

**Ministry of Forestry**  
**Forest Department**  
**Taninthayi Nature Reserve Project**

**Report on Flora Survey in Taninthayi Nature Reserve**



**Submitted by**  
**U Hla Maung Thein (National Consultant)**

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# Taninthayi Nature Reserve Project

## Final Report on Flora Survey in Taninthayi Nature Reserve

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## Executive summary

There has been no attempt to scientific study on the species diversity and forest community structure in tropical evergreen forest of Myanmar although the flora was listed in the project area in where it may have very unique from other forest ecosystem for both floristic diversity and biodiversity, and forest community structure in Myanmar. As being the objectives of study, the floristic composition and habitat structure described in this report are basically of great important not only to promote the conservation, maintenance and sustainability of biological diversity but also is essential to provide scientific baseline information for developing the biodiversity database and will play a critical part in the process of management plan of TNRP.

The vegetation survey was conducted using the systematic sampling method. The cluster of ten 40 m x 30 m sample plots were systematically arranged 3200 m x 500 m rectangular sampling unit. Total area of vegetation study was 6.6 ha. Five sampling units having distance of about 8 kilometers between adjacent units and in addition 6 transects with 10 m x 100 m were set within the TNRP area. All plants with dbh  $\geq 10$  cm were recorded in the whole survey area. Plants less than 10 cm dbh were sampled in 56 of 10 m x 10 m subplots. Seedlings and saplings less than 5 cm dbh or  $\geq 30$  cm height were also recorded in 56 of 5 m x 5 m subplots.

A total number of 257 species with dbh  $\geq 10$  cm in the present study area was recorded. The species and stand density per hectare ranged from 62 to 81 and 362 to 429 respectively. The ecological significant species in the study area were Taung thayet (*Sweintonia floribunda*), Kyetmauk (*Nephelium* spp), Kywethwe (*Myristica* spp.), Thabye spp (*Syzygium* spp.), Thit sho (*Pentace griffithi*), and Kadut (*Parashorea stellata*), while the dominant family was Dipterocarpaceae. According to the results of frequency diagram and species area curves, the characteristic of the study forest was the heterogeneous forest community with high value of species diversity and evenness. Composition of rare species was 164 species. Population of Kanyin (*Dipterocarpus* spp.), Thingan (*Hopea* spp.), Ban (*Anisoptera* spp.) and Kaung hmu (*Anisoptera scaphula*) species belonging to *Dipterocarpaceae* family listed globally the threatened endangered species was low and getting probably to become rare species. Special attention therefore is needed to conserve for not only the endangered species but also the rare species.

The size structure of the study forest followed the trend of normal forest. Basal area per hectare ranged from 20 to 47.6 m<sup>2</sup> with an average of 32 m<sup>2</sup>. Stand structure of story was closely similar to rain forest having several layers; in contrast the semi-evergreen open forest in lower elevation had three strata of vegetation. Regeneration in undergrowth layer was abundant but undergrowth vegetation and regeneration was completely lacking in some of the areas due to seasonal fire.

The factors affecting the ecology of the study site were encroachment of logging, hunting and rubber, cashew plantation, seasonal fire, erosion and land slide in steep slope areas, and strong wind. Consequently, those kinds of disturbances were very sensitive to dynamics of species diversity and population development, community structure, habitats of wildlife and then environment in terms of soil and water resources.

Finally, floristic diversity and structure of the study area, status of wildlife and habitats are considerably good state when compare with that of the other tropical evergreen forests.

# Final Report on Flora Survey in Taninthayi Nature Reserve

## 1. Introduction

The Union of Myanmar is a tropical country in Continental South East Asia with a total land area of 676,577 km<sup>2</sup>. It is characterized by a tropical monsoon climate with three well-defined seasons, namely summer, rainy and cool seasons. Due to various climatic conditions, diverse landscapes and geographical features with varying altitudes, complex river systems confined to Myanmar territory, and about 1,900 km long coastal line in the Bay of Bengal and Andaman Sea, diverse forest ecosystems have distributed in Myanmar. Arrays of forest ecosystems include marine and coastal in the southwest and south, complex estuarine mangroves in the Ayeyarwady Delta to diverse terrestrial tropical forests on the prominent plateaus running north to south and alpine and grassland on high mountains with snow-capped peak in the far north. The most northern part of Myanmar, considered being transitional zone between eastern and western Himalaya is known as a biodiversity hot spot in the world. Data from forest resource assessment carried out in 2005 (FRA 2005 cited Myint Oo, 2007) indicated that 50.2% of the total land area (676,577 km<sup>2</sup>) is covered with 8 different categories of major forest ecosystems (Table 1) (Anon, Forest Department, 2003).

Table 1. Major forest ecosystems in Myanmar

Forest Ecosystems	Area in "000" ha	Percentage of Forest Area
Tidal/Beach and Dune/Swamp Forests	1,375.0	4
Tropical Evergreen Forest	5,500.4	16
Mixed Deciduous Forest	13,406.8	38
Dry Forest	3,437.7	10
Deciduous Dipterocarps Forest	1,718.7	5
Hill and Temperate Evergreen Forest	8,937.8	25
Fallow land	998.3	2
Total Forested Area	35,374.7	100

Forest ecosystems in Myanmar are fragile and need to be conserved properly to generate diverse functions and not only needs to provide forest products to fulfill the basic needs of local communities and substantial foreign exchange earnings to the State economy but also to contribute biodiversity conservation and environmental stability.

In Myanmar, biodiversity conservation was initiated by the Kings as early as 1775 when teak was proclaimed as Royal tree. Again the preservation of Wild Elephant Act was prepared in 1879 with subsequent amendment in 1883. In Myanmar, Protected Area System (PAS) is administered in accordance with the Protection of Wildlife and Wild Plants and the Conservation of Protected Areas Law (1994) to protect and conserve biodiversity. Large areas of Myanmar's forest cover provide a unique opportunity to conserve biodiversity within

protected areas. Myanmar Forest Policy (1995) stipulates to keep under the category of PAS as 5% of the total land area in short run and 10% in long run. Efforts need to be made to safeguard the forest ecosystems and biodiversity by establishing and maintaining protected areas. At present, 7.3% of the total land area is represented as conservation reserves under PAS with 42 Protected Areas including proposed areas (Anon, MOF, 2007). Myanmar is emulating a network of PAS which represents important ecosystems all over the country. The protected areas are established across the country not only to ensure in-situ conservation of a variety of wildlife species, both flora and fauna and their habitats but also to be able to carry out scientific research with specific objectives. In addition, one botanical garden and two zoological gardens were established for ex-situ conservation of some endangered wild plants and animals in Myanmar.

Myanmar is endowed with a wealth of biodiversity and the most biologically diverse country in the mainland of Southeast Asia with an impressive array of fauna and flora. However, the major contributors of threats to biodiversity are improper and ineffective land use for cultivation of agricultural crops, unsustainable agricultural practice in upland areas such as shifting cultivation, encroachment into forests, and indiscriminate cutting of forests causing tropical deforestation. In addition, poverty, poor education and lack of awareness of local people regarding the conservation of biodiversity, poaching, hunting, illegal wildlife trade, and drought and forest fires are also exerting serious threats to biodiversity.

Due to the factors mentioned above, the forest areas are changed to other land uses and forest ecosystems are devastating across the country as well as along the border area and consequently threaten the conservation of biodiversity. The actual forest cover had decreased at an annual rate of 220,000 ha during the period 14 years from 1975 through 1989 while the physical transfer of forest land into non-forest uses in the same period was about 15,000 ha annually (Anon, Forest Department, 2000).

The rate of deforestation in the tropics is estimated to be 17 to 20 millions hectares annually. However a large fraction of earth's biodiversity lives in forests or depends on forests, especially tropical forests (Narendra P. Sharma, 1992). In spite of a great deal of efforts being exerted to conserve biodiversity, increased human pressure on biodiversity is unavoidable and will potentially cause further degradation. As a result, there was lost of natural habitats and declination of forest biodiversity over a couple of decades of the past in Myanmar. There is great tendency of wild animal and plant species to become extinct in the very near future if appropriate measures are not performed in time.

A number of forest habitats including marine and coastal lines are home to many wildlife and wild plant species diversity in Myanmar. There are about 7,000 plant species, 300 mammals, 360 reptiles, 1,000 birds and more than 1,200 species of butterfly. In particular, 7,000 plant species, 1,347 species of big trees, 741 species of small trees, 96 species of bamboo, 1,696 species of shrub, 36 species of rattan and 841 species of orchids are identified in Myanmar. The checklist of the Trees, Shrubs, Herbs, and Climbers of Myanmar compiled by Hundley and Chit Ko Ko (1987) was recently revised by Kress and et al. in 2003 to 273 families, 2,371 genera, and over 11,800 plant species in Myanmar.

In line with the Sustainable Forest Management, the Forest Department (FD) under the guidance of the Ministry of Forestry (MOF) has been playing a key role in the implementation of biodiversity conservation which benefits not only the State but also the South-East Asia Region as a whole. FD endeavors to extend the establishment of PAS in representative areas of every different ecosystem across the country for biodiversity

conservation, ecosystem balancing and environmental stability in the long run. In line with this goal, some compartments of Heize/Kaleinaung reserves and Luwaing reserve were promulgated as Taninthayi Nature Reserve (TNR). TNR has been notified as Nature Reserve under PAS in 2005 with the area extent of 1700 km<sup>2</sup> to support the planning and operation of a protected area for protection and sustainable management of biodiversity and rain forest ecosystem. Taninthayi Nature Reserve Project (TNRP) has been implemented by FD, MOF with the funds derived from the operation of two gas pipeline companies in the region, the Mottama Gas Transportation Company (MGTC) and Taninthayi Pipe Line Company (TPC) for support and long-term operation of the project.

