes or for sport and that seasonal hunting with limited opportunity may be permitted.

Source: 'Nagaland village declared no-hunting zone', The Sentinel, 29/01/02.

8.5 Biodiversity Hot Spots in Nagaland

The whole state of Nagaland is rich in Biodiversity. A few areas of the State are still pristine and harbour a wide variety of endemic species of plants, animals and microorganisms and are experiencing anthropogenic threats of various kinds. Some of these areas have been identified and are hereafter referred to as biodiversity hot spots of Nagaland. There is an utmost need to undertake initiatives for focused conservation of Biodiversity in these areas by undertaking the research work and by involving people. There is a need to start immediate action to protect these areas for conservation of their biodiversity. Actions are also required for documentation of the biodiversity present in these areas. The locations of these hotspots are shown in Fig 8.4.

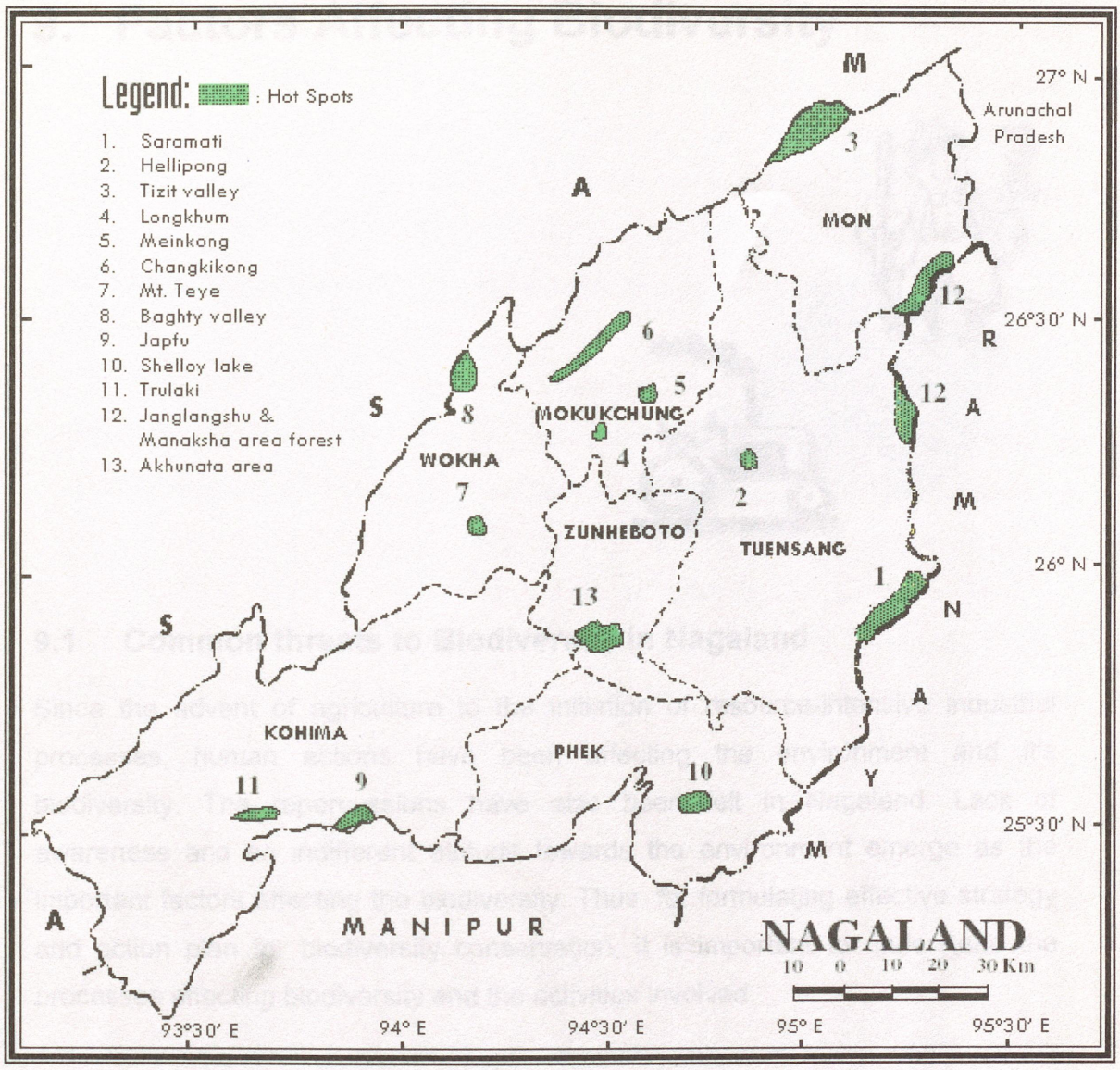
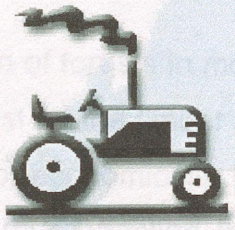


Fig 8.4: Map showing the Biodiversity hot spots of Nagaland

(The locations and area of the Hot Spots are not to scale and are purely indicative)

9. Factors Affecting Biodiversity





9.1 Common threats to Biodiversity in Nagaland

Since the advent of agriculture to the initiation of resource-intensive industrial processes, human actions have been affecting the environment and it's biodiversity. The repercussions have also been felt in Nagaland. Lack of awareness and an indifferent attitude towards the environment emerge as the important factors affecting the biodiversity. Thus, for formulating effective strategy and action plan for biodiversity conservation, it is important to understand the processes affecting biodiversity and the activities involved.

Some of the factors affecting Biodiversity in Nagaland are listed below:

9.1.1 Intensification of Agriculture: Agricultural practices by their very nature always lead to change in land use, removal of natural cover, overuse of land, soil erosion causing nutrient depletion and change in cropping patterns, therefore effecting decrease in population, disappearance of species, population fragmentation, destruction of habitats, change in weed flora and pest fauna and loss of landscape diversity. In several parts of Nagaland, particularly in the periurban areas and in the plains, intensification of agriculture is causing the above-mentioned changes in land use thus directly or indirectly affecting the domesticated as well as wild biodiversity.

9.1.2 **Shifting cultivation**: Shifting cultivation leads to removal of natural cover, burning of vegetation, soil erosion, wetland siltation and clearing of natural vegetation, therefore effecting decrease in plant and animal population, disappearance of species, population fragmentation, destruction of habitats and loss of habitat diversity. Increase in area under shifting cultivation may further accelerate the rate of depletion of biological resources.

9.1.3 **Privatisation of forests**: The privatisation of forests in most cases leads to the destruction of the original pristine forest for the timber trade and later on makes way for monoculture plantations of economically profitable species which may not be endemic to the area thus effecting the loss of natural vegetation and forest cover, destruction of habitats, low emphasis to under storey vegetation, impairment of ecosystem functions, reduced natural regeneration and loss of endemic species. In Nagaland, large areas of land and forests are being privatised. On such lands, tree plantations and other commercial crops are being grown causing depletion of biodiversity.

9.1.4 **Deforestation**: The main causes of deforestation in Nagaland are clearance of vegetation for agriculture (especially Jhum) and timber trade. Some forest and natural vegetation loss is also taking place for setting up of industries and expansion of human habitations. Deforestation in a hilly State like Nagaland often irrepairably damages the local ecosystem leading to the loss of native flora and fauna.

9.1.5 **Urbanization**: Urbanization leads to change in land use, rural-urban migration, change in natural habitats, increase in demographic pressure in urban areas, degradation of peri-urban areas, sub-urbanization of the countryside and involves high impact infrastructure, vehicular access to natural areas and increase in municipal waste generation in a small area thus effecting population movement and fragmentation, urban explosion and rural depopulation, local disappearance of species and also a loss of aesthetic value. The impact of urbanization on vegetation and biodiversity can be seen near Dimapur, Kohima, Mokokchung and other towns and cities of Nagaland.

9.1.6 **Industry**: Industrial development invariably leads to air, water, soil and noise pollution and over-exploitation of resources involving high impact infrastructure and waste generation. Nagaland is one of the least industrialized states of the country. However, the adverse impacts of industrialization can already be seen in Tuli and Dimapur. A large number of saw mills and other wood based industries are locally affecting the biodiversity of the State.

9.1.7 **Trade**: This process leads to resource overuse. Trade in timber, and NTFPs of plants and animal origin are causing depletion of the biodiversity of Nagaland. Increase in population and demand has increased the trade of these products and thus may cause or accelerate the depletion of biodiversity.

9.1.8 **Aquaculture**: This also involves the introduction of exotics leading to resource competition, predation; mortality of species not fished for food thus effecting population reduction, disappearance of species at the regional level, loss of natural diversity and movement/exit of natural species due to competition with introduced species. The Nagaland fisheries department has issued orders banning the introduction of exotics. However, the threat still looms large and deserves serious attention of the people and government of the State.

9.1.9 **Hunting and Poaching**: This practice leads to the mortality of animal species and illegal trade thus effecting population reduction and extinction of wildlife species. Although officially banned, a large number of wild animals are still being killed for meat in Nagaland. This is a serious threat, but some public awareness is developing and the people are starting to realize the importance of wildlife and biodiversity.

9.1.10 **Wild Fire**: In Nagaland, shifting cultivation is one of the leading causes of wild fires. The starting point of jhum cultivation is the burning down of a chosen site. If embers or burning plant parts are carried by the wind to another area the jhum fire become uncontrollable. Sometimes a wild fire engulfs large areas burning down young plants and animals thus causing a

serious loss of biodiversity. In some parts of Nagaland where traditional burning of forests is practiced, large chunks of natural flora and fauna are destroyed every year.

9.1.11 Water Degradation: Water is the most important resource. Its unscientific utilization and overuse leads to a reduction in its quantity and degradation in its quality. Alteration of natural river systems and wetlands by humans causes loss of aquatic biodiversity, habitat changes and ecosystem alteration and socio-economic impacts. Nagaland has a number of rivers and streams. Siltation of these aquatic bodies due to shifting cultivation, deforestation and other land development works are causing degradation thus affecting the aquatic biodiversity.

9.1.12 Hydel Projects: These require high impact infrastructure thus effecting change in natural systems. Submergence of large areas under reservoirs and population displacement, habitat loss and genetic alterations are the other impacts of hydel projects. The Doyang and Lokimero projects are bound to cause adverse impacts on the biodiversity of Nagaland.

9.1.13 Over-exploitation of Medicinal plants: The indiscriminate overuse and unethical exploitation of medicinal plants for commercial benefit without consideration for their replenishment affect their population and cause extinction of the species. In Nagaland a large proportion of the population depends on traditional medicines derived from plants and animals. Often, extraction of these herbs is not done in a sustainable manner thus affecting the biodiversity.

9.1.14 Animal Husbandry: This practice often involves cross-breeding, overgrazing and commercialization thus effecting loss of genetic diversity, forest denudation, disappearance of native varieties and breeds. Animal husbandry in Nagaland has not yet picked up and therefore the impacts are not so visible. Care however needs to be taken so as to avoid any adverse impact of animal husbandry development including the rearing of Mithun on the local biodiversity.

9.1.15 **Forestry and Plantations**: The process often involves the introduction of exotic species, thus effecting loss of native species. Large-scale plantations of teak and monoculture of other commercial trees is also changing the vegetation structure in several parts of Nagaland.

9.1.16 **Rise in Population**: Nagaland has recorded the fastest population growth during recent decades. This may lead to increased pressure on natural resources, loss of forest cover due to the spread of agriculture on forest lands thus effecting destruction of natural ecosystems, soil erosion, population fragmentation and increased pressure on biological and other natural resources.

9.1.17 **Use of explosives and poisons for fishing**: This involves destructive methods (for example: explosives, poisonous chemicals and plant extracts). These fishing methods cannot be specifically targeted towards desired species. Therefore, there is collateral damage to other aquatic species that inhabit the water body thus causing unwarranted loss of aquatic biodiversity and destruction of the aquatic habitat.

9.1.18 **Lack of awareness**: The people of Nagaland are very much dependent on their biological resources; and often their survival depends on traditional knowledge and know-how about the utilisation of local flora and fauna. However, lack of awareness about the dangers of overexploitation and other related activities may lead to the loss of these vital resources and indigenous knowledge systems.

9.1.19 **Use of pesticides**: The use of pesticides in agriculture is an important requirement for obtaining a good harvest. Unfortunately, the remnants of several pesticides accumulate in the soil and water bodies. Therefore, the use of pesticides has severe implications for soil and aquatic organisms. Careful monitoring of pesticide use needs to be done so that it does not adversely affect biodiversity.

9.1.20 **Unemployment**: The State of Nagaland is not very strong economically and developmental activities have begun taking shape only a few decades back.

When people find themselves without a job, they turn to exploit the natural resources surrounding them through trade in timber, NTFPs and animals (legal or illegal). Without a proper understanding of the repercussions of their actions and without alternative means of securing a livelihood, the trend will continue and lead to widespread damage to the environment in general and biodiversity in particular. Creation of jobs for the unemployed will help conserve biodiversity as it will reduce the pressure on forests and other natural ecosystems.

