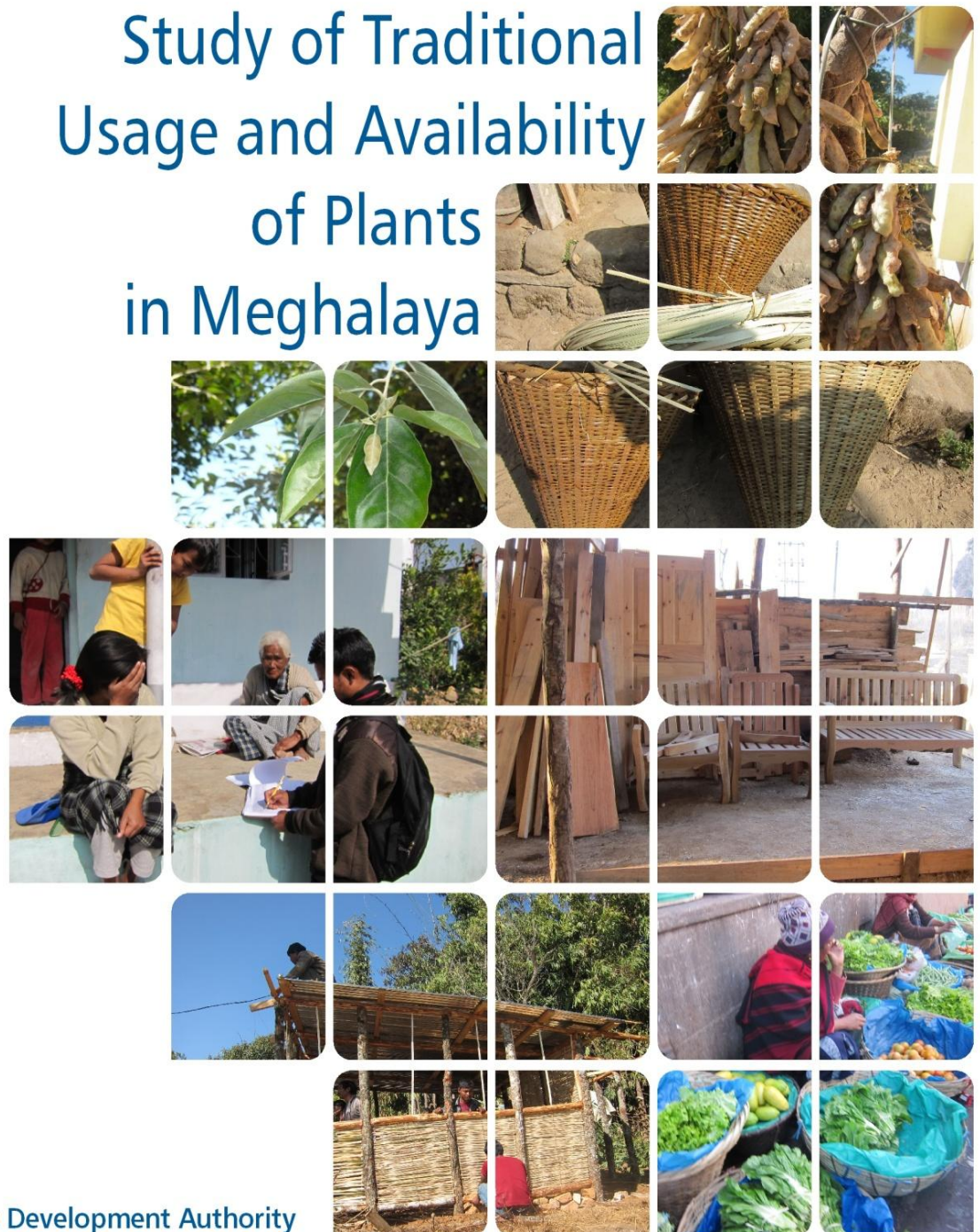


June 2014

Study of Traditional Usage and Availability of Plants in Meghalaya



Prepared for:

Meghalaya Basin Development Authority



Prepared by:

SENES Consultants India Pvt. Ltd.
&
ENDEV

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1 Introduction

1.1 PROJECT BACKGROUND

Meghalaya is situated between 25° North and 26°10' North latitude and 89°45' East and 92°45' East longitude and covers an area of ~22,429 sq. km. The present state of Meghalaya comprises of three predominant ethnic groups, the Garos, the Jaintias and the Khasis. The state is divided into 11 districts - East Khasi Hills, West Khasi Hills, South-West Khasi Hills, Ri- Bhoi, West Jaintia Hills, East Jaintia Hills, East Garo Hills, West Garo Hills, South-West Garo Hills, North Garo Hills and South Garo Hills.

Meghalaya ranks seventh amongst the Indian states in respect of percentage of geographical area under forest cover (42.30%). The forests of Meghalaya are rich in biodiversity and endowed with rare species of orchids and medicinal plants. The major forest types in Meghalaya are Subtropical Pine, Subtropical Broadleaf, Tropical Wet Evergreen, Tropical Semi-Evergreen, and Tropical Moist Deciduous Forests. Sacred groves mostly located in the Khasi and the Jaintia hills represent the climax vegetation of the area (Ministry of Environment and Forest 2001). This state forms part of the Indo-Burma hotspot and is rich in biodiversity. According to legal classification, reserved forests constitute 11.71%, protected forests 0.13% and other forests constitute 88.16% of the total forests of the State¹. The State Government has control over only 10% of the total forest which include the national parks, biosphere reserves and sanctuaries. The control of other forests areas mostly rests with the community, private individuals and the Autonomous District Councils, as per Schedule 6th of the Indian Constitution, providing special status to selected states of North-Eastern India including Meghalaya.

¹ State of Forest Report 2009

The indigenous people of the state – Khasi, Garo and Jaintia have utilized the vegetation in the forest for their subsistence from time immemorial. The inter generation passage of knowledge on the usage of the plants has been through oral rendition and informal training. Meghalaya is one of the few places in the country where vegetation has been so venerated that sacred groves have been assigned that have been barred from being totally utilized or partially utilized by the local inhabitants. The forests are nurtured close to the habitation and can be classified according to the traditional institutional arrangement and their intended use in **Table 1-1** (Thabah, RRBR, 2010, Tiwari et al,2010) .

Table 1-1: Classification of Forests as per Institutional arrangement

Forest Types	Local Nomenclature
Sacred Forests	Law Kyntang, Law Lyngdoh, Law Niam, Klhw u Blei
Village Supply Forest	Law Shnong
Village Restricted Forest	Law Adong
A group of Villagers/Community Land	Law Ri Raid
Associate of Villagers	Law Ri Seng
Clan Forest	Law Ri-Sumar, Law Lum Jingtep and Law Kur
Private Forests	Ri Kynti

The forests of Meghalaya provide both the timber and non-timber forest products (NTFPs) which are source of livelihood and income for the local people. Substantial quantities of NTFPs used for subsistence as well as cash income are extracted everyday from these forests. The indigenous people of the state have been utilizing the vegetation in the forest for their subsistence.

The rich forest resources of Meghalaya are degrading at a very fast rate because of unsustainable practices. The ever increasing population puts a tremendous pressure on the existing resources as more and more forest resources are being exploited to meet the demand of the growing population. Cultivation of plants has led to change in landuse where by land for cultivation has been increased by clearing natural vegetation. Selective cultivation and with the advent of industrialization the direct dependency on the wild for obtaining food, medicine, etc has reduced over the years.

This study was undertaken by SENES Consultants India Pvt. Ltd. in association with ENDEV- Society for Environment and Development on being assigned by Meghalaya Basin Development Authority to catalogue and chronicle the plants that have been used traditionally in households of the native people of the state.

1.2 OBJECTIVE OF THE STUDY

This study has been commissioned by Meghalaya Basin Development Authority (MBDA) with an objective to catalogue the plants that have been used traditionally in households of the local people, its availability and livelihood dependency of the local people. The study will provide the required baseline information for number of plants species used as food, medicines, fodder, fuel, decoration and furniture making by the local community. The study will also provide the information of availability of plant species in the wild, those are used for various purposes. The study will assist decision makers to draw up plan for sustainable uses of plants to offer a better the economic condition to the local people

1.3 SCOPE OF THE STUDY

The scope of the study is limited to 20 villages across the different agro-climatic zones of state. The scope of the study has been formulated in consultation with MBDA. The scope specifically includes undertaking of the following:

- Documenting the plant species used traditionally as edible plants, medicinal plants, fodder and medicinal plants for livestock, fuel wood, construction materials, and ornamental plants.
- Understanding community perspectives on availability of plant species in their locality;
- Assess the marketing potentiality of plants, those are collected by the villagers, through survey of market;
- Identify the plant species that can be cultivated or sustainably harvested from wild for livelihood purposes.

1.4 STRUCTURE OF THE REPORT

The report consists of six chapters. The report is structured as follows:

Chapter 1: Introduction

Chapter 2: Methodology

Chapter 3: Study area

Chapter 4: Profile of the study area

Chapter 5: Traditional uses of plants – Edible

Chapter 6: Traditional uses of plants – Fuel and firewood

Chapter 7: Traditional uses of plants – Fodder and Veterinary Medicine

Chapter 8: Traditional uses of plants – Medicines

Chapter 9: Traditional uses of plants – Building and Ornaments

Chapter 10: Livelihood opportunity – Market Survey

Chapter 11: A Road Map

Chapter 12: Conclusion

2 Methodology

This section discusses the detailed methodology undertaken to conduct this study.

2.1 PROJECT INITIATION

In order to develop a common understanding of the project's objectives and formulate a work plan, an inception meeting was held on 27th November 2013 at MBDA office, Meghalaya with MBDA project team. This was followed by meeting the local survey teams to develop an understanding the characteristics of agro-climatic zones and short listing the villages for survey. In the inception meeting, selection criteria for villages were discussed with the project team. SENES-ENDEV team finalized the 20 villages for primary survey in five agro-climatic zones in close consultation with project team on 16th December 2014 at MBDA office.

2.2 SELECTION OF VILLAGES

The villages were selected considering the (i) agro-climatic regions (ii) proximity to market and (iii) proximity to the natural forest/protected areas (wherever possible). The approach for selection has been discussed in detail.

2.2.1 Agro-climatic Zone

Meghalaya has eight distinct agro-climatic regions that are namely (Refer **Figure 2.1**):

1. Central Thermic Plateau with Temperate Climatic Regime
2. Central Thermic Plateau with Sub – Tropical Climatic Regime
3. Central Hyperthermic Plateau with Tropical Climatic Regime
4. Central Hyperthermic Plateau with Sub – Tropical Climatic Regime

5. Southern Slopes & Valleys (East) with Tropical Climatic Regime
6. Southern Slopes & Valleys (East) with Sub – Tropical Climatic Regime
7. Southern Slopes & Valleys (West) with Tropical Climatic Regime
8. Hills of Northern Slopes with Tropical Climatic Regime

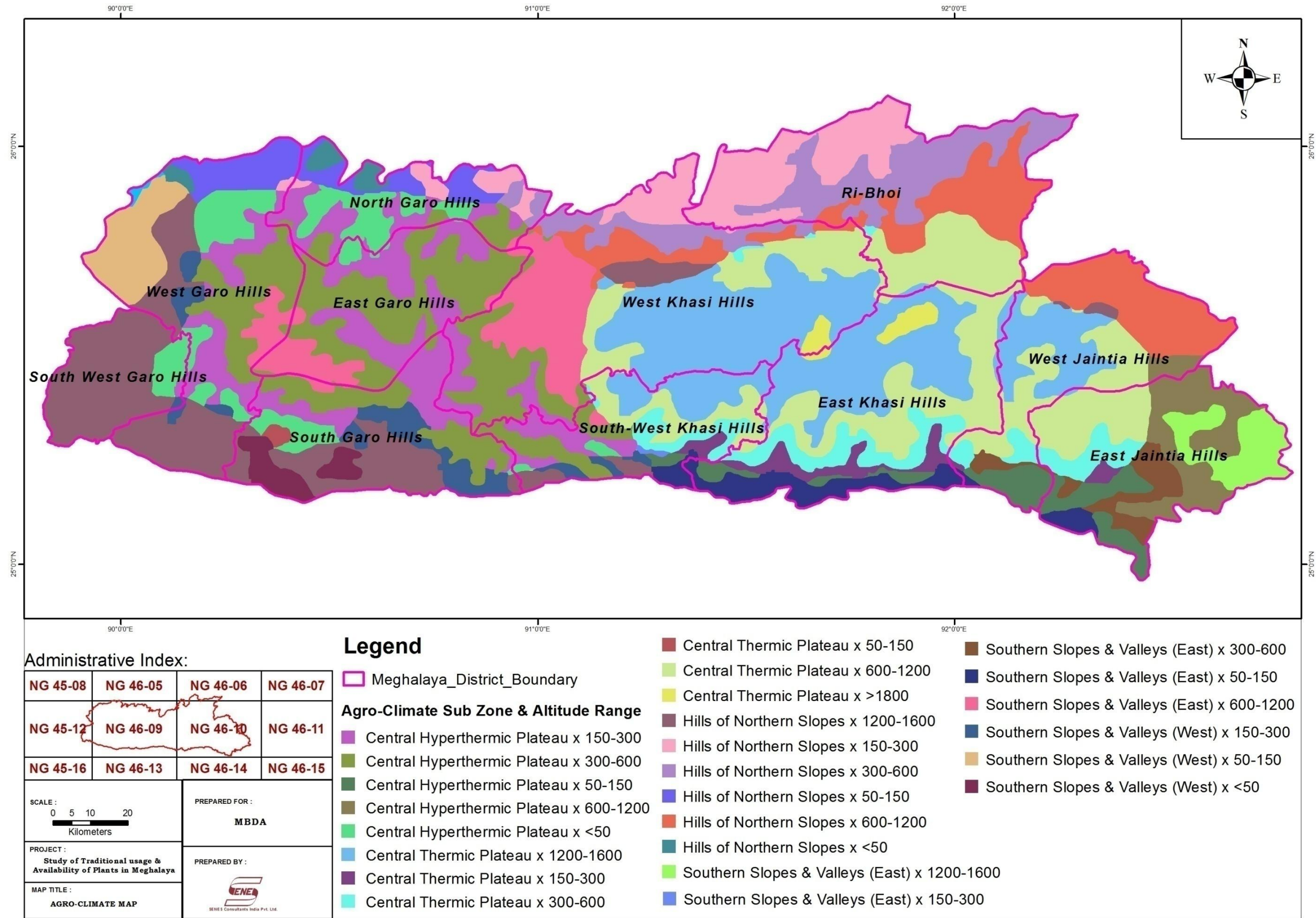
Altitude wise the agro-climatic regions can be further subdivided into 27 sub-zones as represented in **Table 2.1**. The agro-climatic zone with sub-zones is presented in **Figure 2.1**.

Table 2-1: Altitude-wise Agro-Climatic Zones in Meghalaya

Sl. No.	Agro-Climatic Sub-Zone	Altitudinal Range	Area (Sq. Km)
1.	Southern Slopes & Valleys (East)	150-300	355
2.	Southern Slopes & Valleys (East)	600-1200	625
3.	Southern Slopes & Valleys (East)	300-600	354
4.	Southern Slopes & Valleys (East)	50-150	450
5.	Southern Slopes & Valleys (East)	1200-1600	420
6.	Southern Slopes & Valleys (West)	150-300	430
7.	Southern Slopes & Valleys (West)	300-600	150
8.	Southern Slopes & Valleys (West)	<50	545
9.	Southern Slopes & Valleys (West)	50-150	1905
10.	Hills of Northern Slopes	150-300	655
11.	Hills of Northern Slopes	600-1200	1580
12.	Hills of Northern Slopes	300-600	1210
13.	Hills of Northern Slopes	<50	155
14.	Hills of Northern Slopes	50-150	575
15.	Hills of Northern Slopes	1200-1600	175

Sl. No.	Agro-Climatic Sub-Zone	Altitudinal Range	Area (Sq. Km)
16.	Central Thermic Plateau	150-300	325
17.	Central Thermic Plateau	600-1200	2730
18.	Central Thermic Plateau	300-600	695
19.	Central Thermic Plateau	50-150	55
20.	Central Thermic Plateau	1200-1600	2960
21.	Central Thermic Plateau	>1800	155
22.	Central Hyperthermic Plateau	150-300	1870
23.	Central Hyperthermic Plateau	600-1200	975
24.	Central Hyperthermic Plateau	300-600	2230
25.	Central Hyperthermic Plateau	<50	40
26.	Central Hyperthermic Plateau	50-150	790
27.	Central Hyperthermic Plateau	1200-1600	20

Figure 2-1: Agroclimatic Zones of Meghalaya



Since the scope of work is limited to 20 villages, hence five agro-climatic zones were selected for this study, presented in **Table 2.2**.

Table 2-2: Selected Agro-climatic Zones

Agro-climatic Zones	Altitude Range			
Southern Slopes and Valleys (East)	50 - 300 m	300-600 m	600-1200 m	1200-1600 m
Southern Slopes and valleys (West)	50 - 300 m	300-600 m	600-1200 m	1200-1600 m
Hills of Northern slopes	50 - 300 m	300-600 m	600-1200 m	1200-1600 m
Central Thermic Plateau	50 - 300 m	300-600 m	600-1200 m	1200-1600 m
Central Hyperthermic Plateau	50 - 300 m	300-600 m	600-1200 m	1200-1600 m

2.2.2 Markets

The study focuses on opportunities for commoditization of plants/plant products that would provide sustainable livelihood to the local people. Hence, the proximity to the market was a key factor to selection of villages. A list of prominent markets in Meghalaya has been given in **Table 2.3**.

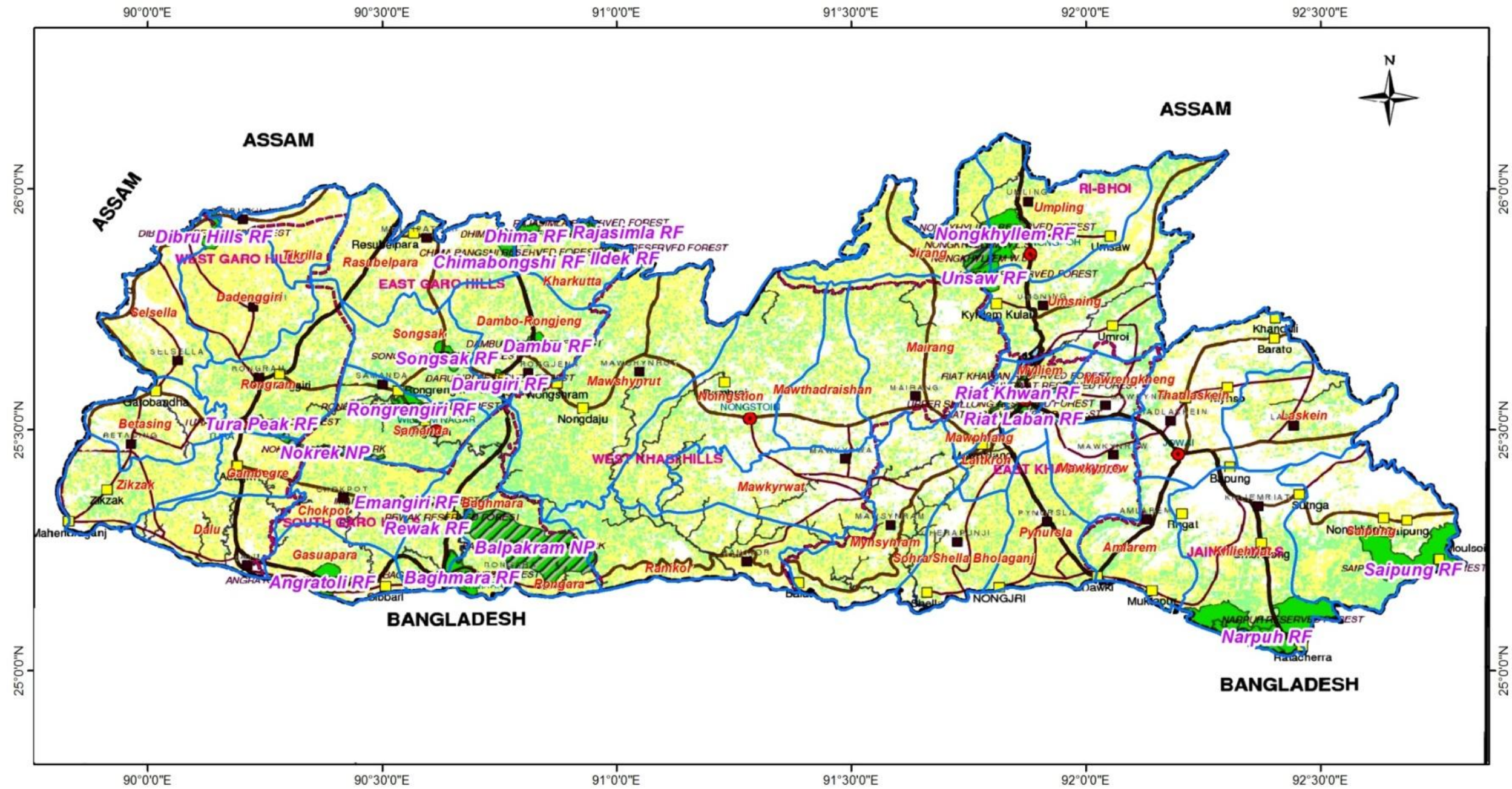
2.2.3 Reserve Forest & Wildlife Sanctuary

The selection of villages also considered the proximity of Reserve forest/protected areas, where the plant diversity is more than the other area and local people can collect plants and its part for different uses. The Reserve forest and protected forest in Meghalaya is presented **Figure 2.2**.

2.2.4 Selected Villages

Twenty villages were selected in 18 developmental blocks representing different agro-climatic zone, proximity to market and proximity to Reserve Forest/Protected area the state were selected. The selected villages for this study are presented in **Table 2.3** and **Figure 2.3**.

Figure 2-2: Reserve Forest and Protected Areas in Meghalaya

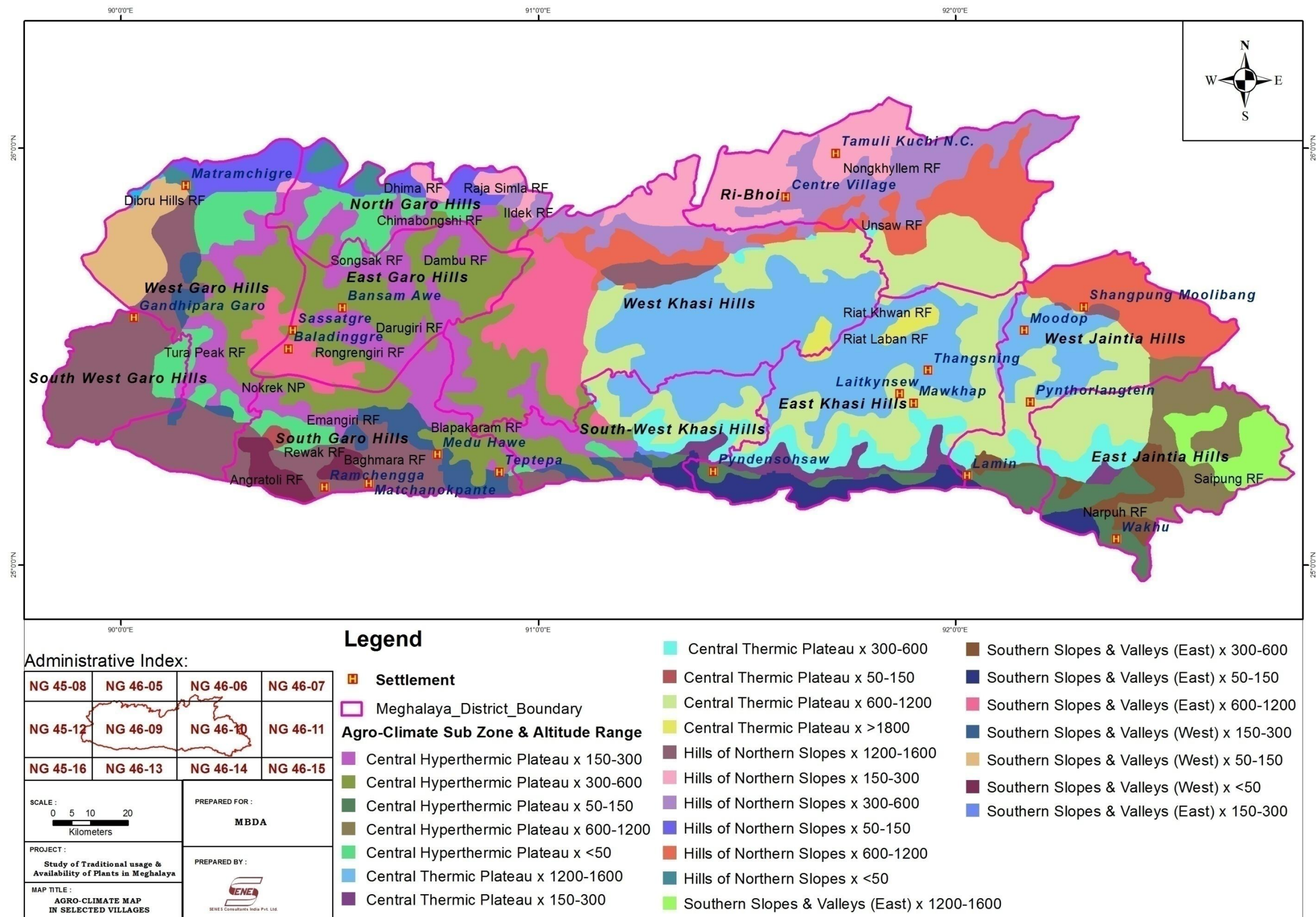


Administrative Index:		Legend <ul style="list-style-type: none"> ● DISTRICT HEADQUARTER ■ BLOCK HEADQUARTER □ TOWN --- STATE BOUNDARY - - - DISTRICT BOUNDARY == NATIONAL HIGHWAY == STATE HIGHWAY == DISTRICT ROAD □ MEGHALAYA BLOCK BOUNDARY □ BARAPANI RESERVIOR □ MAJOR RIVER ■ RESERVED & PROTECTED FOREST ▨ NATIONAL PARK & WILDLIFE SANCTUARY □ OPEN FOREST ■ DENSE FOREST 	SCALE : 0 15 30 60 Kilometers	PREPARED FOR : MBDA
NG 46-05	NG 46-06		PROJECT : Use & Availability of Traditional Plants Study in Meghalaya	PREPARED BY :  SENES Consultants India Pvt. Ltd.
NG 46-09	NG 46-10		MAP TITLE : WILDLIFE SANCTUARY MAP	

Table 2-3: Selected Villages

Agro-climatic Zone	Altitude	Market		Reserve forest/ protected Area		Selected Villages
		Name	Distance (km)	Name	Distance (km)	
Central Thermic Plateau	50 - 300 m	Garobodha	1.2			Gandhipara Garo
	300-600 m	Balat	7			Pyndensoshaw
	600-1200 m	Cherrapunjee	1			Laitkynsew
	1200-1600 m	Smit Market	3			Thansning
Hills of Northern Slope	50 - 300 m	Byrnihat	2			Tamulikuchi
	300-600 m	Patharkmah	3			Center Village
	600-1200 m	Umsning	3			Mawkhap
	1200-1600 m	Nartiang				Moodop
Central Hyperthermic Plateau	50 - 300 m	Samanda	5	Rongreggiri Reserve Forest,	<2	Bansam Awe
	300-600 m	Chibinang and Dadenggre	5	Dibru Hills Reserve Forest	<3	Matramchiggre
	600-1200 m	Tura	2	Nokrek Reserve Forest	<2	Baladinggre
	1200-1600 m	Rongram	5	Nokrek Reserve Forest	<4	Sassatgre
Southern Slopes & Valley (West)	50 - 300 m	Dumnikura	2			Ramchengga
	300-600 m	Mahadeo	4	Balpakram National Park	<2	Teptepa
	600-1200 m	Baghmara	2	Balpakram National Park	<1	Matchanokpante
	1200-1600 m	Rongra	2	Balpakram National Park	<1	Medu Hawe
Southern Slopes and Valley (East)	50 - 300 m	Umkiang				Wakhu
	300-600 m	Shangpung	1			Shangpoong Moolibang
	600-1200 m	Jowai	5			Pynthorlangtein
	1200-1600 m	Amlarem	1			Lamin

Figure 2-3: Selected Villages for the Study



2.3 DEVELOPMENT OF TOOLS FOR THE STUDY

To achieve the objective of the study, a sampling tool has been developed in the form of a questionnaire (**Annexure 1**) that will be targeted towards village head, household level, traditional healers and market sellers of different villages. It has been decided that on average 25% of household in each village will be surveyed and a minimum of 20 and a maximum of 50 households will be selected where the total number of household is less or more than 100.

2.4 TRAINING OF SURVEY TEAM

2.4.1 Survey Team

Two survey teams were selected comprising four people who are local and well conversant with the local language for conducting the survey. The sampling team was supervised by SENES-ENDEV team.

2.4.2 Training

A one-day classroom followed by on-the-field training program was organized for the purpose and the team was informed about the project, ethics of the survey activity and different aspects of the questionnaire.

2.5 PRIMARY SURVEYS

2.5.1 Community Head

Public consultations were held to collect general information about the village, major tribe/community, occupation, number of households, nearest forest & protected areas, community level conservation initiatives, market, dependency of wild plant resources, etc. 20 numbers of community level consultation was conducted in a structured format.

2.5.2 Household

A combination of basic socio-economic information and traditional uses of plants surveys were conducted in 479 households (25% of the total households of the selected villages) for obtaining a representative picture of the traditional uses of

plants and its availability in the state. Since village level household lists were not available, the survey was executed by selecting houses in each village through systematic random sampling following the right-hand rule.