In Myanmar, owing to diverse ecological conditions, tropical evergreen forest among the several types of forests ecosystem, constitutes 16% of total forest area and mostly distributes in Taninthayi division in southern part of Myanmar (FD, 2003). Therefore the vegetation type in TNR is almost clothed with the tropical evergreen forest (Smith, H. C. 1926; Anon, RS and GIS, FD, 2006; Kermode, C.W.D. 1964). Several studies on flora and fauna at the vicinity of the gas pipelines were carried out in the surroundings of the project area, such as vegetation and vascular flora study along the Yetagun-Yadana pipeline (Maxwell, J. F., 2001), vegetation and biodiversity study of the Yadana project area (Francis H.J. Crome, 1996), on shore environmental baseline study (ERM, 1996). Either assessment of botanical collection or species richness alone is insufficient for the management of biodiversity conservation in a nature reserve (Nelson et.al, 1990, ter Steege et al., 2000a). Nevertheless no attempt has been made to study the species diversity and forest community structure in tropical evergreen forest of the project area even though the diversity of flora and habitat structure provide unique information for the solid foundation and efficient management and conservation of tropical rainforest community. Numerous studies of species composition and vegetation structure analysis on the moist deciduous forest, especially natural teak bearing forests area were reported by some researchers, because the natural teak forest plays a vital role for the national economy (Than Soe Oo, 2000; Aung That Zin, 2000; Kyaw Lwin, 2001, Nyi Nyi Kyaw, 2003; Than Soe Oo, 2005; Khin Thida Tun, 2006). However, the studies mentioned above were oriented on 'silvicultural grounds' for sustainable development of natural teak forest.

Crome (1996) had pointed out that during the baseline survey of Biodiversity of Yadana Project Area, "the remaining evergreen forests on the Thitkha taung and slopes of the eastern Zimba stand out as regionally and nationally significant forests." Whitmore (1998) also stated that among the various forest ecosystems in the tropics, tropical rain forest are globally significant as reservoir of biodiversity and fixed carbon and important at local and regional scales as providers of environmental services and sources of economic products. About one-half of the world's species live in tropical rain forests even though they occupy about 7% of the land area. In the tropics with increasing threats of forest degradation, biodiversity loss and the loss of environmental services, there has been an escalating need for in-depth studies on forest dynamics and biophysical characteristics in order to support sustainable resource development and achieve environmental protection (Daily et al., 1997; Sanchez-Azofeifa et al., 2003, 2005 cited M. Kalacska et al. 2006). For these reasons, the present study will focus on information about the floristic composition and its structure which is of great importance not only to promote the conservation, maintenance and sustainability of biological diversity but is also essential to provide scientific base line information to develop the biodiversity database.



## 2. Objectives of the study

The main purpose of this study is to provide the baseline flora information as part of biodiversity database towards the development of Taninthayi Nature Reserve Management Plan.

The specific purposes are as follows:

- to explore the floristic composition and species diversity; and
- to study the stand distribution and forest structure.

## 3. Ecological description of the study site

### 3.1. Location

TNR lies between Ye Dawai road in the west along with the Andaman sea and Myanmar Thailand international border line in the east and is located administratively in Yebyu and Dawai townships of Dawai district in the northern part of Taninthayi Division in the south Myanmar. TNRP area (Figure 1) is geographically situated between the latitudinal range of N 14°20'50" to 14°57'55" and the longitudinal range of E 98° 5'10" to 98° 31'32" (Anon, RS & GIS, FD, 2007). TNR was notified as the Nature Reserve under PAS in 2005 with a total area of 1700 square kilometers (about 169998.7 ha). It consists of three reserves, viz., the eastern parts of Kaleinaung Reserve and Heinze Reserve (about 85764 ha or 211836.8 acres), and Luwaing Reserve (about 84307 ha or 208240 acres). These reserves were notified as Reserve Forests in 1885, 1902 and 1932 respectively which are the very old reserved forests of tropical rain forest in Myanmar.

### 3.2. Climate

The climate in the study area is the seasonal and tropical monsoon type with high rainfall. Average annual rainfall is 5,000 mm with about 145 rainy days from May to October. Average temperature range is 25-28°C with the hottest in March and the coldest in January (Meteorological Department of Dawei District). According to the weather station of MGTC, average annual rainfall near the study site from year 2001 to 2005 was 5,436 mm (rainfall pattern shown in Table 2 and Figure 2).

### 3.3. Type of vegetation

TNR is almost covered by tropical rain forest distributed in high elevation of mountain site, but the forest is associated with the deciduous hardwood and bamboo forest in the low land as shown in land cover map of TNRP (Figure 3). According to Maxwell (2001), Anon, RS & GIS, FD (2007), Smith (1926) the composition of flora in the study site is briefly described that "The canopy layer is occupied by evergreen tree species with the height ranging from 40-60 m. Some evergreen canopy species include *Dipterocarpus costatus*, *Dipterocarpus turbinatus*, *Hopea odorata*, *Dysoxylum excelsum*, *Sweintonia schwenkii* in association with deciduous species, are *Parkia sumatrana* and *Tetrameles nudiflora* in the study area. Understory species are mostly evergreen in which the common understory species are *Polyalthia simiarum*, *Shima wallichii*, *Diospyros brandisiana* and *Cinnamomum iners* while some of shrub and tree let species includes *Microtropis bivalves*, *M. discolor*, *Leea indica*, *L. xora* and *L. diversifolia*. Some species of evergreen woody climbers are *Ancistrocladus tectorious*, *Sphenodesme involucre* and *Premna latifolia*, and some ground herbs are

*Aglaonema simplex*, *Hypolytrum nemorum* and the ferns *Asplenium apogamus*. Several rattan species of the genus *Calamus*, and some bamboo species such as *Dentrocalamus longispathus* and *Gigantochloa apus* of bamboo species were found in the study area”.

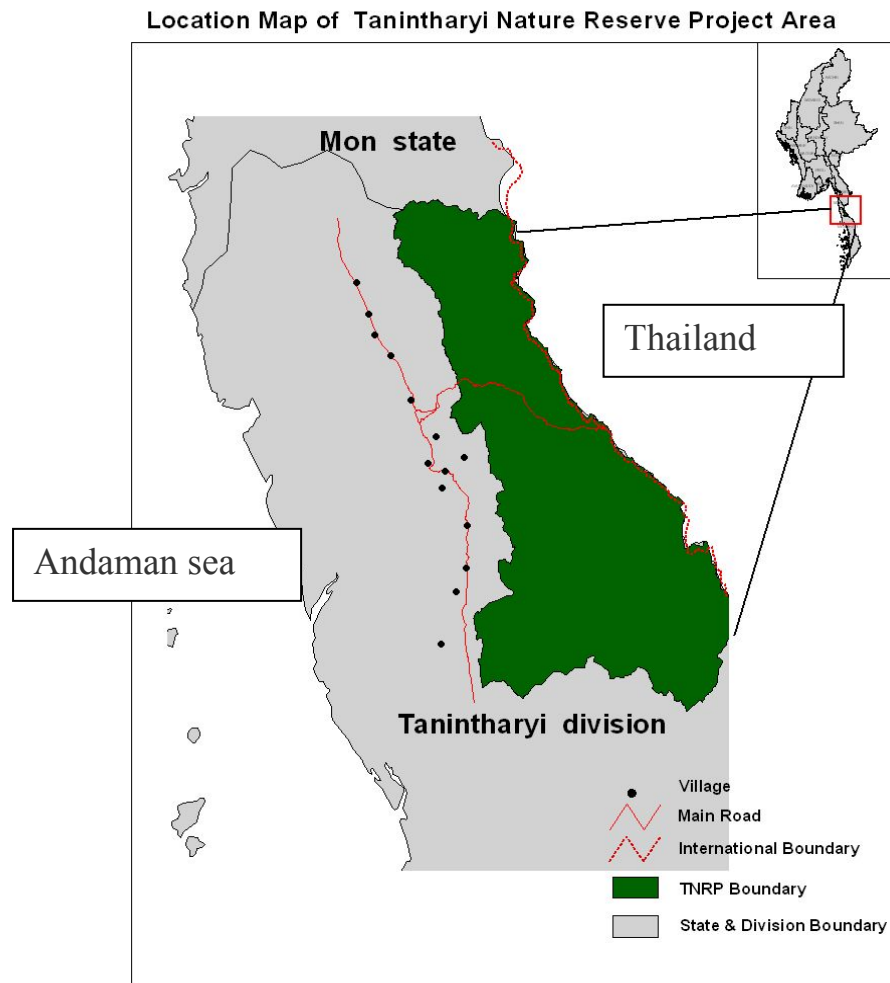


Figure. 1. Location of Taninthayyi Nature Reserve Project Area.