9.1.21 **Lack of biodiversity concerns in infrastructure development**: A number of village level infrastructure development projects are being undertaken by the government of Nagaland and other agencies. Often these are small and localized and therefore do not attract the Forest Conservation Act. However, they affect the local biodiversity and the sum effect of all such small projects may perhaps seriously affect the biodiversity of the state.

10. Project Proposals



For implementation of the strategies and actions suggested in Chapter 11 of this document, it is imperative to generate data and information, develop human resources and motivate and sensitize local people for conservation of biodiversity. In order to achieve this, the following projects have been suggested. The basic frameworks of the projects are given below. However, the suggested agencies can be approached to submit detailed proposals when funds are available. These projects are indicative only. More local need-based projects can be invited from the experts/agencies working in related fields. The State Forest Department will function as the nodal agency for all the projects mentioned below.

10.1 District Level Training Workshops for Officials of Village Development Board, Village Councils etc.

In order to create awareness and to mobilize and sensitize people at large for conservation and scientific management of biodiversity at the local level, it is required to organize training workshops for the local leaders of socio-political organizations such as Village Development Boards, Village Councils, Naga Mothers Association etc. in each district or subdivision headquarters.

Duration of Training Workshop: Two Days

Agency: Nagaland University, Kohima and NEHU, Shillong.
Estimated expenditure: Rs. 75,000 /- per Training Workshop
No. of Participants: 50
Total No. of VDB & VC in the state: about 1000
Total No. of Trainings required : 20
Fund required for training: 20 x 75,000 = Rs. 5,00,000 /-
Institutional fee and training materials etc.: Rs. 1,00,000 /-
Total estimated expenditure: Rs. 18,00,000 /-
Period: March 2003 – February 2004

10.2 Inventorization of biodiversity and identification of hotspots of Biodiversity in Nagaland

Review of Literature and discussion with policy makers and planners have revealed that no systematic and comprehensive study is available on the flora and fauna of Nagaland. The Botanical Survey of India and Zoological Survey of India and some researchers of North-Eastern Hill University have conducted studies either for a few districts (Gurung, 1997) or for certain category of plants or animals (Darlong, 1994). For scientific management and conservation of Biodiversity, the first and foremost requirement is the inventory of the bio-resources.

Agencies: Centre for Environmental Studies, North-Eastern Hill University, Shillong and Nagaland University, Kohima and the Botanical Survey of India.
Duration of the Project: 3 years, 2003 – 2006
Project Assistants: 5, @ Rs 5000 /- per month; Research Associate: 1 @ Rs 8000/ per month (5000x5x36=9 lakhs + 8000x1x36=2.88 lakhs) Total 11.88 lakhs
Field Assistants: 2 @ 3000 /- per month (3000x2x36= 2.16 lakhs)
Vehicle: 1, Rs 5 lakhs
P. O. L.: Rs 75,000 /-
Contigency: Rs 75,000 /-
Herbarium: Rs 50,000 /-
Fund Requirements: Rs 21.04 lakhs

10.3 Documentation of Medicinal Plants (MPs) and Non-Timber Forest Products (NTFPs) of Nagaland

Nagaland is very rich in Medicinal plants and NTFPs. People of Nagaland heavily depend on these forest products for their health care and food, fodder, fuelwood and a number of other household requirements. With modernization and economic development the traditional knowledge and practices concerning conservation of MPs and NTFPs are losing grounds. Further, due to increase in population and resultant demands of such products, at places the harvest and use are no more sustainable. So far no systematic study has been taken up for documentation of these resources. It is considered essential and most topical to conduct a study for documentation of MPs and NTFPs for their conservation and scientific management.

Agencies: Centre for Environmental Studies, NEHU, Shillong and Nagaland University, Kohima.

Duration of the Project: 3 years, 2003 – 2006

Project Assistants: 4, @ Rs 5000 /- per month; Research Associate: 1 @ Rs 8000/ per month (5000x4x36=7.2 lakhs +8000x1x36=2.88 lakhs) Total 10.08 lakhs

Field Assistants: 2 @ Rs 3000 /- per month (3000x2x36= 2.16 lakhs)

Vehicle: 1, Rs 5 lakhs

P. O. L.: Rs 75,000 /-

Contigency: Rs 75,000 /-

Herbarium: Rs 50,000 /-

Fund Requirements: Rs 19.24 lakhs

10.4 Documentation of Indigenous Ecological Knowledge (IEK) of Nagaland

Nagaland is a storehouse of traditional and indigenous ecological knowledge. More than fifteen major tribes inhabit the state, each having its own distinct dialect, culture, food habit, life style, customs and rituals. These characteristics make Nagaland one of the richest treasures of IEK in the Indian sub-continent.

Documentation of IEK is a fundamental requisite for planning and implementation of any programme relating to conservation and management of biodiversity or for that matter any natural resource.

Agencies: Centre for Environmental Studies, NEHU, Shillong and Nagaland University, Kohima

Duration of the Project: 2 years, 2003 – 2005

Project Assistants: 2, @ Rs 5000 /- per month (5000x2x36=3.6 lakhs) Total 3.6 lakhs

Field Assistants: 1 @ 3000 /- per month (3000x1x36= 1.08 lakhs)

Contigency: Rs 75 ,000 /-

Fund Requirements: Rs 5.43 lakhs

11. Biodiversity Strategy and Action Plan

Strategy I: ***Incorporating biodiversity concerns in state policies and laws***

ACTION PLAN I: PROPOSED ACTIONS

I.A Review state policies concerning use of natural resources and developmental works. Incorporate biodiversity concerns in state policies/guidelines. This can be done by constituting a committee of heads of various govt. department, experts and peoples representatives to suggest the requisite changes in existing policies/ guidelines.

I.B Enact new acts /amend existing acts and other legal instruments making them sensitive to biodiversity conservation. Government should issue necessary guidelines to various Departments to take into account the biodiversity concerns during implementation of developmental projects.

I.C Document traditional laws and practices concerning biodiversity conservation, and authorize the use of appropriate customary laws in resource use regulations, dispute resolution, and other related matters

I.D Strictly enforce existing biodiversity related laws.

Agencies: Coordinated action of Forest, Agriculture, Horticulture, Animal Husbandry, Fisheries, Sericulture, and Wastelands Development Departments. Forest Department may act as a Nodal Department

Time frame: Three years

Fund Requirement: Can be done with the existing budgetary provisions of concerned government departments

Priority: High

Strategy II: ***Involving people in biodiversity conservation***

ACTION PLAN II: PROPOSED ACTIONS

II.A Organize trainings, meetings, lectures, talks, seminars, workshops, debates and rallies on biodiversity related topics.

II.B Use print and electronic media for generation of mass awareness about biodiversity emphasizing on their tangible and intangible benefits.

II.C Sensitize the NGOs, Women Organizations and Socio-Political Institutions (SPIs) to work for biodiversity related issues.

II.D Associate common people in participatory documentation of local biodiversity like preparation of biodiversity register with an aim to promote learning while working.

II.E Incorporate biodiversity value and conservation methods in school curricula.

II.F Involve village people, both women and men in decision-making. Representation of women in various decision-making bodies must be made mandatory.

Agencies: Department of Public Relations, All India Radio, Doordarshan, Print Media, State Development Departments viz., Forest, Agriculture etc., State Biodiversity Board, State Biodiversity Research Institute, State Council of Science and Technology, Socio-Political Institutions, Local NGOs and other organizations, such as NSF, Naga Mothers' Association, State Education Department, Schools, Colleges and Universities.

Time Frame: Five years

Fund requirements: Rs 10 lakhs per annum (for organizing workshops, awareness camps, printing of brochures, training people for making biodiversity registers and other related activities)

Priority: High

Strategy III: ***Involving Socio-Political Institutions (SPIs) and Religious Institutions (RIs) e.g. Churches and NGOs in promotion of sustainable use of biodiversity.***

ACTION PLAN III: PROPOSED ACTIONS

III.A Utilize the influence and reach of SPIs, RIs and NGOs in motivating people to desist from hunting, unsustainable harvest and marketing of wild biodiversity

III.B Organize training and experience sharing workshops for SPIs, RIs, and NGOs to build their capacity in the area of biodiversity conservation.

III.C Make it mandatory for the NGOs and SPIs to incorporate biodiversity related issues in all projects funded by GOI and donor agencies

Agencies: Forest Department, State Biodiversity Board, SPIs, RIs, Local NGOs, National and International NGOs, NAEB, NWDB, CAPART, Nagaland University and North-Eastern Hill University, Shillong

Time Frame: Two years

Fund Requirements: Rs 5 Lakhs per annum (for activities mentioned under item no. IIIB)

Priority: High

Strategy IV: ***Reviving and documenting traditional biodiversity conservation practices and Indigenous Knowledge Systems (IKS)***

ACTION PLAN IV: PROPOSED ACTIONS

IV.A Document traditional biodiversity conservation practices and Indigenous Knowledge Systems (IKS). Some of these practices and IKS may need scientific enquiry and experimentation.

IV.B Make people aware about the value of their rich cultural and traditional heritage and motivate them for the promotion and preservation of IKS.

IV.C Respect and revive indigenous practices and knowledge, and integrate them with relevant practices and knowledge from outside

IV.D When used by outside society, ensure that a fair and equitable share of the benefits comes back to the communities and persons from whom the knowledge originated, where this is possible to identify for instance, Indigenous knowledge on Alder-based agriculture of Khonoma Village, method of preparation of herbal dyes, tribe specific designs of Naga shawls etc.

IV.E Conduct studies on flora and fauna to fill in the gap in knowledge on biodiversity.

IV.F Document medicinal plants and animals used by traditional healers.

IV.G Facilitate preparation of a biodiversity register for every village of the state. This can be prepared by the community women and men themselves with help, if need be, of outside scientists, NGOs, and officials.

IV.H Establish herbaria /pictorial atlas of flora and fauna of the state.

IV.I Undertake participatory research work/study to generate data on forces governing hunting of wildlife and its trade, trade route, uses and marketing.

IV.J Guard trade routes from trafficking of wildlife and its products.

IV.K Conduct periodic census of wildlife species in each village/cluster of villages by local institutions.

Agencies: Forest Department, State Biodiversity Board, Department of Culture, School, College and University Students and Teachers, Women Organizations, Local Journalists, Traditional Village Institutions such as VDBs, VCs, Socio-Political Institutions, NGOs and Political Parties /Leaders, Nagaland University, North-Eastern Hill University, Colleges, Traditional Herbal Practitioners

Time Frame: Five years

Fund Requirements: Rs 10 lakhs per annum (for activities under item nos. IVA-K

Priority: High

Strategy V: ***Motivating individual landowners to adopt biodiversity conservation measures***

ACTION PLAN V: PROPOSED ACTIONS

V.A Educate people on the nutritive, medicinal and economic values of minor agricultural crops and homestead biodiversity.

V.B Encourage village institutions e.g. VDBs and VCs to socially recognize /provide incentives/awards to the households for best maintenance of homesteads in their jurisdiction.

V.C Develop mechanism for compensating the owners of big chunk of natural forests for the ecosystem services rendered to the community/nation. For instance, if a private forest is protecting a water source of the village, the village community/VDB should pay the owner of the forest for this service.

V.D Provide loan to individuals for raising diverse tree plantations on private wastelands.

V.E Encourage bioresource-based enterprises to produce raw materials for their use.

Agencies: Forest Department, State Biodiversity Board, Colleges, Universities, Traditional Chiefs, Socio-Political Institutions, NGOs, National and International Donor Agencies, N.A.E.B., M.oE.F., N.W.D.B., NABARD, F.D.A. and D.R.D.A.

Time Frame: Three years

Fund Requirements: Rs 5 Lakhs per annum (for activities mentioned above)

Priority: High

Strategy VI: ***Controlling spread of agriculture and human habitations in areas covered by natural forests and other biodiversity rich habitats***

ACTION PLAN VI: PROPOSED ACTIONS

VI.A Help Village Development Boards/ Village Councils develop a land use plan for their respective villages using participatory tools.

VI.B Motivate and empower VDBs and VCs to demarcate forest, agriculture and human habitation areas in every village on a map and formulate strict rules governing transfer of land from one land use to the other.

Agencies: State Departments of Agriculture, Forests, DRDA, F.D.A., Political Leaders, Grassroot workers, Traditional Chiefs, SPIs, VDBs and VCs.

Time Frame: Three years

Fund Requirements: Rs 20,000 per village i.e. approximately Rs 100 lakhs for the entire state for three years

Priority: High

Strategy VII: ***Reducing dependence on biomass for household energy and construction materials***

ACTION PLAN VII: PROPOSED ACTIONS

VII.A Demonstrate the methods of using LPG /Kerosene for cooking/space heating etc and educate rural people about its economic and environmental benefits

VII.B Popularize use of non-conventional sources of energy and energy saving devices viz., photovoltaic cells and energy efficient chulhas.

VII.C Improve availability and encourage use of modern house building materials like GI sheets, iron, cement and bricks in rural areas in order to reduce the use of timber.