The field survey was done during the month of January-February 2014 by using a structured questionnaire. The interviews of the selected households were done by personal visits to the households

Subsequently, the survey was executed using the field tested questionnaire and the field data was compiled in a database specifically designed for the purpose.

2.5.3 Market

Market survey was conducted to understand the plant or plant products from wild plants sold in the market, its source and selling price. The objective of this survey is to assess the opportunities for commoditization of plants/plant products that would provide sustainable livelihood to the local people. 10 markets were surveyed during the survey period.

2.5.4 Traditional Healers

Primary survey was also conducted among the traditional healers in the surveyed villages to gather information related to plant and plants parts used as a medicine, its availability, marketing opportunity, conservation and cultivation opportunity, etc. A total of 9 traditional healers were surveyed during this survey.

2.6 LITERATURE REVIEW

Ethnobotanical studies related to the flora of Meghalaya abound since 1980s (Rao and Neogi, 1980; Kharkhongor P and Joseph J, 1981; Rao, R.R., 1981; , Rao and Shanpru, 1981; Kumar et al 1987, Rao et al 1989; etc). These studies have primarily documented the flora and their uses in the region. The interest lay on the medicinal plants that are used from time immemorial by the ethnic groups of Jaintias, Garos and Khasis. These works have been primarily of documentation nature that further continued in the works of Dolui et al 2004; Kayang et al 2005; Kayang H, 2007; Sawaian et al 2007; Hynniewta and Kumar, 2008; Chhetri, 2010). Laloo et al (2006) and Tynsong et al (2007) and Barik et al attempted to an extensive study of medicinal plants (**Table 2.4**). Laloo et al., 2006 conducted a

comparative study of species richness of a disturbed and undisturbed sacred groves and further studied the population structure and regeneration potential of four selected species.

Tynsong et al., 2007 studied the diversity and distribution of the medicinal plants in the four agro-ecological zones of the state. It was a household based study with questionnaire in selected villages in each zone. The species richness of plants used as medicines across the four zones were obtained. Further, health practices, collection and processing, marketing and contribution to livelihood along with developments and conservation have been reported in this study.

Barik et al., 2009 has studied 25 villages across Khasi, Jaintia and Garo Hills extensively and documented the habit, the endemism, distribution of endemism, threat status, consumption pattern of medicinal plants used under traditional healing system.

A study by the Central Statistical Organization in 2008 has enumerated the plants collected from the wild, used for medicinal and edible purpose by the Khasis and Garos of Meghalaya.

All these studies have focused majorly either on medicinal or edible. There is a considerable void in information on plants used as fodder and medicine, building materials and ornamental plants that has been attempted in this study.

Table 2-4: Related Study in Meghalaya

Reference	Study Location	Mode of study	Type of plants	Type of Study
Dolui et al, 2004	East Khasi Hills and Jaintia	Folklores from local healers and user were studied	Medicinal	Plants and their parts during treatment along with the mode of use has been documented
Kayang et al, 2005	Khasi Hills	Survey through personal interviews	Medicinal	Documentation of plants along with their status and mode of utilization
Laloo et al, 2006	East and West Khasi Hills	Sampling by Quadrat method at Sacred Groves	Medicinal	Species richness was studied and population structure and regeneration potential of four species were studied

Reference	Study Location	Mode of study	Type of plants	Type of Study
Tynsong et al , 2007	Four agro-ecological zones	Household survey and Group discussion with villagers	Medicinal	Analyses the status of medicinal plants and suggests equitable utilization and management of these species.
Kayang, H, 2007	Khasi, Jaintia and Garo regions	Survey with local Tribals and Markets of villages and towns	Edible	Documentation of wild edible plants and their mode of utilization.
Sawain et al , 2007	Khasi region	Interviews with local people and marketers	Edible	Enumeration of 249 species of wild edible plants
Hynniewta and Kumar, 2007	Khasi and Jaintia region	Interviews with Village headmen, community leaders, priests and patients	Medicinal	Documentation of medicinal plants, mode of application and dosage of herbal drugs.
Barik et al, 2008	25 villages covering whole state	Interviews with villagers	Medicinal	Endemic medicinal plants were identified along with their threat status, consumption pattern
Central Statistical Organization	Khasi and Gari region	Secondary Literature	Medicinal and edible	Enumeration of plants collected from the wild
Chettri R.B, 2010	Khasi, Garo and Jaintia Hills	Interview with elderly people	Edible and Medicinal	Enumeration of ethnically domesticated plants along with habit, habitat and their utility.
Tiwari et al, 2010	South Garo Hills	Quadrat study, Interviews, FGDs	Edible and Medicinal	Traditional knowledge for plants, Forest diversity
Singh et al, 2012	Garo Hills	Intterviews	Edible	Documentation of wild edible plants and their mode of utilization.

2.7 LIMITATIONS OF THE STUDY

- This study covers only 20 villages to represent the different agro-climatic/ sub agro-climatic zones of the state and representing the traditional uses of plants and their availability.

- Household surveys have been limited to 25% of the village households that were selected from total household data as per 2011 census.
- Only 10 markets were surveyed by the survey team
- Only 9 traditional healers were surveyed by the team, and it was difficult to obtain sufficient information from them
- The scientific name of all the plants could not be determined through primary survey or secondary literature. As a result, the comparison between plants from different regions speaking different dialects like Garo, Khasi and Jaintia could not be worked out.

3 Study Area

Twenty villages in five agro-climatic zones were selected for this study. Brief description of the study area is discussed below:

3.1 CENTRAL THERMIC PLATEAU (CTP)

The agro-climatic region comprises of the East Khasi, West Khasi and Jaintia Hill districts. The agro-climate region is characterized by warm summer and cold winter belonging to semi temperate climate. The mean annual rainfall ranges from 2415 to 11418 mm. Pre dominant type of vegetation is pine forest.

Four villages selected in the Central Thermic Plateau. Brief description of these villages is provided in **Table 3.1**.

Table 3-1: Village Profile of Central Thermic Plateau

Village	Block	Profile
Gandhipara Garo	Betasing	This is a relocated village. In 1964 they shifted from Bangladesh due to war and Govt. gave them current area to settle. No community lands only homestead area. Homestead plantation- Areaca nut, bamboo, mango, jackfruit, segun.
Pyndensoshaw	Mawsynram	it was found that about 50% of the edible plants comes from inside and 50% of the edible plants used by the people in the village comes from outside
Laitkynsew	Shella- Bholaganj	Laitkynsew village belongs to Mairang-Nongkhlaw Syiemship. It was found that most of the local people are daily labourers, during winter season they sustain their livelihood by growing agricultural crops but in summer due to wet climatic condition only few agricultral crops can grow.

Village	Block	Profile
Thangsning	Mnawkynrew	During the survey it was found that most of the local people cultivate plants for their household requirements, where as few of them sell and supply outside the village. Since no conservation methods are adopted regarding the forest and plants, hence many traditional plants used by the local people are obtained from outside the village.

3.2 HILLS OF NORTHERN SLOPE (HNS)

The soils are generally shallow in the hill tops exposing numerous rocky outcrops & medium to deep along the slope and in the lowlands. The northern slope, the red soil is exposed, and with rain and wind, it erodes and covers everything. Agriculture is the mainstay of the people of the area. Principal agricultural Crops include Paddy, Potato, Maize, Sweet Potato, Yam & other Vegetables. Important horticulture crops are Sohphie bah (*Myrica nagi*), Sohphie nam (*M. farquhariana*, *M. esculenta*), Pear, Peach, Plum, Sohlyngdkhur (*Morus alba*), Himalayan cherry, Passion fruit, etc

The natural vegetation of the area is fairly poor due to tremendous biotic pressure such as recurring fire hazards, overgrazing & over exploitation of timber and fuel wood, particularly charcoal burning which has spelt a bane for the farmers of the area. The barren undulating topography of the area blended in a mosaic of rocky outcrop exposures where soil depth is very low to low with sandy soil texture bears testimony to this fact. As a result of these factors Pine (*Pinus kesiya*) has become the dominant tree species across landscapes. The primary vegetation of the area can be seen only on a few scattered pockets along depressions having good moisture concentration mostly on the northern aspects. The important tree species includes - *Quercus spp.* (Dieng sning, Dieng sai), *Castanopsis spp.* (Dingstap, Dieng sohot), *Schima khasiana*, (Dieng ngan) *Myrica nagi*, (Sohphie bah) *Myrica farquhariana*, (Sohphie nam) *Betula alnoides*, (Dieng lieng lieh) *Alnus napalensis*, (Dieng lieng iong) *Bucklandia populnea*, (Dieng doh)

Four villages selected in the Hills of Northern Slopes. Brief description of these villages is provided in **Table 3.2**.

Table 3-2: Village Profile of Hills of Northern Slopes

Village	Block	Profile
Tamuli Kuchi	Umling	It was found that most of the people are business man, daily labourers and factory workers. In this area pineapple and banana cultivation is abundant but is owned by the Khasis from Shillong. Tamulikuchi village belongs to Hima- Myllem Syiemship
Center Village	Jirang	It belongs to the Hima Raid (Jirang). Most of the local people cultivate kba-lum (khasi red rice). During the survey it was found that almost 100% of the plants (edible) used by the people comes from outside. Cultivation in this area decrease from time to time due to lack of awareness among the people whereby deforestation, forest fire and overgrazing increased day by day
Mawkhap	Umsning	The village belongs to Hima Myllem under Sardar Raid Mawthoh. Majority of the villages are cultivators and daily labourers
Moodup	Thadlashkein	The tribal people belong to Pnar tribe. Cultivation is done mostly for sying (ginger) and kba(rice).



Center Village



Moodup Village



Survey at Tamuli Kuchi village



Yrmi Khlaw collected at Mawkhap village

3.3 CENTRAL HYPERTHERMIC PLATEAU (CHP)

The agro-climatic region constitutes middle and lower plateau region falling in continuation with the Central Plateau and covers East and West Garo Hills and part of East and West Khasi Hills and Jaintia Hills districts. It is characterized by hot and moist summers and cool winters belonging to subtropical climate. The mean annual rainfall ranges from 2000 to 3362 mm. These soils are under grass land and forest, suitable for fruits and plantation crops.

Four villages selected in the Central Hyper-thermic Plateau. Brief description of these villages is provided in **Table 3.3**.

Table 3-3: Village Profile of Central Hyper-thermic Plateau

Village	Block	Profile
Bansam Awe	Samanda	SH is passing through this village. Homestead plantations in the village, major species are areca nut pineapple, bamboo, jackfruit, banana. Village reserve is around 100ha, collection of wild vegetables is allowed for the villagers. Bolsal, Segun and bamboo are the main species. Bolsal and Segun plantation was done by Social Forestry and then handed over to the village
Matramchiggre	Dadenggiri	Village is approximately 1km from NH. Community forest area/ Jhum fallow areas. This would be open and degraded forest area with main species being Cha'gro and Boldak and Parkram. Homestead plantation with

Village	Block	Profile
		bamboo, jackfruit etc. Dibru Hills Reserve Forest – adjoining the village. Mostly Segun (Teak) trees and Jalai. Dense forest but planted by Forest Department
Baladinggre	Rongram	NH is approximately 100 m from the village. The nearest market is Ringrey -around 0.5km. Homestead area with arecanut, coconut, jackfruit and some other species. Tura peak forest is less than 0.5 km from village – The forest is moderately dense comprising mostly natural indigenous species like Bolchim, Boldak, Mao and wild vegetables.
Sassatgre	Rongram	

3.4 SOUTHERN SLOPES AND VALLEY (WEST) & EAST (SSV-W & SSV-E)

The area includes most of the southern part of West and East Khasi Hills, some part of the Jaintia Hills and a very small area of South Garo Hills District. The altitude ranges from 400 to 1200 m and the important soil types are Red, Yellow and Alluvial Soil. The area receives very heavy rainfall. The region is characterized by steep slopes. There are vast tracts of grasslands on highly drained flats and slope of hills with isolated patches of crooked forests only in low lying areas. Tropical moist deciduous type of forest is the dominant forest type of the region. The southern slope of the state is rich in floral diversity.

Four villages in Southern Slopes and Valley (West) and four villages in Southern Slopes and Valley (East) is selected for the primary survey. Brief description of these villages is provided in **Table 3.4**.

Table 3-4: Village Profile of Southern Slope & Valley (West)

Village	Block	Profile
Ramchenga	Gasuapara	Ramchenga is divided into West Ramchenga (90 households) and East Ramchenga (48 households). Tura Baghmara SH is passing through village. The Closest market- Dumnikura is approximately 2km from village. The village has homestead plantations – areca nut with few other species like jackfruit, bolsal, segun, bamboo etc. The closest forest is Angratuli Reserve Forest – 2km. from

Village	Block	Profile
		villagers don't have access. Private forest patches-average size 20 bighas. Comprising species like Boldak, bamboo, Pakram, Bolsubret, Bolmatra. Used for personal construction and firewood needs. Community forest area is open forest used mostly for firewood.
Teptepa	Rongara	The village is approximately 1.0 km from State Highway. Balpakram National Park is located approximately 1.0 km from the village. Community forest is 0.5 km from the village. Dense natural and man-made forest is located in the village. The village has village reserve forest, Jhum forest mix (jhum areas and recovering jhum fallows) and homestead plantation. Homestead plantations comprise tezpata, arecanut, agor, jackfruit, bamboo etc. Community forest and village reserve comprises dense forest area made up of natural forest –Boldak, Chamolja, Chram, Chamchia, Dongram species and lots of wild vegetables and medicinal plants
Matchanokpante	Baghmara	
Medu Hawe	Songsak	This village is on the top of a hill. Access is via cement steps made under NREGA. Balpakram National Park is on the other side of the village and Hangsapal village is at the bottom of the hill. The village is approximately 14 km from SH and Closest market is Rongrengpal market, approximately 5km from the village. The village has homestead plantation; main species are areca nut, pan, cashew and rubber. The village has 2 village reserve forest main vegetations are Bolchengrong, Bolchim, Bolbok, Gambari, Wa'nok, Wa'dro. Balpakram National Park is located approximately 1.0 km from the village.

Photographs of the Surveyed Village



Ramchenga village: Survey



Ramchenga village: Agriculture land & homestead plantation



Teptepa village Forest



Teptepa village: Tejpata collected from Community Forest



Medu Hawe: Homestead plantation



Medu Hawe: village: Survey

Table 3-5: Village Profile of Southern Slope & Valley (East)

Village	Block	Profile
Wakhu	Kliehirat	The people belong to Pnar tribe. They earn their livelihood by doing daily labour and cultivating kwai and pathi (Betel nut and betel leave)
Shangpung moolibang	Lashkien	Most of the people of Shangpung Moolibang are found sustain their livelihood by doing daily labour.
Pynthorlangtein	Thadlashkein	Most of the local people belong to Pnar tribe. Most of them are farmers or cultivators and some daily labourers and little business man were also found
Lamin	Amlarem	Lamin village belongs to War Jaintia of West Jaintia Hills District, bordered with our neighbouring country Bangladesh. Most of the local people of Lamin Village carry out betels nuts and betel leaves plantation like all their neighbouring villages

4 Profile of Selected Villages

Twenty villages selected for the survey. Out of 20 villages, 4 villages are located in East Khasi hills, 9 villages in Garo hills, 4 villages in Jaintia hills and 3 villages in Ri-Bhoi area. The village profile is described below:

4.1 DEMOGRAPHY

Total population in 20 selected villages is 10,615. The smallest village is Teptepa with a population of 114 and largest village is Lamin with population of 1508. The average sex ratio of the villages is 984 females per 1000 male. The average literacy rate is 77.9%. The average working population in these villages is 49.45%. The highest working population is recorded in Medu Hawe village with 90.45% and lowest working population is recorded in Ramchengga with 32.73%. Major working population is cultivator (58.07%), this is followed by other workers (23.25%), agriculture labour (18.30%) and household industries (0.37%).

4.2 COMMUNITY

The main inhabitants of these selected villages are the Indigenous tribes like Khasis, Garos and Pnars, but besides these tribes - Karbis, Nepalies are also present.

4.3 OCCUPATION

Agriculture is the main occupation of the people of Meghalaya. The Garos practice 'jhum' cultivation. The Garos residing adjacent to Goalpara district of Assam also practice settled cultivation. The Hajongs however, do not practice 'shifting' cultivation. The Khasi have four main types of land uses, viz. (1) the forest land for jhum cultivation, (2) wet paddy land, (3) high grass land and (4) homestead land which is situated close to their courtyard. Some of them are engaged in bee-keeping, as also labourers who are employed on road and

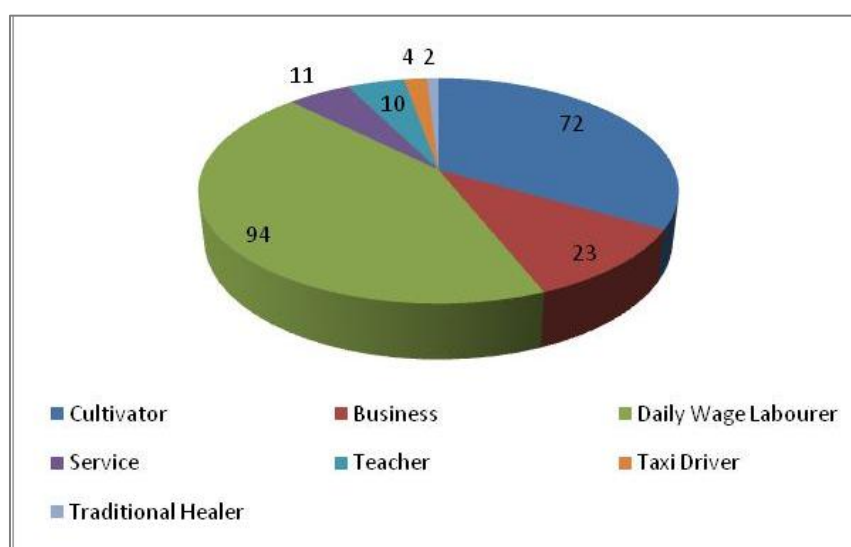
building construction, etc. In addition to the above occupations, educated individuals have taken up teaching, government jobs and private services as their profession. Besides, a very small fraction of the population depends on business of varying nature and size.

The livelihood in the rural areas is generally driven by differential landholding pattern and availability of different opportunities.

In case of Garo hills, most village land is communally owned, shifting cultivation and collection of forest products from the forest for sustenance are the main livelihood activities. But when the lands are privately owned, settled agriculture and cash crop cultivation are the main activities².

This survey reveals that primary occupations of the selected villages are related to agriculture, cultivator, daily wage labour, business, services, etc. The local people also collect the wild plants from the nearby area mostly for their own uses. The village wise primary occupation pattern is represented in **Figure 4.1**.

Figure 4-1: Primary Occupation Pattern in the Selected Villages



² S.K. Barik Natural Resource Management Policy Environment In Meghalaya Impacting Livelihood of Forest Poor

4.4 FOREST & PROTECTED AREA

Nine villages are located in close proximity to National Park, Wildlife Sanctuary, Reserve Forest, Protected forest area and seven villages are located in close proximity to community reserve forest, village forest. The primary survey result shows that, local people have been collecting the plants or plant parts from the Reserve Forest and Protected forest. The local people have the limited access in Wildlife Sanctuary and National Park for collection of plants/ plant parts.

4.5 SACRED GROVES

There are about 101 sacred groves, spread over a total of about 10,000 ha, scattered all over the state (mainly in the Khasi and Jaintia Hills)³. The sacred groves of Meghalaya are located in the public lands set aside for religious purpose under the traditional land use system. Sacred groves enjoy adequate legal support as they are covered by the United Khasi and Jaintia Hills Autonomous District (Management and Control of Forests) Act, 1958.

The primary survey result shows that only three sacred groves (2 in East Khasi hills and 1 in Jaintia hills) are located in the selected villages. Sacred groves in the East Khasi hills are accessible to the community, where as the groves in the Jaintia hills are not accessible to the community.

4.6 COMMUNITY CONSERVATION MEASURES

For the conservation of forest, village community has imposed certain restriction in the community forest and village forests. These are as follows:

- Cutting of trees for personal use is prohibited but allowed only for construction of community hall or community works;
- Fuel wood collection only by hand for domestic use;
- Plants and tree are not allowed to be cut down without permission from the village headman
- Extraction of NTFP is allowed only for personal use
- Certain plant species are not allowed for collection like "Jermi"

³ Community Conserved Areas- Meghalaya, FES

5 Traditional Uses of Plants and Availability – Edible Plants

5.1 INTRODUCTION

Plants are primary source of nutrients for human beings. Over ages, mankind has learned to cultivate selective plants based on its primary requirement. Today, food is primarily obtained from market in raw or processed form produced from plants that are cultivated. Yet, for the marginalized and indigenous people, plants that grow in wild provide the major sources of nutrient.

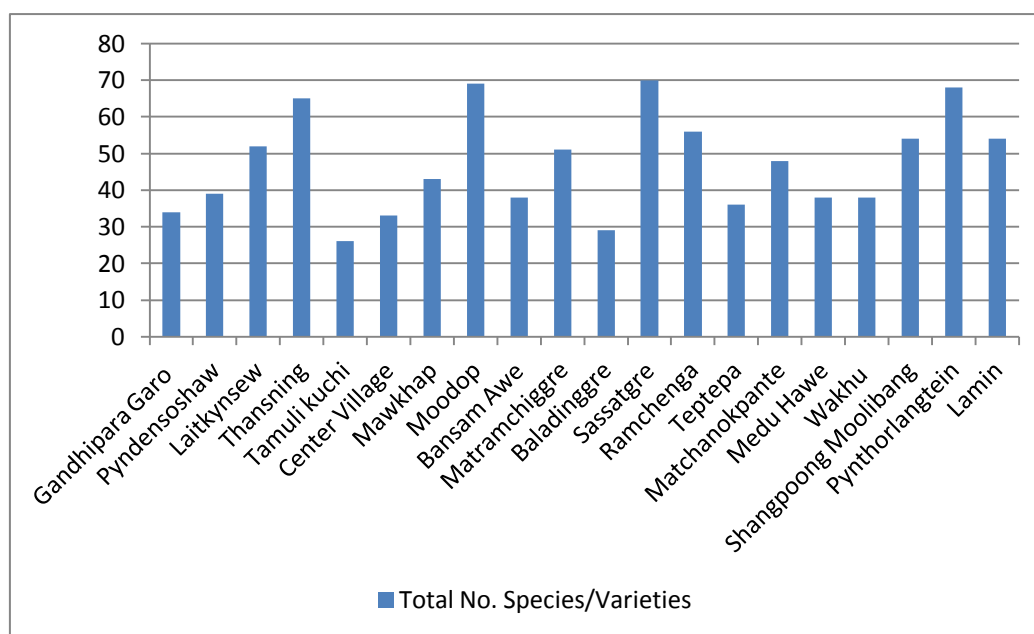
5.2 EDIBLE PLANTS – ACROSS AGROCLIMATIC ZONES

5.2.1 Total Number of Edible Plants

Paucity in study of edible plants has been noted by Sawain et al., 2007 they documented the plants reported by local people across Meghalaya in 2004-05 and reported 249 species to be used for edible purpose that were collected from the wild and also cultivated. A similar study conducted by Kayang in 2007 enumerates the usage of plants collected exclusively from the wild and used for edible purpose across tribes of Garo, Khasi and Jaintia. A total of 110 species has been reported by Kayang, H. Tiwari et al in 2010 has noted 39 species used across five villages in South Meghalaya that are collected from the forests for edible purpose. Another study conducted by Singh et al., 2012 in five villages close to Nokrek Biosphere Reserve in Garo Hills has shown the usage of 71 species collected from the wild for edible purpose.

The present survey revealed the use of three hundred and ten species/variety of plants for food that are cultivated and collected from wild in the five agroclimatic zones. The list of plants collected from wild for edible purpose is given in **Annexure 2A**. The total number of species/varieties used as edible plants ranged from 26 in Tamuli kuchi to 70 in Sassatgre (**Figure 5-1**).

Figure 5-1: Species/Varieties of Edible Plants Available in the Selected Villages

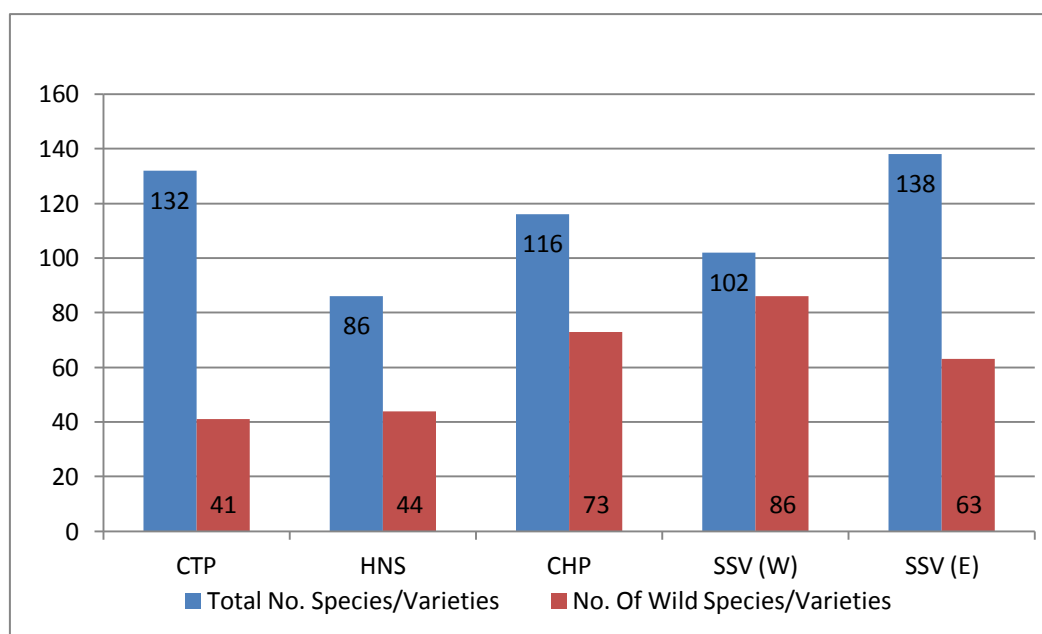


The maximum usage of edible plants are in Southern Slopes and Valley (East) - 138 species/variety and Central Thermic Plateau -132 species/variety followed by Central Hyperthermic Plateau - 116 species/variety and Southern Slopes and Valley (West) -100 species/variety. The minimum usage of plants for food is in Hills of Northern Slope -86 species/variety. This is in consonance with the spread of urbanization that is linked with the inlay of the National Highways. Tamulikuchi Village lies close to NH-40 that connects Jorabat with Jowai. At Jorabat NH-40 meets NH-37 that leads to Guwahati, a major commercial and educational epicenter of North-East. In this village only twenty six species/varieties are used for edible purpose.

5.2.2 Source of collection

The plants used for edible purpose could be either cultivated or collected from wild. There are few species for which the responses have been varied as obtained from both wild and cultivated across villages. To remove ambiguity, a comparison has been made across the five agroclimatic zones with species/varieties of plants that have been reported to be exclusively collected from wild (**Figure 5-2**).

Figure 5-2: Source of Collection of Edible Plant from the Wild

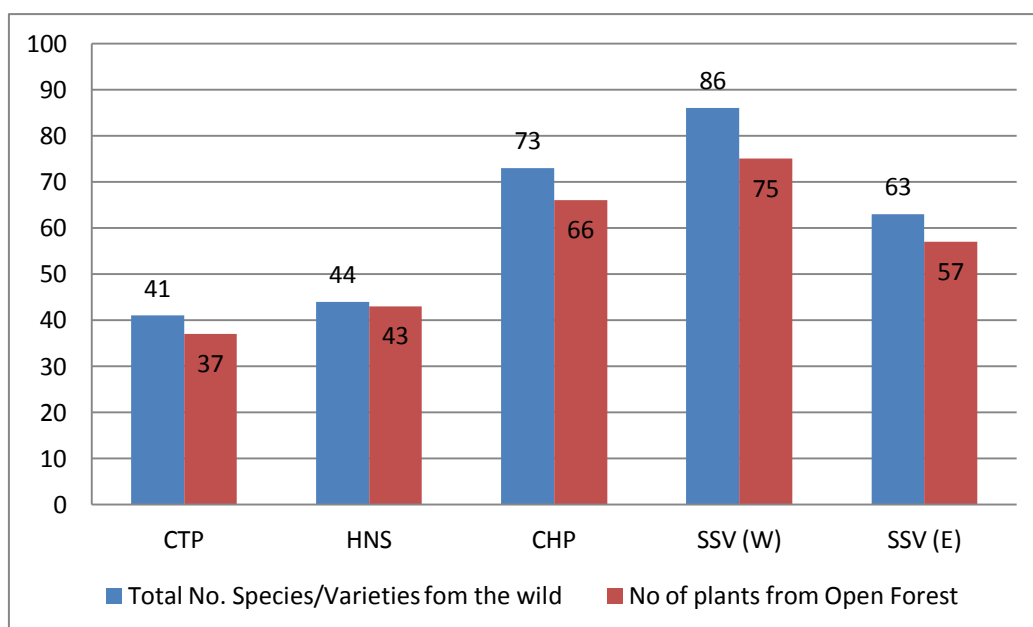


The study reveals that 84% (86 species/varieties out of 102) the species/varieties used in the Southern Slopes and Valley (West) (SSV (W)) are collected from the wild followed by Central Hyperthermic Plateau (CHP) -63% (73 species/varieties out of 116), and then Southern Slopes and Valley (East) (SSV(E)- 45% (63 species/varieties out of 138). A considerable number of plants have been reported for edible purposes from Central Thermic Plateau (CTP) of which only 31% (41 species/varieties out of 132) are collected from the wild. This is also lower than that reported from the Hills of Northern Slope (HNS) - 51% (44 species/varieties out of 86).