Table 2. Rainfall (mm) in study area

Month	2001	2002	2003	2004	2005	Average
Jan.	0.00	0.00	0.00	0.00	0.00	0.00
Feb.	0.00	0.00	0.00	0.00	0.00	0.00
Mar.	80.80	0.00	80.40	0.00	8.30	33.90
Apr.	0.00	21.00	13.80	0.00	28.00	12.56
May	822.50	890.20	851.10	503.10	594.90	732.36
June	1231.20	802.10	850.00	1078.40	1322.40	1056.82
July	1087.60	1437.70	1199.90	825.90	1632.40	1236.70
Aug.	1864.30	1469.10	1515.50	1814.70	1037.40	1540.20
Sept.	362.80	1110.00	741.90	516.50	876.10	721.46
Oct.	90.90	111.30	121.50	32.40	0.00	71.22
Nov.	40.20	69.80	0.00	0.00	0.00	22.00
Dec.	0.00	42.20	0.00	0.00	0.00	8.44
Average	5580.30	5953.40	5374.10	4771.00	5499.50	5435.66

Source : MGTC

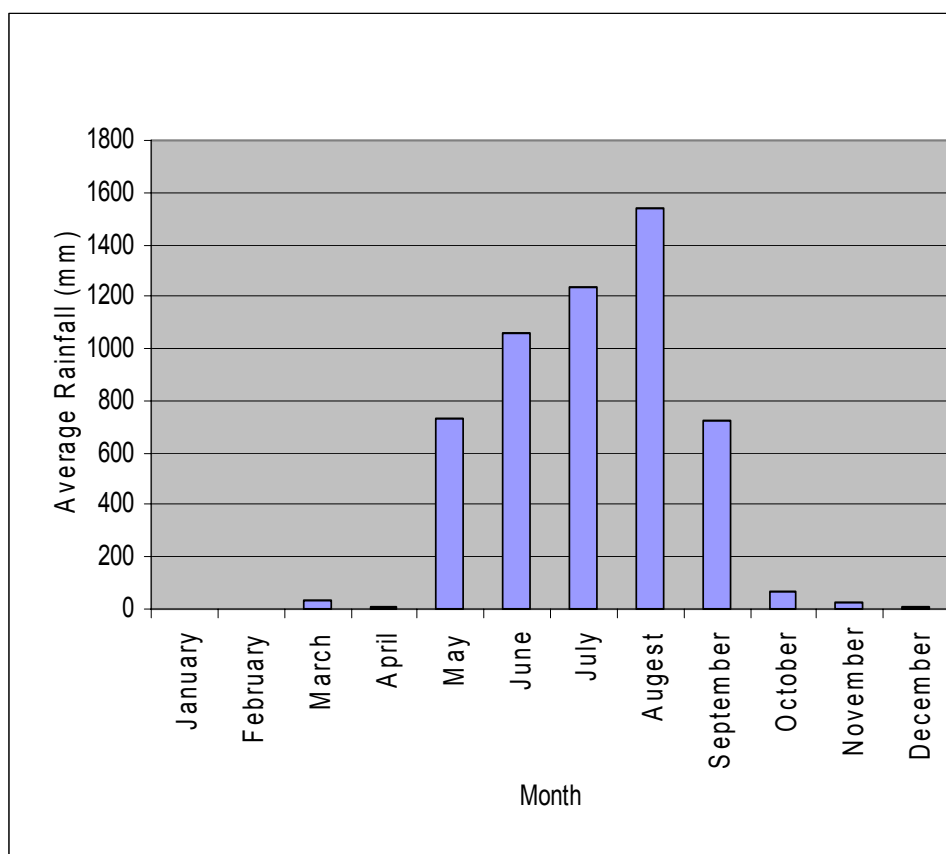


Figure 2. Average monthly rainfall (2001 to 2005) in the study site of TNRP.

### 3.4. Topography

Most area in TNRP is undulating and high elevation of terrain in the range of above sea level from 15 m in low land to 1,400 m at the ridge of Thai border with more than 37% of the slope in the most part of the area (Anon, RS & GIS, FD, 2007). The mountain range is running from north to south while the slope rises almost west to east climbing to the ridge top and is oriented to the western aspect. Most sampling plots were located in the middle slope of the mountain range while a few plots were in the lowland near the streams with altitudes ranging from 58 m to 527 m.

### 3.5. Types of soil

Geological formation in the Kleinaung and Heinze reserves consists mostly of granite intrusion, and weathering of granite gives rise to gravelly soil on which giant evergreen forest is found (Smith, 1926). The soil type in the study site falls into the yellow and red brown forest soil zone. The red brown and well structured forest soils having a good drainage with the pH value ranging from 5.5 to 6.5 occur on the well drained hill slopes at the elevation from 300 m to 1,200 m above sea level. The region of gentle slopes of low hills and foot hills at the elevation of 100 m to 500 m above sea level are covered by the yellow brown forest soils.

## **4. Method**

### **4.1. Sampling method**

A complete assessment of flora in a large area such as the area of TNRP is normally impossible due to the limitation of staff, finance, accessibility, security condition and duration of survey season. Therefore, sampling units and transects were subjectively selected based on maps of crown coverage classes and forest types of TNRP, developed by GIS/RS section of FD (Figure 3). The study site in the TNRP area was traversed along the TEPM service track at the northern boundary and the southern boundary followed the south-western boundary of TNRP. The western boundary was close to the western boundary of TNRP while the eastern boundary followed the Myanmar / Thai Border. Due to security reasons the survey team was allowed to stay within 8 km distance from the Ye-Dawei highway.

The vegetation survey was conducted using the following methods (Alder, D. and Synnott, T. J., 1992):

#### **a. Systematic Sampling method**

The systematic sampling method consisted of a 3200 m x 500 m rectangular sampling unit with a cluster of ten 40m x 30m sample plots, systematically spaced 800 m x 500 m along the orientation, subjectively predetermined on the maps. The sample plot was sub-divided into 12 subplots of 10 m x 10 m for recording trees  $\geq 10$  cm dbh. In the subplot number 1, recordings were made for trees between 10 cm and 5 cm dbh as well as climbers, palms and bamboo. Within the subplot number 1, a 5 m x 5 m plot was further sub-divided for regeneration survey. Layout of sample plots in a single sampling unit was shown in Figure 4. Coordinate locations of all plants in the sample plots were measured and recorded.

#### **b. Transect method**

Vegetation survey was also conducted in a transect belt of 10 m x 100 m to observe the stand structure. The transect belt was sub-divided into 10 subplots of 10 m x 10 m.

### **4.2. Sample plot layout**

Using GPS, the survey team firstly visited the predetermined point of each sampling unit and selected the actual sampling point depending on the topography and stand conditions. Areas with very steep slope with greater than 40-degree inclination, fully fallow land and bamboo brake were avoided and actual sampling point was set as close as possible to the preset point. Topography in terms of slope inclination, orientation and altitude of the plots was recorded and as well as its geographical location using GPS. Sample plots were mostly located in the middle slope of the mountain ranges. Therefore, the physical condition of the study forest was characterized by very steep slope over 25 degree with the altitude ranging from 58 m to 527 m. Summary of characteristics of sample plots was described in appendix A.

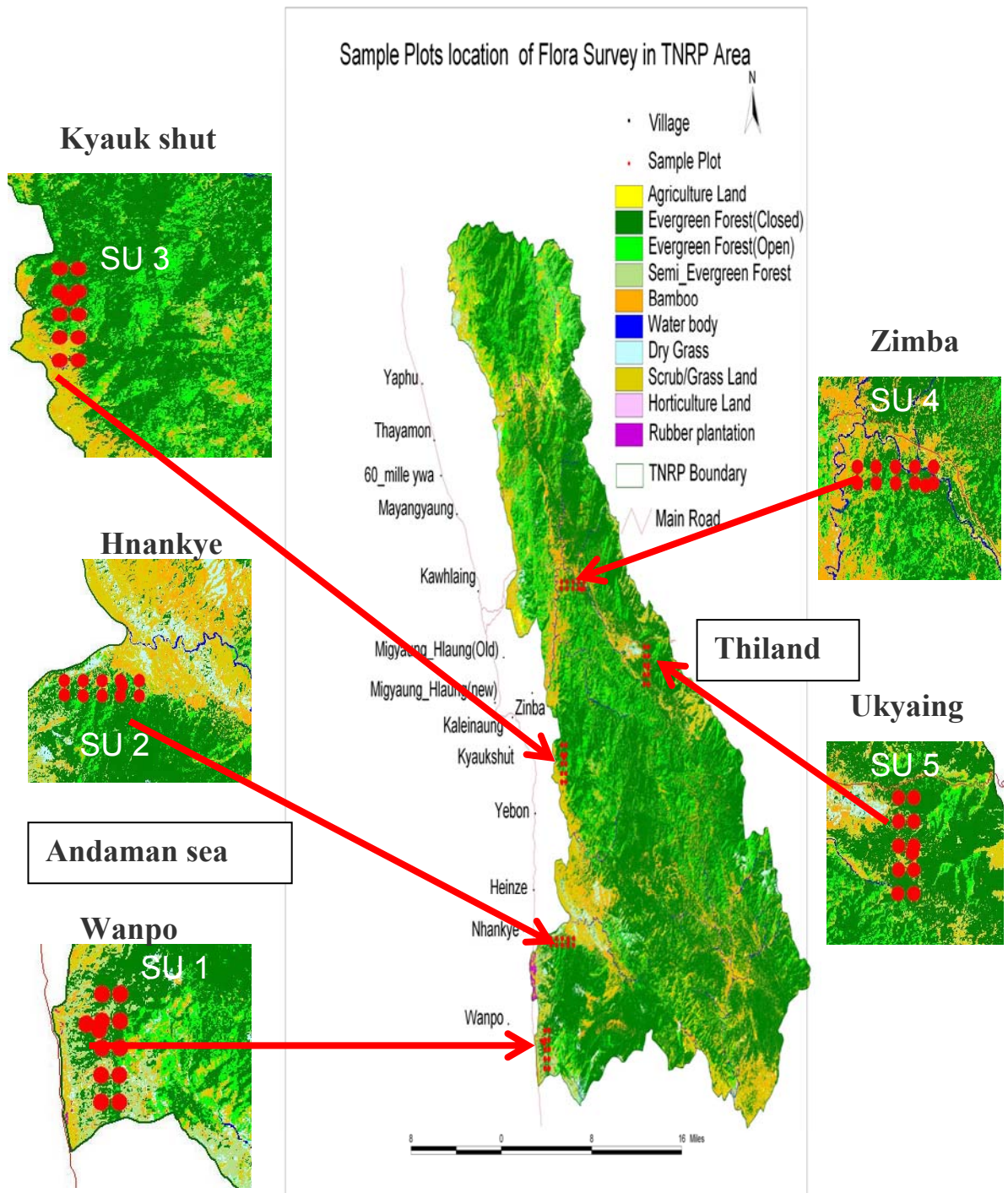


Figure 3. Land cover and layout of Sample plot for Flora Survey in TNRP.