Agencies: Department of Information and Public Relations, State Agency for Non-Conventional Energy Sources, M.N.E.S., G.O.I., State Department of Civil Supply and Public Distribution, State Council for Science and Technology, Department of Forests, Environment and Ecology & Wildlife.

Time Frame: Five years (to cover approximately 200 villages each year)

Fund Requirements: Rs 10 lakhs per annum (for augmenting the distribution system, organizing awareness programmes on use of non-conventional and renewable sources of energy)

Priority: Medium

Strategy VIII: ***Checking degradation of land and water resources***

ACTION PLAN VIII: PROPOSED ACTIONS

VIII.A Prepare a comprehensive report on the status of land and water resources including their management practices and causes of degradation in the state. The State Govt. may commission some competent agency for undertaking this work.

VIII.B Categorize and prioritize the degraded lands and water bodies for treatment and ecorestoration.

VIII.C Take up biological/physical measures of ecorestoration with people's involvement and after proper impact analysis.

VIII.D Take steps for prevention and control of soil and water pollution, such as popularization of organic farming, replacing use of plastic carry bags with paper bags, composting of house hold organic wastes, installation of sewage treatment plants particularly in urban areas.

Agencies: Departments of Environment and Forests, Soil Conservation, Agriculture, irrigation and Flood control, Municipal Boards, Town committee members, Fisheries, P.H.E., State Pollution Control Board, State Council for Science and Technology.

Time Frame: Three years

Fund Requirements: Rs 10 lakhs per annum (for preparation of a comprehensive report on the status of land and water resources, installation of sewage treatment plants etc.)

Priority: Medium

Strategy IX: ***Involving youth and students in biodiversity conservation***

ACTION PLAN IX: PROPOSED ACTIONS

IX.A Motivate and involve Youth Organizations such as Naga Students Federation and Students Unions of all major Naga tribes in sustainable use and protection of biodiversity by inculcating the values of biodiversity in the minds of young people.

IX.B Organize seminars/workshops for the student leaders on biodiversity related topics.

Agencies: Extension wing of State Forest Department, Department of Youth Affairs and Sports, Schools, Colleges, University Student and Youth Organizations and State Biodiversity Board

Time Frame: Three years

Fund Requirements: Rs 5 lakhs per annum (for imparting training and creating awareness among Naga Youth).

Priority: High

Strategy X: ***Reducing adverse impacts of industries and mining on biodiversity***

ACTION PLAN X: PROPOSED ACTIONS

X.A Understand and monitor the impacts of industries on Biodiversity
X.B Make Environmental Impact Assessment more sensitive to biodiversity.

X.C Make public hearings and consultations with the affected communities mandatory.

X.D Monitor and evaluate the implementation of Environmental Management Plan by the industry.

X.E Authorize local socio-political institutions for taking actions against the guilty.

X.F Encourage biomass-based industries to raise captive plantations.

X.G Identify specific sites and regions, which should remain off-limits to industries because of their ecological fragility or rarity, or cultural sensitivity.

X.H Identify industrial zones in areas where the impact on biodiversity is minimum for instance, areas adjoining Assam.

X.I Promote scientific methods of mining and ecorestoration of mined areas.

Agencies; Ministry of Environment and Forests, GOI, State department of Forest and Environment, Department of Geology and Mining, State Pollution Control Board, Law Enforcement Agencies, State Department of Industries.

Time Frame: Three years

Fund Requirements: Nil

Priority: Medium

Strategy XI: ***Improving availability of timber and fuel wood in the vicinity of human habitations.***

ACTION PLAN XI: PROPOSED ACTIONS

XI.A Identify and select fast growing indigenous tree species using participatory methods

XI.B Raise plantations of fast growing tree species on the wastelands

XI.C Reforest with indigenous tree species and or regenerate the degraded forests

XI.D Provide incentives for tree plantations on private lands

XI.E Redouble the social forestry programmes and conduct EIA of such plantations, especially in terms of biodiversity

Agencies: State Forest Department, Department of Wastelands Development, Department of Agriculture, Department of Soil Conservation, D.R.D.A., F.D.A., NGOs, N.A.E.B., N.W.D.B., and Universities

Time Frame: Five years

Fund Requirements: Rs 15 Lakhs per annum (for identification of fast growing indigenous tree species, their selection and plantation and EIA)

Priority: Medium

Strategy XII: ***Increasing area under protected area network***

ACTION PLAN XII: PROPOSED ACTIONS

XII.A Identify privately owned biodiversity rich forest areas in Nagaland

XII.B Motivate communities to lease out forest lands to the government on 'care and share' basis. Motivate and provide support to the community for declaring "community conserve forest areas"

XII.C Purchase pristine forest lands for the conservation of rare and endangered species like Tragopan, Hornbill, Mithun and primate species.

Agencies: State Forest Department, Civil Administration, SPIs, M.oE.F (GoI), VDBs, VCs

Time Frame: Five years

Fund Requirements: Rs 20 Lakhs per annum (for purchase of pristine forests)

Priority: Low

Strategy XIII: ***Ensuring equitable sharing of benefits of biodiversity***

ACTION PLAN XIII: PROPOSED ACTIONS

XIII.A Train local institutions in sustainable extraction, value addition and marketing of biodiversity products, such as NTFPs and medicinal plants

XIII.B Create new institutions, women societies to raise herbal gardens and undertake farming of selected species of wildlife and adoption of available technologies for captive breeding of wildlife, such as Tragopan.

Agencies: Departments of Industries and Commerce, Forests and Agriculture, Cooperatives, and Social Welfare, VDBs, VCs

Time Frame: Three years

Fund Requirements: Rs 10 lakhs per annum (for training and captive breeding)

Priority: Medium

Strategy XIV: ***Building new institutions for biodiversity conservation***

ACTION PLAN XIV: PROPOSED ACTIONS

XIV.A Constitute a State Biodiversity Board as envisaged in Biodiversity Bill consisting of Chief Secretary as Chairperson, Heads of Biodiversity related Departments, representatives of NGOs and community institutions and experts. The term of reference of this board should be 'to conserve the biodiversity of Nagaland.

XIV.B Create an office of State Biodiversity Adviser to advise the Govt. on implications of various developmental activities on the biodiversity. The advisor should be a Biodiversity expert of repute.

XIV.C Establish a State Biodiversity Research Institute for inventorying, documenting, developing/ standardizing the techniques for value addition to biodiversity products, extension and training etc.

XIV.D Establish Biodiversity Park in each district for *ex situ* conservation of biodiversity, education of general public and recreation and promotion of eco-tourism.

Agencies: State Government Planning Board, Department of Forests, Environment and Ecology & Wildlife.

Time Frame: Five years

Fund Requirements: Initial grant of Rs 400 Lakhs, Twenty-five lakhs per annum (for establishment of the Institute and Biodiversity Parks and their maintenance).

Priority: High

Strategy XV: ***Incorporating biodiversity concerns in planning and project implementation***

ACTION PLAN XV: PROPOSED ACTIONS

XV.A Involve biodiversity experts in planning and project formulation. Appoint a Biodiversity/ environment advisor in each Department. State Planning Board must have a biodiversity specialist as a member.

XV.B Critically analyze short term and long term impacts of proposed action on biodiversity

XV.C Develop a state specific curriculum on Biodiversity and train/sensitize decision makers (e.g. Politicians, Bureaucrats) and project implementers (e.g. engineers, extension workers) in the area of biodiversity

Agencies: Planning Board, State Departments related to development and infrastructure, Staff Training Institutes, Department of Forests, Environment and Ecology & Wildlife, Universities

Time Frame: Three years

Fund Requirements: Rs 10 lakhs per annum (for analysis of impact, organizing programmes to train/sensitize decision makers and project implementers).

Priority: High

Strategy XVI: ***Promoting interdepartmental cooperation for biodiversity conservation***

ACTION PLAN XVI: PROPOSED ACTIONS

XVI.A Develop mechanism for information sharing and confidence building among officers and staff of various development departments. A committee of senior officers drawn from various biodiversity related departments may be constituted. This committee may meet periodically to discuss biodiversity concerns in planning and implementation of projects.

XVI.B Involve line departments in decision-making process. For instance, Agriculture, Soil Conservation, Wastelands Development, Rural Development Departments are considered as line departments for the Forest Department.

XVI.C Constitute an interdepartmental committee for evaluation and monitoring of the cooperation.

XVI.D Build transparency and accountability in the functioning of Departments.

Agencies/Authorities: Chief Secretary, Commissioners, and Heads of various Govt. Departments.

Time Frame: One year

Fund Requirements: Nil

Priority: High

Strategy XVII: ***Taking appropriate steps to use market forces for the benefit of biodiversity and to mitigate their adverse impacts***

ACTION PLAN XVII: PROPOSED ACTIONS

XVII.A Enact suitable legislation for promoting sustainable collection, harvest, marketing and commercial exploitation of bio-resources, keeping conservation needs in mind. The industries may be asked to disclose information on species used, location from where collected, quantities extracted, amount given to local collectors and benefit sharing arrangements with local communities, if any. Such information should be given first to the village from where collection is taking place by each industry and finally to the state/central Government.

XVII.B Educate people about market price and value of biodiversity

XVII.C Develop marketing network for organic farm products.

XVII.D Where necessary establish cooperative society/ other local institutions to safeguard people from middle man and external market forces

XVII.E Promote bio-fertilizers and bio-control of pests

XVII.F Khadi and Village industries board may take a proactive role in promotion of bio-resource based handicrafts, health and medicinal products.

Agencies: State Planning Board, State Department of Agriculture, Horticulture, Forest, Cooperation, Industries and Commerce, TRIFED, Public Relations and Khadi and Village Industries.

Time Frame: Five years

Fund Requirements: Rs 10 lakhs per annum (for promoting establishment of marketing network, cooperative society and local institutions and for popularizing bio-fertilizer, bio-resource based handicraft, health and medicinal products)

Priority: Low

Strategy XVIII: ***Promoting Organic Farming***

ACTION PLAN XVIII: PROPOSED ACTIONS

XVIII.A Inform people about adverse impacts of agrochemicals (e.g. fertilizers and pesticides)

XVIII.B Desist from promotion of chemical fertilizers and synthetic pesticides

XVIII.C Undertake market survey for organic farm produce

XVIII.D Help producers in selling their products in domestic and international markets

XVIII.E Identify crops having market potential and suitable for cultivation in Nagaland

XVIII.F In due course, declare Nagaland an organic state

Agencies: State Department of Agriculture, Horticulture, Forest, Fisheries, Animal Husbandry, Cooperation, Industries and Commerce, Public Relations and Khadi and Village Industries.

Time Frame: Five years

Fund Requirements: Rs 10 lakhs per annum (for extension works, market survey and promoting organic farming)

Priority: Medium

Strategy XIX: ***Protecting wild animals from game and hunting***

ACTION PLAN XIX: PROPOSED ACTIONS

XIX.A Involve student and social organizations in conservation of wildlife

XIX.B Enforce wildlife laws with peoples cooperation by involving VDBs, VCs, SPIs, RIs, NSF, NSUs

XIX.C Establish captive breeding facilities for threatened/endangered species such as Tragopan, Hornbill etc.

XIX.D Discourage people from consuming wildlife meat and enact social sanctions for this purpose

Agencies: State Forest Department, M.oE.F. (GoI), Naga Students Federation, NSUs, SPIs, and Law Enforcing Agencies VDBs and VCs.

Time Frame: Two years

Fund Requirements: Rs 10 lakhs (for establishing captive breeding facilities)

Priority: High

Strategy XX: ***Developing eco-tourism for biodiversity conservation***

ACTION PLAN XX: PROPOSED ACTIONS

XX.A Identify biodiversity rich areas of tourist interest such as Japfu peak, Dziikou valley etc.

XX.B Develop eco-tourism related infrastructure

XX.C Educate local people about the benefits of eco-tourism by organizing awareness programmes

XX.D Manage biodiversity friendly tourism with people's cooperation. Develop the skill of local people in managing eco-tourism with a view to handover the management in due course.

Agencies: State Department of Tourism, Department of Tourism (GoI), and State Forest Department, SPIs and NGOs

Time Frame: Two years

Fund Requirements: Rs 10 lakhs per annum (for developing eco-tourism related infrastructure)

Priority: Medium

Strategy XXI: ***Involving Defence Personnel in Biodiversity Conservation***

ACTION PLAN XXI: PROPOSED ACTIONS

XXI.A Undertake ice-breaking exercises between civil and defense personnel.

XXI.B Train and sensitize defense personnel with biodiversity concerns

XXI.C Provide funds and technical expertise to defense organizations for formulation and implementation of biodiversity conservation related projects

XXI.D Involve defense personnel during peacetime in Afforestation activities by allotting particular area to each Unit/defense establishment.

Agencies/Authorities: Senior Bureaucrats, Political Leaders, Defense Establishments, VDBs and SPIs

Time Frame: Five years

Fund Requirements: Rs 4 lakhs per annum (for imparting training and organizing discussion meetings and providing funds to defense establishments for undertaking afforestation and other biodiversity conservation related projects)

Priority: Low

Strategy XXII: ***Discouraging monoculture tree/commercial plantation***

ACTION PLAN XXII: PROPOSED ACTIONS

XXII.A Select tree species with people's choice considering economic as well as ecological benefits and help the communities in taking well-informed decisions in this regard

XXII.B Develop nursery and plantation management methods for native tree species.