5.2.3 Location of Collection Areas

The location of collection of the plants gives an insight of the place of availability or habitat and aerial extent of the movement of the local people for the purpose of collection. The study focuses on the location of collection of the edible plants collected from the wild. It has been observed that the maximum collection is done from the open forests ranging from 87.21% in the Southern Slopes and Valley (West) to 97.73% in the Hills of Northern Slopes (**Figure 5-3**). The variety of habitat available for collection of edible plants from the wild is less in the Hills of Northern Slope compared to Southern Slopes and Valley (East).

Figure 5-3: Wild Edible Plants Collected from the Open Forests



5.2.4 Purpose of Collection

The plants that are cultivated are used for household purpose and the surplus is sold in the market like Pashor Kait, Rynsun khasi, Sohmylleng, Sohmynkhen Jhur, Sohphlang, Sohphoh, Sying Makhir, Chyrmit, Hantara, Kubi, Phul Kubi, Salad, Tebrong, Te e, Baring, Jallik, Saru, Kwai and Pathi, etc,

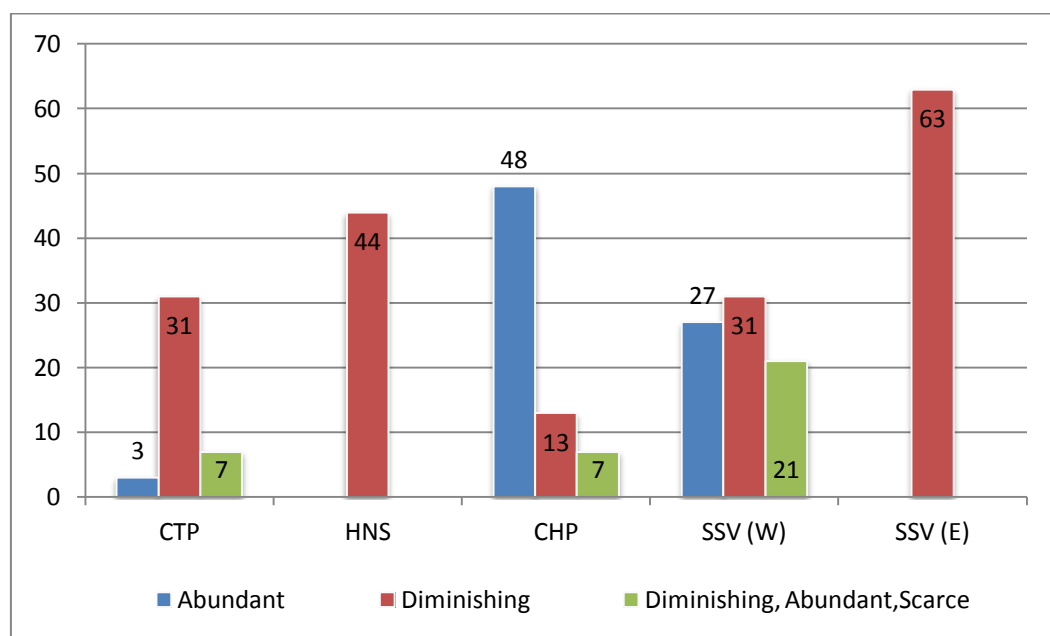
Very few edible plants collected from the wild are sold in the market. The few species that are sold are Alot, Apolka, Chinatong, Dambong, Meá, Me'bitchu, Me'çheng, Me'gong, Sobok, Ambare, Gasampe (Do'ju), Sokmil, Te'patang, Lada, Laiur, Larain, Laru, Jyrlud, Myrdoh, Slachet, Syndom, Sohphan, Jiaharew, Jiahasla, etc.,

5.2.5 Availability of Plants

The availability of the wild edible plants and their diminishing trend as opined by the villagers is represented in **Figure 5-4** and **Figure 5-5**. Amongst, the five zones, the maximum abundance of edible plants have been reported from the Central Hyperthermic Plateau (65.75%) followed by Southern Slopes and Valley (West) (31.40%). Only 7.32% of species/varieties that are collected from the wild are reported to be available in abundance in the Central Thermic Plateau. All the edible plants that are collected from the wild in the Hills of Northern Slopes and

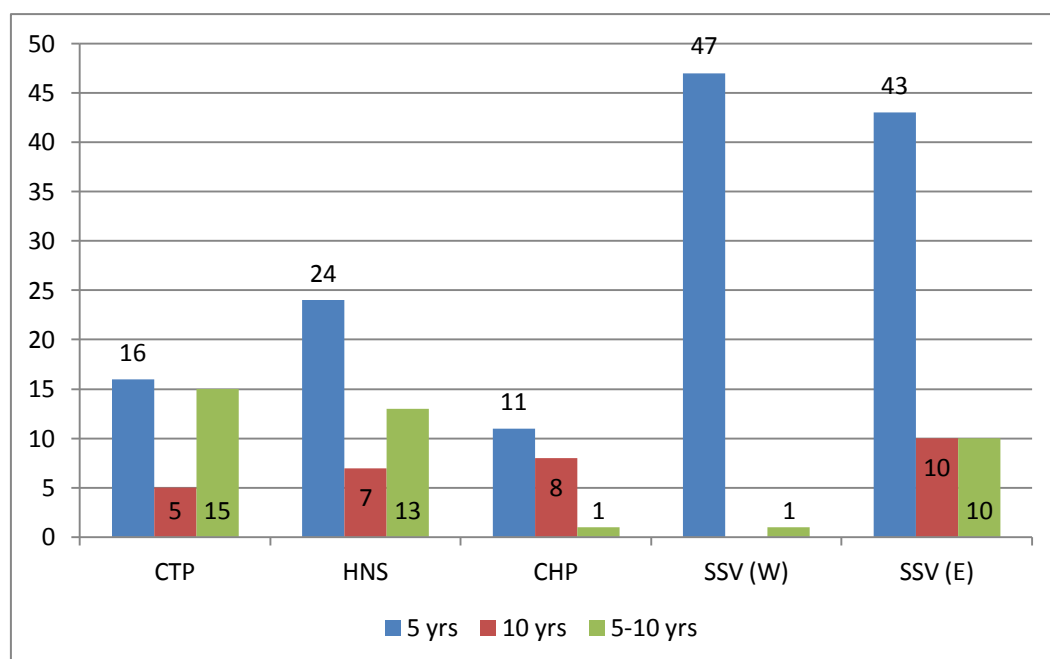
Southern Valley and Slopes (East) are diminishing. There are few plants for which mixed opinion has come across as available in abundance in few villages and diminishing or being scarce in other villages. The percentage of mixed opinions is highest from the villages of Southern Slopes and Valley (West) 24.42% followed by Hills of Northern Slopes (17.07%) and Central Hyperthermic Plateau (9.6%).

Figure 5-4: Availability Status of Edible Plants Collected from the Wild



The maximum decline in the availability of the plants has been in the past five years as opined by the villagers. 42.11 % of the plants in the Central Thermic Plateau, 54.55% in the Hills of Northern Slope, 55% in the Central Hyperthermic Plateau, 0.90% in the southern slopes and Valley (west) and 68.25% in the Southern Slopes and Valley (East) have declined in the past five years.

Figure 5-5: Reduction in Availability of Edible Plants Collected from the Wild



5.2.6 Cause for Changes in Availability

The respondents were probed to understand their perception about the causes for changes in availability of plants. The perceptions varied across villages but were uniform within the village. Deforestation was the common factor across the villages for reduction in availability. None of the responses indicated the increase in availability of any plant species/varieties. Responses as lack of awareness reflect the gradual erosion of knowledge in usage of plants from wild. This response was obtained from majority of the villages such as Pyndensoshaw, Thansning, Laitkynsew, Center Village, Mawkhap, Moodop, Wakhu, Shangpoong Moolibang, Pynthorlangtein and Lamin.

In Central Thermic Plateau, the major reason for decline in the availability of the plants was deforestation, forest fire and urbanization. Opinions as agriculture and overgrazing formed the secondary cause for the change.

In Hills of Northern Slope, deforestation, forest fire and urbanization were the major causes cited for decline of plant species.

In Central Hyperthermic Plateau, shifting cultivation, deforestation, urbanization, and overgrazing were the major reason cited for the reduction in availability of the plants in Baladinggre, Matramchiggre and Sassatggre. In these villages

change in weather was also cited as a primary reason for the decline in plant species.

In Sothern Slopes and Valley (West), agriculture, deforestation, urbanization is the major causes as opined for the decline in availability of plants from Ramchenga, Matchanokpante. Forest fire is the only cause for reduction of plants like Darichik in Teptepa.

In Southern Slopes and Valley (East), agriculture, deforestation, forest fire, urbanization is the reason cited uniformly across the villages for the decline in availability of the plants.

The perception about the cause in change in availability of plants used for other purposes like fuel and firewood, fodder and veterinary medicine, medicines, building and ornamental plants remain same and hence not reported elsewhere.

5.3 ANALYSIS OF WILD EDIBLE SPECIES/VARIETIES OF PLANTS ACROSS VILLAGES IN DIFFERENT AGROCLIMATIC ZONES

5.3.1 Central Thermic Plateau – Edible Plants

Source and Location of Collection Areas

In the Central Thermic Plateau (**Figure 5-6**), the proportion of wild plants used as edible plants is similar in the two villages of Gandhipara Garo (38.24%) and Laitkynsew (28.85%). The proportion of wild plants used for consumption is highest in Pyndensohsaw (48.72%) and least in Thansning (10%). In Central Thermic Plateau (**Figure 5-7**), 64% of the wild plants are obtained from the Open Forest followed by contribution from the Village Woodlots. Other locations include Open Grassland and Homestead Plantations. Plants like Chiggi, Chonggi and Gachli are obtained from waterbodies in Gandhipara Garo.

Figure 5-6: Village wise of Collection of Wild Edible plants in Central Thermic Plateau

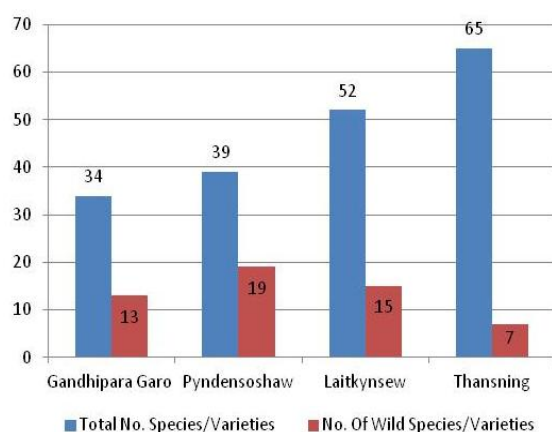
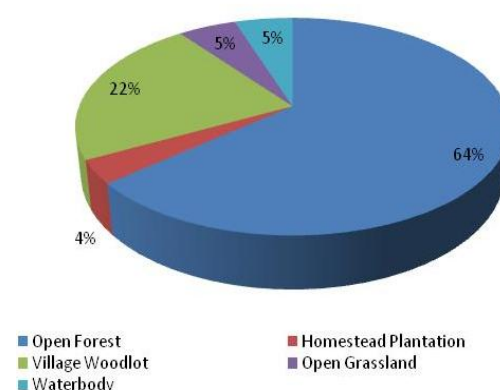


Figure 5-7: Location of Collection -Wild Edible Plants in Central Thermic Plateau



Widely Used Species and their Availability – Central Thermic Plateau

Figure 5-6: Village wise of Collection of Wild Edible plants in Central Thermic Plateau

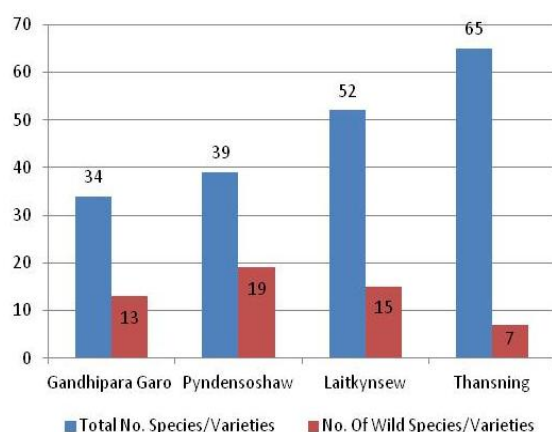
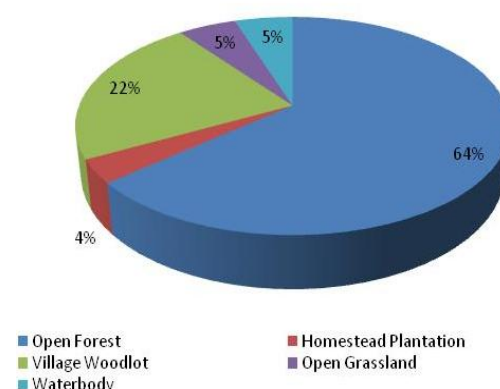


Figure 5-7: Location of Collection -Wild Edible Plants in Central Thermic Plateau



Widely Used Species and their Availability – Central Thermic Plateau

A list of species reported by at least 75% respondents in each agroclimatic zone has been given in tabular form in this report. This list will be helpful in selecting species that might be used for livelihood options.

In Central Thermic Plateau, three villages in Khasi are presented in **Table 5-1**. The local dialect of the Garo region is different; hence the names

reported are different compared to those from Khasi region. In the villages across Khasi and Garo region 23 and 3 species respectively were reported to be used by 75% of the respondents. A comparison between plants reported from Pyndensohshaw, Laitkynsew and Thansning reveals that Jamyrdoh is the only plant that is used across the three villages. Sohnamtra, Kait and Tympew in Pyndensohshaw, Sohphan, Slatyrpad and Jamyrdoh in Laitkynsew and Jamyrdoh, Sohphoh Nongklaw and Jatera in Thansning are highest reported species. Chiggi, Alot and Mea are species that are in maximum use in the Garo region. The availability of the plants for the species that has been reported by atleast 25% respondents has been presented in **Table 5-1**. As reported earlier (**Figure 5-4 and 5-5**), the availability of the plants in this agroclimatic zones is in decline. The plants in the Khasi region shown below have been reported to be diminishing over the past 5 to 10 years. Few plants like Jamyrdoh, Soh Phan, Slatyrpad, Sohphoh Nongkhlaw shken and Sohmylleng are reported to be diminishing since past five years. The rate of diminishing is approximately equal across altitudes. In Gandhipara Garo the response to availability has been mixed ranging from abundant to scarce.

Table 5-1: List of widely used wild edible plant species and their availability in the Central Thermic Plateau

Sl. No.	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pyndensohshaw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of Respondants			
1.	Alot	<i>Phlogacanthus thyrsoiflorus</i>	Ab, Sc, Dm_5,10	—	—	—
2.	Batnongrim	—	—	Dm_5,10	—	—
3.	Chigi	—	Ab,Dm_5,10	—	—	—
4.	Dhonia khlaw	<i>Eryngium foetidum L., (Apiaceae),</i>	—	Dm_5,10	—	—
5.	Hurdoh	—	—	Dm_5,10	—	—
6.	Jajew	<i>Begonia josephi Br.</i>	—	Dm_5,10	—	—
7.	Jamyrdoh	<i>Houttuynia cordata</i>	—	Dm_5	Dm_5	Dm_5,10
8.	Japew	—	—	Dm_5,10	—	—
9.	Jatera	—	—	Dm_5,10	—	—

Use and availability of traditional plants

Sl. No.	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pyndensohshaw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of Respondants			
10.	Jhur khang	<i>Lactuca laevigata</i> (Bl.) DC.,	—	Dm_5,10	—	—
11.	Kait	<i>Musa sp.</i>	—	Dm_5,10	Dm_5,10	—
12.	Me'a	<i>Dendrocalamus hamiltonii</i>	Ab, Sc, Dm_5,10	—	—	—
13.	Shken (bamboo)	—	—	—	Dm_5	—
14.	Slatyypad	—	—	—	Dm_5	—
15.	Soh Phan	<i>Artocarpus integrifolia</i> / <i>Artocarpus heterophyllus</i> Lam.	—	—	Dm_5	—
16.	Sohbah	—	—	Dm_5,10	—	—
17.	Sohkynpnor	—	—	Dm_5,10	—	—
18.	Sohmritkhlaw	—	—	Dm_5,10	—	—
19.	Sohmylleng (Amla)	<i>Emblica officinalis</i> Gaertn./ <i>Euphorbiaceae</i>	—	—	Dm_5	—
20.	Sohniamtra	—	—	Dm_5,10	Dm_5,10	—
21.	Sohphie	<i>Myrica esculenta</i> Ham. Ex D. Don.	—	—	Dm_5,10	Dm_5,10
22.	Sohphoh Nongkhlaw	<i>Pyrus communis</i>	—	—	—	Dm_5
23.	Sohprium	<i>Psidium quava</i>	—	Dm_5,10	—	—
24.	Sohshang	<i>Elaeagnus latifolia</i> Linn.	—	—	Dm_5,10	—
25.	Tympew	<i>Piper betle</i> Linn./ <i>Piperaceae</i>	—	Dm_5,10	—	—
26.	Tyrkhang	—	—	Dm_5,10	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

5.3.2 Hills of Northern Slopes – Edible Plants

Source and Location of Collection Areas

In the Hills of Northern Slopes (**Figure 5-8**), the proportion of collection of plants from the wild is low especially in Tamulikuchi -11.54% (3 out of 26 species) and highest in Center Village -57.58% (23 out of 69). The usage is approximately same in Mawkhap and Moodop (27.91 and 33.33%).

In the Hills of Northern Slopes (**Figure 5-9**), where the usage of edible plants is low, approximately 97% of plants collected from the wild are obtained from the open forest followed by agricultural land. A miniscule percentage is available from Village Woodlots and Open Grassland. Center Village and Mawkhap has community forest reserve to which they have partial access. Tamuli kuchi and Moodop does not have any such community reserves.

Figure 5-8: Village wise of Collection of Wild Edible plants in Hills of Northern Slope

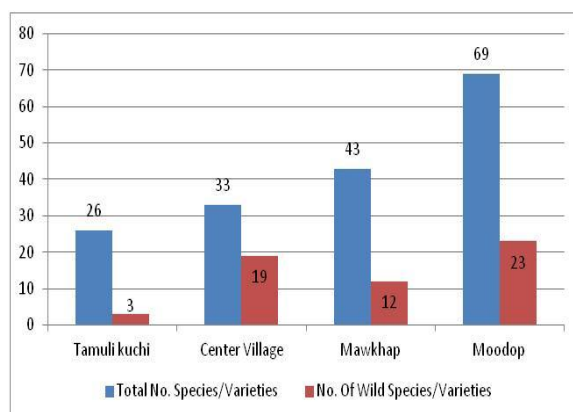
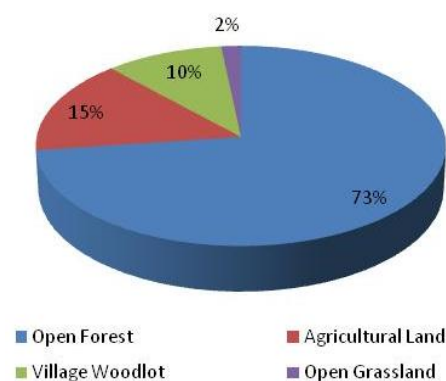


Figure 5-9: Location of Collection - Wild Edible Plants in Hills of Northern Slope



Widely Used Species and their Availability – Hills of Northern Slopes

In the Hills of Northern Slopes, 39 plants have been reported to be used by more than 75% respondents (**Table 5-2**). The dialect spoken in Ri-Bhoi differs from that spoken in Thadlaskein. Hence the species name reported from Moodop is different from the other villages in Ri-Bhoi. Hence, comparison could not be made across all four villages but only for those in Ri-Bhoi. Sohphan is the common plant reported from all three villages of Ri-Bhoi. Kait, Sohtrun and Sohphan in Tamuli kuchi, Sohtrun, Sohkhynpor and Sohphan in Center Village, Sohphan, Jajew,

Sohjew and Jamyrdoh in Mawkhap and Jyrlud, Myrdoh and Latdoh in Moodop are the highest reported species.

As shown in **Figure 5-4 and 5-5**, the availability of plants is reported to be in decline in this agroclimatic zone. Saru is the only plants in Moodop that has been reported to be in abundance by all the respondents. The rate of decline is reported to be over the past five years for plants in Center Village compared to the other villages where the availability of plants have been note to decline over past 10 years.

Table 5-2: List of widely used wild edible plant species and their availability in the Hills of Northern Slopes

Sl. No	Name of Plant	Scientific Name	Tamuli Kuchi (50-300m)	Center Village (300-600m)	Mawkhap (600-1200m)	Moodup (1200-1800m)
			% of Respondants			
1.	Chken	—	—	—	—	Ab,Dm_10
2.	Dhonia khlaw	<i>Eryngium foetidum</i> L., (Apiaceae),	—	Dm_5	—	—
3.	Jaguwa	—	—	Dm_5	—	—
4.	Jajew	<i>Begonia josephi</i> Br.	—	Dm_5	—	—
5.	Jalyniar	—	—	—	Dm_5	—
6.	Jamyrdoh	<i>Houttuynia cordata</i>	Dm_5,10	—	Dm_5,10	—
7.	Jathang	—	Dm_5,10	—	—	—
8.	Jewjnit tyrli	—	—	Dm_5	—	—
9.	Jewshor	—	—	Dm_5	—	—
10.	Juwang	—	—	Dm_5	—	—
11.	Jyllang	<i>Allium tuberosum</i> (Roxb)	Dm_5,10	—	—	—
12.	Jyrlud	—	—	—	—	Dm_5,10
13.	Kait	<i>Musa sp.</i>	Ab,Dm_10	—	—	—
14.	Khliengsyiar	—	Dm_10	—	—	—
15.	Lachein	—	—	—	—	Dm_5
16.	Lajaw	—	—	—	—	Dm_5
17.	Latdoh	—	—	—	—	Ab,Dm_5,10
18.	Mahek	—	—	Dm_5	—	—
19.	Myrdoh	—	—	—	—	Ab,Dm_5,10

Sl. No	Name of Plant	Scientific Name	Tamuli Kuchi (50-300m)	Center Village (300-600m)	Mawkhap (600-1200m)	Moodup (1200-1800m)
			% of Respondants			
20.	Pajir	—	—	Dm_5	—	—
21.	Pdangtyrlong	—	—	Dm_5	—	—
22.	Pohladew	—	—	Dm_5	—	—
23.	Sakhia	—	—	—	—	Ab, Dm_5,10
24.	Saphai	—	—	—	—	Dm_5
25.	Saru	—	—	—	—	Ab
26.	Sohbah	—	Dm_5,10	Dm_5	—	—
27.	Sohbrai	—	—	Dm_5	—	—
28.	Sohiong	<i>Prunus nepalensis</i>	—	—	Dm_5	—
29.	Sohjew	—	—	—	Ab,Dm_5,10	—
30.	Sohkynpnor	—	—	Dm_5	Dm_5,10	—
31.	Sohniamtra	—	Dm_10	—	—	—
32.	Sohphan	<i>Artocarpus integrifolia</i> / <i>Artocarpus heterophyllus Lam.</i>	Dm_5	Dm_5	Dm_10	—
33.	Sohphareng	<i>Prunus persica</i>	—	Dm_5	—	—
34.	Sohpieng	<i>Mangifera indica</i> / <i>spondias mangifera</i>	—	—	Dm_5,10	—
35.	Sohsainmasi	—	—	Dm_5	—	—
36.	Sohsaw	—	Ab,Dm_5,10	—	—	—
37.	Sohtrun	—	Ab, Dm_10	Dm_5	—	—
38.	Wang	—	—	—	—	Ab,Dm_5
39.	Wang khlaw	—	—	Dm_5	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

5.3.3 Central Hyperthermic Plateau – Edible Plants

Source and Location of Collection Areas

In the Central Hyperthermic Plateau (**Figure 5-10**) the proportion of wild plants used in Baladinggre -79.31% (23 out of 29) is similar to Bansam Awe -73.68% (28

out of 38). The collection of wild plants is considerably less in Matramchiggre - 60.78% (31 out of 51) though it lies close to Dibru Hills Reserve Forest. The collection of edible plants from wild is least from Sassatggre -57.14% (40 out of 70).

In the Central Hyperthermic Plateau (**Figure 5-11**), 90.41% of the wild plants are obtained from the Open forest. The dense forests around these villages also provide considerable number of edible plants in this zone. The other available habitats are homestead plantations and waterbodies. Plants like Anghemitura, Chiggi, Choonggi and Gradek are available from the waterbodies.

Figure 5-10: Village wise Collection of Wild Edible plants in Central Hyperthermic Plateau

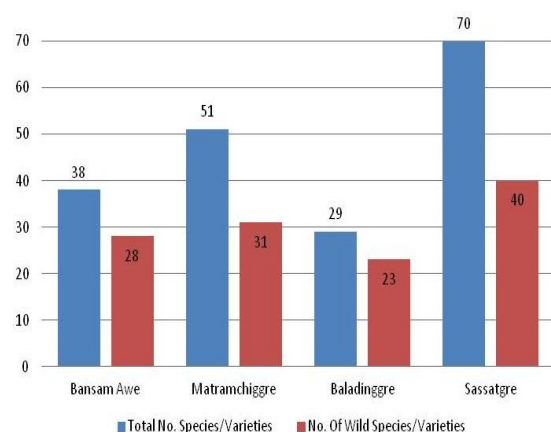
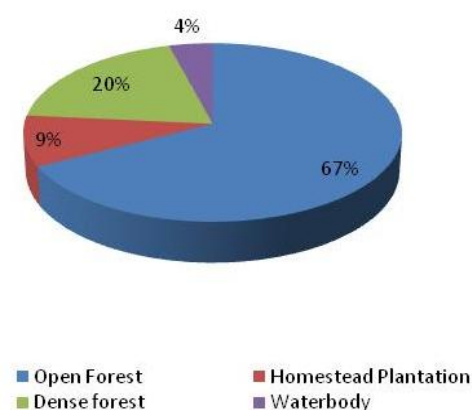


Figure 5-11: Location of Collection -Wild Edible Plants in Central Hyperthermic Plateau



Widely Used Species and their Availability – Central Hyperthermic Plateau

In Central Hyperthermic Plateau, only 13 species have been reported by more than 75% of respondents (**Table 5-3**). Sobok is the only species that has been reported across all four villages. Me'bitchu, Chiggi, Mea and A lot in Bansam Awe, Megong, SobokAnd Chonggi in Matramchiggre, Sobok, Mebitchu and Alot in Baladinggre and Sobok, Mebitchu and Chiggi in Sassatggre is reported to be used maximum.

In Central Hyperthermic Plateau, the plants reported in Bansam Awe and Matramchiggre are available in abundance. All the plants reported in Matrmachiggre except Grongmintri are diminishing over the past 5 years. There has been mixed response for plants in use in Sassatggre as for the same species approximately half of the respondents have said abundant and the rest have

opined as Diminishing over the past five years. Plants like Mea, Ambare and Doju/ Gasmape are available in abundance.

Table 5-3: List of widely used wild edible plant species and their availability in the Central Hyperthermic Plateau

Sl. No.	Name of Plant	Scientific Name	Bansam Awe	Matramchi ggre	Baladin-ggre	Sassatgre
			50-300m	300-600m	600-1200m	1200-1600m
% of Respondants						
1.	Alot	<i>Phlogacanthus thyrsoiflorus</i>	Ab	—	Dm_5, Ab	—
2.	Ambare/Ambre	—	Ab	Ab	Ab,Dm_5	—
3.	Bakwe	—	Ab	—	—	—
4.	Chigi	—	Ab	Ab	—	Ab/Dm_5,10
5.	Chongi	—	—	Ab	—	—
6.	Darichik	<i>Flacourtia jangomas (Lour.) Rae.</i>	—	—	Dm_5	—
7.	Do'ju/Gasampe	—	Ab	Ab	—	Ab
8.	Me'a	<i>Dendrocalamus hamiltonii</i>	Ab	Ab	Dm_5	—
9.	Me'bitchu	<i>Begonia picta Sm.</i>	Ab	—	Dm_5	Ab/Dm_5,10
10.	Me'cheng	—	Ab	—	—	—
11.	Me'gong	<i>Bauhinia purpurea</i> Linn./ <i>Caesalpiaceae</i>	Ab	Ab	—	—
12.	Sobok	—	Ab	Ab	Dm_5	Ab/Dm_5,10
13.	Te'patang	—	—	—	—	Ab/Dm_5

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

5.3.4 Southern Slopes and Valley (West) – Edible Plants

Source and Location of Collection Area

In Southern Slopes and Valley (West) (**Figure 5-12**), the proportion of edible plants collected from the wild is above 80% in all four villages. The maximum dependency on the wild is in Medu Hawe - 92.11% (35 out of 38) and Teptepa - 86.11% (31 out of 36) that is close to Balpakram National Park (within one km).

These villages lie close to rich vegetation and community Reserve Forests to which they have partial or complete access.

In the Southern Slopes and Valley (West) (**Figure 5-13**), 68% of plants are available from the open forest followed by Dense Forest, Homestead Plantation and Waterbodies.