### a. Sampling Unit and Sample Plot

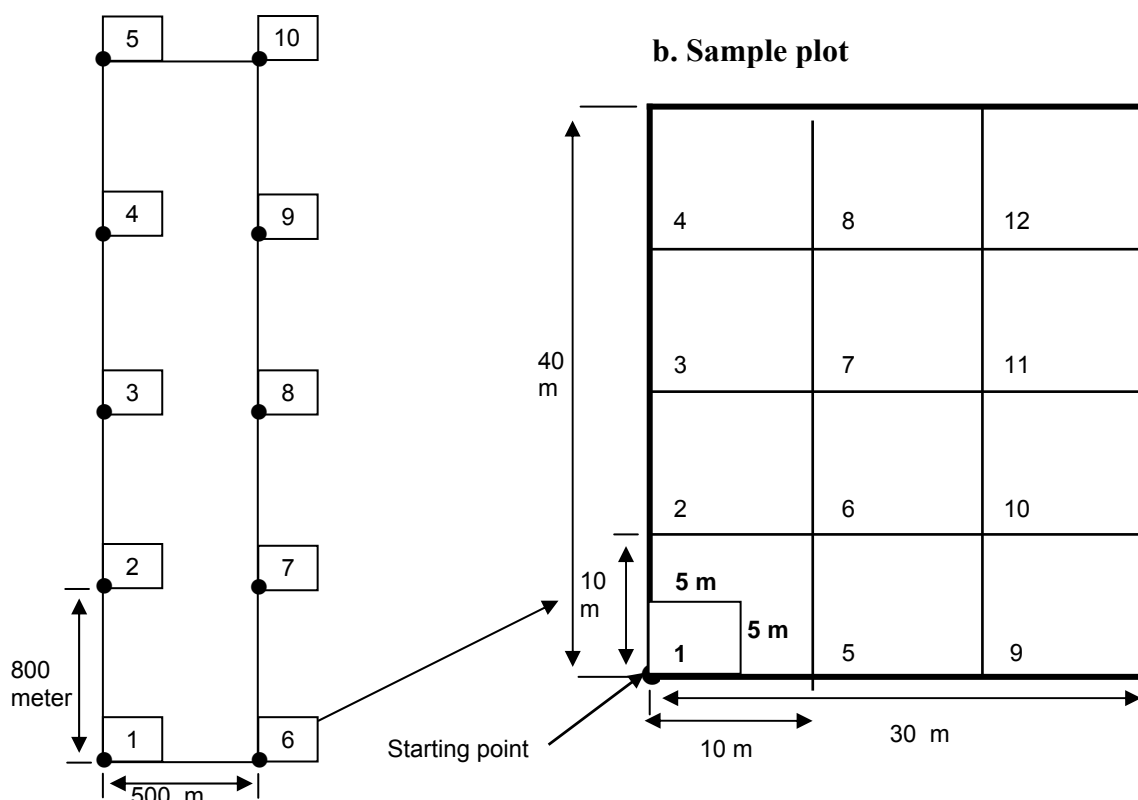


Figure 4. Sampling unit design of the study area.

### 4.4. Vegetation survey

The survey was conducted in 5 sampling units distributed with an approximate distance of 8 km between adjacent units from the southern most part of TNR to TEPM service track in the TNRP area during the period from late March to mid May, 2007. Two units were located along TEPM service track in Kaleinaung Heinze reserves forests; the remaining units were established near the villages namely Wanpo, Kyauk Shut and Hnankye in Luwaing reserve forest. In addition, survey in six transects near and within the respective sampling units was also performed. Total survey area was 6.6 ha.

For species identification, the plants found in sample plots were firstly identified by the field team with the assistance of available references (John Kress et al, 2003; Hundley, H. G. and U Chit Ko Ko, 1987; Simon Gardner, et al., 2000) and the villagers who are familiar with the local plant species. And all plant specimens collected from the sample plots were identified for the family and species level by the taxonomists from Botany Department of Dawai University. Furthermore, the remaining unknown specimens of the species were sent to the herbarium of FRI, FD, Yezin for further identification.

#### 4.5. Data analysis

After the field survey, data entry was carried out in Excel work sheet. Analysis of species richness and diversity, and vegetation structure were conducted using the Excel 2000 and SPSS soft ware.

##### 4.5.1. Species diversity

Species diversity describes a combination of the richness and evenness of species at a particular unit area. Richness means the number of species per unit area. Evenness is defined as the distribution of individual among the species. This maximizes when all the species have the same number of individual.

Among the several methods of diversity measurement, Shannon-Wiener Index and Shannon Evenness were applied in this study. Shannon-Wiener Index and Evenness are calculated by the following equations (Magurran, 1988).

$$\text{Shannon-Wiener index } H' = \sum P_i \ln P_i$$

$P_i = n_i/N$ , the proportional abundance of the  $i$  species

$N$  = Total number of individual

$n_i$  = Number of individual of  $i$  species

$$\text{Shannon Evenness} \quad E = H'/\ln S$$

$E$  = Evenness of species distribution

$H'$  = Shannon index

$S$  = Number of species

The significance test for the difference of species diversity between the sampling units in the value of Shannon-Wiener index ( $H'$ ) obtained from 5 sampling units was conducted by using Student's  $t$  test with the following formula (Jayarman, K. 2000).

$$\text{Var } H' = (\sum P_i * (\ln P_i)^2 - (\sum P_i * \ln P_i)^2 / N - ((S-1)/2N^2))$$

$$t = (H'_1 - H'_2) / (\text{Var } H'_1 + \text{Var } H'_2)^{1/2}$$

$$df = (\text{Var } H'_1 + \text{Var } H'_2)^2 / (((\text{Var } H'_1)^2 / N_1) + ((\text{Var } H'_2)^2 / N_2))$$

##### 4.5.2. Species similarity

Similarity of species composition in the study site between the individual sampling units was assessed using the following index of Sorensen coefficient reported by Sorensen (1948, cited Magurran, 1988).

$$K_s = 2c/(a+b)$$

Where  $a$  = total number of species in sampling unit A

$b$  = total number of species in sampling unit B

$c$  = total number of the common species in both sites

#### 4.5.3. Importance Value Index (IVI)

The method consists of assigning categories of ecological importance to each species into communities under evaluation, by adding of each relative abundance, relative frequency and relative dominance in the community (Curtis and Meintosh, 1951, cited Lamphret, 1989).

**Relative abundance (RA)** =  $100 \times (\text{number of individuals of a species} / \text{number of individuals of the sample})$

**Relative frequency (RF)** =  $100 \times (\text{number of sampling units containing a species} / \text{sampling units for all species of the sample})$

Note –percentage of total of the absolute frequencies of all species

**Relative dominance (RD)** =  $100 \times (\text{basal area of a species} / \text{total basal area of the sample})$

**Importance Value Index (IVI)** = Relative abundance + Relative frequency + Relative dominance

### 5. Results

#### 5.1. Floristic richness and diversity

##### 5.1.1. Floristic richness and composition

In the five sampling units and six transects (6.6 ha), total number of species with dbh  $\geq 10$ cm was 257 species; of which only 191 species could be identified. Regarding life forms, 248 tree species were recorded together with 4 climbers, 2 bamboos and 3 palms (Table 3). Among the sampling units, species density/ha varied from 62 to 81 while the largest species density was observed in sampling unit 1 (Wanpo) and Sample Unit 3 (Kyauk Shut).

Table 3. Species composition and life forms by sampling units

Sampling Unit	Area (ha)	No. of species	Tree	Shrub	Climber	Herb	Bamboo	Palm
SU 1 (WP)	1.4	113	110	0	2	0	0	1
SU 2 (HK)	1.3	97	94	0	2	0	0	1
SU 3 (KST)	1.3	105	101	0	2	0	1	1
SU 4 (ZBA)	1.3	89	87	0	1	0	0	1
SU 5 (UK)	1.3	81	75	0	4	0	1	1
Total	6.6	257	248	0	4	0	2	3

The number of woody plant family in the study area was 46 belonging to identified species of 191. The dominant family was *Dipterocarpaceae* with 15 species followed by *Euphorbiaceae* (12), *Lauraceae* (11), *Anacardiaceae* (10), *Myrtaceae* (10) and *Sterculiaceae* (10) (Figure 5). List of species and families is attached in detail in appendix B.