XXII.C Establish nurseries of native tree species at village level.

XXII.D Avoid raising of bamboo, rubber, tea, coffee, plantations on forestlands.

Agencies: State Departments of Forest, Agriculture, Wastelands Development, Soil and Water Conservation, DRDA, VDBs, Rubber and Coffee Boards,

Time Frame: Three years

Fund Requirements: Rs 10 Lakhs per annum (for undertaking PRA for choice of species, establishment of nurseries of native tree species)

Priority: Medium

Strategy XXIII: ***Promoting Community Conservation Practices by taking into account measures for their continued existence***

ACTION PLAN XXIII: PROPOSED ACTIONS

XXIII.A Document existing village conservation practices, including community conserved areas.

XXIII.B Demarcate new village forest reserves, village forests and other common property resources (CPRs) including water bodies, grazing lands etc or clarify the boundaries where currently unclear.

XXIII.C Provide legal backing to community conserved areas such as declaring Community Reserves under the proposed Biodiversity Bill.

XXIII.D Document/codify benefit sharing mechanisms for CPRs for each village

XXIII.E Provide cash or kind incentives to VDBs, VCs and village communities for maintenance and management of biodiversity rich CPRs. Encourage and provide support for community managed "Organic Farms" based on local knowledge and skills

XXIII.F Provide technological and managerial inputs to the traditional institututions, village level organizations and village communities for declaring/maintaining village forest reserves

Agencies: State Forest Department, VDBs, VCs, DRDA, State Biodiversity Board, NGOs, SPIs, and Traditional Chiefs
Time Frame: Three years

Fund Requirements: Rs 10,000 per village i.e. 100 lakhs (for activities mentioned in item no. XXIIIA, B, D and E) for three years.

Priority: High

REFERENCES / BIBLIOGRAPHY

1. *Annual Administrative Report (1999-2000) Dept. of Soil & Water Conservation, Govt. of Nagaland, Kohima.*
2. *Annual Administrative Report (1999-2000) Dept. of Veterinary & Animal Husbandry, Govt. of Nagaland, Kohima.*
3. *Annual Administrative Report (2000-2001) Dept. of Arts & Culture, Govt. of Nagaland, Kohima.*
4. *Annual Administrative Report (2000-2001) Dept. of Forests, Environment & Ecology and Wildlife, Govt. of Nagaland, Kohima.*
5. *Annual Administrative Report (2000-2001) Dept. of Industries & Commerce, Govt. of Nagaland, Kohima.*
6. *Annual Administrative Report (2000-2001) Dept. of Sericulture, Govt. of Nagaland, Kohima.*
7. *Annual Administrative Report (2000-2001) Dept. of Sericulture, Govt. of Nagaland, Kohima.*
8. *Annual Administrative Report (2000-2001) Dept. of Soil & Water Conservation, Govt. of Nagaland, Kohima.*
9. *Approach to the tenth Five Year Plan (2001), Govt. of Nagaland, Dept. of Wastelands Dev., and Kohima.*
10. *Bakshi, P. M. (1994), The Constitution of India, selective comments by P. M. Bakshi.*
11. *Botanical Survey of India (Ministry of Environment and Forest), Calcutta.*
12. *Chowdhery, H. J. and Murti, S. K. 2000, Plant Diversity and Conservation in India – An Overview.*
13. *Darlong, V. T. (1994), Wildlife Research in Nagaland - A Review in Regional Workshop on the Coordination and Monitoring of Wildlife research.*
14. *First Semi-Annual Report (April-Sept., 2001), NEPED, Kohima.*
15. *Floristic Diversity and Conservation Strategies in India, Vol. III: In the context of States and Union Territories, Botanical Survey of India, MoEF, Calcutta.*
16. *Forest Statistical Handbook of Nagaland (1994), Govt. of Nagaland.*
17. *Ghosh, S. K. and A. P. Lipton (1982) Icthyofauna of the N.E.H. Region with special Reference to their Economic Importances. Special bulletin No. 1, Publication of ICAR research complex for NEH Region, Shillong.*
18. *Govt. of Nagaland, Kohima (1968) The Arts and Crafts of Nagaland, Naga Institute of Culture, Govt. of Nagaland, Kohima.*
19. *Govt. of Nagaland, Kohima, Nagaland- The use of Alder trees, SCERT, Govt. of Nagaland, Kohima.*
20. *Govt. of Nagaland, Kohima, Nagaland-Panikheti on mountain slopes, SCERT, Govt. of Nagaland, Kohima.*

21. Hore, D. K. (1998) Fruit Germplasm Diversity and its Development in North East India, India. Proceedings of the National Conference on Science and Technology: 101-106

22. Hore, D. K. and Sharma, B. D. (1993) Crop Germplasm Resources Collection from Nagaland State, India. Indian Journal of Forestry 16: 372-377.

23. Hynniewta, T. M, (1999) Nagaland in Floristic Diversity and Conservation Strategies in India, Vol. III: In the context of States and Union Territories, Botanical Survey of India, MoEF, Calcutta: 1259 – 1291.

24. Hynniewta, T. M., Wadhwa, B. M. and Katki, S. K. 2000, Orchids of Nagaland.

25. IIRR (1999) Building upon Traditional Agriculture in Nagaland, India, NEPED & IIRR.

26. IIRS (2002). Biodiversity Characterization at Landscape Level in North-East India using Satellite Remote Sensing and Geographic Information System, Indian Institute of Remote Sensing (National Remote Sensing Agency), Dept. of Space, Govt. of India, Dehra Dun.

27. Jamir, N. S. (1999), Ethnobiological Studies among Naga Tribes in Nagaland in Workshop on "peoples' participation in Biodiversity Conservation"

28. Jamir, N. S. and Rao, R. R. 1988, Ferns of Nagaland, Published by Bishen Singh Mahendra and Pal Singh, Dehra Dun.

29. Kanjilal et. al. 1934 – 1940.

30. Land use Statistics in Nagaland (2000) Dept. of Agriculture, Govt. of Nagaland, and Kohima.

31. Maitra, K. (1991) Nagaland- Darling of the Northeast, Mittal Publ. New Delhi.

32. Millennium Issue Statistical Hand Book of Nagaland (2000), Dept. of Economics & Statistics, Govt. of Nagaland, Kohima.

33. Naga Institute of Culture, Govt. of Nagaland, Kohima (1968), The Arts and Crafts of Nagaland.

34. Nagaland Annual Review (2000), Directorate of Information & Public Relations, Nagaland.

35. Nagaland, (1997), The Telegraph, Saturday 28 June 1997.

36. Nayar, M. P. 1996, Hot Spots of endemic plants of India, Nepal and Bhutan, S. B. Press, Trivandrum.

37. Sapuchankija, Y. Kumar and P. B. Gurung, 1992, Orchids of Nagaland, Forest Department of Nagaland, Kohima.

38. Singh, K. P. and Sinha, G. P. 1994, Lichen Flora of Nagaland, Published by Bishen Singh Mahendra, Pal Singh, Dehra Dun.

39. Singh, K. S. (1994) Peoples of India, Nagaland (vol. XXXIV), Anthropological Survey of India, Seagull Books, Calcutta.

40. Singh, V. B. and Singh, K. (1996), Spices.

41. State Industrial Policy (2000), Govt. of Nagaland, Kohima.

42. State of Forest Report – 1999, Forest Survey of India (Ministry of Environment and

Forest), Dehra Dun

43. *The Area and Production of major Fruit and Vegetable crops of Nagaland (2000) Dept. of Horticulture, Govt. of Nagaland, Kohima.*
44. *Thong, Joseph S. (1997) Head-Hunters' Culture (Historic Culture of Nagas), Perashen, Tseminyu, Nagaland.*
45. *Tikader, B. K. 1983, Threatened Animals of India, zoological Survey of India, Calcutta.*
46. *Wastelands- An Overview (2000), Govt. of Nagaland, Dept. of Wastelands Dev., Kohima.*
47. *Zeliang D. K., Kevichusa R. and Angami T., Nagaland- The Use of Alder trees. SCERT, Dept. of Education, Govt. of Nagaland, Kohima.*
48. *Zeliang, D. K. (1992). A perspective in Land use in Nagaland, Govt. of Nagaland, Kohima.*

APPENDIX I

A LIST OF THE LESSER KNOWN FOODS OF NAGALAND

Species name	Local name	Uses
Allium amamplorasm	Allolasung	Whole plant as vegetable
Amaranthus caulatus	Aru/rua	Leaves as vegetable and the seeds as secondary staple food and as for brewing local wine
Asparagus racemocus	Asangshi	Vegetable and medicine
Bauhinia varigata	Nongksangsuben	Flowers as vegetable
Begonia palmata	Kokralik	Vegetable and medicine
Calamus acanthospatus	Arr/Chanthong	Young shoot as vegetable
Calamus erectus	Arr/Khongjang	Young shoot as vegetable
Caryuta obtusa	Meri - asang	Soft starch inside the stem is eaten as secondary staple food and the young shoots as vegetable
Centella asiatica	Emsenkorokla	Vegetable and medicine
Clerondendron coleobrokianum	Umrem	Vegetable and medicine
Didymosperma nana	Chiya	Same as Caryuta obtusa
Dillenia indica	Shity kozu	Fruits as vegetable
Dioscoria bulbifera	Chamen	Tubers consumed as secondary staple food
Ficus glomerata	Akku	Young leaves as vegetable
Elastestoma lanceofolia	Changpangchemba	Leaves as vegetable
Elastostema cunneatum	Changpangchemba	Leaves as vegetable
Fagopyrum esculentum	Lpakwa	Vegetable
Ficus macrophyla	Mamma	Fruits are eaten and the leaves as fodder
Flemingia vesteta	Shoflang	Tubers are eaten, also as medicine
Gnetum gnemone	Melem	Leaves and fruits as vegetable
Herpetospermum pedunculosum	Joee	Leaves as vegetable
Hibiscus sabdarifa	Sentsurep	Leaves and calyx as vegetables
Hibiscus suranthesis	Sentsurep	Same as above
Hodgsonia microcarpa	Assa	Seeds are eaten, bulb of the fruits are as medicine
Litseae citrata	Entsurem	Fruits as condiment and medicine
Manihot esculenta	Alishi	Secondary staple food
Marantha arundinea	Amm-shi	Same as above
Houttynia cordata	Mokma	Whole plant as vegetable and as medicine
Ipomia batatas	Tsumarshi	Secondary staple food
Lasai spinosa	Churang/Thurang	Leaves as vegetable and medicine
Ocimum bacillicum	Nagpera	Whole plant as vegetable, condiment and as medicine
Paederia foetida	Sunemli	Leaves as vegetable and medicine
Passiflora utilis	Entsulashi	Leaves as vegetable, medicine and the fruits as desert

Passiflora quadringular	Entsulashi	Same as above
Perila ocimoides	Nappa	Whole plant as vegetable, condiment and as medicine
Polygonum chinensis	Khallo-wa	Young twig as vegetable
Rhus simialata	Tangpu	Husk of the seeds are as condiment and medicine
Schima wallichii	Mesang	Young leaves as vegetable
Sesamum orientalis	Oentsung/Pingnak	Seeds as condiment
Smilax aspera	Aoksuba-li	Young shoots as vegetable
Smilax lanceofolia	Aoksuba-li	Same as above
Solanum nigrum	Kumbowa	Whole plant as vegetable and medicine
Zanthoxylum acanthopodium	Changpet	Fruits as condiment and medicine
Zanthoxylum oxiphylum	Mongmong	Leaves as vegetable and the fruits as condiment and medicine
Zanthoxylum rhesta	Mongret	Same as above

A number of species of bamboo, ferns, mushrooms, orchids and lichens are also consumed as food by the Nagas.

APPENDIX II

SOME FOLKLORE MEDICINAL PLANTS USED BY THE NAGAS.

Amphineurom apulantum – Leaves are crushed into a paste with *Hypericum japonicum* twigs and is applied to extract the magote of the teeth.

Borreria hispida & *Paederia foeteda* – Both the plants are used for the same treatment. The tendril is introduced to the uterus through the vagina for the purpose of abortion.

Brassaiopis glomerata – Aqueous extract of the bark is drunk to cure hyper-acidity and gastric problems.

Choloranthus brachystachy – The twig is crushed into a paste and applied to cure the wounds caused by tiger & dog bites.

Costus speciosus – Paste of the plant is applied to cure wounds on domestic animals.

Curculigo capitulata – Aqueous extract of the corm is applied to cure conjunctivitis and for dilation of pupils. The leaves are torn into strips and are used for stitching the cuts in animal castrations.

Diospyros lanceofolia – Young fruits are eaten and the matured fruits are crushed and introduced to the stream for stuffing the fish.

Dipterocarpus turbinatus – The latex of the plant is mixed with wood ash and applied to the marks punctured by the spines of *Berberis aristata* on the human skin during the inscription of tattoos.