Figure 5-12: Village wise of Collection of Wild Edible plants in Southern Slopes & Valley (West)

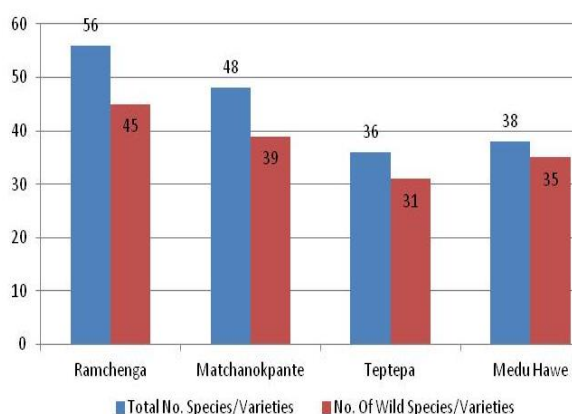
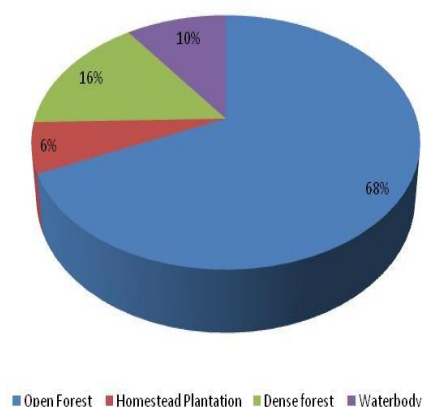


Figure 5-13: Location of Collection Area - Wild Edible Plants in Southern Slopes and Valley (West)



Widely Used Species and their Availability – Southern Slopes and Valley (West)

A total of 23 species has been reported by more than 75% respondents for edible purpose in the Southern Slopes and Valley (West) (**Table-5-4**). A lot, Sobok and Mebitchu has been highly reported to be in use in all the four villages irrespective of difference in altitude in this Agroclimatic zone. Chonggi, Steng, Sobok in Ramchengga, Grongmintri, Steng and A lot in Teptepa, Mebitchu, Soka, A lot and Sobok in Matchanokpante, A lot, steng and Sobok has reported to be used highest in these villages. In Southern Slopes and Valley (West), the availability of plants varies across the villages (**Table 5-4**). In Ramchengaa, except for Darichik, the availability of all plants has been reported to decline over the past 5 years. In Teptepa all the plants are reported to be present in abundance. In Matchanokpante, the availability of majority of the plants has been found to be diminishing over the past five years. In Medu Hawe, the availability of all the plants has been reported to be in abundance. Ramchengaa village is close to Dumnikura Reserve Forest which is not accessible to the villagers. The edible wild plants are mostly collected from open forest followed by homestead plantation.

Table 5-4: List of widely used wild edible plant species and their availabilities in the Southern Slopes and Valley (West)

SI No	Name of Plant	Scientific Name	Ramchengga (50-300m)	Tep-tepa (300-600m)	Matchanokp ante (600-1200m)	Medu Hawe (1200-1600m)
			% of Respondants			
1.	Alot	<i>Phlogacanthus thyrsoiflorus</i>	Dm_5	Ab	Dm_5	Ab
2.	Ambare/Ambre	—	Dm_5	Ab	—	Ab
3.	Ambri	—	—	Ab	—	—
4.	Chigi	—	Dm_5, Ab	—	—	—
5.	Chongi	—	Dm_5, Ab	—	—	—
6.	Chongmru	—	Dm_5, Ab	—	—	Ab
7.	Darichik	<i>Flacourtia jangomas</i> (Lour.) Rae.	Ab	Ab	Dm_5	Ab
8.	Do'ju/Gasampe	—	—	Ab	—	Ab
9.	Gong	—	Dm_5, Ab	—	—	Ab
10.	Gongdarat	—	—	Ab	—	Ab
11.	Grongmintri	—	Dm_5, Ab	Ab	—	Ab
12.	Ka.rika	—	—	—	—	Ab
13.	Me'a	<i>Dendrocalamus hamiltonii</i>	Dm_5	—	—	Ab
14.	Me'bitchu	<i>Begonia picta</i> Sm.	Dm_5	Ab	Dm_5	—
15.	Me'bram	—	—	—	—	Ab
16.	Me'gong	<i>Bauhinia purpurea</i> Linn./ <i>Caesalpinaceae</i>	Dm_5	Ab	—	Ab
17.	Me'gong kambe	—	Dm_5	—	—	—
18.	So'ka	—	—	Ab	Dm_5, Ab	Ab
19.	Sobok	—	Dm_5	Ab	Dm_5	Ab
20.	Steng	—	Dm_5	Ab	—	Ab
21.	Ta'ja (Yam)	—	—	—	—	Ab
22.	Te'sru	—	—	—	—	Ab

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or 10 are number of years over which availability has reduced

5.3.5 Southern Slopes and Valley (East) – Edible Plants

Source and Location of Collection Area

In the Southern Slopes and Valley (East) (**Figure 5-14**), the proportion of edible plants used from the wild is less, ranging from 26.32%-42.59%. The maximum proportion of edible plants from the wild is obtained from Lamin and in the rest of the villages the situation is similar.

The majority (84%) of wild edible plants are obtained from the open forest. A small amount of plants are also available from the Homestead Plantation and Open Grassland.

Figure 5-14: Village wise of Collection of Wild Edible plants in Southern Slopes & Valley (East)

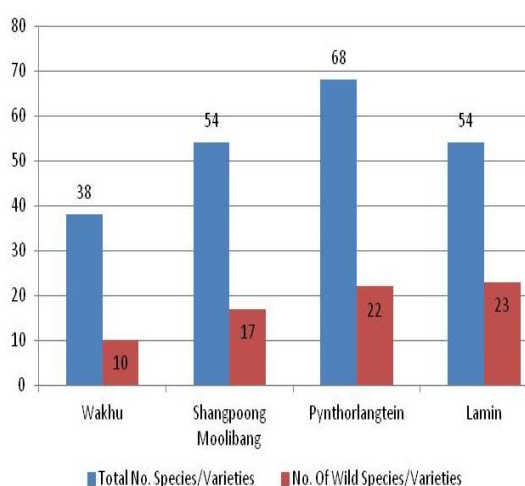
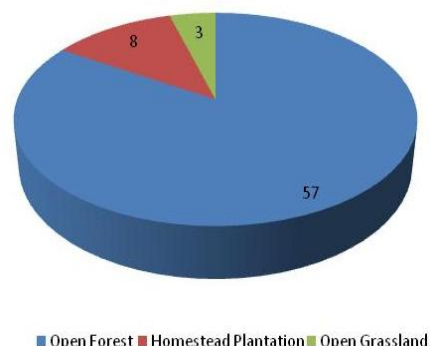


Figure 5-15: Location of Collection -Wild Edible Plants in Southern Slopes and Valley (East)



Widely Used Species and their Availability – Southern Slopes and Valley (East)

A total of 43 species have been reported to be used by more than 75% respondents in this agroclimatic zone (**Table 5-5**). Slachet, Lajaw and Myrdoh in Wakhu, Myrdoh, Jyrlud, Mahek in Shangpoong Moolibang, Myrdoh, Jyrlud and Laru in Pynthorlangtein and Sohphan, Sohkynpor Jiaharew and Jiahasla in Lamin have been reported to be highest in each village.

As reported earlier (**Figure 5-4 and 5-5**), the availability of the plants reported from this zone is diminishing majorly over the past five years (**Table 5-5**). Except for Sohnangheh in Lamin, all the plants have been reported to be in decline.

Table 5-5: List of widely used wild edible plant species and their availability in the Southern Slopes and Valley (East)

Sl. No	Name of Plant	Scientific Name	Wakhu (50-300m)	Shangpung Moolibang (300-600m)	Pynthorlan gtein (600-1200m)	Lamin (1200-1600m)
			% of Respondants			
1.	Bingonslang	—	—	—	—	Ab,Dm_5
2.	Chiahke (Dhonia Khlaw)	<i>Eryngium foetidum</i> L., (<i>Apiaceae</i>),	—	Ab,Dm_5	—	—
3.	Chiehkrot	—	—	—	Dm_5	—
4.	Chken	—	Dm_5,10	—	—	—
5.	Dhonia	—	Dm_5,10	—	—	—
6.	Jakieng	—	Dm_5,10	—	—	—
7.	Jhur paloi	—	Dm_5,10	—	—	—
8.	Jiachra	—	—	—	—	Dm_5
9.	Jiaharew	—	—	—	—	Dm_5
10.	Jiahasla	—	—	—	—	Dm_5,10
11.	Jialachit	—	—	—	—	Dm_5
12.	Jiatalong	—	—	—	—	Dm_5
13.	Jiatanglong	—	—	—	—	Dm_10
14.	Jyrlud	—	—	Dm_5	Dm_5	—
15.	Lajaw	—	Dm_5	Dm_5	Dm_5	—
16.	Lakachiet	—	Dm_5	—	—	—
17.	Lakadong	—	—	—	—	Dm_5
18.	Laphaiur	—	—	Dm_5	—	—
19.	Larain	—	—	Dm_5	Dm_5	—
20.	Laru	<i>Peceospermun acerifolium</i>	—	—	Dm_5,10	—
21.	Mahek	—	—	Dm_5	—	—
22.	Murit	—	Dm_5,10	—	—	—
23.	Myrdoh	—	Dm5,10	Dm_10	Dm_5	—
24.	Sabrap	—	—	—	Dm_5	—
25.	Salangi	—	—	Dm_5	—	Dm_5
26.	Sapiang	—	—	—	—	Ab, Dm_5
27.	Sapriam	—	—	Dm_5	—	Ab,Dm_5

Sl. No	Name of Plant	Scientific Name	Wakhu (50-300m)	Shangpung Moolibang (300-600m)	Pynthorlan gtein (600-1200m)	Lamin (1200-1600m)
			% of Respondants			
28.	Slachet	—	Dm_5	—	Dm_5	—
29.	Slapieh	—	—	Dm_5	—	—
30.	Sohbiang	—	—	—	—	Ab,Dm_5
31.	Sohchram	—	Dm_5,10	—	—	—
32.	Sohkynpnor	—	—	—	—	Dm_5,10
33.	Sohliang	—	—	—	—	Dm_5
34.	Sohlyngdkhur	—	—	—	—	Ab,Dm_5
35.	Sohmanir	—	—	—	—	Dm_5
36.	Sohngangheh	—	—	—	—	Ab, Dm_5
37.	Sohphan	—	—	—	—	Dm_5,10
38.	Spunai	—	—	Dm_5	—	—
39.	Symphler	—	Dm_5,10	—	—	—
40.	Tohtari	—	—	—	—	Dm_5,10
41.	Tyngkhieh	—	—	Dm_5,10	Dm_5	—
42.	Wang	—	Ab,Dm_10	—	—	—
43.	Wang murit	—	Ab, Dm_5	—	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or 10 are number of years over which availability has reduced

6 Traditional Uses of Plants and Availability –Fuel and Firewoods

6.1 INTRODUCTION

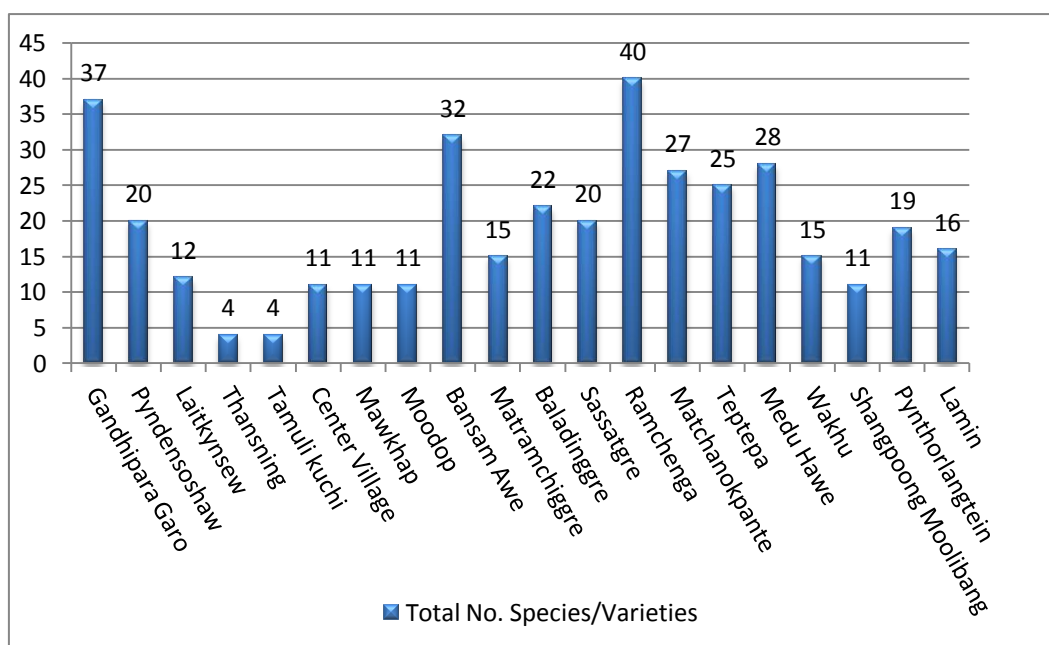
Fuel wood is a conventional source of energy resource that has been reported to be widely used for domestic purpose in Meghalaya due to its ready availability (Technical Report, CSO, Bhat and Sachan, 2004). In Meghalaya, the community reserves forests are accessed for collection of dry and fallen woody parts for domestic purposes (both for fuel and fire). The major tree species reported to be harvested for meeting the firewood demands are: *Lagerstroemia parviflora*, *Vitex pendularis*, *Bauhinia spp.*, *Schima wallichii*, *Dillenia indica*, *Syzygium cuminii*, *Castanopsis spp.*, *Macaranga denticulate*, *Careya arborea* and *Albizzia lebbek*. The consumption of firewood is highest in the Khasi community (5.81 kg/capita/day), followed by the Garo (5.32 kg/capita/day) and Jaintia (3.90 kg/capita/day), irrespective of their socio-economic status. The major concern for the firewood lies largely with the production of charcoal for industrial purpose wherein a record of conversion of plants harvested for conversion is not available as most of the plants are obtained from unclassified forests.

6.2 FUEL AND FIRE WOODS ACROSS AGROCLIMATIC ZONES

6.2.1 Total Number of Fuel and Firewood Plants

In this survey the total number of species/varieties of plants used for fuel wood and firewood that are cultivated and collected from the wild range from 4 to 40 as reported by the villagers (**Figure 6-1**). The highest collection of plants for fire and fuel woods is done in the villages of Garo region as observed from **Figure 6-1**. A list containing name of species of plants collected from wild reported from different villages is given in **Annexure 2B**.

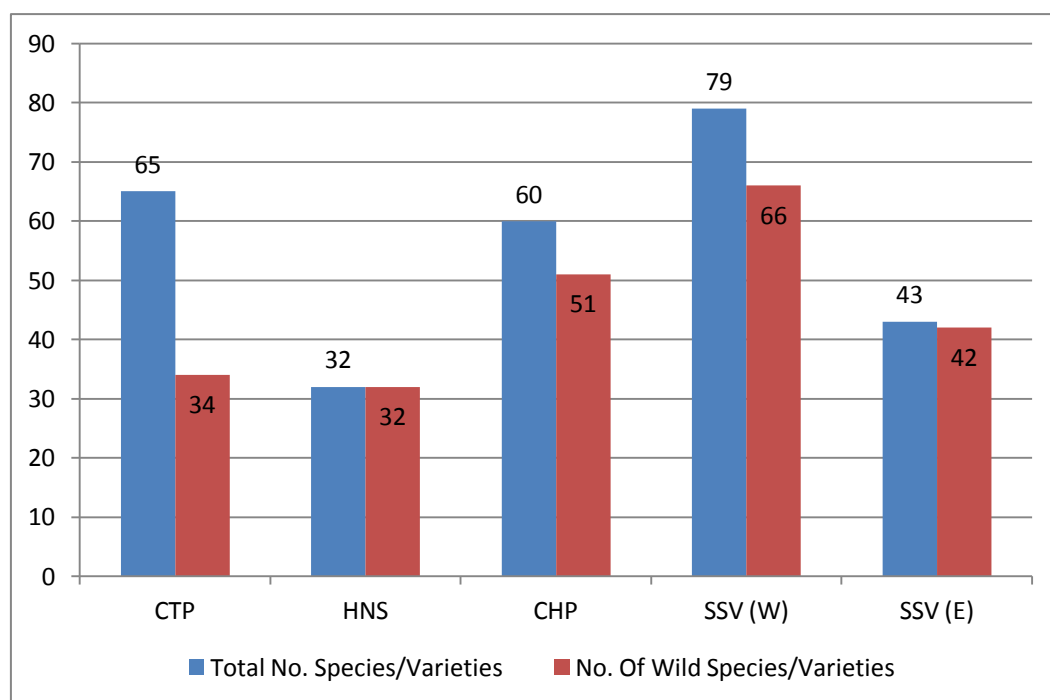
Figure 6-1: Total Number of Plant Species/Varieties used as Fuel & Fire Wood



6.2.2 Source of collection

All the plants used in the Hills of Northern Slope for fuel and firewood is collected from the wild. It is to be noted that number of plant species/varieties used for fuel and firewood is very low in this region (4-11 species/varieties) as shown in **Figure 6-2**. A similar situation is found in Southern Slopes and Valley (East) where the usage of plant varieties for fuel and fire wood is low but totally obtained from the wild except for the Siej chken that is cultivated. In the Central Hyperthermic Plateau and Southern Slopes and Valley (West), barring few species/varieties like Angkil, Arecanut, Cashewnut, Bolbrim, Boldoreng, Samcholijia, Te'brong, Wa'ge, Wa'bok, Wa'nok, Wa'tebok, the rest of the varieties are collected from the wild. In the Central Thermic Plateau, the situation is different. 52% of the plants were collected from the wild in the Central Thermic Plateau. In Gandhipara Garo, 82% plants used for fire and fuel wood is collected from the homestead plantations. Though, in villages as Thansning, Laitkynsew and Pydensosshaw, the plants collected from the wild is fewer.

Figure 6-2: Source of Collection –Species/ Varieties used as Fuel and Fire Woods.



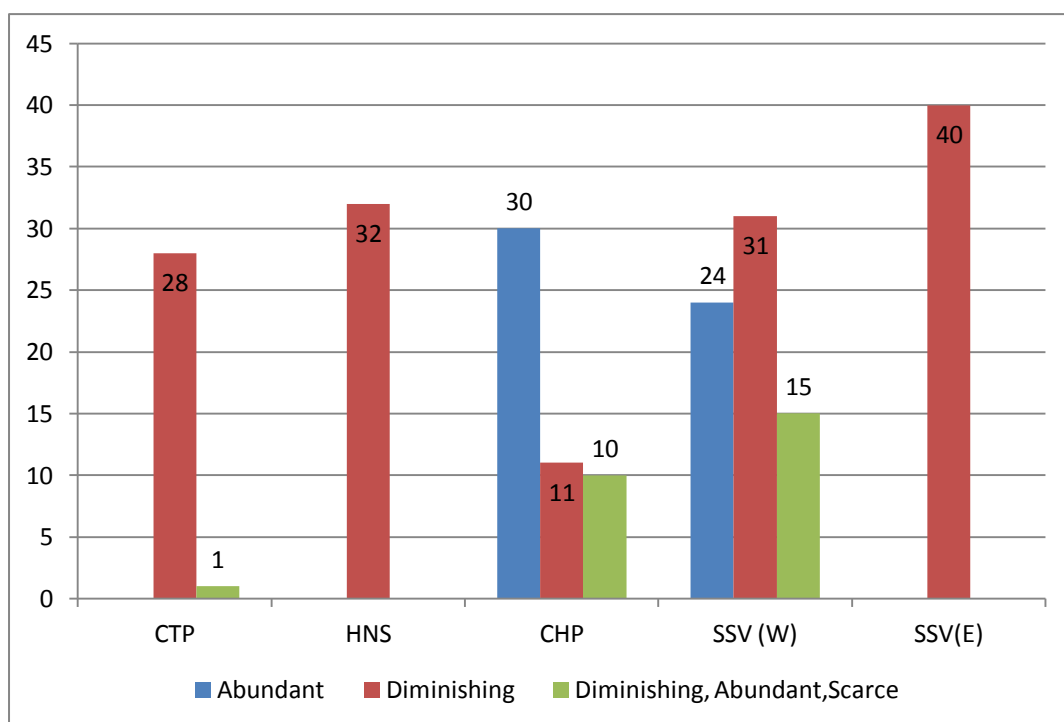
6.2.3 Location of Collection Area

The wild plants used for fire and fuel wood have been collected from various locations like open forest, Village woodlots, Dense forest, etc, There are few species that are exclusively collected for fuel and fire wood, whereas few cultivable species like Cashewnut, Te'brong (Jackfruit), Arecanut used sparsely has also been reported by the respondents.

6.2.4 Availability

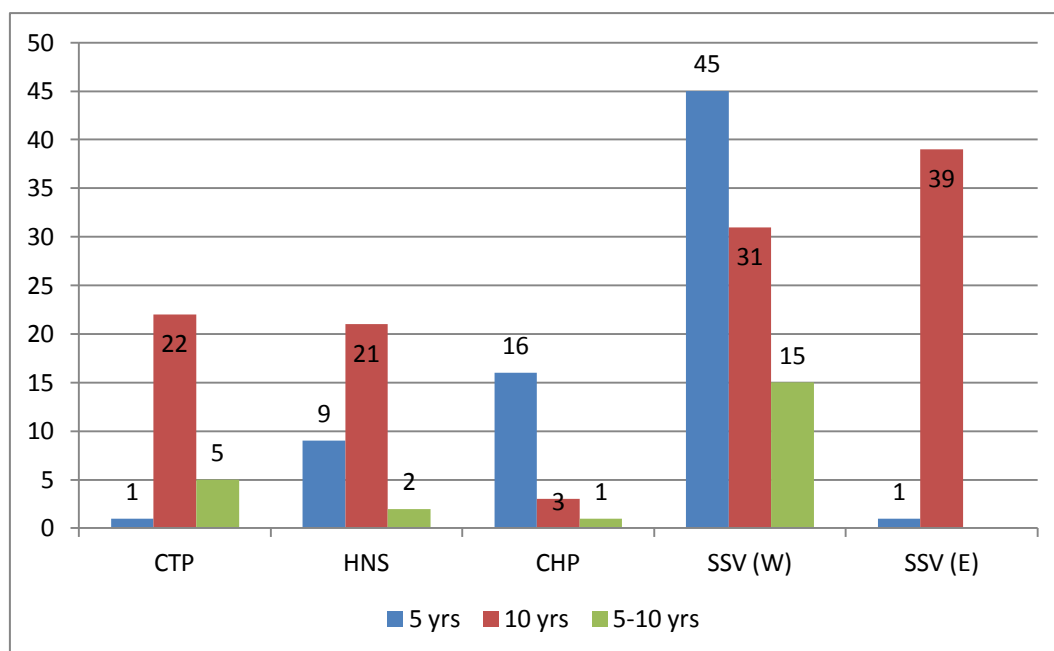
The availability status of the plants collected from the wild for fuel and firewood across the five agroclimatic zones are shown in **Figure 6-3**. The plants collected from the wild for fuel and firewood is abundant in the Central Hyperthermic Plateau and Southern Valley and Slopes (West). Their availability is diminishing at the other agroclimatic zones.

Figure 6-3: Availability Status of Plants collected from the wild for fuel and fire wood



The availability of majority of the species of plants used as fire and fuel wood has been declining over the past 10 years except in the Central Hyperthermic Plateau and the Southern slopes and Valley (West) (**Figure 6-4**). In the Central Thermic Plateau, Hills of Northern Slopes and Southern Slopes and Valley (East), 75.86%, 65.63% and 97.83% plants collected from the wild has declined over the past 10 years due to deforestation, forest fire, urbanization and lack of awareness as cited by the respondents. In the Central Hyperthermic Plateau and Southern Slopes and Valley (West), 50% and 97.83% of plants have declined over the past 5 years due to shifting cultivation, deforestation and urbanization.

Figure 6-4: Reduction in Availability of species/ varieties Collected from the Wild for Fire and Fuel wood



6.3 ANALYSIS OF WILD FUEL AND FIREWOOD PLANT SPECIES/VARIETIES ACROSS VILLAGES IN DIFFERENT AGROCLIMATIC ZONES

6.3.1 Central Thermic Plateau – Fuel and Firewood Plants

Source and Location of Collection Area

All the plants used for fuel and firewood are collected from the wild in Pyndensohsaw and Laitkynsew (**Figure 6-5**). Only 75% (6 out of 8) of the plants in Thansning and 17% of plants in Gandhipara Garo is obtained from the wild.

In the Central Thermic Plateau (**Figure 6-6**), the majority of the plants used for fuel and firewood are collected from the Open Forest, Homestead Plantation, Village Woodlots and Market.

Figure 6-5: Village wise collection of Wild Fuel and Firewood plants in Central Thermic Plateau

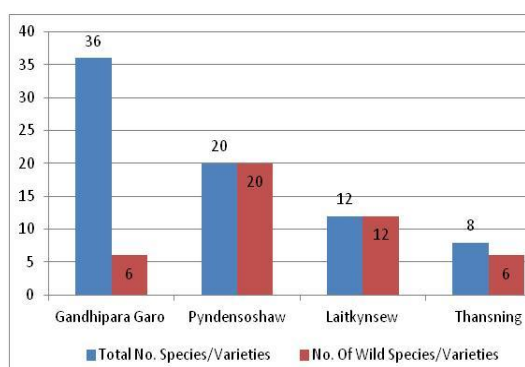
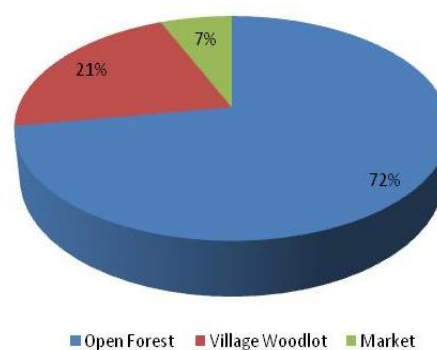


Figure 6-6: Location of Collection of Wild Fuel and Fire wood in Central Thermic Plateau



Widely used species and their availability – Central Thermic Plateau

A total of 15 species has been reported by more than 75% of respondents from the Khasi region and only two from Gandhipara Garo reflecting that the variety of species used as fuel is more in the villages surveyed in Khasi region than in Gandhipara Garo (**Table 6-1**).

The availability of the plants is diminishing over the past decade across all villages in Central Thermic Plateau (**Table 6-1**).

Table 6-1: List of widely used wild fuel and firewood plants and their availability in Central Thermic Plateau

Sl. No.	Name of Plant	Scientific Name	Gandhipara Garo	Pyndensohshaw	Laitkynsew	Thansning
			(50-300m)	(300-600m)	(600-1200m)	(1200-1600m)
% of Respondants						
1.	Bolmatra	—	Sc_5,10	—	—	—
2.	Dieng bti	—	—	—	Dm5,10	—
3.	Dieng iong	<i>Alnus nepalensis</i>	—	Dm_10	—	—
4.	Dieng kseh	<i>Pinus kesiya</i> / <i>Araocaria Cuninghail</i> / <i>Pinus petula</i>	—	—	—	Dm_10
5.	Dieng lakhar	—	—	—	Dm_5,10	—
6.	Dieng lasi	—	—	Dm_10	—	—
7.	Dieng met	—	—	—	—	Dm_10
8.	Dieng myrjong	—	—	Dm_10	—	—

Sl. No.	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pydensohshaw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of Respondants			
9.	Dieng ngan	<i>Schima wallichii</i> (Choisy)	—	Dm_10	Dm_5,10	Dm_10
10.	Dieng rai/ryi	<i>Michelia champaca</i>	—		Dm_10	—
11.	Dieng slatyrpad	—	—	Dm_10	—	—
12.	Dieng snar	<i>Cassia fistula</i>	—	Dm_10	—	—
13.	Dieng sning	<i>Quercus griffithi</i>	—	—	Dm_10	—
14.	Dieng sohot	—	—	Dm_10	Dm_10	—
15.	Dieng Sohphan	<i>Artocarpus integrifolia/</i> <i>Artocarpus heterophyllus</i> L am.	—	—	Dm_10	—
16.	Dieng Sohum	<i>Eugenia jambolana</i>	—	—	Dm_5,10	—
17.	Segun	<i>Shorea robusta</i>	Ab,Dm_5,10	—	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

6.3.2 Hills of Northern Slopes – Fuel and Firewood Plants

Source and Location of Collection Area

All the plants used for fuel and firewood are collected from the wild in all the four villages in this zone (**Figure 6-7**).

In the Hills of Northern Slopes (**Figure 6-8**), the majority of the collection is done from Open Forest followed by Homestead Plantation and Market.

Figure 6-7: Village wise collection of Wild Fuel and Firewood plants in Hills of Northern Slopes

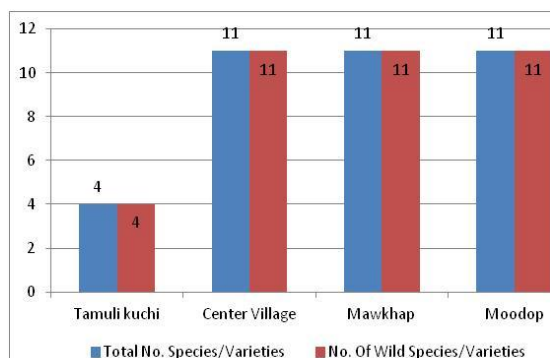
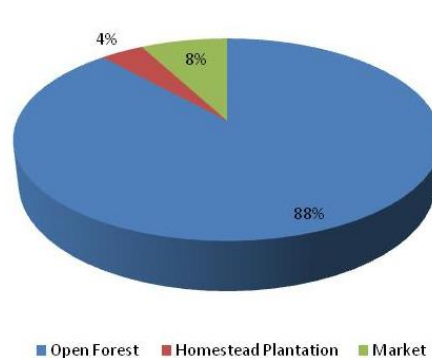


Figure 6-8: Location of Collection of Wild Fuel and Fire wood in Central Thermic Plateau



Widely Used Species and their Availability – Hills of Northern Slopes

A total of 18 species/varieties of plants have been reported by more than 75% respondents across villages in Hills of Northern Slopes (**Table 6-2**). Mawkhap has reported the maximum number of plants species used for fuel and firewood.