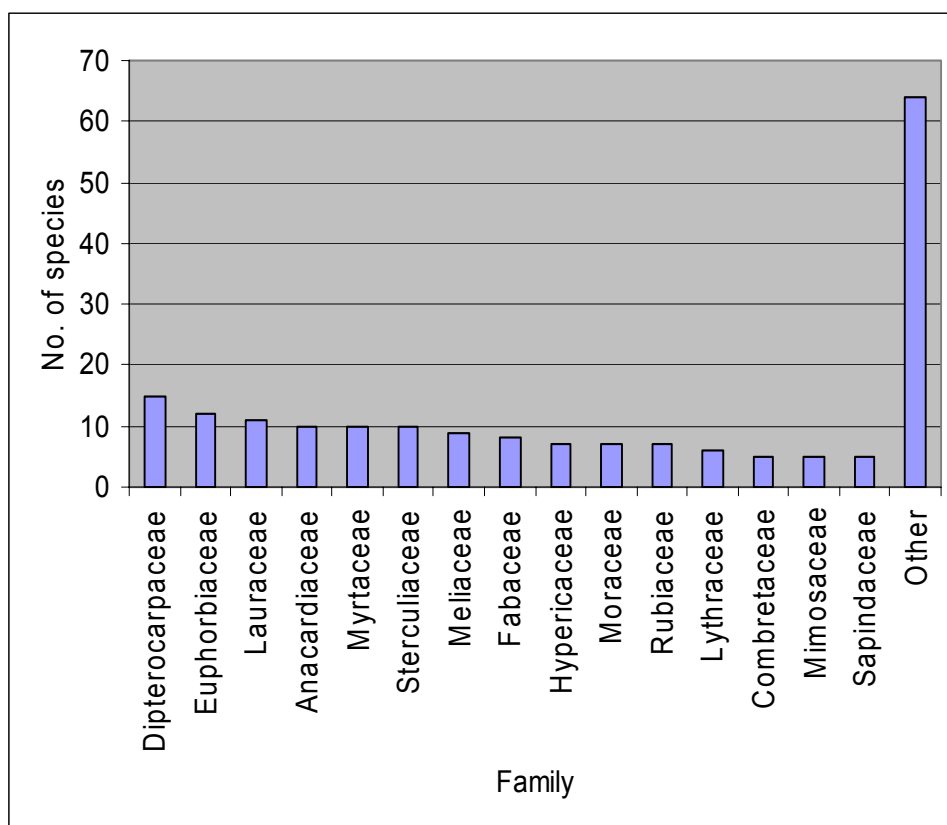


Figure 5. Ranking for dominant family by number of species composition.

#### 5.1.2. Importance Value Index (IVI)

According to the relative abundance, relative dominance and relative frequency, the order of most common tree species were Taung thayet (*Sweintonia floribunda*), Kyetmauk (*Nephelium* spp), Kywe thwee (*Myristica* spp.), Thit sho (*Pentace griffithi*), Kadut (*Parashorea stellata*), Thabye spp. (*Syzygium* spp), Zinbyun (*Dillenia parviflora*), Kalagi (*Barringtonia* spp.). Ranking of ecological significance of top fifteen species in the study area was given in Table 4. The highest important value of species was notably possessed by Taung thayet (*Sweintonia floribunda*) in this study while number of species greater than 5% importance value was only 7 species, Taung thayet (*Sweintonia floribunda*), Kyetmauk (*Nephelium* spp), Kywe thwee (*Myristica* spp.), Thit sho (*Pentace griffithi*), Kadut (*Parashorea stellata*), Thabye spp. (*Syzygium* spp) and Kalagi spp (*Barringtonia* spp). Those 7 species could be considered as ecological indicator species of the study site. Lamprecht (1989) stated that species having absolute abundance of less than 4, in 1 ha could be considered as rare species. Accordingly, in the study site, the composition of rare species was 164 (63%) of total species; 99 species (38%) were observed once, 32 species (12%) twice, 22 species (9%) thrice and 11 species (4%) with four times (Figure 6 and Appendix C).

Table 4. Ranking of Importance Value Index (IVI) in the study site

Sr.	Species	RA (%)	RF (%)	RD (%)	IVI (%)
1	Taung thayet/Taung thayet ni ( <i>Sweintonia floribunda</i> )	6.49	1.05	21.01	28.56
2	Kyet mauk/Kyet mauk chaw ( <i>Nephelium spp</i> )	8.43	1.05	4.78	14.26
3	Kywe thwee ni ( <i>Myristica spp.</i> )	5.80	1.05	2.81	9.66
4	Thabye ni/Thabye ywet thay ( <i>Syzygium spp</i> )	2.90	0.03	4.40	7.33
5	Thit sho ( <i>Pentace griffithi</i> )	2.86	1.05	3.32	7.23
6	Kadut ( <i>Parashorea stellata</i> )	1.86	1.05	3.62	6.53
7	Kalagi ywet kyi ( <i>Barringtonia spp.</i> )	1.89	1.05	3.30	6.25
8	Gat ni ( <i>Amoora wallichii</i> )	2.01	1.05	1.92	4.98
9	Thabye ( <i>Syzygium spp</i> )	2.24	1.05	1.42	4.71
10	Taung lan thaw ( <i>Unidentified</i> )	2.55	0.03	2.01	4.59
11	Bok/Bok ( <i>Diospyros peregrine</i> )	2.78	0.84	0.74	4.37
12	Zinbyun (( <i>Dillenia parviflora</i> )	1.93	0.02	2.40	4.35
13	Kalaw ( <i>Hydnocarpus macrocarpa</i> )	1.82	0.84	1.18	3.84
14	Thit khauk ( <i>Aporusa villosula</i> )	1.86	0.63	0.69	3.18
15	Taung thabye/Taung pyin ( <i>Tristanopsis burmanica</i> )	1.62	0.21	1.16	2.99
16	Others	52.95	87.00	45.23	185.18
	Total	100	100	100	300

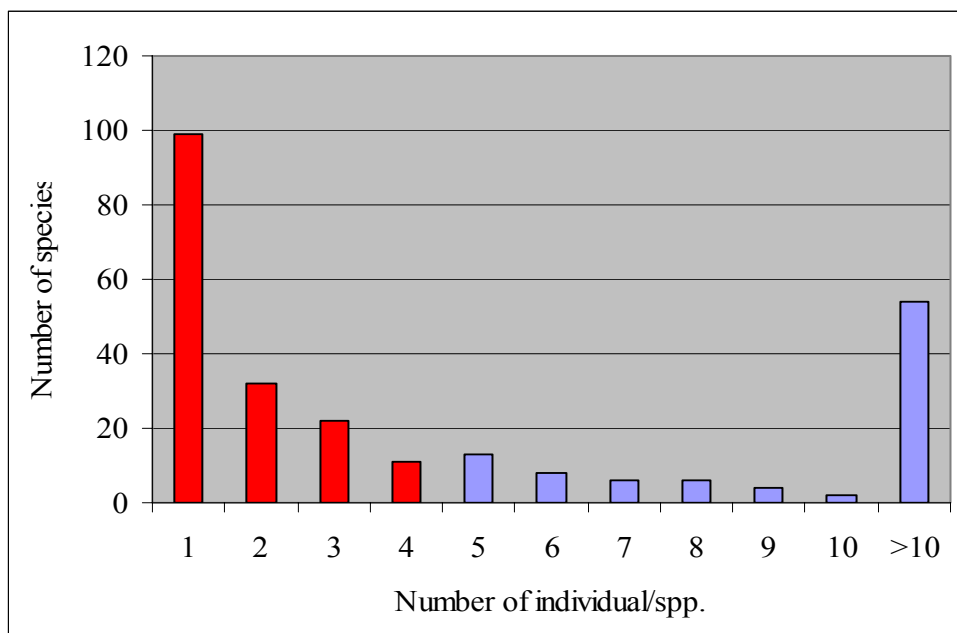


Figure 6. Number of individual by species (Red color represents rare species).

### 5.1.3. Species distribution by frequency classes

In order to detect homogeneity or heterogeneity of the species distribution in the study forest, species distribution by frequency classes was investigated (Table 5). According to the result of frequency chart (Figure 7), 76 % of the total number of species was in lower frequency classes: 1 (1-20%) and 2 (20-40%); while low values were observed in higher frequency classes: 3 (40-60%), 4 (60-80%) and 5 (80-100%). It means that the study forest is floristically very heterogeneous forest community according to Lamprecht (1989). The species which fall in high frequency class 5 were Kadut (*Parashorea stellata*), Kalagi ywet kyi (*Barringtonia spp.*), Taw danyin (*Abarema bigemina*), Kyet mauk (*Nephelium spp*), Kywe danyin (*Callerya atropurpurea*), Kywe thwee ni (*Myristica angustifolia*), Myet na pan (*Pavetta indica*), Taung peinne (*Artocarpus chaplasha*), Taung thayet ni (*Sweintonia floribunda*), Thabye spp (*Syzygium spp*) and Thit sho (*Pentace griffithi*). Those species can be identified as the most common species in the study forest.

Table 5. Species distribution by frequency classes (dbh  $\geq$ 10cm)

Absolute frequency	No. of species	%
1-20%	146	57
20-40%	48	19
40-60%	31	12
60-80%	15	6
80-100%	18	7

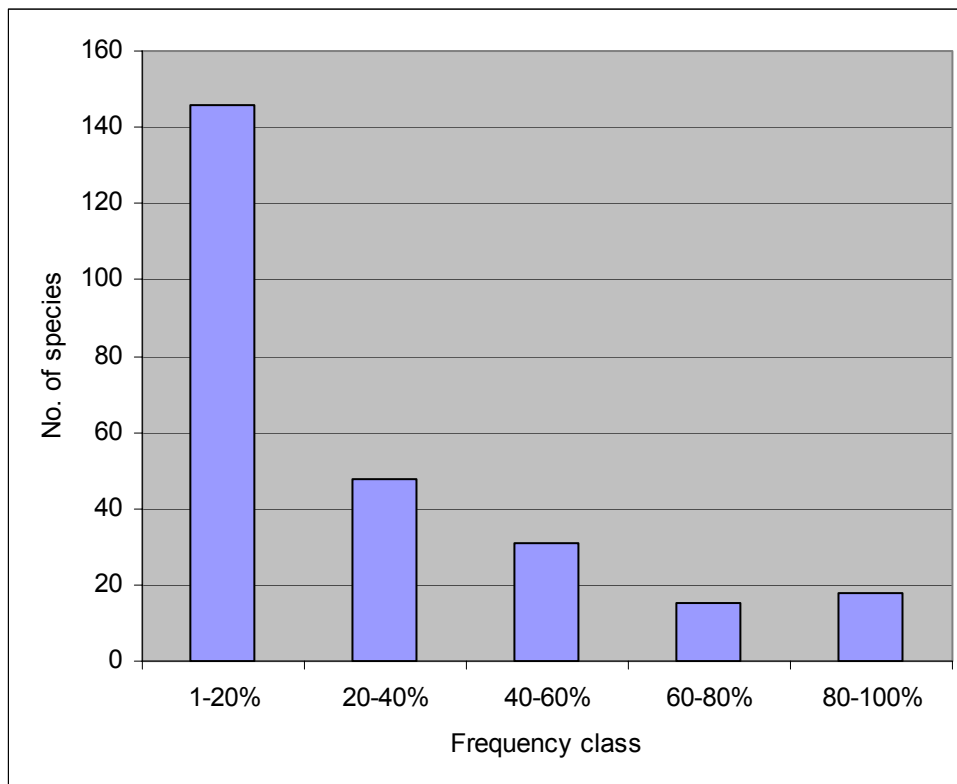


Figure 7. Species distribution by frequency class (dbh  $\geq$ 10cm).