Eurya acuminata – The aqueous extract of the leaves mixed with the extract of *Rubia sikkimensis* roots gives brilliant red colour that is used for dyeing clothes.

Hydnocarpus kurzii – Bulb of the fruits is used for poisoning the rodents.

Lasia spinosa – Eaten as vegetable and as an anti-helmenthis.

Leocosceptrum cannum – Scrapes of the ventral surface of the leaves are used as haemostatic.

Letsia citrata – Aqueous extract is used as insecticides, anticaterpillar and as anti-hatching of eggs. The fruits are also eaten as spices.

Lycopodium cernum – Spores are applied to cure wounds.

Mikania micrantha – Aqueous extract is boiled and drunk for the treatment of high blood pressure.

Mussaenda roxburghii – The aqueous extract of the young twigs is drunk for relieving hiccups, and is used for the treatment of heart and lungs problems.

Smilax aspera – The spines are used for trapping the animals, in which the prey get swollen up when injured by the spines of the plants, and thence can be easily hunted down.

Solanum nigrum – The aqueous extract is applied to neutralize the toxin of bee/wasp stings. The tribals eat the plant as vegetable.

Viscum articulatum – The paste of the plant is applied to cure bone fractures.

APPENDIX III

ANIMALS USED IN THE TREATMENT OF DISEASES BY THE NAGAS.

Name of the Animal	Part used	Treatments
Apple snail (Pila sp.)	Flesh (muscle)	Tuberculosis, Breathing troubles, for healthy eye, mental deficiency
Bat	Flesh and bone	Night blindness, Asthma, Male impotency
Bear	Fat Penis Bile	Rheumatism Male impotency Tonic, aphrodisiac
Cockroach	Entire	Asthma
Cow	Milk Urine	General weakness cracks on the foot Tuberculosis, are stabilizer antiseptic and skin diseases
Crab	Entire	Jaundice, Asthma
Crow	Flesh Blood Bone	Paralysis, delivery pains Paralysis Ear troubles
Barking deer	Bone marrow Bile	Weakness of legs Tonic for liver, stomach troubles, and for malaria
Dog	Flesh Small puppy's soup	General weakness, Tuberculosis, Asthma Easy delivery, after surgery
Drongo bird	Feather	Male impotency
Eagle	Fat	Fracture and in burn
Elephant	Urine Powder of tusk	Rickets, skin diseases Leucoderma
Frog	Flesh Skin	Rickets, easy delivery Applied in burns
Goat	Blood Urine Liver	General weakness Stomach pain, tuberculosis, Asthma Night blindness
Hare	Fat	Applied in baldness, Asthma, Tuberculosis
Hen	Fat	Pains, Fracture, Burns
Horn Bill	Fat Flesh	Rheumatism, Bone fractures, Burns, Skin treatments Dryness of body after delivery, skin treatments
Jackal	Flesh Fat	Tuberculosis, General weakness, Dysentery Rheumatism, Ringworm
Jungle fowl	Flesh Fat	Asthma Bone fracture, Burns, Dry skin
Monitor (Giant lizard)	Flesh Fat Bile	Injuries, Paralysis Rheumatism, Burns, Waist pain, Eye trouble Applied in snakebite
Monkey	Flesh Blood Penis	Internal injury, stomach pain, mental diseases Tuberculosis, Headache and Male impotency
Owl	Bone Fat	Jaundice Bone fracture

Panther	Blood Liver	Age stabilizer Swelling of the body
Pigeon	Flesh	General weakness, Paralysis, Asthma
Pig	Fat Urine	Rheumatism Paralysis
Porcupine	Fat Intestine	Rheumatic pain and burns Stomach pain
Sambar	Antler	Ribs pain, chest pain
Sparrow	Flesh	Male impotency, General weakness
Tiger	Fat Flesh & Liver	Rheumatic pain, Eye trouble General weakness, Body swelling
Tortoise	Flesh	Piles problems, General weakness
Wild Boar	Fat	Rheumatism

APPENDIX IV

ORCHIDS OF NAGALAND

Orchids constitute a unique group of flowering plants in Nagaland. Orchids are a group of monocotyledonous plants known for their diversity of habit and habitat. The exquisite beauty of flowers in colour and shape as well as the keeping quality of some of them have attracted for a lucrative business among commercial horticulturists.

Nagaland, one of the hill states in Northeast India supports very rich and luxuriant vegetation. Concerning various kinds of flora, Nagaland is endowed with rich varieties of orchids occurring in almost all parts of the state.

The Northeast, including Nagaland is blessed with tropical to alpine humid forest with heavy rainfall and high humidity, which provide a suitable habitat for this unique natural heritage. There are over a thousand species of orchids in India. Out of this more than fifty percent, i.e., about 650 species grow in Northeast India. Nagaland can boast for over 360 orchid species. Various types of orchid species found in Nagaland are mentioned as under:

Acampe multiflora *Lindl.*
The flowering period is from April to May. It is found in Medziphema, Meinkong, and Mon.
Acampe ochracea *(Lindl) Hochr.*
Flowering occurs from December to January. It is found in Dzuja and Viswema.
Acampe papillosa *(Lindl.) Lind.*
The flowering period occurs in December to January. It is found in Zenheboto and Pesao.
Acampe rigida *(Lindl) Hochr.*
The flowering period occurs from April to May. It is found in Phek and Aghunato.
Acampe wightiane *Lindl.*
The flowering period is from November to December. It is found in Chesore.
Acanthephlppium striatum *Lindl.*
The flowering period is from July to August. It is found in Jaluke and Doyang.
Acanthephippium sylhetense *Lindl*
The flowering period is from May to June. It is found in Longwa, Chen and Jaluke.
Aerides crassifolium *par. & Rchb. f.*
The flowering period is from April to May. It is found in Dzuja, Tseminyu, Longjang and Changtong.
Aerides fieldingii *Jenkings (commonly called "fox tail" orchid.)*
The flowering period is from May to June. It is found in Changki, Tuli and Mon.
Aerides multiflorum *Roxb.*
The flowering period is from June to August. It is found in Phek and Viswema.
Aerides odoratum *Lour.*
The flowering period is from May to June. It is found in Mokokchung, Changtongya and Chare.
Agrostophyllum brevipes *King& Pantl.*
The flowering period is from July to August. It is found in Kohima and Tseminyu.
Agrostophyllum callosum *Rchb.f.*
The flowering period is from May to July. It is found in Changtongya and Akuluto.
Agrostophyllum khasianum *Griff.*
The flowering period is from July to August. It is found in Sanis, Changki and Meinkong.

Aoectochilus brevilabris *Lindl.*
The flowering period is from October to November. It is found in meinkong, Longkhum and Japfii range.
Anoectochilus crispus *Lindl.*
The flowering period is from June to August. It is found in japfii range, Chentang and Pfutsero.
Anoectochiluss elwesil *King & Pantl.*
The flowering period is from June to July. It is found in Japfii range and Hellipong.
Anoectochilus grandiflorus *Lind.*
The flowering period is from July to August. It is found in Japfii range, Pesao and Changlangshu.
Anoectochilus griffithii *Hk. f.*
The flowering period is from August to September. It is found in Saramati and Dzukou.
Anoectochilus roxburghii *(Wall.) Lindl.*
The flowering period is October. It is found in Meinkong, Longkhum, Pesao and Sangsangyu.
Anthogonium gracile *Wall. ex Lind.*
The flowering period is from August to September. It is found in Aghunato and Surohoto.
Aphyllorchis montana *Rchb. f.*
The flowering period is from July to August. It is found in Changlangshu.
Aphyllorchis prainii *Hk. f.*
The flowering period is from July to August. It is found in Doyang, Sanis, Mangkolemba and Aonokpho.
Appendicula cornuta *Bl*
The flowering period is in August. It is found in Wokha, Doyang, Changki and Mon.
Arachnis bilinguis *Benth.*
The flowering period is from March to April. It is found in Sanis and Changki.
Arachinis cathcartii *J. J.sm.*
The flowering period is from March to April. It is found in Longtok, hellipong and Chesore.
Arundina graminifolia *(D. Don) Hochr.*
The flowering period is from June to October. It is found in Chesore, Chare, Meinkong, Changki and Jaluke.
Ascocentrum ampullaceum *Lindl. ex Wall.*
The flowering period is from March to April. It is found in Peren, Phek and Noklak.
Ascocentrum curvifolium *Schltr.*
The flowering period is from May to June. It is found in Hellipong, Changlangshu and Pangsa.
Ascocentrum micranthum *Lindl.*
The flowering period is from June to August. It is found in Japfii range and Viswema.
Ascocentrum miniatum *Schltr.*
The flowering period is from March to May. It is found in Japfu range, Viswema and Kohima.
Brachycorythis obcordata *(Buch-Ham. ex. D. Don) Summerh.*
The flowering period is from August to September. It is found in Japfii range and Saramati range.
Bulbophyllum aculiflorum *Hk. f.*
The flowering period is from June to July. It is found in Japfii range, Khonoma, Peren and Pfutsero.
Bulbophyllum affine *Lindl.*
The flowering period is June to July. It is found in Kohima, Viswema and Hellipong.
Bulbophyllum andersonii *(Hook. f.) J. J. Sm.*
The flowering period is from October to September. It is found in Japfii range, Viswema, Khonoma and Hellipong.
Bulbophyllum careyanum *(Hk. f.) Spreng.*
The flowering period is October and February. It is found in Japfii range, Khonoma

and Dzulake.

Bulbophyllum caudatum *Lindl.*

The flowering period is June to July. It is found in Japfii range, Khonoma, Peren and Pfutsero.

Bulbophyllum cylindraceum *Lind. (=B. Khasyanum Griff.)*

The flowering period is December to January. It is found in Japfii range and Viswema.

Bulbophyllum dyeranum *(King & Pantl.) Seidenf.*

The flowering period is July to September. It is found in Mon, Watching and Tuli.

Bulbophyllum elatum *(HK. f.) J. J. Sm.*

The flowering period is May to June. It is found in Japfii range, Dzulake and Peren.

Bulbophyllum eublepharum *Rochb. f.*

The flowering period is August and is found in Hellipong, and Chentang.

Bulbophyllum gamblei *Hook. f.*

The flowering period is July to August. It is found in Meinkong, Longkhum, Longwa and Surohoto.

Bulbophyllum guttulatum *(Hk. f.) Balak.*

The flowering period is from August to September. It is found in Japfii range, Dziilake and Pfutsero.

Bulbophyllum gymnopus *Hk. f.*

The flowering period is October to November. It is found in Kohima and Khonoma.

Bulbophyllum helenae *(Kze.) J. J. Sm.*

The flowering period is from May to June. It is found in Japfii range, Pfutsero, Dziilake and Hellipong.

Bulbophyllum hirtum *Lindl.*

The flowering period is November to February. It is found in japfii range Pfutsero, Saramati and Sangsangyu.

Bulbophyllum hymenanthum *Lindl.*

The flowering period is May. It is found in Meinkong and Longkhum.

Bulbophyllum leopardinum *Lindl.*

The flowering period is October to November. It is found in Chentang and Hellipong.

Bulbophyllum leptanthum *Hook. f.*

The flowering period is July and is found in Changtongya, Sanis and Dzuja.

Bulbophyllum odoratissimum *Lindl.*

The flowering period is June to August. It is found in Tseminyu, Phek, Meinkong and Longleng.

Bulbophyllum ornatissimum *(Rchb. f.) J. J. Sm.*

The flowering period is from October to November. It is found in Wokha, Longkhum and Meinkong.

Bulbophyllum penicillium *Par. & Rchb. f.*

The flowering period is from August to September. It is found in Longkhum, Hellipong, Viswema and Khonoma.

Bulbophyllum piluliferum *King & Pantl.*

The flowering period is May. It is found in Changtong, Longleng Chare and Wakching.

Bulbophyllum polyrhizum *Lindl.*

The flowering period is March to April. It is found in Mangkolemba, Aonokpho, Changtongya, Sanis and Tobii.

Bulbophyllum reptans *Lindl.*

The flowering period is from October to November. It is found in Mon, Watching and Doyang.

Bulbophyllum rigidum *King & Pantl.*

The flowering period is from May to June. It is found in Mangkolemba and Medziphema.

Bulbophyllum rothschildianum *(O'Brien) J. J. Sm.*

The flowering period is from September to October. It is found in Longsa and Chare.

Bulbophyllum roxburghii *(Lindl.) Rchb. f.*

The flowering period is September. It is found in Watching and Tobou.

Bulbophyllum secundum *Hk. f.*

The flowering period is from June to July. It is found in Peren, Dzulake, Tseminyu,

Longkhum and Longkhum.

Bulbophyllum striatum *Rchb. f.*

The flowering period is October. It is found in Kohima, Viswema and Saramati range.

Bulbophyllum umbellatum *Lindl. (=B. guttulatum Seidenf. & Arora)*

The flowering period is from May to June. It is found in Japfii range, Viswema Dzulake and Hellipong.

Bulbophyllum uniflorum *Griff.*

The flowering period is from July to August. It is found in Longkhum, Hellipong and Longtok.