The availability of the plants is declining across all the villages over the past decade (**Table 6-2**).

Table 6-2: List of widely used fuel and firewood plants and their availability in Hills of Northern Slopes

Sl No	Name of Plant	Scientific Name	Tamuli Kuchi 50-300m	Center Village 300-600m	Mawkhap 600-1200m	Moodup 1200-1800m
1.	Dieng dymbli	—	—	Dm_5,10	—	—
2.	Dieng kseh	<i>Pinus kesiya</i> / <i>Araocaria</i> <i>Cuninghailii</i> / <i>Pinus</i> <i>petula</i>	Dm_10	—	—	—
3.	Dieng lhit	—	—	Dm_5	—	—
4.	Dieng lieng	<i>Betula alnoides</i>	—	—	Dm_10	—
5.	Dieng met	—	Dm_10	—	—	—
6.	Dieng ngan	<i>Schima wallichii</i> (Choisy)	—	Dm_5,10	Dm_10	—
7.	Dieng sai	—	—	—	Dm_10	—
8.	Dieng sar	—	—	—	Dm_10	—
9.	Dieng sning	<i>Quercus griffithi</i>	—	—	Dm_10	—

Sl No	Name of Plant	Scientific Name	Tamuli Kuchi 50-300m	Center Village 300-600m	Mawkhap 600-1200m	Moodup 1200-1800m
10.	Dieng sohmylleng	<i>Emblca officinalis</i> <i>Gaertn./</i> <i>Euphorbiaceae</i>	—	—	Dm_10	—
11.	Dieng sohot	—	—	—	Dm_10	—
12.	Dieng sohpdang	—	—	Dm_5	—	—
13.	Dieng tyrput	—	—	Dm_5	—	—
14.	Myrdoh	—	—	—	—	Ab, Dm_5,10
15.	Phlangthymme	—	—	—	—	Ab,Dm_5
16.	Shken	—	Dm_10	—	—	—
17.	Siej	—	Dm_5	—	—	—
18.	Tyngklieh	—	—	—	—	Ab, Dm_10

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or 10 are number of years over which availability has reduced

6.3.3 Central Hyperthermic Plateau – Fuel and Firewood Plants

Source and Location of Collection Area

In Central Hyperthermic Plateau, the plants used for fuel and firewood are majorly collected from the wild (**Figure 6-9**).

In the Central Hyperthermic Plateau (**Figure 6-10**), the majority of the collection is from open forest followed by agricultural land, homestead plantation and dense forest.

Figure 6-9: Village wise collection of Wild Fuel and Firewood plants in Central Hyperthermic Plateau

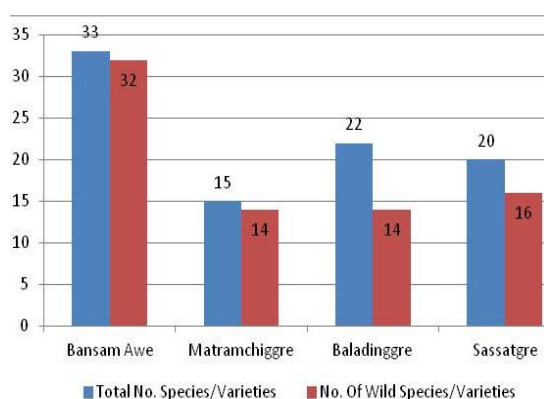
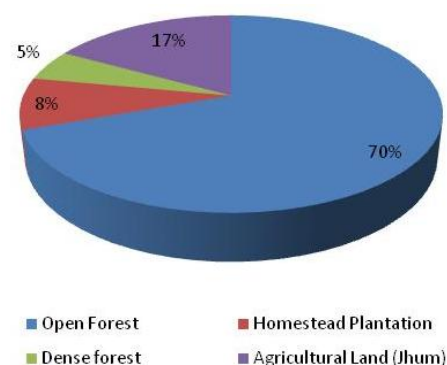


Figure 6-10: Location of Collection - Wild Fuel and Fire wood in Central Hyperthermic Plateau



Widely Used Species and their Availability – Central Hyperthermic Plateau

A total of 12 species have been reported to be used as fuel and firewood by more than 75% respondents across villages in Central Hyperthermic Plateau (**Table 6-3**). Chagro, Kimbal and Chamisi in Bansam Awe, Masanchi, Bolmatra and Chagro in Matramchiggre, Boldak and Megong in Baladinggre and Chagro, Kimbal and Chamisi in Sassatgre are the plants that have been reported to be used highest in this zone.

In this agroclimatic zone, the availability of plants used for fuel and firewood are abundant in Bansam Awe and diminishing in the other villages over the past decade (**Table 6-3**).

Table 6-3: List of widely used fuel and firewood plants and their availability in the Central Hyperthermic Plateau

SI No.	Name of Plant	Scientific Name	Bansam Awe 50-300m	Matramchiggre 300-600m	Baladinggre 600-1200m	Sassatgre 1200-1600m
1.	Agatchi	<i>Dellina pentagyna</i>	—	Ab, Sc, Dm_5	—	—
2.	Bolbit	<i>Litsea monopetalae</i>	Ab	—	—	—
3.	Bolbret	<i>Cadrela toona</i>	Ab	—	—	—
4.	Boldak	—	Ab	—	Dm, Rr_5,10	—
5.	Bolgipok/ Gambari	—	Ab	—	—	—
6.	Bolmatra	—	—	Ab	—	—
7.	Cha'gro	<i>Macaranga denticulate</i>	Ab	Ab, Dm, Sc_5	—	Ab, Dm_5,10
8.	Cha'misi	<i>Eurya accuminata</i>	Ab	—	—	Ab, Dm_5,10
9.	Kimbal	<i>Callicarpa arborea</i>	Ab	—	—	Ab, Dm_5,10
10.	Masanchi	—	—	Ab	—	—
11.	Matmi	<i>Croton joufera</i>	—	Ab	—	—
12.	Me'gong	<i>Bauhania purpurea</i>	—	—	Dm_5	—
Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced						

6.3.4 Southern Slopes and Valley (West) – Fuel and Firewood Plants

Source and Location of Collection Area

In Southern Slopes and Valley (West), majority of the plants used for fuel and firewood is collected from the wild (**Figure 6-11**).

In the Southern Slopes and Valley (West)(**Figure 6-12**), the plants collected from the wild has been majorly collected from the Open Forest, Homestead Plantation, Agricultural land and homestead plantation.

Figure 6-11: Village wise collection of Wild Fuel and Firewood plants in Southern Slopes and Valley (West)

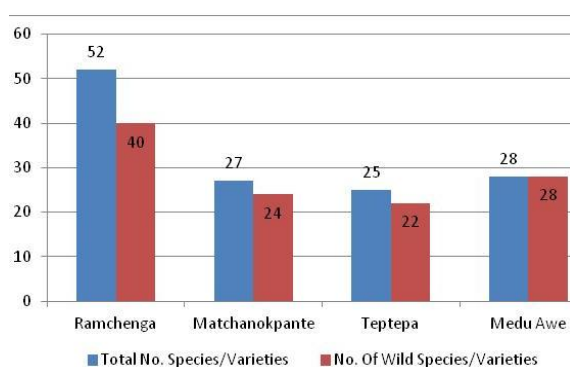
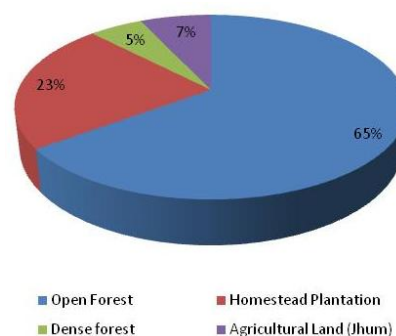


Figure 6-12: Location of Collection - Wild Fuel and Fire wood in Southern Slopes and Valley (West)



Widely Used Plants and their Availability - Southern Slopes and Valley (West)

A total of 19 species have been reported to be used by more than 75% of respondents in this zone (**Table 6-4**). Chagro is the only common species that has been reported to be used by more than 75% of the respondents across the four villages.

The availability of the plants is diminishing in Ramchengga and Matchankpante. The plants reported from Teptepa and Medu Hawe is available in abundance (**Table 6-4**).

Table 6-4: List of Fuel and Firwood plants widely and their availability in the Southern Slopes and Valley (West)

SI No	Name of Plant	Scientific Name	Ramchenga	Teptepa	Matchanokp	Medu Hawe
			50-300m	300-600m	ante 600-1200m	1200-1600m
% of Respondants						
1.	Agatchi	<i>Dellina pentagyna</i>	Dm_5	—	—	—
2.	Agong	—	—	Ab	—	—
3.	Bolbret	<i>Cadrela toona</i>	—	Ab	—	—
4.	Boldak	—	—	—	—	Ab
5.	Boldak	<i>Schima wallichii</i>	—	—	Dm_5,Ab	—
6.	Boldak	<i>Shorea robusta</i>	Dm_5,Ab	—	Ab	—
7.	Bolmatra	—	Dm_5	Ab	Dm_5,Ab	—
8.	Bolsubret	<i>Grewia microcos</i>	—	—	Ab, Dm_5	—
9.	Cha'gro	<i>Macaranga denticulate</i>	Dm_5	Ab	Dm_5, Ab	Ab
10.	Chamchi	—	—	Ab	—	Ab
11.	Chamchia	—	Ab, Dm_5,10,Sc	Dm_5, Ab	—	Ab
12.	Cha'misi	<i>Eurya accuminata</i>	—	Dm_5,Ab	—	—
13.	Dudkuri/bolmatra	<i>Wrightia arborea</i>	Dm_5,10,Sc	—	Ab	—
14.	Kimbal	<i>Callicarpa arborea</i>	—	—	—	—
15.	Mao	<i>Hibiscus macrophyllus</i>	—	—	Ab	Ab
16.	Masanchi	<i>Callicarpa arborea</i>	Dm_5, 10,Sc, Ab	Ab	—	—
17.	Matmi	<i>Croton joufera</i>	—	Ab	—	—
18.	Me'gong	<i>Bauhania purpurea</i>	Dm_5	—	—	—
19.	Pakram	<i>Grewia sp.</i>	—	Ab	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

6.3.5 Southern Slopes and Valley (East) – Fuel and Firewood Plants

Source and Location of Collection Area

All the plants used for fuel and firewood are collected from the wild in all the villages (**Figure 6-13**).

In the Southern Slopes and Valley (East) (**Figure 6-14**), the plants collected from the wild for fuel and firewood have been collected from open forest, market and homestead plantation.

Figure 6-13: Village wise collection of Wild Fuel and Firewood plants in Southern Slopes and Valley (East)

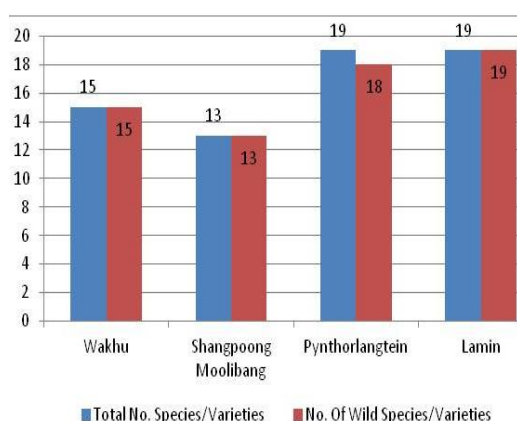
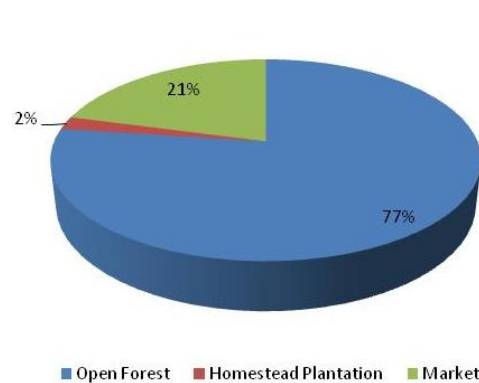


Figure 6-14: Location of Collection - Wild Fuel and Fire wood in Southern Slopes and Valley (East)



Widely Used Species and their Availability

A total of 17 species have been reported for fuel and firewood by more than 75% of respondents across the villages in Southern Slopes and Valley (East) (**Table 6-5**).

The plants in this region are in decline over the past decade as reported by the respondents (**Table-6-5**).

Table 6-5: List of fuel and firewood plants widely used and their availability in the Southern Slopes and Valley (East)

SI No	Name of Plant	Scientific Name	Wakhu 50-300m	Shangpung moolibang 300-600m	Pynthorlangt ein 600-1200m	Lamin 1200- 1600m
1.	Dieng burma	—	Dm_10	—	—	—
2.	Dieng chyrngan	—	Dm_10	Dm_10	Dm_10	Dm_10
3.	Dieng dkhar	<i>Erythrina stricta</i>	—	—	—	Dm_10
4.	Dieng jiatalong	—	—	—	—	Dm_10
5.	Dieng jri	<i>Hevea brasiliensis</i>	—	—	—	Dm_10
6.	Dieng krit	—	—	—	—	Dm_10
7.	Dieng kseh	<i>Pinus kesiya / Araocaria Cuninghail / Pinus petula</i>	—	Dm_10	Dm_10	Dm_10
8.	Dieng lakhar	<i>Mangifera indica/ spondias mangifera / Macaranga denticulata</i>	Dm_10	—	—	—
9.	Dieng lakhiat	—	Dm_10	—	—	—
10.	Dieng makalein	—	—	Dm_10	—	—
11.	Dieng ping	—	Dm_10	—	—	—
12.	Dieng potu	—	Dm_10	—	—	Dm_10
13.	Dieng pyrchiat	—	Dm_10	—	—	—
14.	Dieng rai/ryi	<i>Michelia champaca</i>	—	—	—	Dm_10
15.	Dieng saplew	—	—	Dm_10	—	—
16.	Dieng sning	<i>Quercus griffithi</i>	—	—	Dm_10	—
17.	Dieng sohpieng	<i>Mangifera indica/ spondias mangifera</i>	—	—	—	Dm_10

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

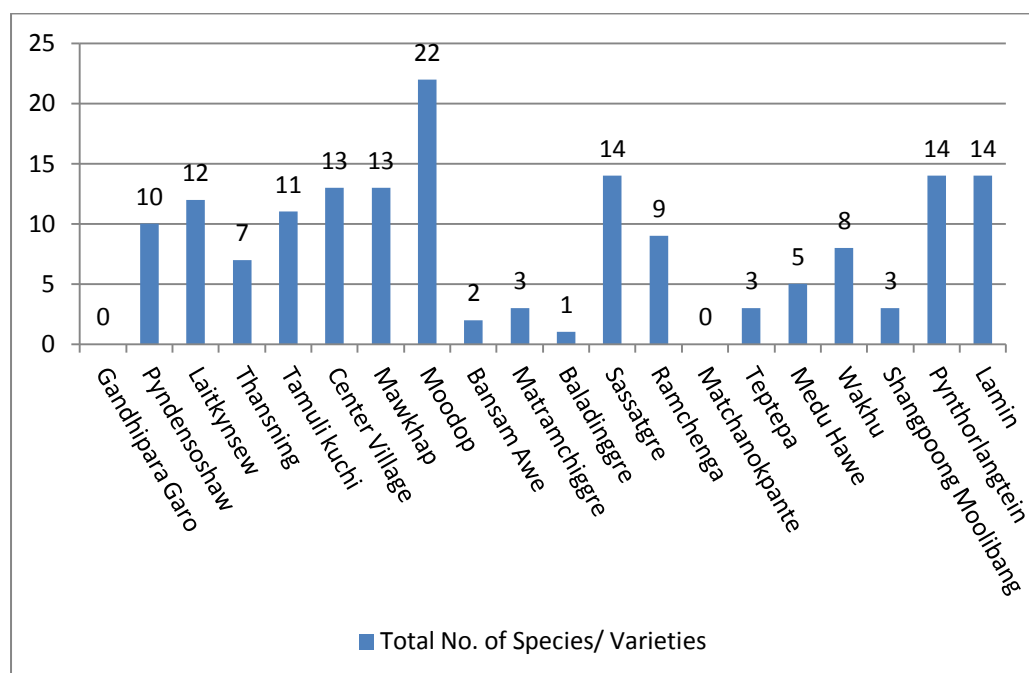
7 Traditional Uses of Plants and Availability –Fodder and Veterinary Medicine

7.1 FODDER AND VETERINARY MEDICINES ACROSS AGROCLIMATIC ZONES

7.1.1 Total number of Fodder and Veterinary Medicines Plants

The total number of plants that are used for fodder and medicine varies in each village. The act of rearing domesticated animals is less in the Garo side as reflected from the responses related fodder and medicines given to animals (**Figure 7-1**). The total number of species reported to be cultivated and collected from the wild ranged from 0-22 for fodder and medicines. The list of plants collected from wild for fodder and veterinary purpose reported from different villages is given in **Annexure 2C**. The maximum number of species was reported from Moodop.

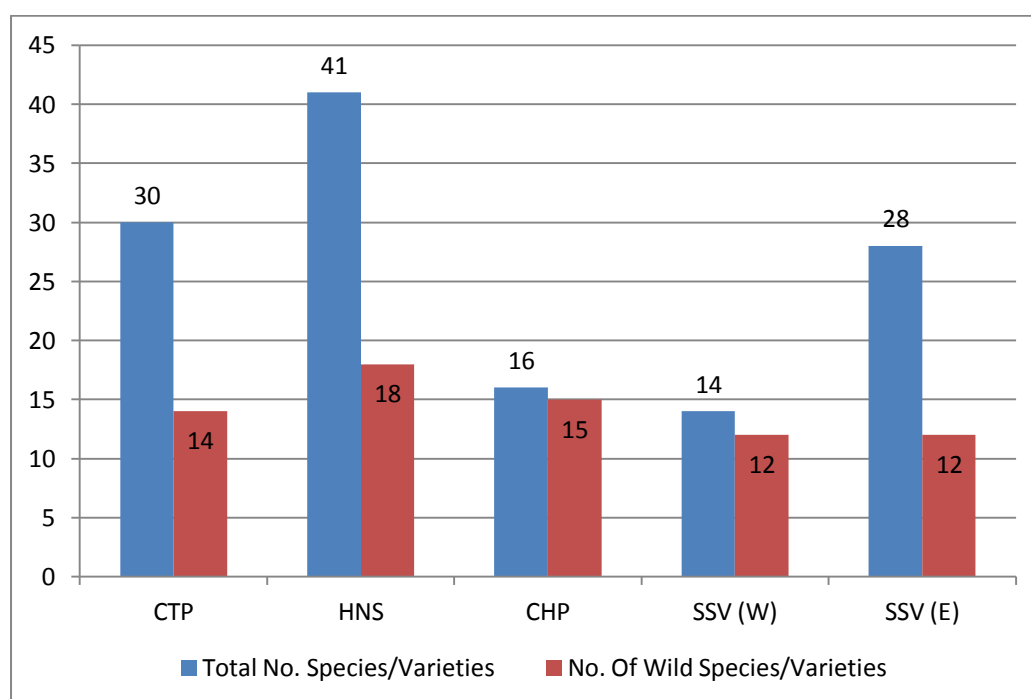
Figure 7-1: Total number of Plant Species/Varieties used for Fodder and Veterinary Medicine



7.1.2 Source of Collection

The collection of plants for fodder and medicines from the wild has been discussed in detail in this section. The collection of the fodder and medicine plants from the wild has range from 42.86% to 93.75% (**Figure 7-2**). In the Central Hyperthermic Plateau and Southern Slopes and Valley (West) the usage of plants as fodder and medicine is less but 85.71 % to 93.75% is obtained from the wild. The collection from the wild is more or less comparable in the other agro-climatic zones (42.86%-46.67%).

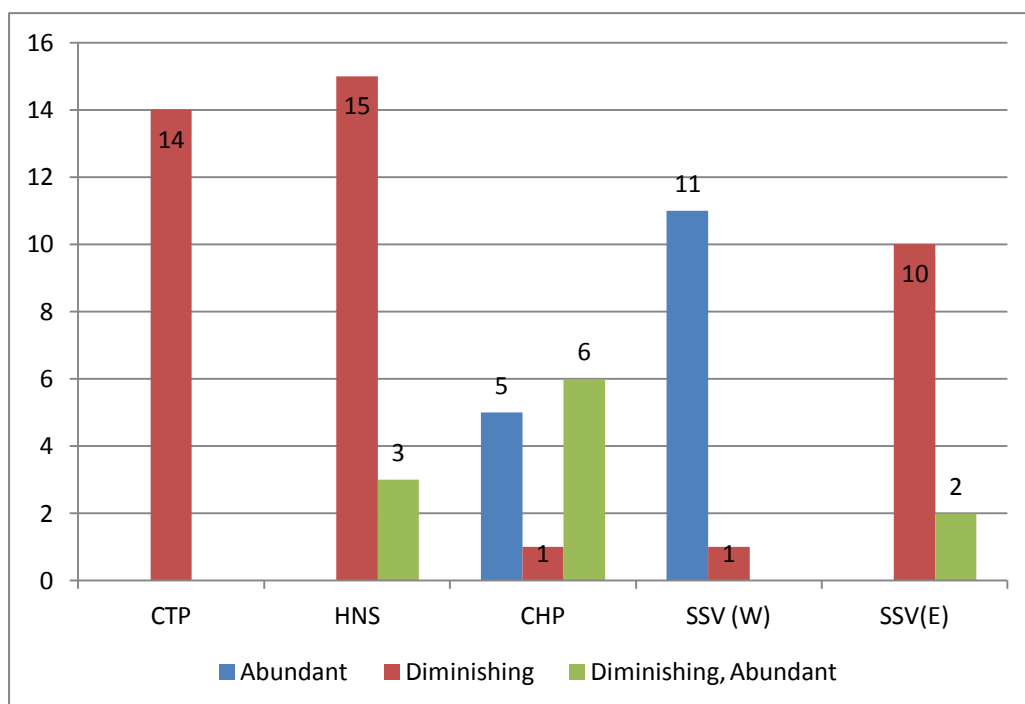
Figure 7-2: Source of Collection - Plants used as Fodder and Veterinary Medicine.



7.1.3 Availability

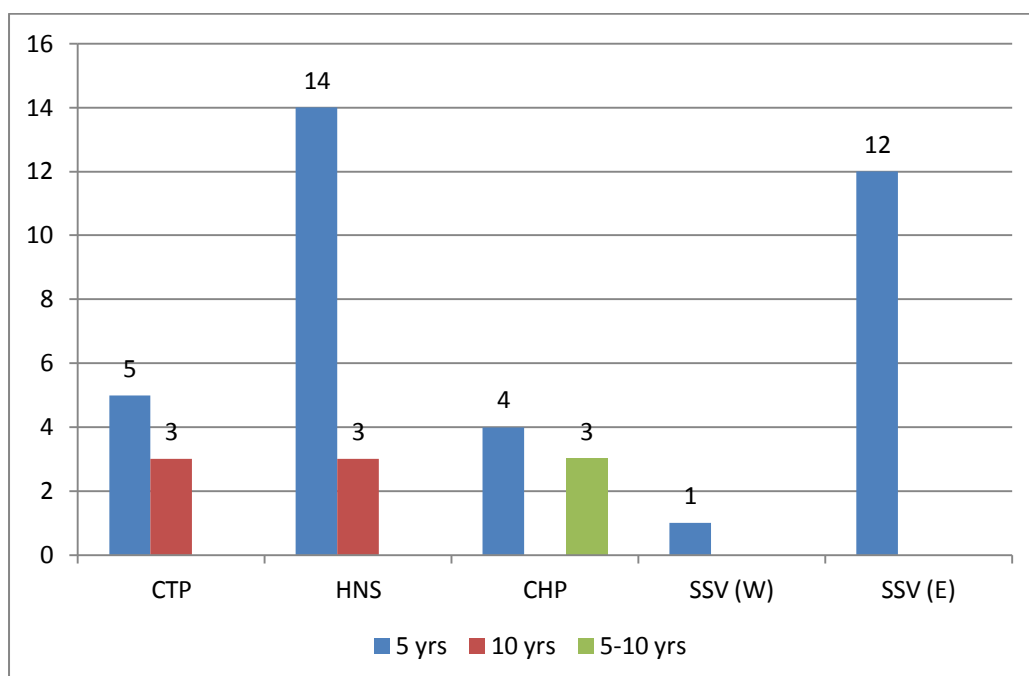
The plants collected from the wild for fodder and medicine is rapidly declining over the past five years (**Figure 7-3**) at Central Thermic Plateau, Hills of Northern Slopes and Southern Slopes and Valley (East). The abundance of the plants has been reported from Central Hyperthermic Plateau and Southern Slopes and Valley (West).

Figure 7-3: Availability Status of Plants Collected from the Wild for Fodder and Veterinary medicine



The diminishing trend in the availability of the plants has been mostly reported for the past five years (**Figure 7-4**) from Central Themic Plateau (35.71%), Hills of Northern Slopes (77.78%), Central Hyperthermic Plateau (57.14%) and Southern Slopes and Valley (West) (100%) and (East) (100%).

Figure 7-4: Reduction in Availability of Plant Species/ Varieties used as Fodder and Veterinary medicine



7.2 ANALYSIS OF WILD FODDER AND VETERINARY MEDICINAL PLANT SPECIES/VARIETIES ACROSS VILLAGES IN DIFFERENT AGROCLIMATIC ZONES

7.2.1 Central Thermic Plateau – Fodder and Veterinary Medicinal Plants

Source and Location of Collection Area

In the Central Thermic Plateau (**Figure 7-5**), the maximum usage of the number of species of wild plants is observed in Thansning followed by Laitkynsew and Pyndensoshaw. Reports of usage of plants for fodder and medicine have not been recorded from Gandhipara Garo.

In the Central Thermic Plateau (**Figure 7-6**), amongst the plants collected from the wild, maximum were obtained from the Open Forest followed by Village Woodlots.

Figure 7-5: Village wise Source of Collection of Fodder and Veterinary medicinal plants in Central Thermic Plateau

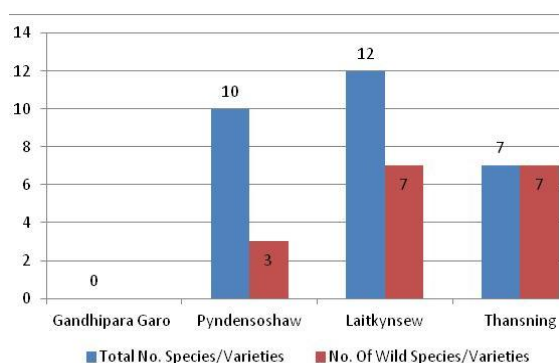
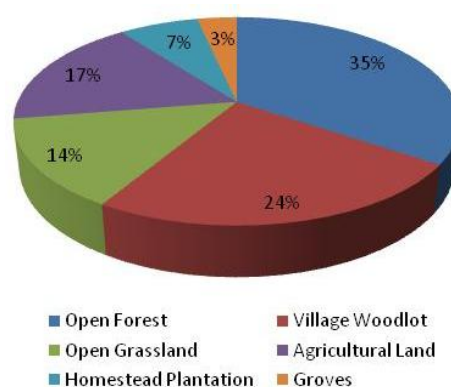


Figure 7-6: Location of Collection of Fodder and Veterinary medicinal plants from Wild in the Central Thermic Plateau



Widely Used Wild Fodder and Veterinary Plants - Central Thermic Plateau

Amongst all the reported plants in Central Thermic Plateau, only four plants in Pyndensoshaw and two plants in Thansning has been reported by more than 75% of villagers.

Syntiewjain in Pyndensohshaw is the only plant that is reported to be used as medicine and also as fodder.

The plants are in diminishing trend in Pyndensoshaw and Thansning (**Table 7-2**).

Table 7-1: List of Fodder and Veterinary medicine plants widely used and their availability in Central Themic Plateau

Sl. No	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pyndensohshaw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of Respondants			
1.	Khliengsyiar	—	—	Dm_10,5	—	—
2.	Langtana	—	—	—	—	Dm_5
3.	Mangkaring	<i>Viscum articulatum</i> Burm. (Loranthaceae),	—	Dm_10,5	—	—
4.	Sohprium	<i>Psidium quajava</i>	—	Dm_10,5	—	—
5.	Syntiewjain	—	—	Dm_10,5	—	—
6.	Tmain khla	—	—	Dm_10,5	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

7.2.2 Hills of Northern Slopes – Fodder and Veterinary Medicinal Plants

Source and Location of Collection Area

In the Hills of Northern Slopes (**Figure 7-7**), respondents from Moodop has reported a considerable number of plant species/varieties (87.36%) for use as fodder and medicine that are collected from the wild (19) followed by Center Village (69.23%).

In the Hills of Northern Slope (**Figure 7-8**), the contribution from the agricultural land and open forest has been equivalent followed by Open Grassland.