#### 5.1.4. Species-area relation

Species-area curves for the individual sampling units and also for overall total survey area were constructed to express number of species in relation to change in area of habitat, not only to consider the minimum representative area but also to detect the habitat diversity within the survey area (Fangliang He and Pierre Legendre, 1996).

The pattern of curves in sampling unit 1 (Wanpo), 3 (Kyauk Shut) and 4 (Zimba) pointed out that new species were still considerably increasing without reaching the asymptotic tendency (Figure 8). This trend indicated that different floristic types and habitats occurred among the plots within the sampling units. In this respect, the sample plots area for flora survey in the units 1, 3 and 4 could still be extendable to reach the minimum representative area for flora survey.

However, the curves of sampling unit 2 (Hnankye), 5 (Ukyaing) and all units combined showed asymptotic tendency in which the increase in number of species was below 10% with 10% expansion of survey area. According to Lamprecht (1989), the survey area for units 2, 5 and all units combined consisted of minimum representative area for flora survey (Figures 8 and 9). Apparently species richness was slightly different among units 1, 2, 3 and 4, although number of species in sampling unit 5, Ukyiang forest site was smaller than other sites. The curve representing all units combined had frequently some rises although the end point of the curve was gradually reached the asymptote (Figures 9). It indicated that the habitats in the sampling units were heterogeneous.

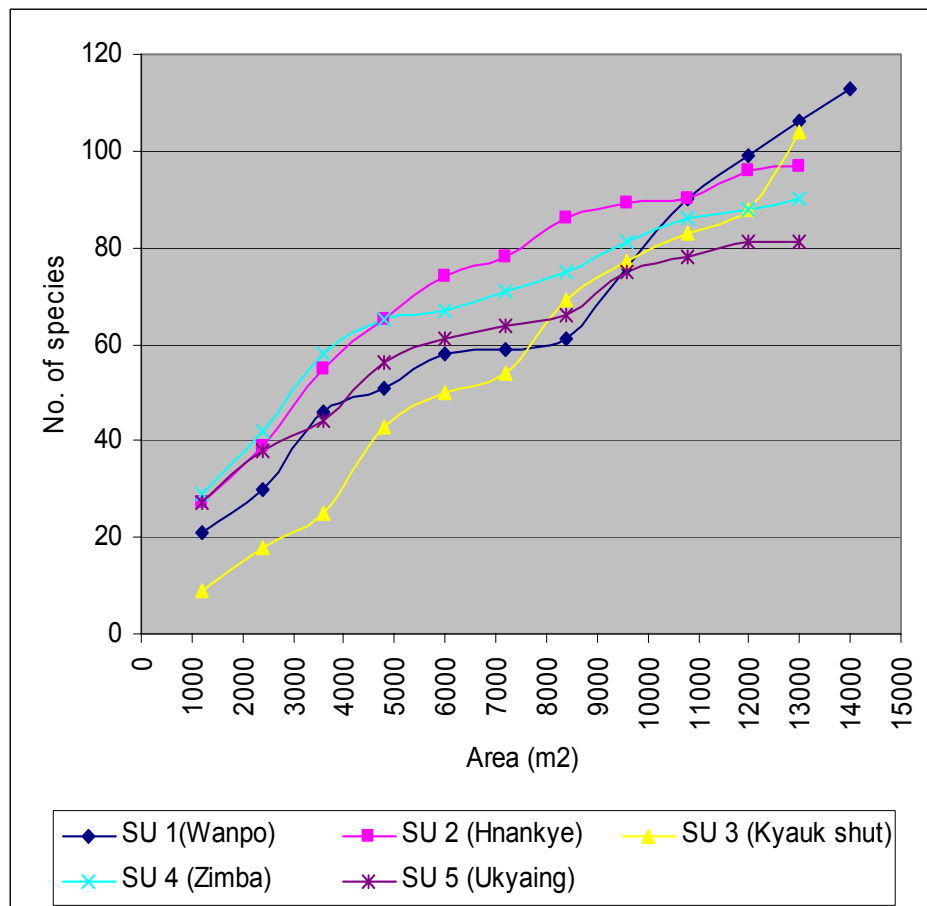


Figure 8. The species area curves for the individual sampling units in study forest.

The comparison of species richness curves by accumulating the area of sub-plots in the present study, in natural teak forest of Kyet shar, in the Bago Yoma and in mountain rain forest of Doi Inthernon in northern Thailand (Kanzaki and et al, 2003) was illustrated in Figure 9. The number of species in the study area was greater than those of forests in Doi and Kyet shar and the site had more heterogeneous floristic community according to the trends of curves.

For the Malaysian rainforests, Fangliang, et al. (1996) recommended a sample area of 5-10 ha to be adequate for a floral survey while Poore (1968) proposed a sample area of 2-5 ha to be sufficient for the same type of forests. As such, a sample area of 6.6 ha in this study was quite adequate for the flora survey.

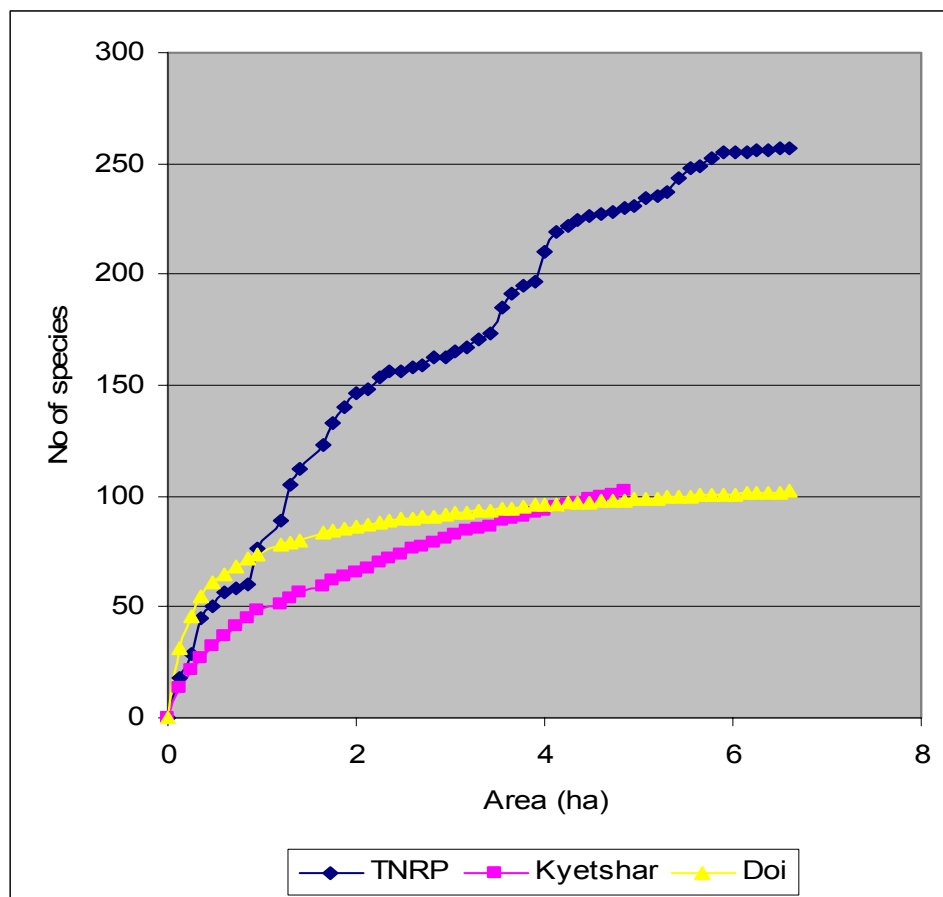


Figure 9. Species area curve of tropical forest, Doi Inthanon, tropical montane forest of Thailand, Kyet shar, natural teak forest in the Bago Yoma and the study forest of TNRP.

#### 5.1.5. Diversity indices and evenness

Among the various indices of diversity measurement, the floristic diversity of the study area was calculated using the Shannon-Wiener index ( $H'$ ) and evenness ( $E$ ) because it especially emphasizes the rare species and is relevant to the higher number of rare species composition for nature conservation in a study area.

The indices values of individual units 1, 2, 3, 4 and 5 were 4.03, 3.83, 3.76, 3.90 and 3.53 respectively with slight variation from all units combined. Diversity value for overall of sampling units was 4.43.

Evenness (E) is constrained between 0 and 1. The result of evenness with more or less 0.8 showed high equitability or more even distribution of species for all units combined and for individual units (Table 6).

An ecosystem with all species represented by the same number of individuals has high value of species evenness. In contrast, an ecosystem where some species are represented by many individuals and other species with very few individuals has low species evenness (Ian Harrison and et al, 2004). In the present study, the indication of higher evenness index is that the most species are evenly represented by number of individuals.

Table 6. Stand density, species richness, Shannon Wiener index and evenness in sampling units.