Bulbophyllum viriflorum *(f.) Schltr. Hk.*

The flowering period is from October to November. It is found in Longkhum and Wokha.

Bulbophyllum wallichii *(Lindl.) Rchb. f.*

The flowering period is from October to November. It is found in Longleng, Chesore, Longkhum and Meinkong.

Calanthe alismifolia *Lindl.*

The flowering period is May to August. It is found in Dzukou, Japfii, and Saramati range.

Calanthe alpina *Hk. f.*

The flowering period is from July to August. It is found in Dzukou and Japfii range.

Calanthe angusta *Lindl.*

The flowering period is from April to May. It is found in Dziilake, Peren and Dzuja.

Calanthe biloba *Lindl.*

The flowering period is from Setember to October. It is found in Japfii range, Khonoma, Chentang, Hellipong and Sangsangyu.

Calanthe brevicornu *Lindl.*

The flowering period is May to June. It is found in Sangsangyu, Chentang and Japfii range.

Calanthe chloroleuca *Lindl.*

The flowering period is from April to May. It is found in Dzukou.

Calanthe clavate *Lindl.*

The flowering period is February to March. It is found in Changlangshu, Pesao, Pangsa, Japfii range and Saramati range.

Calanthe densiflora *Lindl.*

The flowering period is October. It is found in Dzuja, Peren and Phek.

Calanthe foerstermannii *Rchb. f.*

The flowering period is July. It is found in Rangapahar, Merapani and Tuli.

Calanthe gracilis *Lindl.*

The flowering period is October and is found in Chesore, Longleng and Kiphire.

Calanthe herbacea *Lindl.*

The flowering period is from June to July and is found in Dzukou, and Japfii range.

Calanthe mannii *Hk. f.*

The flowering period is March to April. It is found in Sanis, Changki, Longleng and Tobu.

Calanthe masuca *(D. Don) Lindl.*

The flowering period is from August to September. It is found in Kohima, Viswema, Sangsangyu and Longkhum.

Calanthe plantaginea *Lindl.*

The flowering period is from March to April. It is found in Japfu range, Hellipong and Longtok.

Calanthe puberula *Lindl.*

The flowering period is from July to August. It is found in Japfii range, Saramati range, Hellipong and Meinkong.

Calanthe tricarinata *Lindl.*

The flowering period is from May to July. It is found in Viswema, Khonoma, Peren, Longleng and Tuensang.

Calanthe triplicata *(Willem) Ames.*

The flowering period is from July to October. It is found in Merapani, Tsurang and

Naginimora.

Calanthe vaginata *Lindl.*

The flowering period occurs from May to June. It is found in Merapani, Tsurang valley, Tuli, and Naginimora.

Calanthe vestita *Lindl.*

The flowering period is November to December. It is found in Japfu range.

Calanthe whiteana *King & Pantl.*

The flowering period is May. It is found in Saramati and Japfii ranges.

Cephalanthera longifolia *(L.) Frithsch*

The flowering period is from May to July. It is found in Japfii range, Chesore and Longtok.

Ceratostyllis himalaica *Hk. f.*

The flowering period is May to June. It is found in Chentang, Noklak and Pangsa.

Ceratostylis teres *Rchb. f.*

The flowering period is from May to June. It is found in Tezit, Mon, Wakching.

Cheirostylis griffithii *Lindl.*

The flowering period is from October to Novernber. It is found in Japfii range, Hellipong and Chentang.

Cheirostylis pusilla *Lindl.*

The flowering period is from November to December. It is found in Viswema and Peren.

Cleisocentron trichromum *(Rchb. f.) Bruhl.*

The flowering period is from July to August. It is found in Japfii range, and Saramati range.

Cleisostoma aspersum *(Rchb. f.) Garay*

The flowering period is from July to August. It is found in Jaluke, Rangapahar, and Medziphema.

Cleisostoma filiforme *(Lindl.) Garay*

The flowering period is from August to September. It is found in Kohima and Viswema.

Cleisostoma simondii *(Gagnep.) Seidenf.*

The flowering period is from August to September. It is found in Longchang and Chare.

Cleisostoma striatum *(Rchb. f.) Garay*

The flowering period is July to August. It is found in Tuli, Saring, Tsurang valley and Chare.

Cleisostoma subulatum *Bl.*

The flowering period is from July to August. It is found in Intanki and Jaluke.

Cleisostoma racemiferum *(Lindl.) Garay*

The flowering period is from June to July. It is found in Kohima, Dzuja, Medziphema and Tseminyu.

Coelogyne barbata *griff.*

The flowering period is from September to December. It is found in Japfii range, Hellipong, Chentang and Longwa.

Coelogyne corymbosa *Lindl.*

The flowering period is from April to May. It is found in Noklak, Longwa, Longkhum, Wokha and Tseminyu.

Coelogyne cristata *Lindl.*

The flowering period is March to April. It is found in Longleng, Longwa, Chare and Longkhum.

Coelogyne flaccida *Lindl.*

The flowering period is March to April. It is found in Japfii range, Tuensang, Phek and Pfutsero.

Coelogyne fuscescens *Lind.*

The flowering period is from October to December. It is found in Japfii range, Viswema, Chentang and Hellipong.

Coelogyne griffithii *HK. f.*

The flowering period is from April to May. It is found in Mokokchung, Changtongya,

Longjang and Chare.

Coelogyne hitendrae *Das & Jain Orch, Rev. 1978.*

The flowering period is from Aprl to May. It is found in Sangsangyu, Pangsa, Noklak, Chesore and Samator.

Coelogyne longipes *Lindl.*

The flowering period is March to May and is found in Longwa.

Coelogyne micrantha *Lindl.*

The flowering period is February to march. It is found in Chentang, Hellipong and Japfii range.

Coelogyne nitida *(Wall. ex Don) Lindl.*

The flowering period is form May to June. It is found in Japfii range, Pfutsero and Phek.

Coelogyne occultata *Hk. f.*

The flowering period is from June to July. It is found in Japfii range and Pfutsero.

Coelogyne ovalis *Lindl.*

The flowering period is from October to November. It is found in Viswema, Khonoma and Chentang.

Coelogyne prolifera *Lindl.*

The flowering period is from March to April. It is found in Chentang and Phek.

Coelogyne punctulata *Lindl.*

The flowering period is from January to February. It is found in Japfii range, Hellipong and Saramati.

Coelogyne raizada *Jain & Das proc. Ind. Acad. sci. 1978.*

The flowering period is from May to June. It is found in Japfii range, Saramati, Sangsangyu and Pangsa.

Coelogyne rigida *Par & reichb. F.*

The flowering period is June to July. It is found in Tuensang and Hellipong.

Coelogyne schultesii *Jain & Das 1978.*

It blooms in the month of May to June. It is found in Wokha and Sanis.

Coelogyne stricta *(D. Don) Schltr.*

The flowering period is from May to June. It is found in Viswema, Kohima and Tseminyu.

Coelogyne viscosa *Rchb. f.*

The flowering period is in January to February. It is found in Longwa and Longkhum.

Corymborkis veratrifolia *Bl.*

The flowering period is March to May. It is found in Intangki, Rangapahar and Medziphema.

Cremastra wallichiana *Lindl.*

The flowering period is from the month of April to May.

Crytochilus lutea *Lindl.*

The flowering period is from the month of May to June. It is found in Kohima, Pfutsero and Hellipong.

Crytochilus sanguineus *Wall.*

The flowering period is June to August. It is found in Japfii range, Pfutsero, Phek, Hellipong, Chentang and Wokha.

Cymbidium aloifolium *(L.) Sw.*

The flowering period is April to May. It is found in Intangki, Rangapahar, Tsurang, Saring, Tuli, Tezit and Namsa.

Cymbidium cochleare *Lindl.*

The flowering period is from October to November. It is found in Japfii range, Pfutsero, Hellipong and Chentang.

Cymbidium devonianum *Paxt.*

The flowering season is from May to June. It is found in Saramati and Hellipong.

Cymbidium elegans *Lindl.*

The flowering period is from October to November. It is found in Japfii range, Phek and Pesao.

Cymbidium ensifolium *(L.) Sw.*

The flowering period is from November to December. It is found in Japfii range,

Pfutsero, Hellipong, Longtok and Chentang.

Cymbidium eburneum *Lindl.*

The flowering period is from March to April. It is found in Viswema, Japfii range, Noklak, Pangsa and Pesao.

Cymbidium iridioides *D. Don*

The flowering period is from October to November. It is found in Japfii range, Hellipong, Chentang, Sangsangyu and Saramati.

Cymbidium lancifolium *Hook.*

The flowering period is from June to July. It is found in Hellipong, Longtok and Chentang.

Cymbidium longifolium *D. Don*

The flowering period is September to October. It is found in Japfii range, Saramati and Hellipong.

Cymbidium lowianum *Rchb. f.*

TThe flowering period is from April to May. It is found in Chentang, Hellipong and Japfii range.

Cymbidium macrorhizon *Lindl.*

The flowering period is from June to July. It is found in Meinkong, Phek, Kohima and Viswema.

Cymbidium mastersii *Griff. ex Lindl.*

The flowering period is from October to November. It is found in Viswema and Peren.

Cymbidium pendulum *SW. Syn. C. aloifolium*

The flowering period is from April to May. It is found in Saring, Tuli, Namsa and Naginimora.

Cymbidium tigrinum *par.*

The flowering period is April. It is found in Japfii range, Viswema, Pfutsero and Saramati.

Cymbidium tracyanum *Rolfe.*

The flowering period is from October to November. It is found in Chentang, Sangsangyu and Hellipong.

Dendrobium acinaciforme *Roxb.*

The flowering period is from June to July. It is found in Medziphema, Tuli, Mon, Tezit, Saring, Aonokpho and Tsurang.

Dendrobium anceps *Sw.*

The flowering period is from April to May. It is found in Pangsa, Tobou, Peren, and Jaluke.

Dendrobium aphyllum *(R. Br.) C. E. C. Fischer.*

The flowering period is from April to May. It is found in Dzuja, Jaluke, Sanis and Doyang.

Dendrobium aurum *Lindl. Syn. = D. heterocarpum*

The flowering period is from April to May. It is found in Chare, Changtongya, Sanis and Akuluto.

Dendrobium bensoniae *Rchb. f.*

The flowering period is from May to June. It is found in Kohima, Wazeho, Khepri and Samator.

Dendrobium bicameratum *Lindl.*

The flowering season is from the month of August to September. It is found in Doyang, Jaluke and Chare.

Dendrobium candidum *Wall. ex Lindl.*

The flowering period is from April to May. It is found in Saramati, Japfii range and Phek.

Dendrobium chrysanthum *Wall. ex Lindl.*

The flowering period is from September to October. It is found in Wokha, Mokokchung, Longkhum and Changki.

Dendrobium chrysotoxum *Lindl.*

The flowering period is from April to May. It is found in Jaluki, Medziphema, Dzuja, Changki, Changtongya, Longleng and Akuluto.

Dendrobium crepidatum *Lindl.*

The flowering period is from March to May. It is found in Peren and Phek.

Dendrobium densiflorum *Wall.*

The flowering period is April to May. It is found in Longkhum, Noklak, Longsa, Longkhum, Changki, Changtongya, Longleng, Peren, Doyang and Longwa.

Dendrobium denudans *D. Don*

The flowering period is from September to October. It is found in Pesao and Changlangshu.

Dendrobium devonianum *Paxt.*

The flowering period is from May to June. It is found in Viswema, Peren, Pfutsero, Noklak, Tuensang and Changki.

Dendrobium eriaeflorum *Griif*

The flowering period is from September to October. It is found in Viswema and Phek.

Dendrobium falconeri *Hook*

The flowering period is from May to June. It is found in Japfii range, Dziikou, Longtok and Pangsa.

Dendrobium farmeri *Paxt*

The flowering period is April to May. It is found in Longsa, Akuluto and Chesore.

Dendrobium fimbriatum *Lindl. Var. oculatum Hook*

The flowering period is from April to May. It is found in Dzuja, Tseminyu, Peren, Mokokchung, Longkhum and Wokha.

Dendrobium formosum *Roxb.*

The flowering period is from May to June. It is found in Viswema, Japfu range and Peren.

Dendrobium gibsonii *Lindl.*

The flowering period is from July to August. It is found in Mokokchung, Chare, Changki, Tobou and Dzuja.

Dendrobium heterocarpum *Wall. ex Lindl. = Var. – D. aurum*

The flowering period is April. It is found in Longkhum, Tuensang, Japfii range and Viswema.

Dendrobium hookerianum *Lindl.*

The flowering period is from April to May. It is found in Dzuja, Jaluki, Longjang, Doyang, Mon and Tezit.

Dendrobium infundibulum *Lindl.*

The flowering period is from April to May. It is found in Hellipong, Tuensang, Kohima and Mokokchung.

Dendrobium jenkinsii *Wall. es Lindl.*

The flowering period is from April to May. It is found in Saramati range, Phek and Changlangshu.

Dendrobium lindleyi *Steud.*

The flowering period is from February to March. It is found in Kohima, Mokokchung, Tuensang, Wokha and Zenheboto.