Figure 7-7: Village wise Source of Collection of Fodder and Veterinary medicinal plants in Hills of Northern Slope

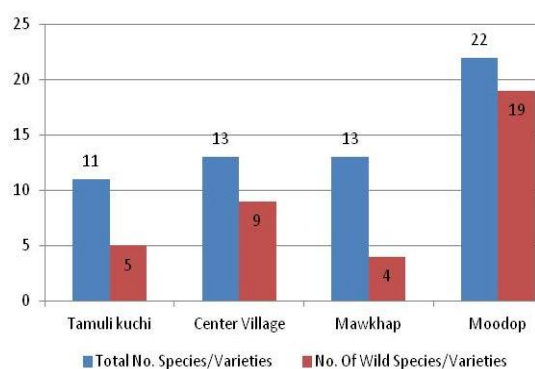
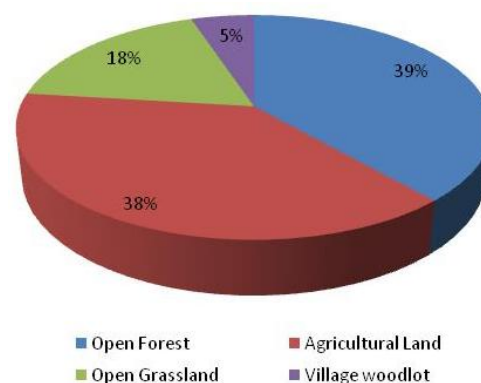


Figure 7-8: Location of Collection of Fodder and Veterinary medicinal plants from Wild in Hills of Northern Slope



Widely Used Plants and their Availability - Hills of Northern Slopes

Across the villages of Hills of Northern Slopes, none of the plants have been reported to be used by more than 75% respondents.

7.2.3 Central Hyperthermic Plateau – Fodder and Veterinary Medicinal Plants

Source and Location of Collection of Plants

In the Central Hyperthermic Plateau (**Figure 7-9**), Sassatggre has revealed the maximum usage of plant species/varieties for fodder and medicine amongst other villages. In Bansam Awe and Matramchigre all the plant varieties that are used are collected from the wild.

In the Central Hyperthermic Plateau (**Figure 7-10**), the majority of the plants used for fodder and medicine is obtained from the open forest.

Figure 7-9: Village wise Source of Collection of Fodder and Veterinary Medicinal Plants in Central Hyperthermic Plateau

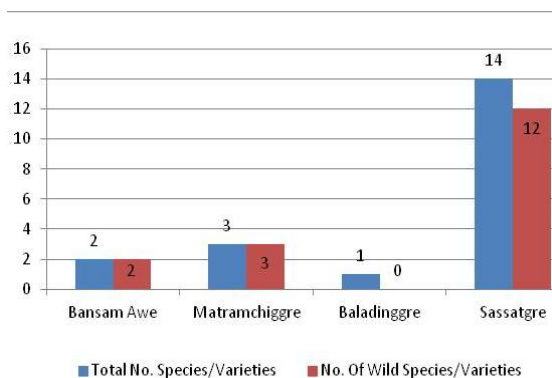
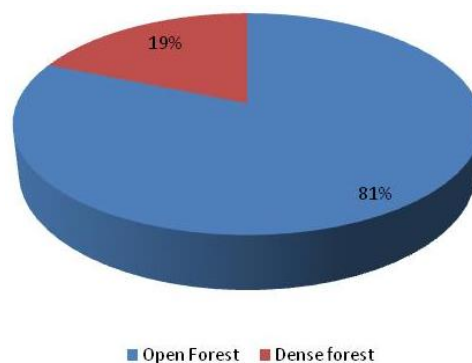


Figure 7-10: Location of Collection of Fodder and Veterinary medicinal plants from Wild in Central Hyperthermic Plateau



Widely Used Fodder and Veterinary Plants and their Availability - Central Hyperthermic Plateau

Across the villages of this zone, none of the plants have been reported to be used by more than 75% respondents.

7.2.4 Southern Slopes and Valley (West) – Fodder and Veterinary Medicinal Plants

Source and Location of Collection

In Southern Slopes and Valley (West) (**Figure 7-11**), the usage of plants for the purpose of fodder and medicine is less compared to others like, edible, fuel, etc. The collection of the plants is from the wild in all the villages.

In the Southern Slopes and Valley (West) (**Figure 7-12**), the plants for fodder and medicines is collected from various locations but mostly from open forest followed by homestead plantation, agricultural land, dense forest and waterbodies.

Figure 7-11: Village wise Source of Collection of Fodder and Veterinary Medicinal Plants in Southern Slopes and Valley (West)

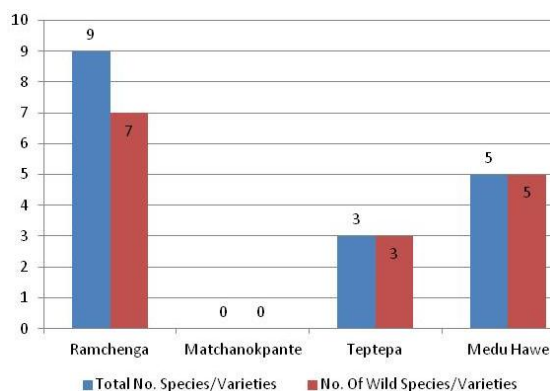
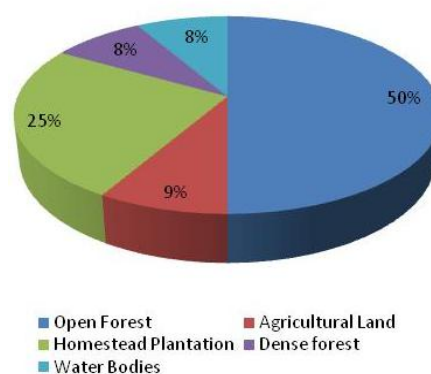


Figure 7-12: Location of Collection of Fodder and Veterinary medicinal plants from Wild in Southern Slopes and Valley (West)



Widely Used Plants and their Availability - Southern Slopes and Valley (West)

Across the villages of Southern Slopes and Valley (West), none of the plants have been reported to be used by more than 75% respondents.

7.2.5 Southern Slopes and Valley (East) – Fodder and Veterinary Medicinal Plants

Source and Location of Collection Area

In the Southern Slopes and Valley (East) (**Figure 7-13**), the collection of plants from the wild range from 25-50% except in Shangpoong Moolibang where the number of species used is less but obtained only from the wild.

In the Southern Slopes and Valley (East) (**Figure 7-14**), the collection of fodder plants is done from different locations like open forest, Homestead Plantation, market, Agricultural land and Open Grassland.

Figure 7-13: Village wise Source of Collection of Fodder and Veterinary Medicinal Plants in Southern Slopes and Valley (East)

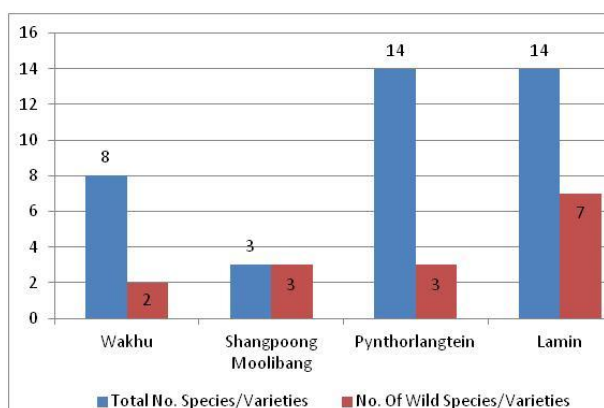
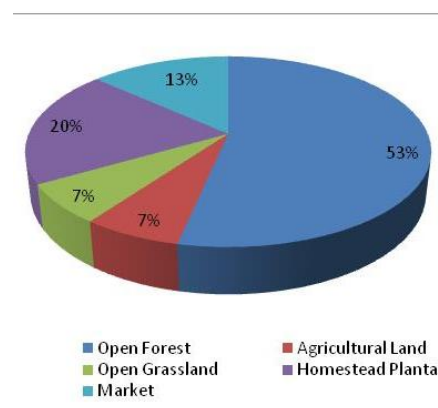


Figure 7-14: Location of Collection of Fodder and Veterinary medicinal plants from Wild in Southern Slopes and Valley (East)



Widely Used Plants and their Availability - Southern Slopes and Valley (East)

Sapriam and Myrdoh, in Wakhu have been reported to be used by more than 75% of the respondents (**Table 7-2**).

The plants reported highest from Wakhu are in diminishing trend (**Table 7-2**).

Table 7-2: List of of plants used for fodder and Veterinary medicine in Southern Slopes and Valley (East)

Sl. No	Name of Plant	Scientific Name	Wakhu (50-300m)	Shangpung moolibang (300-600m)	Pynthorlangtein (600-1200m)	Lamin (1200-1600m)
			% of Respondants			
1.	Myrdoh	—	Dm_10,5	—	—	—
2.	Sapriam	—	Dm_10,5	—	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

8 Traditional Uses of Plants and Availability –Medicinal Plants

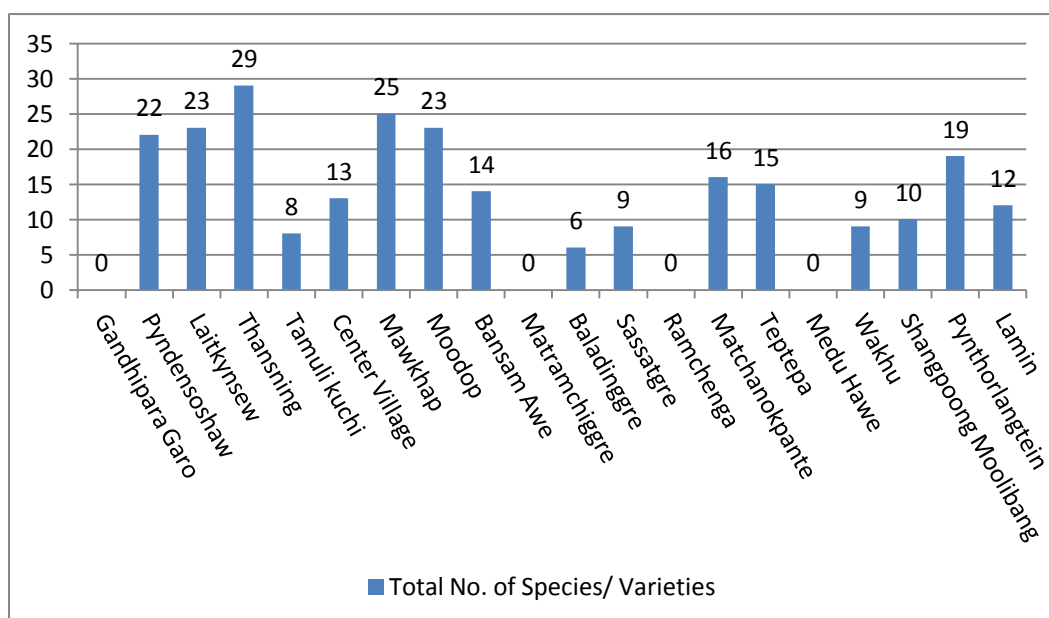
8.1 MEDICINAL PLANTS ACROSS AGROCLIMATIC ZONES

8.1.1 Total Number of Medicinal Plants

The usage of plants for medicinal purpose has elicited a lot of curiosity and has led to their study and documentation from 1980s (Kharkhongkar and Joseph, 1981; Rao R R, 1981; Neogi, B et al., 1989, etc). The medicinal plants are consumed for preventive and curative purpose across socio-economic status in Meghalaya. Majority of the people seek either form of traditional healer like traditional birth attendants, herbal practitioners and bone setters in times of need. Every village of the state has atleast one traditional healers known as *U Nong ai Dawai Kynbat* in Khasi Hills, *U Wa e Dawai* in Jaintia Hills and *Kaviraaj or Ojha* in Garo Hills. A Directory of Traditional Healers/Herbal Practitioners of Meghalaya and Database of Medicinal and Aromatic Plants commonly used by them for healthcare has been documented and published by Meghalaya State medicinal Plants Board.

A total 46 plant species along with the method of use for different species has been documented by Dolui et al 2004 based on folklore and interviews with local healers. Kayang et al conducted a study across the tribal villages of Meghalaya and identified and documented 57 species of plants along with the method of use used for treating different ailments. The total number of plants used for medicinal purpose that are cultivated and collected from wild range from 0 to 29 (**Figure 8-1**). The maximum number of species/varieties was reported from Thansning. Usage of plants for medicines has not been reported from Gandhipara Garo, Matramchiggre, Medu Awe, Ramchengga. The list of plants collected from wild for medicinal purpose from wild is given in **Annexure 2D**.

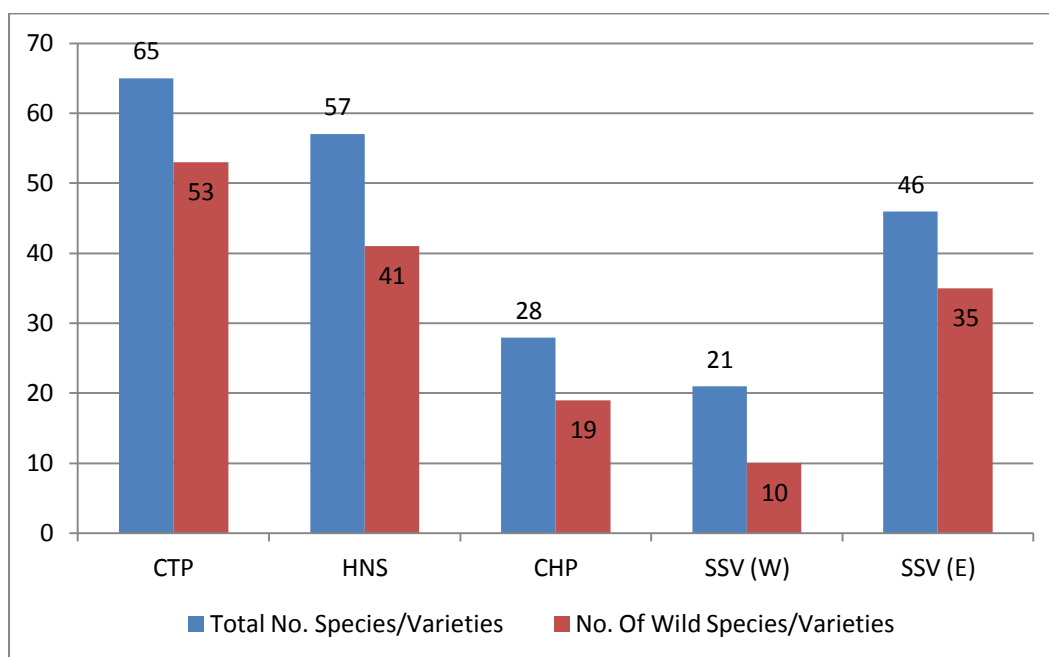
Figure 8-1: Total Number of Medicinal Plant in the Selected Villages.



8.1.2 Source of Collection

The plants that were used from the wild for medicinal purpose (**Figure 8-2**) was highest at Central Thermic Plateau followed by Hills of Northern Slopes and Southern Slopes and Valley (East). The collection of wild plants from the for medicines is less for Central Hyperthermic Plateau and Southern Slopes and Valley (West)

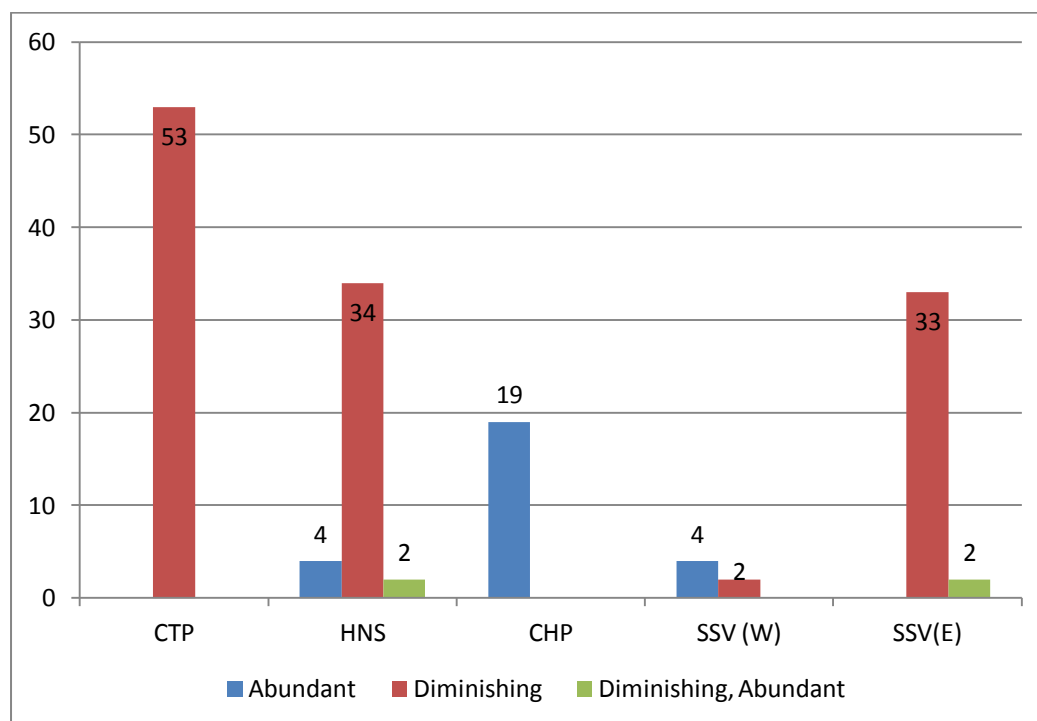
Figure 8-2: Source of Collection of Medicinal Plants



8.1.3 Availability

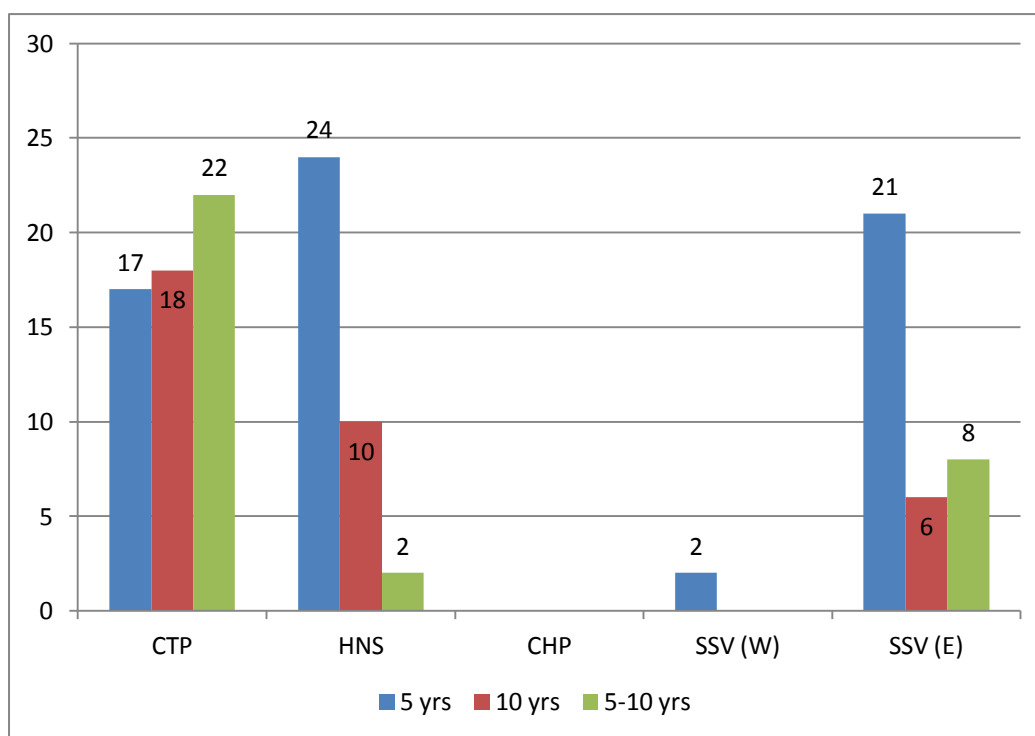
The availability of plants used for medicine has been declining in Central Thermic Plateau, Hills of Northern Slopes and Southern Slopes and Valley (East) (**Figure 8-3**). The availability of plants is still in abundance in Central Hyperthermic Plateau and Southern Slopes and Valley (West).

Figure 8-3: Availability Status of Medicinal Plants Collected from the Wild



The plants that are used for medicinal purpose has declined over the past 5 years in all the agroclimatic zones (**Figure 8-4**). In Central Thermic Plateau and Southern Slopes and Valley (East) a considerable plants have been on the decline over the past 5-10 years. The reduction in availability has been majorly due to shifting cultivation, deforestation, urbanization and lack of awareness.

Figure 8-4: Reduction in Availability of Medicinal Plants Collected from Wild



8.2 ANALYSIS OF WILD MEDICINAL PLANT SPECIES/VARIETIES ACROSS VILLAGES IN DIFFERENT AGROCLIMATIC ZONES

8.2.1 Central Thermic Plateau – Medicinal Plants

Source and Location of Collection Area

In the Central Thermic Plateau (**Figure 8-5**), the usage of plants from Gandhipara Garo has not been reported. The highest collection is done in Thansning Village followed by Pyndensohsaw and Laitkynsew.

In the Central Hyperthermic Plateau (**Figure 8-6**), the maximum number of species/varieties is obtained from the Open Forest followed by Village Woodlot and Homestead Plantations.

Figure 8-5: Village wise Source of Collection of Medicinal Plants in Central Thermic Plateau

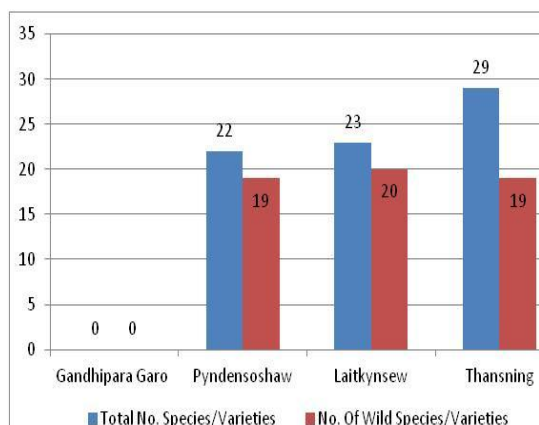
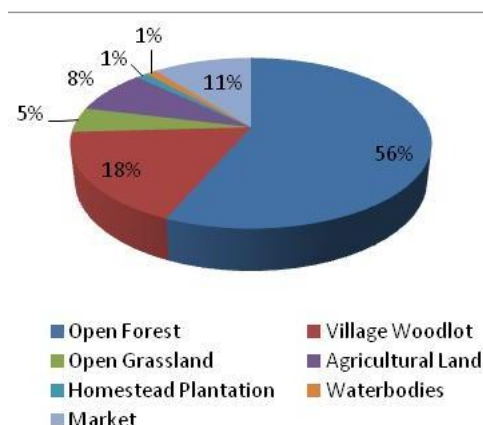


Figure 8-6: Location of Collection of Medicinal plants from Wild in Central Thermic Plateau



Widely Used Plants and their Availability - Central Thermic Plateau

A total of 5 species has been reported to be used by more than 75% of the respondents (**Table 8-1**). The availability of the plants is diminishing over the past decade. Traditional healers cultivate most of the plants required for preparing their medicines (**Table 8-1**).

Table 8-1: A list of medicinal plant widely used and their availability in the Central Thermic Plateau

Sl. No.	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pyndensoshaw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of Respondants			
1.	Khliengsyiar	—	—	Dm_10,5	—	—
2.	Langtana	—	—	—	—	Dm_5
3.	Sohpriam	<i>Psidium quajava</i>	—	Dm_10,5	—	—
4.	Syntiewjain	—	—	Dm_10,5	—	—
5.	Tmain khla	—	—	Dm_10,5	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

8.2.2 Hills of Northern Slopes– Medicinal Plants

In the Hills of Northern Slopes (**Figure 8-7**), the collection of wild plants for medicine is comparable in Mawkhap and Moodop, Followed by Center Village and Tamulikuchi.

In the Hills of Northern Slopes (**Figure 8-8**), the maximum species/varieties of plants are obtained from the Open Forest and Agricultural Land followed by Village Woodlot and Open Grassland.

Figure 8-7: Village wise Source of Collection of Medicinal Plants in Hills of Northern Slopes

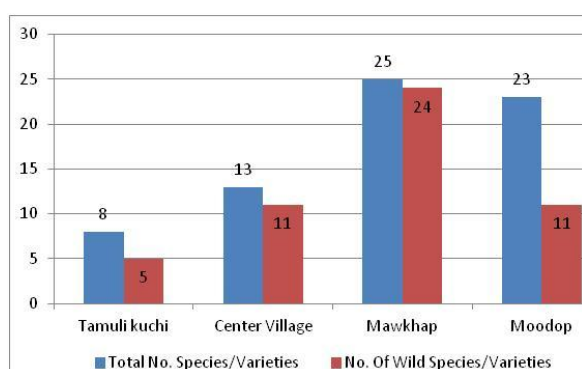
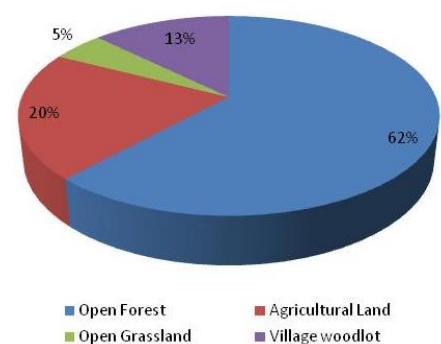


Figure 8-8: Location of Collection of Medicinal plants from Wild in Hills of Northern Slopes



Widely Used Plants and their Availability - Hills of Northern Slopes

A total of 8 plant species has been recorded from more than 75% of the respondents (**Table 8-2**).

All the plants have been reported to be in diminishing mode across all villages (**Table 8-2**).

Table 8-2: List of wild medicinal plants and their availability in Hills of Northern Slopes

SI No	Name of Plant	Scientific Name	Tamuli Kuchi (50-300m)	Center Village (300-600m)	Mawkhap (600-1200m)	Moodup (1200-1800m)
			% of Respondants			
1.	Bat-Jermani	—	—	—	Dm_10	—
2.	Jajew	<i>Begonia josephi Br.</i>	—	Dm_5	—	—
3.	Jamyrdoh	<i>Houttuynia cordata</i>	—	Dm_5	—	—

SI No	Name of Plant	Scientific Name	Tamuli Kuchi (50-300m)	Center Village (300-600m)	Mawkhap (600-1200m)	Moodup (1200-1800m)
			% of Respondants			
4.	Khlieng syiar	—	—	—	Dm_10,5	—
5.	Lbong syiar	—	—	Dm_5	—	—
6.	Sohmylleng	<i>Emblica officinalis Gaertn./</i>	—	—	Dm_10,5	—
7.	Sohpriam	<i>Psidium quajava</i>	—	Dm_5	Dm_10,5	—
8.	Synsar	—	—	—	Dm_10,5	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

8.2.3 Central Hyperthermic Plateau– Medicinal Plants

Source and Location of Collection Area

In the Central Hyperthermic Plateau (**Figure 8-9**), all the plants that used for medicinal purposes has been collected from the wild in Sassatggre and Bansam Awe. In Baladinggre, the plants have been reported to be cultivated.

In the Central Hyperthermic Plateau all the plants are collected from the open forest (**Figure 8-10**).

Figure 8-9: Village wise Source of Collection of Medicinal Plants in Central Hyperthermic Plateau

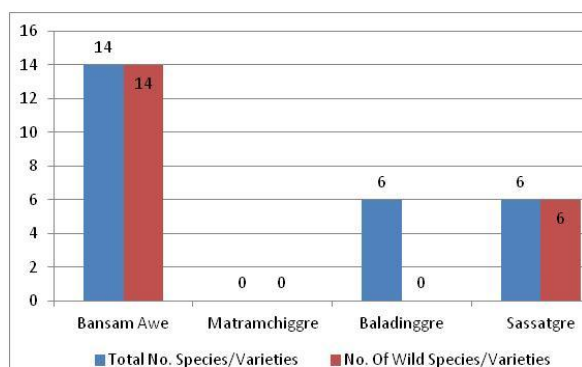
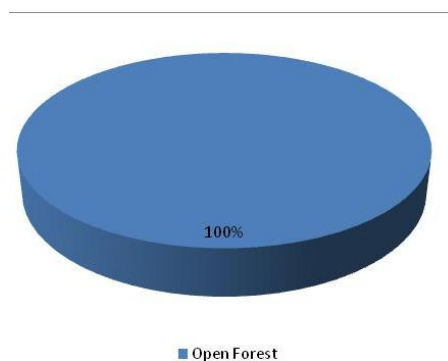


Figure 8-10: Location of Collection of Medicinal plants from Wild in Central Hyperthermic Plateau



Widely Used Plants and Their Availability - Central Hyperthermic Plateau

None of the plants reported from this zone have been reported to be used by more than 75% of the people.

8.2.4 Southern Slopes and Valley (West) – Medicinal Plants

Source and Location of Collection Area

In the Southern Slopes and Valley (West) (**Figure 8-11**), the proportion of plants collected from the wild for medicinal purposes is comparable in Matchanokpante and Teptepa.

In the Southern Slopes and Valley (West), all the plants are collected from the dense forest (**Figure 8-12**).

Figure 8-11: Village wise Source of Collection of Medicinal Plants in Southern Slopes & Valley (West)

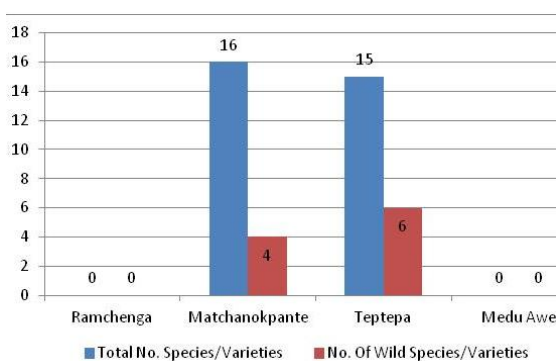
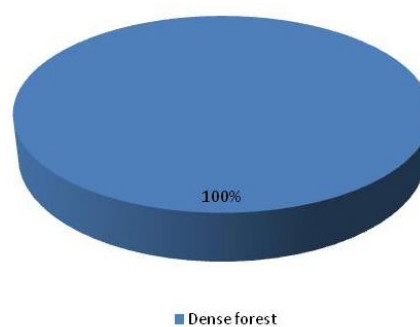


Figure 8-12: Location of Collection of Medicinal plants from Wild in Southern Slopes & Valley (West)



Widely Used Plants and their Availability - Southern Slopes and Valley (West)

None of the plants reported from this zone have been reported to be used by more than 75% of the people.