<b>Sampling unit</b>	<b>No. of individual (N)</b>	<b>No. of species (S)</b>	<b>H'</b>	<b>E</b>
All units combined	2587	257	4.43	0.79
SU 1 (Wanpo)	541	113	4.03	0.85
SU 2 (Hnankye)	557	97	3.83	0.84
SU 3 (Kyauk Shut)	470	105	3.76	0.81
SU 4 (Zimba)	487	89	3.90	0.87
Su 5 (Ukyaing)	532	81	3.53	0.80

In order to investigate species diversity and homogeneity in five sampling units, species diversity of each sampling unit was computed using the Shannon-Wiener index. The difference in the value of Shannon-Wiener index obtained from the sampling units was tested for significance using Student's t test. Accordingly, species diversity between SU 1 (Wanpo) and SU 3 (Kyauk Shut), between SU 1 and SU 5 (Ukyaing) were highly significant at the level of both 1% and 5%. Nevertheless, significance was found between SU 1 and SU 2, SU3, between SU 5 and SU 2, SU 4 at 5% level of probability. But no significance was found between SU 2 and SU 3, SU 4; between SU 3 and SU 4, SU 5. It could therefore be concluded that species diversity was significantly higher in SU 1 than other sampling units. The analysis of results is given in Table 7.

Table 7. The analysis on the difference in species diversity of pairs sampling units.

No.	Sampling unit	No. of Ind. (N)	No. of spp. (S)	Diversity index (H')	The variance in diversity Var H'	The corresponding degree of freedom (V)	Observed t value
SU 1	WP	541	113	4.0346	0.0024	1113	2.95*
SU 2	HK	557	97	3.8333	0.0023		
SU 1	WP	541	113	4.0346	0.0024	808	3.45***
SU 3	KST	470	105	3.7657	0.0037		
SU 1	WP	541	113	4.0346	0.0024	1116	2.12*
SU 4	ZBA	487	89	3.8943	0.0020		
SU 1	WP	541	113	4.0346	0.0024	1015	4.82***
SU 5	UK	532	81	3.6941	0.0026		
SU 2	HK	557	97	3.8333	0.0023	807	0.87 ns
SU 3	KST	470	105	3.7657	0.0037		
SU 2	HK	557	97	3.8333	0.0023	1115	0.93 ns
SU 4	ZBA	487	89	3.8943	0.0020		
SU 2	HK	557	97	3.8333	0.0023	1016	1.98*
SU 5	UK	532	81	3.6941	0.0026		
SU 2	HK	557	97	3.8333	0.0023	1082	2.95*
SU 1	WP	541	113	4.0346	0.0024		
SU 3	KST	470	105	3.7657	0.0037	1354	1.70 ns
SU 4	ZBA	487	89	3.8943	0.0020		
SU 3	KST	470	105	3.7657	0.0037	1191	0.90 ns
SU 5	UK	532	81	3.6941	0.0026		
SU 3	KST	470	105	3.7657	0.0037	1312	0.87 ns
SU 2	HK	557	97	3.8333	0.0023		
SU 3	KST	470	105	3.7657	0.0037	1278	3.45***
SU 1	WP	541	113	4.0346	0.0024		
SU 4	ZBA	487	89	3.8943	0.0020	903	2.94*
SU 5	UK	532	81	3.6941	0.0026		
SU 4	ZBA	487	89	3.8943	0.0020	955	2.12*
SU 1	WP	541	113	4.0346	0.0024		
SU 4	ZBA	487	89	3.8943	0.0020	981	0.93 ns
SU 2	HK	557	97	3.8333	0.0023		
SU 4	ZBA	487	89	3.8943	0.0020	734	1.70 ns
SU 3	KST	470	105	3.7657	0.0037		
SU 5	UK	532	81	3.6941	0.0026	1136	4.82***
SU 1	WP	541	113	4.0346	0.0024		
SU 5	UK	532	81	3.6941	0.0026	1169	1.98*
SU 2	HK	557	97	3.8333	0.0023		
SU 5	UK	532	81	3.6941	0.0026	843	0.90 ns
SU 3	KST	470	105	3.7657	0.0037		
SU 5	UK	532	81	3.6941	0.0026	1180	2.94*
SU 4	ZBA	487	89	3.8943	0.0020		

- \* and \*\*\* mean significance at 5% level and both of 1% and 5% levels respectively.

### 5.1.6. Species similarity

Species composition similarity between certain pairs of sampling units using Sorrenson's Similarity Index was investigated (Sorensen.1948, cited Magurran, 1988). Two related coefficients are commonly used which have ranges of 0 (completely dissimilarity) to 1 (total similarity). In the present study, because of the values of similarity index were almost less than 0.5 ranging from 0.34 to 0.48, the similarity of species composition was slightly low across the sampling units (Table 8).

Table 8. Sorensen's coefficient of similarity among different sampling units.

Sampling unit	SU1 (WP)	SU 2 (HK)	SU 3 (KST)	SU 4 (ZBA)	SU 5 (UK)
SU 1 (WP)	1	0.47	0.39	0.40	0.38
SU 2 (HK)		1	0.34	0.40	0.48
SU 3 (KST)			1	0.38	0.35
SU 4 (ZBA)				1	0.44
SU 5 (UK)					1

## 5.2. Forest structure in the study area

### 5.2.1. Stand density and distribution

A total of 2587 stems with dbh  $\geq 10$ cm were recorded in the survey area of 6.6 ha. Among the sampling units, stem density per hectare varied from 362 to 428 with an average of 392 ( $\pm 27$ ) in which the highest stem density was observed in the sampling unit 2 (Hnankye) and the lowest in the sampling unit 3 (Kyauk Shut).

Among the three basic patterns of spatial distribution of horizontal stand structure such as random, clump and uniform types, vegetation distribution in the study area was found to have a random pattern as illustrated in Figure 10 a, b and c. The plotting was based only on the (x, y) coordinates of individual plant locations measured in sample plots of different forest types in terms of deciduous, semi-evergreen and evergreen forest types. Forest type a, deciduous, located at the foot hill in 125 m elevation was quiet open and the most dominant species was bamboo with sparse deciduous species while semi-evergreen type b, located at 211 m and evergreen type c at 347 m of elevation were densely covered by evergreen species with dense regeneration.



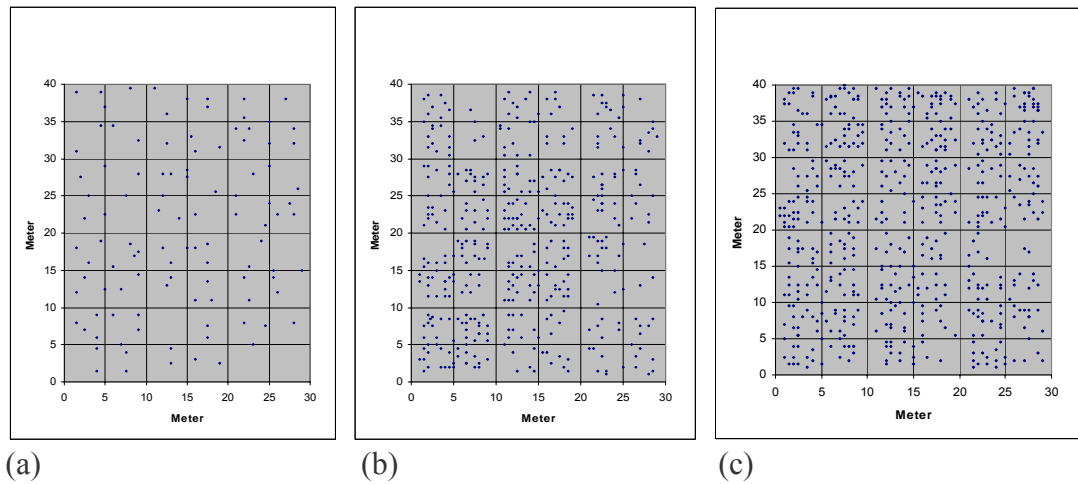


Figure 10. Samples of stand distribution in forest of Deciduous (a), Semi-evergreen (b) and Evergreen type (c) in 30 m x 40 m sampling unit 3 (Kyauk Shut).

### 5.2.2. Basal area distribution

Basal area per hectare significantly varied from 20.3 m<sup>2</sup> in sampling unit 1 of Wanpo to 47.5 m<sup>2</sup> in sampling unit 5 of Ukyaing with an average of 32 m<sup>2</sup> ( $\pm 10.2$ ) (Figure 11 and Table 9). The 10 most abundant species in terms of basal area occupied 48% of the total, of which Taung thayet (*Sweintonia floribunda*) was the most dominant species in the study site with 21% followed by Kyet mauk (*Nephelium* spp), Kadut (*Parashorea stellata*), Kanyin (*Dipterocarpus turbinatus*), Thit sho (*Pentace griffithi*), Kywe thwee ni (*Myristica angustifolia*), Thabye (*Syzygium* spp) and Zinbyun (*Dillenia parviflora*) with the basal area less than 4.8% of the total basal area (Figure 12).

Table 9. Basal area of sampling units.