Dendrobium longicornu *Lindl.*

The flowering period is from October to November. It is found in Japfii range, Chentang, Hellipong, Saramati and Pesao.

Dendrobium moschatum *Sw.*

The flowering period is from May to June. It is found in Kiphire, Longkhum, Longkhum and Wokha.

Dendrobium nobile *Lindl.*

The flowering period is from April to May. It is found in Peren, Phek, Kiphire and Noklak.

Dendrobium ochreatum *Wall. ex Lindl.*

The flowering period is from April to May. It is found in Viswema, Kohima, Phek, Mokokchung, Tuensang and Wokha.

Dendrobium porphyrochilum *Lindl.*

The flowering period is from September to October. It is found in Chentang, Noklak and Samator.

Dendrobium primulinum *Lindl.*

The flowering period is from March to April. It is found In Dzuja, Peren, Phek,

Changki, Longjang, Chare and Akuluto.

Dendrobium pulchellum Roxb. ex Lindl.

The flowering period is from April to May. It is found in Changlangshu, Pangsa, Saramati, Peren and Viswema.

Dendrobium sp. (Under investigation).

The flowering period is from September to November. It is found in Tuensang and Tobou.

Dendrobium stuposum Lindl.

The flowering period is from June to July. It is found in Noklak, Pangsa, Meluri and Wazeho.

Dendrobium terminale Par. & Rchb. f.

The flowering season is from September to October. It is found in Jaluke, Peren and Phek.

Dendrobium thysiflorum Rchb. f.

The flowering period is from April to May. It is found in Longkhum, Tobou, Chare, Longsa, Longkhum and Changki.

Dendrobium transparens Wall. ex Lindl.

The flowering period is from April to May. It is found in Viswema, Phek, Peren and Samator.

Dendrobium wardianum Warner.

The flowering period is from April to May. It is found in Japfii range, Peren and Pfutsero.

Dendrobium williamsonnii Day & Rchb. f.

The flowering period is from March to April. It is found in Viswema, Peren, Pangsa, Saramati and Noklak.

Diplomeris hirsute (Lindl.) Lindl.

The flowering period is from June to August. It is found in Dziikou, Japfii range and Saramati range.

Diplomeris pulchella D. Don

The flowering period is from August to November. It is found in Japfii peak and Saramati peak.

Diplopora championii (Lindl.) Hk. f.

The flowering period is from July to August. It is found in Jaluke, Peren and Phek.

Epigeneium amplum (Lindl.) Summerh.

The flowering period is from the month of from October to November. It is found in Kohima, Mokokchung, Tuensang and Akuluto.

Epigeneium fuscescens (Griff.) summerh.

The flowering period is from October to November. It is found in Phek, Tuensang and Samator.

Epigeneium rotundatum (Lindl.) summerh.

The flowering period is from April to May. It is found in Pfutsero, Viswema, Chentang, Pangsa and Saramati.

Eria acervata Lindl.

The flowering period is June to July. It is found in Jaluki, Medziphema, Mon and Tezit.

Eria alba Lindl.

The flowering period is from June to July. It is found in Noklak, Pangsa, Chentang and Samator.

Eria amica Rchb. f.

The flowering period is April. It is found in Kiphire, Meluri and Mon.

Eria bambusifolia Lindl.

The flowering period is from December to February. It is found in Chentang and Japfii range.

Eria biflora Griff.

The flowering period is from August to September. It is found in Chentang and Tuensang.

Eria bractescens Lindl.

The flowering period is from the month of April to May. It is found in Medziphema, Aonokpho, Mangkolemba and Doyang.

Eria coronaria *Rchb. f.*
The flowering period is from October to November. It is found in Japfii, Phek, Viswema and Dziilake.
Eria dasyphylla *Par. & Rchb. f.*
The flowering period is from May to June. It is found in Jaluki, Medziphema, Changtongya and Mangkolemba.
Eria excavata *Lindl. ex Hk. f.*
The flowering period is from June to July. It is found in Viswema, Khonoma and Chentang.
Eria graminifolia *Lindl.*
The flowering period is from July to August. It is found in Japfii range, Pfutsero and Saramati.
Eria muscicola *Lindl.*
The flowering period is from August to September. It is found in Kohima and Pfutsero.
Eria paniculata *Lindl.*
The flowering period is from February to March. It is found in Peren, Viswema and Pfutsero.
Eria pannea *Lindl.*
The flowering period is from April to May. It is found in Pangsa and Pesao.
Eria spicata *(D. Don) Handel – Mazz*
The flowering period is from July to August. It is found in Viswema, Tseminyu, Dzuja, Khonama, Mokokchung, Wokha and Longkhim.
Eria stricta *Lindl.*
The flowering period is from December to February. It is found in Peren, Phek and Saramati range.
Eria vittata *Lindl.*
The flowering period is from March to April. It is found in Japfu range, Viswema, Chentang and Longkhim.
Eulophia bicallosa *(D. Don) P.F. Hunt & Summerh.*
The flowering period is from March to April. It is found in Intangki and Merapani.
Eulophia graminea *Lindl.*
The flowering period is from March to April. It is found in Meluri and Wazeho.
Eulophia nuda *Lindl.*
The flowering period is from June to July. It is found in Namsa, Naginimora and Saring.
Flickingeria fimbriata *A.d. Hwakes*
The flowering period is from May to July. It is found in Longjang, changki and Medziphema.
Flickingeria fugax *(Rchb.f.) Seidenf.*
It blooms in the month of May. It is found in Peren, Noklak and Chesore.
Galeola falçoneri *Hook.f.*
The flowering period is from July to August. It is found in Peren, Longkhim and Zunheboto.
Galeola lindleyana *Rchb.f.*
The flowering period is from July to August. It is found in Japfu range, Dzulake, Sangsangyu, Chentang and Hellipong.
Gastrochilus acutifolium *(Lindl.) Kze.*
The flowering period is from November to Decemer. It is found in Longkhim, Meinkong and Phek.
Gastrochilus calceolaris *Don*
The flowering period is from March to April. It is found in Japfu range, Hellipong, Saramati and Pfutsero.
Gastrochilus distichus *(Lindl.) Kze.*
The flowering period is from January to February. It is found is Viswema, Pangsa and Noklak.
Gastrochilus inconspicuum *(Hk.f.) Seidenf.*
The flowering period is from June to July. It is found in Rangpahar and Merapani.
Gastrochilus pseudodistichus *(K. & P.) Seidenf.*

The flowering period is from September to October. It is found in eren, Phek and Meinkong.

Geodorum densiflorum *(Laur.) Schltr.*
The flowering period is from June to July. It is found in Japfu range and Dzukou.

Goodyera foliosa *Benth.*
The flowering period is from September to October. It is found in Hellipong and Dzukou.

Goodyera fusca *(Lindl.) Hk. f.*
The flowering period is from August to September. It is found Dzulake and Pfutsero.

Goodyera hispida *Lindl.*
The flowering period is in September. It is found in Japfu range and Saramati.

Goodyera procera *(Ker.) Hook.*
The flowering period is from April to May. It is found in Dzukou.

Goodyera repens *(Ker – Gaw.) Hook.*
The flowering period is in May. It is found in Japfu range.

Goodyera schlechtendaliana *Rchb.f.*
The flowering period is from October to November. It is found in Chentang and Kohima.

Goodyera secundiflora *(Groff.) Lindl.*
The flowering period is from October to November. It is found in Japfu range, Chentang and Sangsangyu.

Goodyera viridiflora *(Bl.) Bl.*
The flowering period is from July to August. It is found in Meinkong, Longkhum and Longkhim.

Habenaria acuifera *Wall.*
The flowering period is from July to August. It is found in Phek, Dzuja and Peren.

Habenaria dentata *(SW) Schltr.*
The flowering period is from August to September. It is found in Phek ad Viswema.

Habenaria ensifolia *Lindl.*
The flowering period is from July to august. It is found in Pfutsero and Japfu range.

Habenaria furcifera *Lindl.*
The flowering period is from July to Augus. It is found in Japfu range, Dzukou, Dzulake, Longkhim, Longkhum and Meinkong.

Habenaria intermedia *D. Don*
The flowering period is from July to August. It is found in Chentang, Sangsangyu and Pesao.

Habenaria malleifera *Hk.f.*
The flowering period is from August to September. It is found in Doyang, Wokha and Chare.

Habenaria pactinata *(Var. arienata) Hook.f.*
The flowering period is from July to August. It is found in Japfu range and Saramati.

Habenaria stenopetala *Lindl.*
The flowering period is from August to September. It is found in Pfutsero, Longkhim and Helipong.

Herminium lanceum *(Thumb. Ex Sw.) Vuijk.*
The flowering period is from July to August. It is found in Kohima, Viswema and Longkhim.

Herminium macrophyllum *(D. Don) Dandy.*
The flowering period is fom July to August. It is found in Chentang and Yako.

Herminium monorchis *(L.) R.Br.*
The flowering period is from July to August. It is found in Japfu and Dzukou.

Hetaeria rubens *(Lindl.) Benth. Ex Hook.f.*
The flowering period is from December to January. It is found in Viswema and Dzulake.

Hygrochilus parishii *(Veitch. Rchb.f.) Pfitz.*
The flowering period is from the end of May to June. It is found in Viswema and Pfutsero.

Kingidium deliciosum *(Rchb.f.) Sweet.*

The flowering period is from July to August. It is found in Tuensang and Phek.

Kingidium taenialis (Lindl.) Hunt.

The flowering period is from May to June. It is found in Kiphere, Kohima and Dzulake.

Liparis assamica King and Pantl.

The flowering period is from October to November. It is found Tsurang, Tobou, Mon and Medziphea.

Liparis bistriate Par. & Reichb. f.

The flowering period is from July to August. It is found in Changlangshu and Pesao.

Liparis bituberculata (Hook.f.) Lindl.

The flowering period is from May to June. It is found in Japfu range, Chentang and Sangsangyu.

Liparis bootanensis Griif.

The flowering period is in the month of August. It is found in Japfu range, Dzulake and Peren.

Liparis caespitosa (Lam.) Lindl.

The flowering period is from July to August. It is found in Dzulake and Hellipong.

Liparis cordifolia Kook.f.

The flowering period is from September to October. It is found in Puliebadze, Viswema and Japfu range.

Liparis delicatula Hook.f.

The flowering period is from August to September. It is found in Dzulake and Peren.

Liparis distans Clarke.

The flowering period is from October to November. It is found in Japfu range and Pfutsero.

Liparis longipes Lindl.

The flowering period is from October to November. It is found in Japfu range.

Liparis nervosa (Thumb) Lindl.

The flowering period is from July to August. It is found in Noklak and Chentang.

Liparis odorata (Willd.) Lindl.

The flowering period is from July to August. It is found in Dzuja and Wokha.

Liparis pardoxa (Lindl.) Rchb.f.

The flowering period is from July to August. It is found Pangsa and Noklak.

Liparis petiola (D. Don) P.F. Hunt & Summerh.

The flowering period is in May. It is found in Japfu range, Viswema and Kohima.

Liparis plantaginea Lindl.

The flowering period is from June to July. It is found in Japfu range.

Liparis platyrachis Hk.f.

The flowering period is during August. It is found in Dzulake and Saramati.

Liparis pulchella Hook.f.

The flowering period is from June to August. It is found in Kohima, Tsemenyu, Wokha and Tuensang.

Liparis resupinata Ridley

The flowering period is from October to November. It is found in Chesore and Hellipong.

Liparis viridiflora (Bl.) Lindl.

The flowering period is from October to November. It is found in Chare and Noklak.

Luisia inconspicua (Wall. ex Hook.f.) K. & P.

The flowering period is from June to July. It is found in Jaluke, Longleng and Doyang.

Luisia prachystachys (Lindl.) Bl.

The flowering period is from March to April. It is found in Pfutsero, Phek and Changtongya.

Luisia teretifolia Gaud

The flowering period is from May to June. It is found in Naginimora and Namsa.

Luisia trichorhiza (Hook) Bl.

The flowering period is from March to April. It is found in Viswema and Pfutsero.

Luisia zeylanica Lindl.

The flowering period is fro March to April. It is found in Viswema and Japfu range.