8.2.5 Southern Slopes and Valley (East) – Medicinal Plants

Source and Location of Collection Area

In the Southern Slopes and Valley (East) (**Figure 8-13**), the proportion of plants collected from the wild is comparable in all the villages. The number of

species/varieties used from the wild is highest in Pynthorlangtein followed by Lamin, Wahkoh and Shangpoong Moolibang.

In the Southern Slopes and Valley (East) (**Figure 8-14**), the maximum plants are obtained from the open forest followed by agricultural land, homestead plantation and open grassland.

Figure 8-13: Village wise Source of Collection of Medicinal Plants in Southern Slopes and Valley (East)

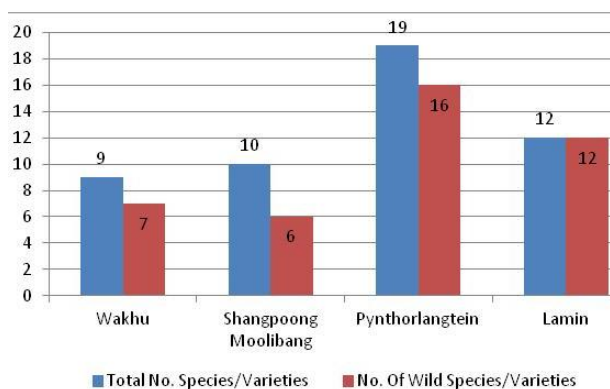
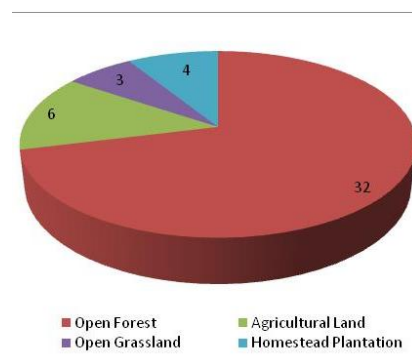


Figure 8-14: Location of Collection of Medicinal plants from Wild in Southern slopes and Valley (East)



Widely Used Plants and their Availability - Southern Slopes and Valley (East)

Two plants have been reported by more than 75% of the respondents in Wakhu (**Table 8-3**). In other villages, none of the plants are used by more than 75% of the respondents.

The plants reported are in decline over the past 5 to 10 years (**Table 8-3**).

Table 8-3: List of wild medicinal plants widely used and their availability in Southern Slopes and Valley (East)

Sl. No	Name of Plant	Scientific Name	Wakhu (50-300m)	Shangpung moolibang (300-600m)	Pynthorlangtein (600-1200m)	Lamin (1200-1600m)
			% of Respondants			
1.	Myrdoh	—	Dm_5,10	—	—	—
2.	Sapriam	—	Dm_5,10	—	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

9 Traditional Uses of Plants and Availability –Building and Ornamental Plants

9.1 BUILDING AND ORNAMENTAL PLANTS ACROSS AGROCLIMATIC ZONES

9.1.1 Total number of Building and Ornamental Plants

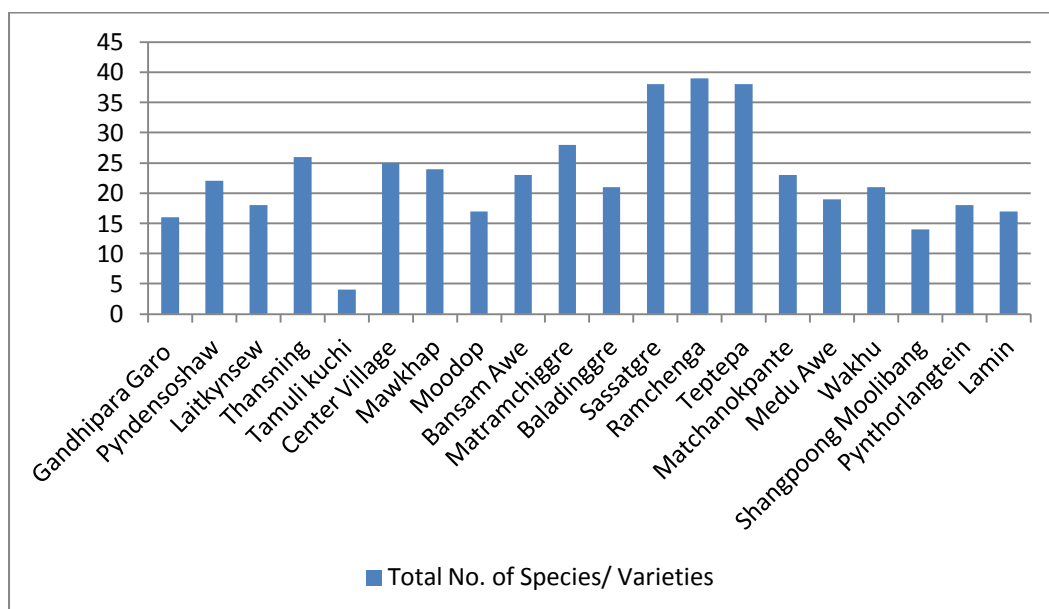
In 1990, the Forest Survey of India identified and classified the forest of Meghalaya on the availability of economically important tree species. The forests were classified into six types based on the dominant available species – 1) Khasi Pine; 2) Teak; 3) Sal; 4) Hardwood mixed with conifers; 5) Upland hardwood and 6) Miscellaneous. The earlier estimate of the standing stock volume shows that the proportion of Miscellaneous was the highest (81.59%) amongst all the types. The major timber species prevalent in Meghalaya as per NER is given in **Table 9-1**.

Table 9-1: Major Timber species prevalent in Meghalaya

Major Timber species		
1	Timber	<i>Albizia lebeck, Artocarpus integrifolia, Dipterocarpus macrocarpus, Gmelia arborea, Mesua ferra, Michelia champaca, Phoebe goalparensis, Pinus kesiya, Quercus spp., Schima wallichii, Terminalia myriocarpa, Shorea robusta, Tectona grandis etc.</i>
2	Pulpwood	<i>Bichofia paliathum, Bombax ceiba, Duabanga indica, Shorea assamica.</i>
3	Plywood	<i>Bombax ceiba, Dipterocarpus macrocarpus, Mangifera indica, Schima wallichii, S. khasiana.</i>
4	Construction	<i>Artocarpus integrifolia, Duabanga sonneratioes, Gmelia arborea, Mesua ferra, Michelia champaca, Phoebe goalparensis, Schima wallichii, Shorea assamica, Terminalia myriocarpa.</i>

There is a wide usage of plants for building materials and ornamental plants (**Figure 9-1**). The number of species/varieties cultivated and collected from wild range from 4 to 39. The maximum number of species has been reported from Ramchenga, Teptepa and Sassatgre. The list of plants collected from wild for building and ornamental purpose is given in **Annexure 2E**.

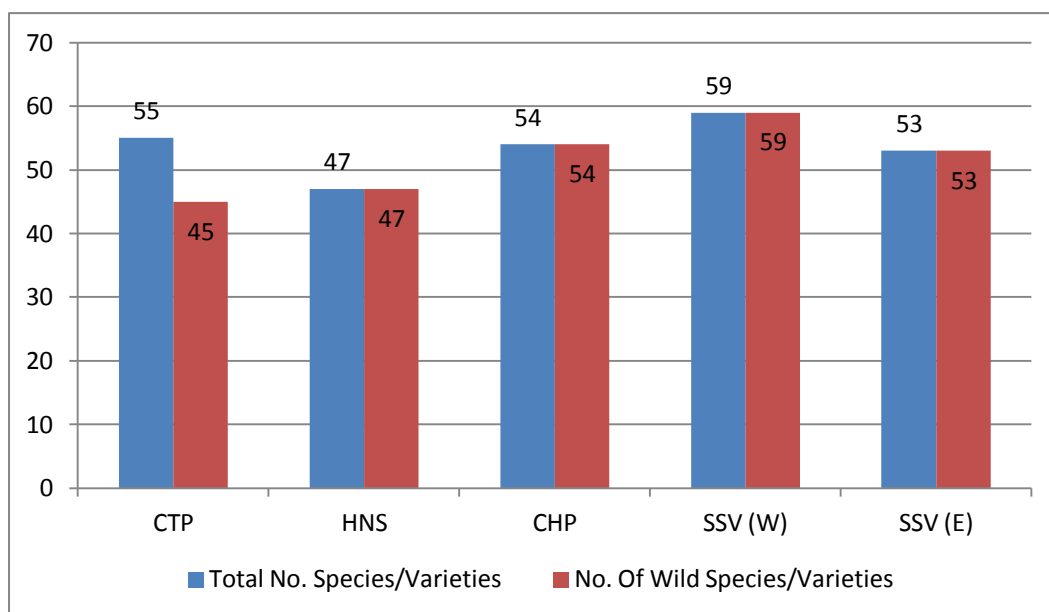
Figure 9-1: Total Number of Plant species/varieties used for building materials and ornamental plants in the selected villages.



9.1.2 Source of Collection

The proportion of plants used from the wild range from 82% in the Central Thermic Plateau and 100% in the other agroclimatic zones (**Figure 9-2**).

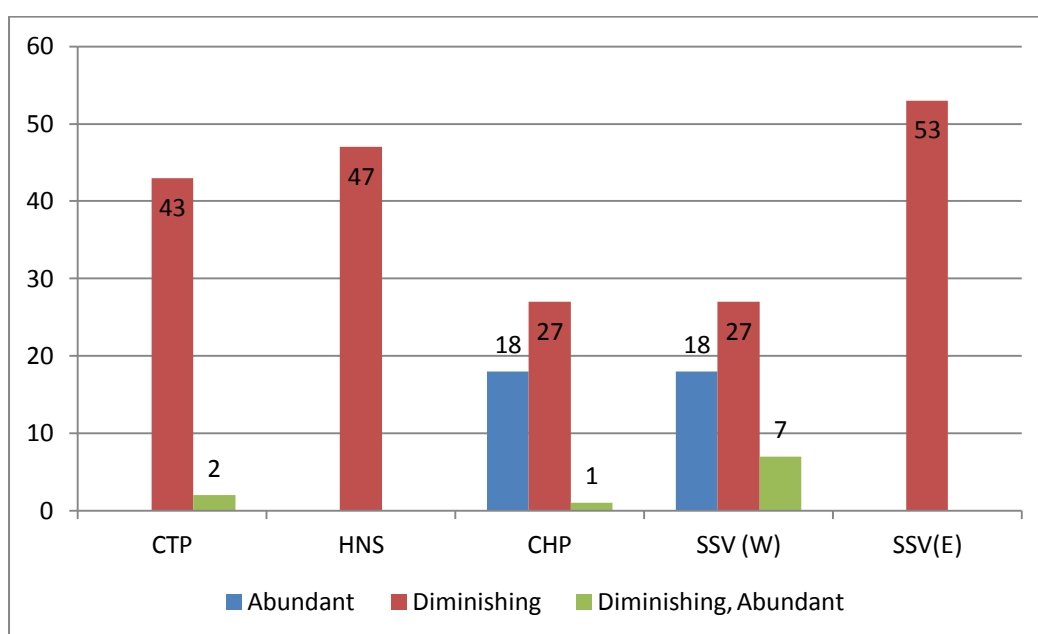
Figure 9-2: Source of Collection of Plants used as Building Materials and Ornamental Plants



9.2 AVAILABILITY

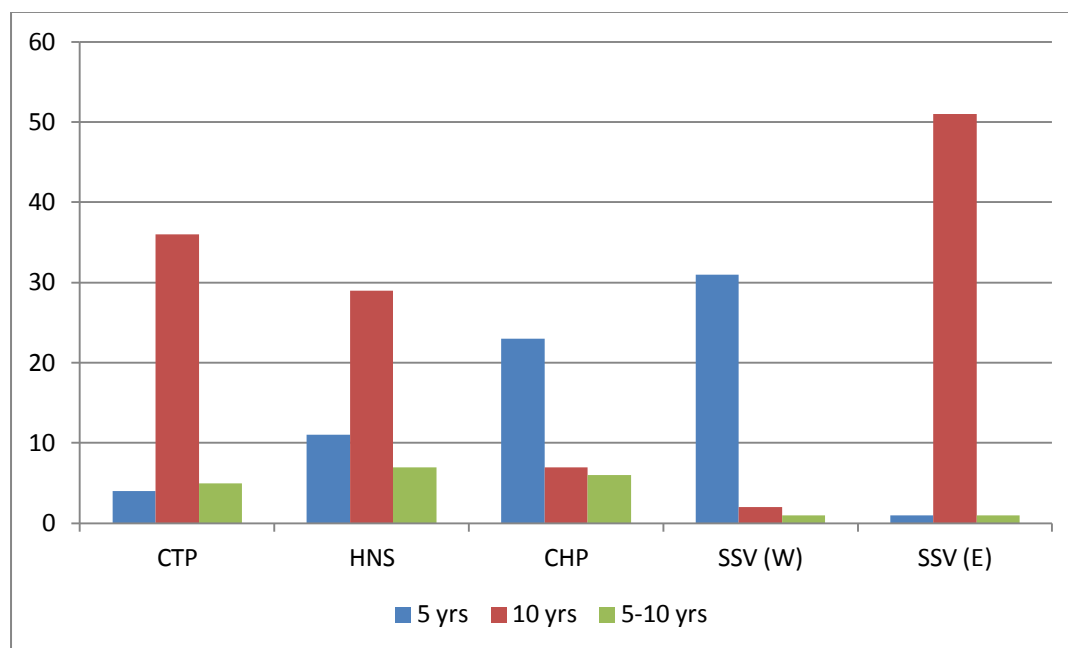
The availability of the plants used as building material and ornamental plants have diminished in all the agroclimatic zones (**Figure 9-3**). An equivalent number of plants have been reported to be abundant in the Central Hyperthermic Plateau and Southern Slopes and Valley (West).

Figure 9-3: Availability Status of Building Materials and Ornamental Plants Collected from Wild



For the plants used as building material and ornamental plants, the maximum decline has been noted over the past 10 years followed by five years and five to ten years (**Figure 9-4**) due to rapid urbanization, deforestation and unawareness.

Figure 9-4: Reduction in Availability of Plant Species/ varieties of Building Materials and Ornamental Plants Collected from the Wild



9.3 ANALYSIS OF WILD BUILDING AND ORNAMENTAL PLANT SPECIES/VARIETIES ACROSS VILLAGES IN DIFFERENT AGROCLIMATIC ZONES

9.3.1 Central Thermic Plateau – Building and Ornamental Plants

Source and Location of Collection Area

In Pyndensohshaw and Laitkynew, all the plants used for building ornamental purposes are collected from the wild. 12% (2 out of 16) of plants in Gandhipara Garo and 46% in Thansning are collected from the wild (**Figure 9-5**).

In the Central Thermic Plateau (**Figure 9-6**) the majority of plants are collected from the Open Forest followed by markets, Village Woodlots and Homestead Plantations.

Figure 9-5: Village wise Source of Collection of Building and Ornamental Plants in Central Thermic Plateau

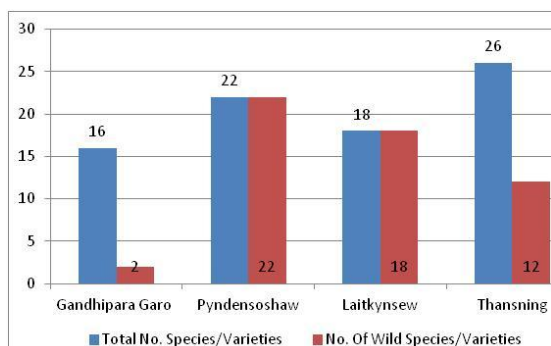
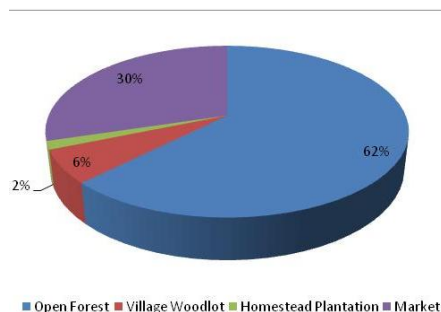


Figure 9-6: Location of Collection of Building Materials and Ornamental Plants from Wild in the Central Thermic Plateau



Widely Used Plants and their Availability - Central Thermic Plateau

A list of 17 species in table reveals the name of species that have been reported by more than 75% of respondents in each village (**Table 9-2**).

The availability of the plants in this region is diminishing over the past decade (**Table 9-2**).

Table 9-2: A list of wild building and ornamental plants widely used and their availability in Central Thermic Plateau

Sl. No	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pyndensohs haw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of respondents			
1.	Bolsal	—	Ab, Dm, R_10,5	—	—	—
2.	Dieng Bilat	—	—	—	—	Dm_10
3.	Dieng bti	—	—	—	Dm_10	—
4.	Dieng kseh	<i>Pinus kesiya</i> / <i>Araocaria Cuninghaili</i> / <i>Pinus petula</i>	—	Dm_10	—	Dm_10
5.	Dieng met	—	—	—	Dm_10	—
6.	Dieng ngan	<i>Schima wallichii</i> (Choisy)	—	Dm_10	Dm_10	—
7.	Dieng rai	—	—	Dm_10	Dm_10	—
8.	Dieng snar	<i>Cassia fistula</i>	—	Dm_10	—	—

Sl. No	Name of Plant	Scientific Name	Gandhipara Garo (50-300m)	Pyndensohs haw (300-600m)	Laitkynsew (600-1200m)	Thansning (1200-1600m)
			% of respondents			
9.	Dieng sning	<i>Quercus griffithi</i>	—	—	Dm_10	—
10.	Dieng sohmasem	—	—	Dm_10	—	—
11.	Dieng sohphan	<i>Artocarpus integrifolia/</i> <i>Artocarpus heterophyllus Lam.</i>	—	—	Dm_10	—
12.	Dieng tanglang	—	—	Dm_10	—	—
13.	Dieng taroi	—	—	Dm_10	—	—
14.	Segun (Teak)	—	Dm, R, Sc_5.10	—	—	—
15.	Siej skong	—	—	Dm_10	—	—
16.	Tiew dieng knup mawiang	—	—	—	Dm_10	—
17.	Tiewdieng lynskaw	—	—	—	Dm_10	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

9.3.2 Hills of Northern Slopes– Building and Ornamental Plants

Source and Location of Collection Area

In the Hills of Northern Slopes (**Figure 9-7**), all the plants in Mawkhap and Moodop are collected from the wild. In Tamulikuchi, 94% (36 out of 38) and in Center Village 78% is collected from the wild.

In the Hills of Northern Slopes (**Figure 9-8**), the majority of plant species are obtained from the Open Forest followed by Village Woodlots, Homestead Plantations, Market and Open Grassland.

Figure 9-7: Village wise Source of Collection of Building and Ornamental Plants in Hills of Northern Slopes

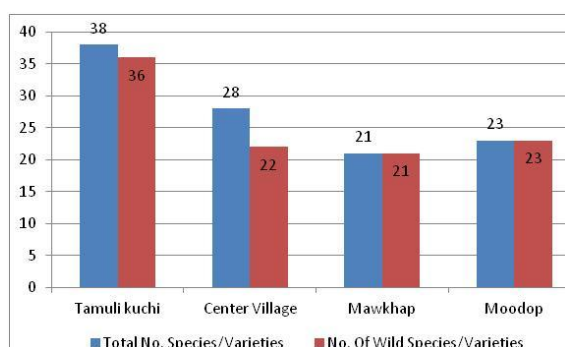
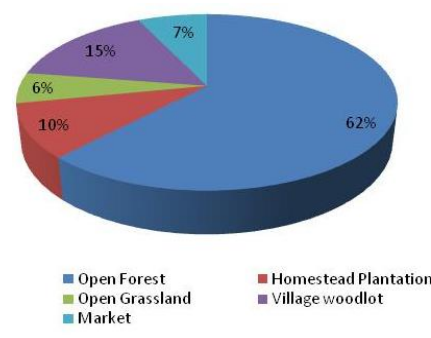


Figure 9-8: Location of Collection of Building Materials and Ornamental Plants from Wild in Hills of Northern Slopes



Widely Used Plants and their Availability - Hills of Northern Slopes

A total list of 23 species has been given in **Table 9-3** that has been reported to be used by more than 25% of the respondents (**Table 9-3**).

The availability is reducing over the past one decade across the villages (**Table 9-3**).

Table 9-3: List of wild Building and Ornamental plants widely used and their availability in Hills of Northern Slopes

Sl. No.	Name of Plant	Scientific Name	Tamuli Kuchi	Center Village	Mawkhap	Moodup
			(50-300m)	(300-600m)	(600-1200m)	(1200-1800m)
% of Respondants						
1.	Dieng blei	—	—	Dm_5,10	—	—
2.	Dieng kseh	<i>Pinus kesiya</i> / <i>Araocaria Cuninghail</i> / <i>Pinus petula</i>	Dm_10	—	—	Dm_10
3.	Dieng Lieng	<i>Betula alnoides</i>	—	—	Dm_10	Dm_10
4.	Dieng makalein	—	—	—	—	Dm_10
5.	Dieng met	—	Dm_10	—	—	—
6.	Dieng ngan	<i>Schima wallichii</i> (Choisy)	—	Dm_5	Dm_10	—
7.	Dieng ryi	—	—	—	—	Dm_10
8.	Dieng sai	—	—	—	Dm_10	—
9.	Dieng sal	—	—	Dm_5	—	—
10.	Dieng sar	—	—	—	Dm_10	—

Sl. No.	Name of Plant	Scientific Name	Tamuli Kuchi (50-300m)	Center Village (300-600m)	Mawkhap (600-1200m)	Moodup (1200-1800m)
			% of Respondants			
11.	Dieng sning	<i>Quercus griffithi</i>	—	—	Dm_10	—
12.	Dieng sohpdang	—	—	Dm_5	—	—
13.	Phlang rishong	—	—	—	Dm_10	—
14.	Phlang traw	—	—	Dm_5	—	—
15.	Shken	—	Dm_10	—	Dm_5,10	—
16.	Siej	—	Dm_10	Dm_5,10	Dm_5	—
17.	Siej chlew	—	—	Dm_5	—	—
18.	Siej khnap	—	—	Dm_5	—	—
19.	Siej Thnieng	—	—	Dm_5	—	—
20.	Siej-shken	—	—	—	Dm_10	—
21.	Tiewdieng bashad	—	—	—	Dm_10	—
22.	Tiewdieng lyngskaw	—	—	—	Dm_5,10	—
23.	Tiewdieng tdongmaw	—	—	—	Dm_10	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

9.3.3 Central Hyperthermic Plateau– Building and Ornamental Plants

Source and Location of Collection Area

In this zone, all the plants are collected from the wild in Sassatggre, and more than 90% of the plants collected for building and ornamental plants recollected from the wild (**Figure 9-9**).

In the Central Hyperthermic Plateau (**Figure 9-10**), the maximum plants are collected from the dense forest followed by open forest and homestead plantation.

Figure 9-9: Village wise Source of Collection of Building and Ornamental Plants in Central Hyperthermic Plateau

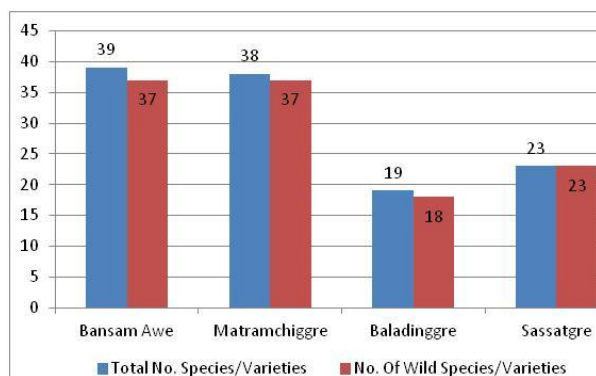
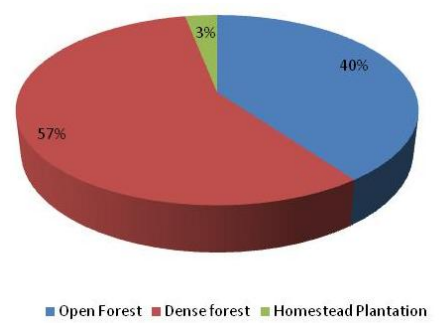


Figure 9-10: Location of Collection of Building Materials and Ornamental Plants from Wild in Central Hyperthermic Plateau



Widely Used Plants and their Availability - Central Hyperthermic Plateau

A total of 12 species has been reported to be use by more than 75% of the respondents in this zone (**Table 9-4**).

The availability of widely used plants are in decline in all villages except in Bansam Awe.

Table 9-4: List of wild building and ornamental plants widely used and their availability in Central Hyperthermic Plateau

Sl. No.	Name of Plant	Scientific Name	Bansam Awe	Matramchiggre	Baladinggre	Sassatgre
			50-300m	300-600m	600-1200m	1200-1600m
% of Respondants						
1.	Bolbret	<i>Cadrela toona</i>	—	Ab,Dm_5	—	—
2.	Boldak	<i>Schima khasiana</i>	Ab	—	Dm_5	Ab, Dm_5,10
3.	Bolsal	<i>Shorea rubusta</i>	Ab	—	Dm_5	—
4.	Cha'gro	<i>Macaranga denticulta</i>	Ab	—	—	Ab, Dm_5,10
5.	Chamisi	—	Ab	—	Dm_5	Ab, Dm_5,10
6.	Gambari	<i>Gmelina arborea</i>	—	—	—	Ab
7.	Kimbal	<i>Callicarpa arborea</i>	Ab	—	—	Ab, Dm_5,10
8.	Mao	<i>Hibiscus macrophyllus</i>	Ab	Ab,Dm_5	—	—

Sl. No.	Name of Plant	Scientific Name	Bansam Awe	Matramchigre	Baladinggre	Sassatgre
			50-300m	300-600m	600-1200m	1200-1600m
% of Respondants						
9.	Segun (Teak)	—	Ab	—	Dm, Rr,S_5,10	—
10.	Wa.tebok	—	Ab	Ab,Dm_5	Dm_10	Ab
11.	Wa'ge	—	Ab	—	Dm, Rr_5,10	Ab
12.	Wa'tre	—	Ab, Dm_5	Ab,Dm_5	Dm_5	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

9.3.4 Southern slopes and Valley (West) – Building and Ornamental Plants

Source and Location of Collection Area

In the Southern Slopes and Valley (West) (**Figure 9-12**) the majority of the plants are collected from the Open Forest, followed by Dense Forest Homestead Plantation and Village Woodlot.

Figure 9-11: Village wise Source of Collection of Building and Ornamental Plants in Southern Slopes and Valley (West)

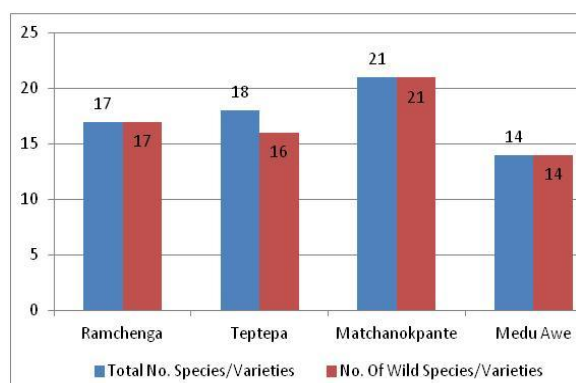
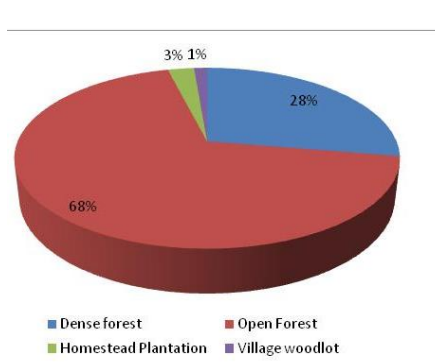


Figure 9-12: Location of Collection of Building Materials and Ornamental Plants from Wild in Southern slopes and Valley (West)



Widely Used Plants and their Availability - Southern slopes and Valley (West)

A total of 18 species has been reported by more than 75% of respondents from the Southern Slopes and Valley (West) (**Table 9-5**)

The availability of the plants varies across different villages (**Table 9-5**). In Medu Hawe, the plants are reported to be available in abundance whereas it is reported to be diminishing over the past five years.

Table 9-5: List of Building and Ornamental plants widely used and their availability in Southern Slopes and Valley (West)

SI No	Name of Plant	Scientific Name	Ramchenga	Teptepa	Matchanokpante	Medu Hawe
			(50-300m)	(300-600m)	(600-1200m)	(1200-1600m)
% of Respondants						
1.	Bolchengrong	—	—	—	—	Ab
2.	Bolchim	<i>Duabanga grandiflora</i>	—	Dm_5	—	Ab
3.	Boldak	<i>Schima khasiana</i>	Dm_5	Dm_5	Dm_5	—
4.	Bolsal	<i>Shorea robusta</i>	Dm_5	Dm_5	Dm_5	—
5.	Cha'gro	<i>Macaranga denticulta</i>	—	Ab,Dm_5	—	—
6.	Chambu	<i>Syzygium cumini</i>	—	Ab	—	—
7.	Chamchia	—	Dm_5	Dm_5	—	—
8.	Gambari	<i>Gmelina arborea</i>	—	—	—	Ab
9.	Kilte	—	—	—	—	Ab
10.	Mao	<i>Hibiscus macrophyllus</i>	—	—	—	Ab
11.	Rangri	<i>Vitex peduncularis</i>	Dm_5,10	Ab,Dm_5	—	—
12.	Segun (Teak)	—	Dm_5	—	Ad,Dm_5	—
13.	Siso	—	Ad,Dm_5	—	Ad,Dm_5	—
14.	Snaru	—	Dm_5	—	—	—
15.	Wa'ge	—	Dm_5	—	—	—
16.	Wa'dro	—	Dm_5	Ab	—	—
17.	Wa'tre	—	Ab,Dm_5	Ab	—	—

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

9.3.5 Southern Slopes and Valley (East) – Building and Ornamental Plants

Source and Location of Collection Area

The plants collected for building and ornamental purpose is collected from the wild in all the villages in this zone (**Figure 9-13**).

In the Southern Slopes and Valley (East) (**Figure 9-14**), the majority of the plants are collected from the open forest followed by market, homestead plantation and open grassland.

Figure 9-13: Village wise Source of Collection of Building and Ornamental Plants in Southern Slopes and Valley (East)

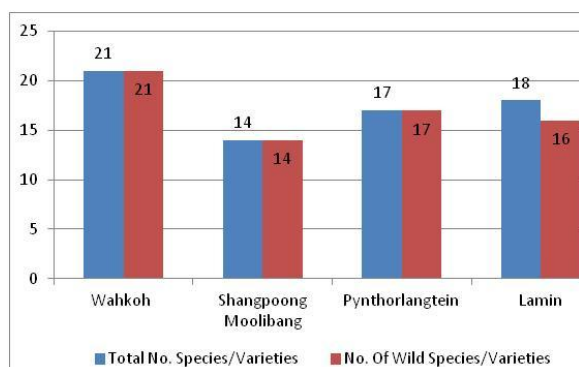
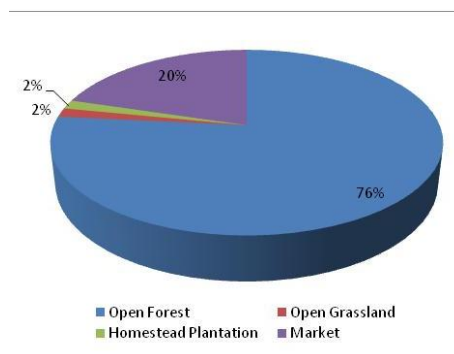


Figure 9-14: Location of Collection of Building Materials and Ornamental Plants from Wild in Southern slopes and Valley (East)



Widely Used Plants and their Availability- Southern Slopes and Valley (East)

A list of 27 plants species given in **Table 9-6**, has been reported by more than 25% of respondents in this zone.

The plants reported from this zone are in a declining trend over the past ten years (**Table 9-6**).

Table 9-6: Status of availability of plants reported from Southern Slopes and Valley (East)

Sl. No.	Name of Plant	Scientific Name	Wakhu (50-300m)	Shangpung moolibang (300-600m)	Pynthorlang tein (600-1200m)	Lamin (1200-1600m)
			% of Respondants			
1.	Chken	—	—	Dm_10,5	—	—
2.	Dieng bhoi	<i>Eryngium foetidum</i> L.,	Dm_10	—	—	—

Use and availability of traditional plants

Sl. No.	Name of Plant	Scientific Name	Wakhu (50-300m)	Shangpung moolibang (300-600m)	Pynthorlang tein (600-1200m)	Lamin (1200-1600m)
			% of Respondants			
3.	Dieng cham	—	Dm_10	—	—	—
4.	Dieng champa	—	Dm_10	—	—	—
5.	Dieng chyrgan	—	—	—	—	Dm_10
6.	Dieng dar	—	Dm_10	—	—	—
7.	Dieng dkhar	<i>Erythrina stricta</i>	—	—	—	Dm_10
8.	Dieng jri	<i>Hevea brasiliensis</i>	—	—	—	Dm_10
9.	Dieng kseh	<i>Pinus kesiya / Araocaria Cuninghail / Pinus petula</i>	—	Dm_10	Dm_10	—
10.	Dieng lakhiang	—	Dm_10	—	—	—
11.	Dieng laryi	—	—	Dm_10	—	—
12.	Dieng lein	—	—	—	Dm_10	—
13.	Dieng makalein	—	—	—	—	—
14.	Dieng mut	—	Dm_10	—	—	—
15.	Dieng myrchasandi	—	Dm_10	—	—	—
16.	Dieng Patu	—	—	—	—	Dm_10
17.	Dieng riswet	—	Dm_10	—	—	—
18.	Dieng ryi	<i>Michelia champaca</i>	—	—	—	Dm_10
19.	Dieng sar	—	—	Dm_10	Dm_10	—
20.	Dieng sning	<i>Quercus griffithi</i>	—	Dm_10	Dm_10	—
21.	Dieng sympate	—	—	—	Dm_10	—
22.	Dieng syndoh	—	—	—	Dm_10	—
23.	Khah	—	—	—	—	Dm_10
24.	Syntu miaw	—	—	—	—	—
25.	Thnieng	—	—	—	—	Dm_10
26.	Tiewdien pamtiah	—	—	—	—	Dm_10
27.	Tiewiambaid	—	—	—	—	Dm_10

Ab- Abundance, Dm-Diminishing, Sc-Scarce, Rr-Rare; 5 or10 are number of years over which availability has reduced

10 Livelihood Options –Market Survey

Earlier study conducted by Tynsong et al., 2007 has emphasized on the creation of livelihood options from involvement in the trade of medicinal by the local villagers through Meghalaya Khadi and Village Industries. Medicinal plants collected from the wild have been reported to fetch earnings as they are in demand in the local as well other markets like Guwahati, Cachar, etc (Barik et al.,2009).

It has been observed that apart from medicinal plants, as reported earlier, there are plants that have been collected from the wild and used for purposes like food, fuel and firewood, Fodder and Medicine, Building Materials and Ornamental Plants also sold in the market. They have been listed in **Table 10.1**.

Table 10-1: Plants Collected from Wild –Sold in the Market

Sl. No.	Edible Plants	Fuel/Fire Wood	Fodder & Veterinary Medicine	Medicinal Plants	Building & Ornamental
1	Alot	Bolpu	Syntler	Jamyrdoh	Bolsal <i>Shorea robusta</i>
2	Chiehkrot	Dieng Bilat	Thylliang	Jangew mawnia	Chken
3	Iarain	Dieng Kseh		Jathang	Dieng rngi
4	Iaru	Dieng lein		Jhur kthang	Dieng sapyrthit
5	Jajaw	Dieng ling		Jynseng	Dieng Bilat
6	Jamyrdoh	Dieng makalein		Kseh blei	Dieng bor
7	Jatera	Dieng Met		Langning	Dieng bti
8	Jathang	Dieng Ngan		Mangkaring	Dieng jri
9	Jyrlud	Dieng pyrthit		Sohphie	Dieng khirilaphut
10	Lachein	Dieng ryi		Tyrkhang	Dieng kseh
11	Laphaiur	Dieng saplew			Dieng Laphing

Sl. No.	Edible Plants	Fuel/Fire Wood	Fodder & Veterinary Medicine	Medicinal Plants	Building & Ornamental
12	Murit	Dieng sapyrthit			Dieng lieng
13	Sashang	Dieng sase			Dieng met
14	Soh Manir	Dieng sning			Dieng ryi
15	Soh Phan	Dieng sohot			Dieng saplew
16	Sohkynphor	Dieng Sohphan			Dieng snar
17	Sohliang	Dieng sympate			Dieng sning
18	Sohmylleng (Amla)	Dieng syndoh			Dieng sohmarem
19	Sohmynthar				Dieng sohmosem
20	Sohniamtra				Dieng sohot
21	Sohpieng				Dieng sohphan
22	Steng				Dieng sohum
23	Thnieng				Dieng sympate
24					Khah
25					Segun
26					Siso
27					Thnieng
28					Tiew Bangor

11 A Road Map

11.1 INTRODUCTION

The 12th Five Year Plan (2012-17) of Meghalaya State has acknowledged the need of proper knowledge for effective conservation and rational utilization of natural resources to create food/water/livelihood security, climate change management and sustainable development for a land that has plenty yet has half the population below the poverty line. The heavy dependence of the marginal population on natural vegetation has been established through the present study (**Section 5.2.4, 6.1.2, 7.1.2, 8.1.2 and 9.1.2**). This dependence on the wild creates pressure that is depleting the natural vegetation cover consequently reducing food security creating a vicious cycle that further reduces the natural vegetation and alleviates poverty. The need for launching a government programme to sustainably harvest the wild edible produce without putting pressure on any particular species and further an effort for cultivating few important wild species has been put forth in earlier studies (Sawain et al., 2007). The Government is committed to conservation of natural vegetation through community participation. Livelihood generation through sustainable conservation of natural resources is the objective of the present study. The first step towards discerning opportunity for livelihood generation from forests is through capturing the knowledge of the plants being used traditionally for various purposes and their potential for marketing. A situation analysis for creating a road map to generate livelihood is discussed below.

11.2 SITUATION ANALYSIS

This study gives an insight to the potential for harvesting plants or parts for food, fodder, medicine, fuel and building and ornamental plants for commercial purpose with a sustainable approach from the wild. It is the perception of the villagers that the availability of these plants is declining over time across all

villages. Exceptions have been villages like Bansam Awe, Matramchiggre, Teptepa and Medu hawe in Central Hyperthermic Plateau and Southern Slopes and Valley (West) respectively. The plants from these villages are collected mainly from dense forests as these villagers have access to protected forests like Rongrengiri Reserve Forest, Dibru Hills Reserve Forests and Balpakram National Park (**Refer Table 2.3**). In other villages as Center Village, Mwkhap, Pynthorlangtein, Matchanokpante, Wakhu, Lamin and Medu Hawe, the wild plants are majorly collected from open forests like Law Shnong. The study reveals that the majority of the collection from the wild is for self consumption and the opportunity to market is less due to insufficient surplus, appropriate storage facility and marketing network. There can be two approaches towards collecting the produce and marketing it. One, the produce is collected from the wild and marketed. Since, the plants reported from most of the villages are diminishing over the past decade, harvesting will not be sustainable unless the availability of the species is present in abundance. Hence, this can be feasible for plants that are reported to be available only in abundance in villages across agroclimatic zones. The other approach could be that the plants can be cultivated and the produce harvested and sold. Since, the first method is not sustainable in the longterm hence, propagation and cultivation of the plants has to be established in appropriately selected sites. The analysis of the present situation has led to species prioritization, site selection, adaptive management through resource assessment, research gap, market study and need for a structured organization that will provide a roadmap to help generate livelihood for the local people.

11.2.1 Prioritization of species

The prioritization of species could be done with a tool designed by Cunningham (2001) based on factors like geographic distribution, population sizes, plant uses and likelihood of sustainable harvesting. Or else, the priority can be simply based on usage and availability for marketing produce that are harvested from the wild as shown in **Table 11-1 A-C**.

Table 11-1: Village-wise priority species suitable for sustainable harvesting

A: Edible

SI No	Cluster No	Site	Name of Plants	Availability
1	I	Bansam Awe	Mebitchu, Chigi, Alot, Mea, Sobok, Ambare, Mecheng, Bakwe, Doju,	A
2	II	Matramchiggre	Megong, Sobok, Chongi, Chiggi, Mea, Ambare, Doju,	A
3	III	Sassatggre	Doju	A
4	IV	Teptepa	Grongmintri, Steng, Alot, Sobok, Mebitchu, Soka, Megong, Ambare, Darichik, Doju, Anbri, Gongdarat	A
5	V	Matchanokpante	Gongdarat	A
6	VI	Medu Hawe	Alot, Grongminti, Steng, Sobok, Soka, Megong, Ambare, Mebram, Karika, Tesru, Taja	A
7	VII	Lamin	Sohngangheh, Sapiang	A

B: Fuel and Firewood

SI No	Cluster No	Site	Name of Plants	Availability
1	I	Bansam Awe	Chagro, Kimbal, Chamisi, Boldak, Agatchi, Megong, Bolbret, Bolbit, Bolgipok	A
2	II	Matramchiggre	Masanchi, Bolmatra, Matmi	A
3	III	Sassatggre	Boldak, Bolbit	A
4	IV	Teptepa	Chagro, Masanchi, Bolmatra, Pakram, Bolbret, Matmi, Agong, Chamchi	A
5	V	Matchanokpante	Boldak (Shorea robusta), Dudkuri, Mao	A
6	VI	Medu Hawe	Chagro, Chamchia, Chamchi, Mao	A

C: Building and Ornamental Plants

SI No	Cluster No	Site	Name of Plants	Availability
1	I	Bansam Awe	Boldak, Chagro, Mao, Bolsal, Chamisi, Kimbal, Segun, Watebok, Wage	A

SI No	Cluster No	Site	Name of Plants	Availability
3	II	Sassatggre	Wage, Watebok, Gambari	A
4	III	Medu Hawe	Gambari	A

The plants that are widely used for different purposes in each village across agroclimatic zones have been listed in preceding chapters – 5, 6, 7, 8, 9. Amongst them, the plants species that are used by more than 50% respondents will be selected as priority species for cultivation for livelihood generation (**Table 11-2 A to D**). This is in consonance with plants that are sold in the market (**Table 10-1**). The medicinal plants have not been prioritized separately owing to the presence of in-detail work by Meghalaya State Medicinal Plants Board, Shillong in “**Action plan cum road map for development of medicinal plants sector in Meghalaya**”.

Table 11-2: Village-wise Priority Species suitable for cultivation

A: Edible

Sl. No.	Village Name	Name of Plants
1	Gandhipara Garo	Chigi
2	Pyndensohshaw	Jajew, Jamyrdoh, Japew, Jhurkthang, Kait, Sohlynpor, Sohmitrkhlaw, Sohnamtra, Tympew
3	Laitkynsew	Slatyypad, Sohphan,
4	Thansning	Jamyrdoh
5	Tamuli kuchi	Jamyrdoh, Jathang, Kait, Sohphan, Sohsaw, Sohtrun
6	Center Village	Chken, Jajew, Juwang, Mahek, Pajir, Pdasngtyrlong, Sohbah, Sohbrai, Sohkympor, Sohphan, Sohphareng, Sohtrun
7	Mawkhap	Janyrdoh, Sohjew, Sohkympor, Sohphan, Sohpieng
8	Moodup	Jyrlud, Latdoh, Myrdoh, Saru,
9	Bansam Awe	A lot, Chigi, Mebitchu, Mea, Sobok
10	Matramchiggre	Chigi, Chongi, Megong, Sobok
11	Baladinggre	A lot, Mebitchu, Sobok
12	Sassatggre	Chigi, Mebitchu, Sobok
13	Ramchenga	A lot, Chigi, Chongi, Mea, Sobok, Taja
14	Teptepa	Alot, Ambri, Mebitchu, Grongmintri, Steng, Sobok,
15	Matchanokpante	Mebitchu, Soka
16	Medu Hawe	Alot, Grongminti, Steng, Sobok,

Sl. No.	Village Name	Name of Plants
17	Wakhu	Lajaw, Jakieng, Murit, Myrdoh, Slachet, Sohchram, Wang
18	Shangpoong Moolibang	Lajaw, Jyrlud, Laphiur, Mahek, Myrdoh, Slapieh
19	Pynthorlangtein	Lajaw, Laru, Jyrlud, Myrdoh, Slachet, Tyngkieh
20	Lamin	Jiachra, Jiaharew, Jiahasla, Jialachit, Jiatanglong, Lakadong, Salangi, Sohkympor, Sohliang, Sohphan, Tohtari

B: Fuel and Fodder

Sl. No.	Village Name	Name of Plants
1	Gandhipara Garo	-
2	Pyndensohshaw	Dieng ngan, Dieng iong, Dieng snar,
3	Laitkynew	Dieng ngan, Dieng lakhar, Dieng bti, Dieng sning
4	Thansning	Dieng kseh, Dieng met
5	Tamuli kuchi	Dieng met, Dieng kseh
6	Center Village	Dieng ngan, Dieng sohpdang, Dieng dymbli, Dieng tyrput, Dieng lihit
7	Mawkhap	Dieng ngan, Dieng sar, Dieng sai, Dieng sohot, Dieng lieng, Dieng sning
8	Moodup	-
9	Bansam Awe	Chagro, Kimbal, Chamisi,
10	Matramchiggre	Chagro, Masanchi, Bolmatra, Agatchi, Matmi
11	Baladinggre	-
12	Sassatggre	Chagro, Kimbal, Chamisi
13	Ramchenga	Chagro, Masanchi, Dudkuri, Megong
14	Teptepa	Chagro, Masanchi, Bolsubret, Bolmatra, Pakram, Bolbret, Matmi, Agong
15	Matchanokpante	Boldak sal, Boldak Schima, Chamchi
16	Medu Hawe	Chagro, Chamchia, Kimbal
17	Wakhu	Dieng potu, Dieng lakhar, Dieng ping
18	Shangpoong Moolibang	Dieng chyrngan, Dieng kseh
19	Pynthorlangtein	Dieng chyrngan, Dieng kesh,
20	Lamin	Dieng chyrngan, Dieng potu, Dieng krit, Dieng jri, Dieng jitanglong, Dieng sohpieng,

C: Fodder and Veterinary Medicinal Plants

Sl. No.	Village Name	Name of Plants
1	Pyndensohshaw	Tmain khla, Syntiewjain,
2	Wakhu	Sapriam
3	Shangpoong Moolibang	Dieng chyrngan, Dieng kseh
4	Pynthorlangtein	Tmain Khla, Syntiewjain

D: Building and Ornamental Plants

Sl. No.	Village Name	Name of Plants
1	Gandhipara Garo	-
2	Pyndensohshaw	Dieng rai, Dieng tanglang, Dieng Sohmasem, Dieng taroi
3	Laitkynsew	Dieng rai, Dieng ngan, Tiewdieng lynskaw, Dieng bti,
4	Thansning	Dieng met
5	Tamuli kuchi	Dieng kseh, Siej, Dieng met
6	Center Village	Dieng ngan, Dieng blei
7	Mawkhap	Dieng ngan, Tiewdieng tdongmaw, tiewdieng lyngskaw
8	Moodup	Dieng kseh, Dieng lieng, Dieng ryi
9	Bansam Awe	Boldak, Watebok,
10	Matramchiggre	Mao, Watre
11	Baladinggre	Bolsal, Segun
12	Sassatggre	Boldak, Chagro, Chimisi, Watebok,
13	Ramchenga	Bolsal, Rangri, Boldak, Segun, Wage
14	Teptepa	Rangri, Gambari, Watre, Chagro, Wadro
15	Matchanokpante	Boldak sal, Boldak Schima, Chamchia
16	Medu Hawe	Gambari, Bolchim, Mao, Bolchengrong
17	Wakhu	Dieng dar, Dieng mut, Dieng champa
18	Shangpoong Moolibang	Dieng kseh, Dieng sning, Dieng sar
19	Pynthorlangtein	Dieng sning, Dieng kesh, Dieng syndoh, Dieng sympate
20	Lamin	Dieng dkhar, Thnieng, Tiewdieng pamtiah, Dieng jri,

Efforts should be taken to propagate and cultivate the prioritized species through assisted natural regeneration. Cultivation methods for plants like Chagro,

Mebitchu, A lot, Mea, Amabare, Bakwe, Doju, etc exists. Studies like those conducted by NERCORMP for organic cultivation of five cash crops in Northeast should be extended to other wild plants that are required to be cultivated for income generation.

11.2.2 Site Selection

The selection of site for promoting cultivation and propagation will depend on the type of agroclimate in which the species prioritized thrives naturally. As per the study done by National Remote Sensing Agency (NRSA) in 2003, 15.21% of the total geographical area of the state is under wasteland. The predominant wastelands in Meghalaya are – land without scrub, land with scrub, abandoned and current shifting cultivation. These wastelands as available in each agroclimatic zone could be utilized for promoting the priority species. The land under shifting cultivation is temporary wasteland and can be reclaimed by adopting land use practices as suggested by NRSA in Wastelands Atlas of India for North-East India.

1. Silviculture – A practice in which trees and grasses are grown together on a plot of land. This is similar to Law Shnong where the system provides fuel, fodder and maintains vegetation cover. A list of species in villages across different agro climatic zones has been given in **Table 11-2**. Trees that are fast growing with good calorific yield should be planted.
2. Sericulture – A practice in which wasteland having a slope of 0-25% and located adjacent to the villages. At present 130 ha of land in Meghalaya is under sericulture that rears species like Mulberry, Eri and muga. Utilization of wasteland under sericulture might be expanded in the state as the sericulture industry is not thriving in Meghalaya as compared to other North-eastern states.
3. Silviculture – This has to be propagated in wasteland which has a slope of more than 50%. The species that yield timber like *Tectona grandis*, *Shorea robusta*, *Gmelina arborea*, etc as given in **Table 11-2 D** can be planted.
4. Horticulture – To be developed in wastelands with moderate slopes and proper accessibility. Presently, there are 22 horticultural farms and nurseries across different agroclimatic zones of Meghalaya. These

farmlands could be also be used initially for establishing plants from the wild.

5. Agro-horticulture – A system where agricultural crops can be grown along with horticultural crops depending on the choice of the farmer. This can be practiced in the same type of wasteland as horticultural crops.

This baseline data will help us in initial consideration for selection of the particular geographical area that will be further strengthened with ground truthing. In Meghalaya, the land categorized under wasteland will be controlled by different institutions. Relevant permissions have to be sought and the stakeholders consulted before planning any action on these lands.

11.2.3 Information Collection and dissemination

There are diverse forest institutions in the State that manages the forests as per age old traditions. These rules have to be documented and the knowledge has to be disseminated across stakeholders. The good practices of sustainable harvesting (harvesting the produce in the wild), post harvest handling and processing, storage for marketing and also establishing the plants from the wild by propagating and cultivating them has to be properly documented. Further training and manuals have to be developed for capacity building in the long run.

11.2.4 Resource Assessment and Adaptive Management

The prioritised plants have to be further physically identified and corroborated with the answers of the respondents, to remove ambiguity. Since, this study captured the availability of the plants as per the perception of the people, ground truthing for the natural population size and availability in the wild of the identified species have to be done. Also, conservation and regulatory status of the species need to be identified. Moreover India being a signatory to the CITES, the knowledge of the CITES-listed Appendix II species where the trade is prohibited as found detrimental to the survival of the species.

The sustainable harvesting limit for a specific resource within a particular collection area has to be assessed. It has to be corroborated with the current harvesting protocol and finally make the required adjustments in harvest protocols to maintain the target resource at sustainable levels.

The willingness of the community to participate or adopt alternative livelihood opportunity has to be ascertained at selected sites.

The other factors for consideration should be proximity to existing markets, availability of structured resource management (Organised collection system and different stakeholders (e.g government authorities or communities) may already exist. A consultation on hindrance to marketing the harvested produce of the wild yielded a common answer of "lack of storage facility". Presently there are two 1000Mt cold storages in the two Secondary Regulated market of Garobodha in Garo Hills and Mawiong in East Khasi Hills. The capacity of these two cold storages has to be assessed and accordingly further ancillary facilities have to be provided.

Presently there are two factories in Meghalaya that process horticultural products. Apart from producing the conventional items like Orange Squash and Pineapple Jam, etc, these factories have recently started using indigenous fruits like Sohbrab (passion fruit), Sohpyrshong (Carombola), Soh Shang (*Elaeagnus sapida*) and Soh Phie (*Myrica nagi*) to produce Squash, jam, pickles etc. Pineapple and Orange drinks packed in 200 ml RTS (ready to serve) packs have also been added to the list of items produced by these factories. The capacity of the existing facilities has to be assessed and if required the capacity has to be enhanced or new facilities built.

11.2.5 Need for a Scientific Study

The shelf-life of the plants and their products are to be evaluated. The nutritional value and the toxic side effects of the edible and medicinal plants, as also the calorific value of the fuel wood are to be determined. Potential for value addition has to be determined. Preservation methods have to be identified to increase the shelf life. A biochemical assay of plants from Meghalaya like *Eleagnus latifolia*, *Eleagnus pyriformis*, *Myrica nagi* and *Myrica esculentus* revealed their potential to be utilized as natural oxidants (Seal T 2011) Another biochemical assay of nine wild edible plants of Meghalaya by Seal T, 2012, quantified the anti-oxidant potential of the parts of the plants in use. Similarly other research programme can be undertaken to investigate the active ingredient of the plants used for medicinal purposes, nutritional value of the plants used for food and Silvicultural

value of Timber used for building materials. Such scientific data can help to establish a wider potential for marketing and in turn earn livelihood.

11.2.6 Need for a market based research

The existing demand of the plants and the value added products are to be determined across the state. The present method and hurdles of marketing has to be studied. The involvement of stakeholders involved has to be identified. The potential of marketing the product beyond the state has to be identified. Presently there are two food processing units in Meghalaya- Shillong (10MT capacity) in East Khasi Hills and Dainadubi (40MT) in East Garo Hills.

11.2.7 Structured Organization

A structured organization with defined roles and responsibilities has to be framed to sustainably harvest and market the wild plants. State Biodiversity Board should be given the primary responsibility to coordinate the activities related to information compilation and dissemination. A flexible policy that will accommodate the rules laid in several forest institutions, as described in Introduction, in the State will be requisite for successful implementation. An earlier study by NERCORMP in villages of West Khasi Hills and West Garo Hills showed that forest based activities are restricted by village forest rules that prohibit harvesting of forest products for sale hence regulatory modifications at the higher policy level have to be ascertained.

The stakeholders especially collectors have to be supported by additional incentives like Minimum Support Price for pursuing the livelihood.

The Administration of Forests of Meghalaya, Natural Resources management groups, Self Help Groups or NGO's have to be identified who might be already working in field or willing to work for implementing the road map for creatin of livelihood.

The cultivation of the selected species can be carried out in the Forest under District Council or any other chosen area with community participation; the model of constituting Eco Development Committee (EDC) or Forest Protect Committee (FPC) could be adopted. Each of the Committee will be liable to supply the product on time through a Common Collection Centre for common transaction.

11.2.8 Market Model

- The identified species in each of the four categories should be taken up for detailed investigation with regard to the cultivation potential under a well structured Management Plan.
- If the above appears possible, a common Collection Centre should be set up in each of the districts, so that necessary market linkage could be established with an assured supply line from the proposed collection centre. The Meghalaya State Agriculture Marketing Board established in 1983 with the purpose of organizing marketing and market regulations for agricultural produce could also be responsible for the marketing of produce from the wild.
- The cultivators of the identified species will be given the appropriate and justified share of profit after deducting the processing charges and other cost to run the infrastructure. The Meghalaya State Agricultural Marketing Board is already responsible for ensuring fair financial returns to the farmers for their produce. Initially, the above agency could be also entrusted responsibility for ensuring proper remuneration to the collectors of wild produce.
- The produce harvested in Meghalaya can be much better marketed by following a Model established in Himachal Pradesh, Madhya Pradesh or Bhutan that markets its produce successfully as HPMC, Sanjeevani or Druk respectively.
- The processed food (Squashes, Canned Fruits and Juices, Jams, Jellies, Marmalades and Pickles) manufactured in Shillong and Dainadubi lacks a presence beyond the local markets. Hence, proper advertisement in local/national newspaper, electronic media announcing the availability of the materials and their current pricing, could help to establish wide publicity across the state and beyond.
- A detailed Business Plan can be prepared with the professional help from Indian Institute of Management, Shillong.

12 Conclusion

Meghalaya is a state endowed with abundant natural biodiversity that is depleted due to several drivers of deforestation like shifting cultivation, urbanization, forest fire, mining of minerals, extraction of timber and monocultivation propelled by population pressure. In Meghalaya the population lying under poverty line ranges from 35-65% amongst the rural population. This population is heavily dependent on the natural resources for food and livelihood security. This study was aimed towards creating a catalogue of plants that have been used traditionally for several purposes like food, fodder, veterinary medicine, medicines, building and ornamental plants. Twenty villages representing five agroclimatic zones across Meghalaya were selected for this study. An average of 25% households in each village varying from 20 to 50 of households was randomly selected for the survey. A questionnaire was framed to capture the responses of usage and availability of the plants. Further the perception of the villagers on the availability of the plants was captured and the reasons for change documented. The major constrain that was partially overcome was the difference in dialect between the four zones of Garo, Khasi, Jaintia and Ri-Bhoi leading to the possible repetition of names of plants in the list that could not be resolved even after comparison with secondary literature. The list of plants collected from the wild from each village for different purpose is appended to the main report as **Annexure 2A-E**. To summarise, the plants collected from the wild used for various purposes differed across each agroclimatic zone, reported to be maximum from Southern Slopes and Valley (West) followed by Central Hyperthermic Plateau, Southern Slopes and Valley (East), Central Thermic Plateau and Hills of Northern Slopes. These plants are primarily collected from self consumption. The plants are reported to be available in abundance from villages as Bansam Awe, Medu Hawe and Teptepa. In other villages the availability of plants are reported to decline over past one decade owing to factors like deforestation, urbanization and forest fires. The final objective of the study was to select species that can be used for livelihood

generation that will help reduce poverty and sustainably conserve the natural biodiversity of the region. A list of species that can be used for sustainable harvesting and another list of species that can be cultivated and propagated have been recommended. Wastelands available across agroclimatic zones should be considered suitable for cultivation and propagation of plants species that will create livelihood and conserve the biodiversity of the region.

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