Malaxis acuminata D. Don

The flowering period is from May to June. It is found in Puliebadze and Jakhama.
Malaxis biaurita *(Lindl.) O. Kze.*
The flowering period is from July to August. It is found in Chesore, Longtok and Hellipong.
Malaxis cylindroatachya *(Lindl.) O. Kze.*
The flowering period is from July to August. It is found in Longsa and Wokha.
Malaxis jopsephiana *(Reichb.f.) Kze.*
The flowering period is from May to june. It is found in Japfu and Puliebadze.
Malaxis khasiana *the flowering period is from June to July. It is found in Phek.*
Malaxis latifilia *Sm.*
The flowering period is from June to July. It is found in Mokokchung and Longkhim.
Micropera manni *(Hook.f.) Tang & Wang.*
The flowering period is from June to July. It is found in Peren and Phek.
Micropera rostrata *(Roxb.) Balak.*
The flowering period is from May to June. It is found in Kohima, Piphema and Phek.
Monomera barbata *Lindl.*
The flowerinf period is in February. It is found in Tuli, Saring and Mangkolemba.
Neogyne gardneriana *(Lindl.) Rchb.f. ex Pfitz.*
The flowering period is from October to November. It is found in Chentang, Chesore and Hellipong.
Neotianthe secundiflora *(Hook.f.) Schltr.*
The flowering period is from august to September. It is found in Dzukou, Japfu and Saramati.
Neottia *Lindl.*
The flowering period is from July to September. It is found in Dzukou and Saramati.
Nephalaphyllum cordifolium *(Lindl.) Lindl.*
The flowering period is from June to July. It is found in Peren, Dzulake and Phek.
Nervilia aragoana *Gaud.*
The flowering period is from June to July. It is found in Pangsa and Noklak.
Nervilia prainiana *(King & Pantl.) Seidenf.*
The flowering period is from May to June. It is found in Dzukou.
Oberonia acaulis *Griff.*
The flowering period is from October to December. It is found in Peren, Viswema, Longkhum and Wokha.
Oberonia clarkel *Hook.f.*
The flowering period is in October. It is found in Changtongya, Mokokchung and Zubza.
Oberonia ensiformis *(Sm. Ex Rees) Lindl.*
The flowering period is in November. It is found in Peren, Tseminyu and Meinkong.
Oberonia griffithiana *Lindl.*
The flowering period is from March to June. It is found in Longkhum and Wokha.
Oberonia iridifolia *(Roxb.) Lindl.*
The flowering period is from September to November. It is found in Kohima, Tuensang and Mokokchung.
Oberonia longlabris *King & Pantl.*
The flowering period is from July to September. It is found in Meinkong, Japfu range and Akuluto.
Oberonia mannii *Hook.f.*
The flowering period is from June to July. It is found in Kohima ad Viswema.
Oberonia micrantha *King & Pantl.*
The flowering period is from July to August. It is found inViswema and Dzulake.
Oberonia obcordata *Lindl.*
The flowering period is from July to August. It is found I Kohima, Peren and Piphema.
Oberonia orbicularis *Hk.f.*
The flowering period is from November to December. It is found in Mokokchung, Kohima nad Tseminyu.
Oberonia pachyrachis *Rchb.f. ex Hk.f.*
The flowering period is from August to September. It is found in Viswema, Kohima

and Wokha.

***Oberonia pyrulifera** Lind.*

The flowering period is from September to October. It is found in Longkhum, Mokokchung and Meinkong.

***Oberonia recurva** Lindl.*

The flowering period is from July to August. It is found in Longkhum and Meinkong.

***Oreochis foliosa** (Lindl.) Limdl.*

The flowering period is from June to July. It is found in meinkong, Longkhum and Wokha.

***Ornithochilus difformis** (Wall. ex. Lindl.) Schit.*

The flowering period is from June to July. It is found in Viswema and Pfutsero

***Otochilus alba** Lindl.*

The flowering period is in June. It is found in Japfu range, Noklak and Chentang.

***Otochilus fusca** Lindl.*

The flowering period is from November to December. It is found in Nolak. Kohoma, Chare and Chentang.

***Otochilus lancilabius** Seidenf.*

The flowering period is from October to January. It is found in Japsu range, Noklak and Phek.

***Pachystoma senile** (Lindl.) Rchb.f.*

The flowering period is from March to April. It is found in Phek and Peren.

***Panasia uniflora** (Lindl.) Lindl.*

The flowering period is form April to May. It is found in Tseminyu and Viswema.

***Paphiopedilum hirsitussimum** (Lindl.) Stein*

The flowering period is from April to May. It is found in Japfu range.

***Paphiopedilum insigne** (Wall. ex lindl.) Pfitz.*

The flowering period is from October to December. It is found in Noklak and Sangsangyu.

***Paplionathe longicornu** (Lindl.) Garay.*

The flowering period is in September. It is found in Viswema, Peren and Phek

***Paplionathe teres** (Rox.) Schltr.*

The flowering period is from February toarch. It is found in Dzuja, Medziphema, Peren, Changtongya, Anokpho and Changki.

***Pecteilis gigantea** (J.E. Sm.) Rafin.*

The flowering period is from September to October. It is found in Longkhim and Japfu.

***Pecteilis susannae** (L.) Rafin.*

The flowering period is from July to August. It is found in Japfu range, Dzulaki and Peren.

***Pelathanthera insectifera** (Rchb.f.) Ridl.*

The flowering period is from August to September. It is found in Medziphema Doyang, Wazeho and Tizit.

***Peristylus affinis** (D. Don) Waidenf.*

The flowering period is from uly to August. It is found in Dzukou, Japfu and Yakko.

***Peristylus chloranthus** Lindl.*

The flowering period is from July to August. It is found in Longkhim and Chare.

***Peristylus constrictus** (Lindl.) Lindl.*

The flowering period is from July to August. It is found in Changlangshu and Pesao.

***Peristylus densus** (Lindl.) Sant. & Kapad.*

The flowering period is from July to August. It is found in Tobou, Pesao and Noklak.

***Peristylus fallax** Lindl.*

The flowering period is from July to August. It is found in Dzukou and Japfu range.

***Peristylus godyeroides** (D. Don.) Lindl.*

The flowering period is from July to August. It is found in Dzukou and Pfutsero.

***Peristylus mannii** (Reichb. f.) Mukherjee*

The flowering period is from July to August. It is found in Changlangshu and Sangsangyu.

***Peristylus prainii** (Hook.f.) Kranzl.*

The flowering period is from August to September. It is found in Noklak.

Phaius flabus (Bl.) Lindl.

The flowering period is from March to May. It is found in Chentang and Noklak

Phaius longipes (Hook.f.) Holtt.

The flowering period is in November. It is found in Tuensang and Chesore.

Phaius mishmensis Reichb.f.

The flowering period is from September to October. It is found in Chentang and Changlangshu.

Phaius tankervilliae (Aiton) Bl.

The flowering period is from April to June. It is found in Pfutsero, Japfu range, Chentang and Sangsangyu.

Pholidota articulata Lindl.

The flowering period is from June to July. It is found in Noklak, Chentang and Japfu range.

Pholidota calceolata Reichb.f.

The flowering period is from July to August. It is found in Japfu range, Viswema and Phek.

Pholidota convallariae (Reichb.f.) Hook.f.

The flowering period is from March to April. It is found in Chare, Longsa and Kiphire.

Pholidota griffithii Hook.f.

The flowering period is from July to August. It is found in Phek, Japu range and Chentang.

Pholidota imbricata (Roxb.) Lindl.

The flowering period is from May to June. It is found in Dzulake, Tseminyu nad Noklak.

Pholidota imbricata (Roxb.) Lindl. var **coriacea** Hook.f.

The flowering period is from June to September. It is found in Mokokchung and Longkhum.

Pholidota imbricata (Roxb.) Lindl. var **sessilis** Hook.f.

The flowering period is from May to June. It is found in Chare and Longsa.

Pholidota protracta Hk.f.

The flowering period is from October to November. It is found in Khonoma, Japfu range and Pfutsero.

Pholidota rubra Lindl.

The flowering period is from August to September. It is found in Phek and Peren.

Phreatia elegans Lindl.

The flowering period is from July to August. It is found in Viswema, Dzulake and Longkhim.

Platanthera arcuata Lindl.

The flowering period is during the month of June. It is found in Saramati peak and Japfu peak.

Platanthera stenantha (Hk.f.) Soo.

The flowering period is from July to August. It is found in Saramati peak and Japfu peak.

Pleione hookeriana (Lindl.) Moore.

The flowering period is from May to June. It is found in Kohima and Wokha.

Pleione humilis (Sm.) D. Don.

The flowering period is from February to March. It is found in Pfutsero.

Pleione maculata (Lindl.) Lindl.

The flowering period is from October to November. It is found in Longkhum and Meinkong.

Pleione praecox (Sm.) D. Don

The flowering period is in November. It is found in Kohima and Viswema.

Poneorchis chusa (D. Don) Soo.

The flowering period is from July to August. It is found in Saramati.

Pteroceras suaveolens (Roxb.) Holtt.

The flowering period is from March to April. It is found in Mangkolemba, Baghti, Mon and Tezit.

Renanthera imschootiana *Rolfe.*
The flowering period is in June. It is found in Phek, Viswema and Peren.
Rhynchostylis retusa *Bl.*
The flowering period is fro May to June. It is found in Mangkolemba, Tuli, Baghti, Sanis, Longjang and Kangtsung.
Robiquetia succisa *(Lindl.) Seidenf. & Garay*
The flowering period is from May to June. It is found in Merapani, Saring and Tsurang valley.
Satyrium nepalense *D. Don*
The flowering period is from September toOctober. It is found in Dzukou and Japfu.
Schoenorchis gemmata *(Lindl.) J.J. Sm.*
The flowering period is from June to July. It is found in Mon, Tezit, Wakching, Longwa and Chen.
Smitinandia micrantha *(Lindl.) Holtt.*
The flowering period is from June to July. It is found in Changki and Changtongya.
Spathoglottis ixiodes *Lindl.*
The flowering period is from July to August. It is found in Japfu range and Viswema.
Spathoglottis plicata *Bl.*
The flowering period is from June to September. It is found in Peren and Jaluki.
Spathoglottis pubescens *Lindl.*
The flowering period is from June to July. It is found in Viswema, Khonoma and Meinkong.
Spiranthes sinense *(Pers.) Ames.*
The flowering period is in June. It is found in Tseminyu, Viswema and Longkhim.
Sunipia bicolor *Lindl.*
The flowering period is from October to December. It is found in Dzulake, Pfutsero and Japfu range.
Sunipia candida *(Lindl.) Hunt.*
The flowering period is from May to June. It is found in Japfu range, Hellipong and Chentang.
Thelasis longifolia *Hk.f.*
The flowering period is from July to August. It is found in Dzulake and Noklak.
Taeniophyllum khasianum *Joseph and Yog.*
The flowering period is from May to June. It is found in Pfutsero and Viswema.
Thunia alba *(Lindl.) Reichb.f.*
The flowering period is from June to August. It is found in Longkhim, Tuensang, Noklak and Chesore.
Thunia marshalliana *Rchb.f.*
The flowering period is from June to August. It is found in Pfutsero, Viswema, Dzuja, Tseminyu and Chare.
Tropidia curculigoides *Lindl.*
The flowering period is from September to October. It is found in Doyang, Tuli and Medziphema
Tylostyles discolor *Hook.f.*
The flowering period is from February to March. It is found in Pfutsero and Dzuja.
Uncifera acuminata *Lindl.*
The flowering period is from August to September. It is found in Peren and Phek.
Uncifera obtusifolia *Lindl.*
The flowering period is from August to September. It is found in Viswema, Chentang and Hellipong.
Vanda alpina *Lindl.*
The flowering period is from June to July. It is found in Japfu rane, Hellipong and Changlangshu.
Vanda bicolor *Griff.*
The flowering period is from July to September. It is found in Phek, Peren and Viswema.
Vanda coerulea *Griff. Ex Lindl. Common name (Blue Vanda)*
The flowering period is from October to November. It is found in Kohima, Wokha,

Mokochung, Tuensang and Zunheboto.
***Vanda cristata** Wall. Ex Lindl.*
The flowering period is from March to April. It is found in Kiphire, Meluri and Chare.
***Vanda pumila** Hook.f.*
The flowering period is from May to June. It is found in Phek, Peren and Jaluke.
***Vanda tessellata** Roxb.) Hook. ex. G. Don*
The flowering period is from June to July. It is found in Intangki, Rangapahar and Jaluke.
***Vanda testacea** (Lindl.) Reichb.f.*
The flowering period is from Doyang, Merapani, Mangkolemba and Tuli.
***Vandopsis undulata** (Lindl.) Sm.*
The flowering period is from April to May. It is found in Pfutsero and Viswema.
Vandopsis vandarum
The flowering period is from February to March. It is found in Phek and Viswema.
***Yoania prainii** King & Pantl.*
The flowering period is from May to June. It is found in Mon, Medziphema, Naginimora and Rangapahar.
***Zeuxine abbreviata** (Lindl.) Hook.f.*
The flowering period is from August to September. It is found in Mon, Medziphema, Naginimora and Rangapahar.
***Zeuxine flava** (Lindl.) Trimen.*
The flowering period is from April to May. It is found in Japfu range and Pfutsero.
***Zeuxine goodyeroides** Lindl.*
The flowering period is from September to October. It is found in Chentang, Japfu range and Saramati range.
***Zeuxine gracilis** (Breda) Bl.*
The flowering period is from August to September. It is found in Chentang and Yakko.
***Zeuxine nervosa** (Lindl.) Trimen*
The flowering period is from March to April. It is found in Saramati.
***Zeuxine strateumatica** (Lindl.) Schltr.*
The flowering period is from December to January. It is found in Chentang and Hellipong.

(Source: Orchids of Nagaland, Sapuchangkija, Yogendra Kumar and P. B. Gurung. Forest dept. of Nagaland.)