Sampling unit no.	Basal area in Unit (m <sup>2</sup> )	Basal area (m <sup>2</sup> /ha)
SU1 (WP)	28.48	20.3
SU2 (HK)	45.42	34.9
SU3 (KST)	34.53	26.6
SU4 (ZBA)	39.75	30.6
SU5 (UK)	61.71	47.5
Total	209.89	
Average	41.98	32.0
STDE	-	10.2

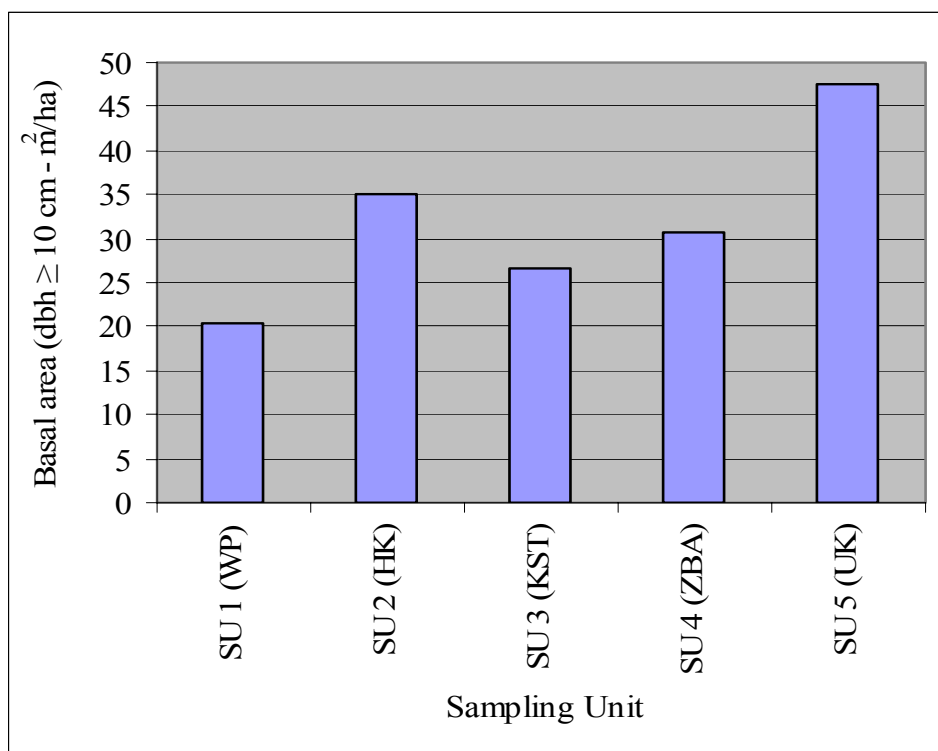


Figure 11. Basal area per hectare in individual sampling units (dbh  $\geq$  10 cm)

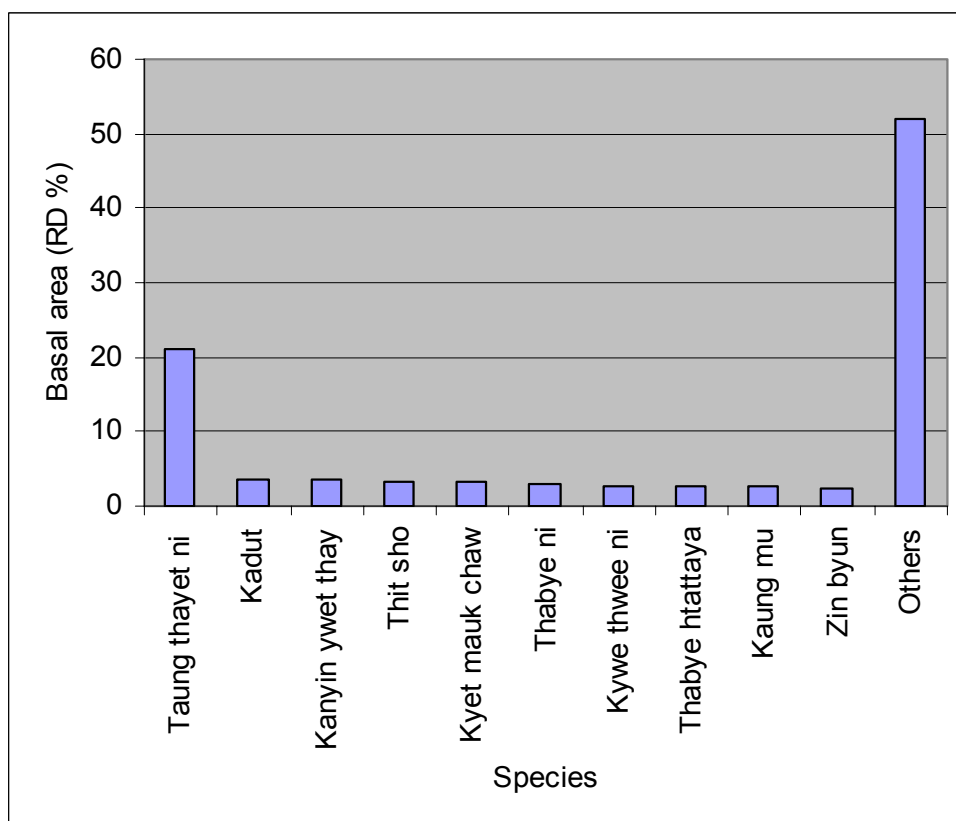


Figure 12. Ranking of relative basal area by species in the study site (dbh  $\geq$  10 cm).

### 5.2.3. Distribution of population and species by DBH (diameter at breast height) classes

In the present study, population structure by DBH classes in the study forest decreased from class to class with a steeper gradient in lower DBH classes and with a gentle slope in higher classes (Figure 13 a and Table 10 a ). Out of total number of stems inventoried, 53% of the stems were accumulated in the 10-30 cm DBH class while only 4.4% was found in DBH 70 cm and above. This pattern followed the trend of normal distribution in a natural forest with a close correlation between the DBH classes and stand density.

Distribution of species by DBH class clearly followed the same trend as stand density distribution (Figure 13 b and Table 10 b). The largest number of species was found in 10-19.9 cm smaller DBH class (211 species, 79%) but a few number reached to larger size classes. Species number steeply decreased from 10-20 cm to 20-30 cm DBH class and gradually decreased from over 30 cm diameter class. Stand density and species richness had consistently decreased with increasing DBH classes from 10 cm to 150 cm. Taung thayet (*Sweintonia floribunda*), Kanyin (*Dipterocarpus turbinatus*), Kaung mu (*Anisoptera scaphula*), Thabye (*Syzygium spp.*), Thingan (*Shorea farinosa*), Pyinma (*Lagerstroemia speciosa*), Kyetmauk (*Nephelium spp.*) and Let kok (*Sterculia foetida*) were found in the higher DBH class of 80 cm and over. Within the 56 sample plots, the range of maximum DBH varied from 28 cm to 144 cm with the largest tree species of Taung thayet (*Sweintonia floribunda*).

Table 10. Distribution of species and individual in DBH classes: dbh  $\geq$ 10 cm (6.6 ha for all, 1.3 ha of SU 2 to 5 and 1.4 ha of SU 1).

Table 10. (a) Number of stems by DBH classes in sampling units.

DBH Class (cm)	SU 1	SU 2	SU 3	SU 4	SU 5	All
10-19.9	294	284	276	258	263	1375
20-29.9	156	129	95	96	106	582
30-39.9	43	56	44	54	49	246
40-49.9	26	34	19	27	27	133
50-59.9	12	21	9	20	20	82
60-69.9	4	13	4	11	22	54
70-79.9	3	6	13	8	10	40
80-89.9	1	6	2	6	8	22
90-99.9	2	1	1	1	18	22
100-109.9	0	2	1	2	1	8
110-119.9	0	2	3	2	4	11
120-129.9	0	1	1	1	1	4
130-139.9	0	0	2	1	2	5
140-149.9	0	2	0	0	1	3
Total	541	557	470	487	532	2587

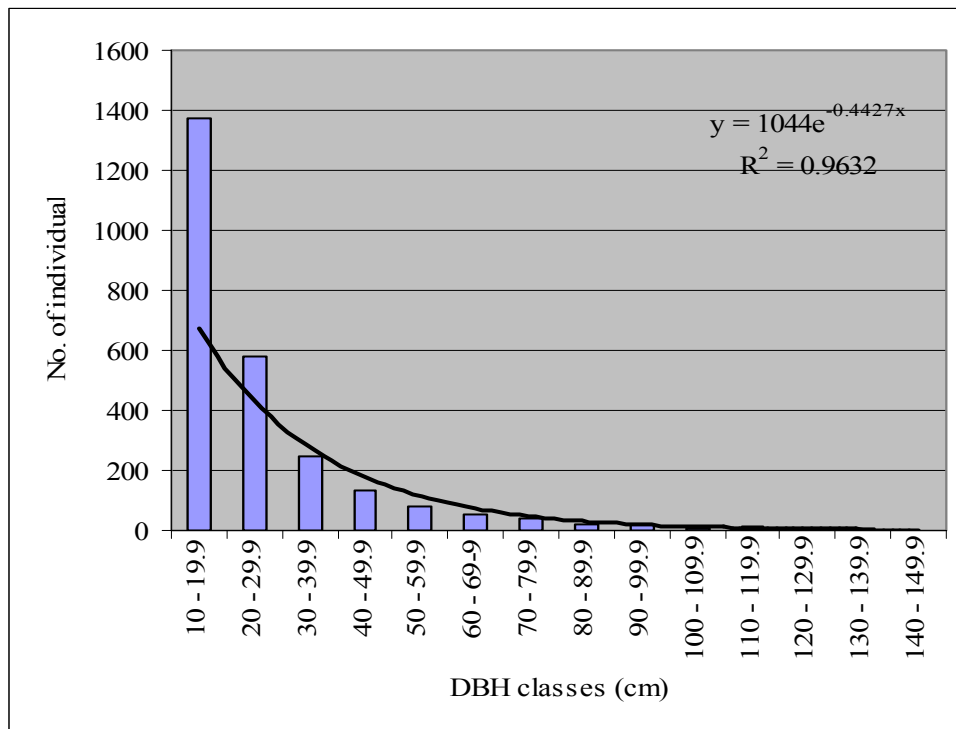


Figure 13 a. Population distribution by DBH classes for all sampling units combined

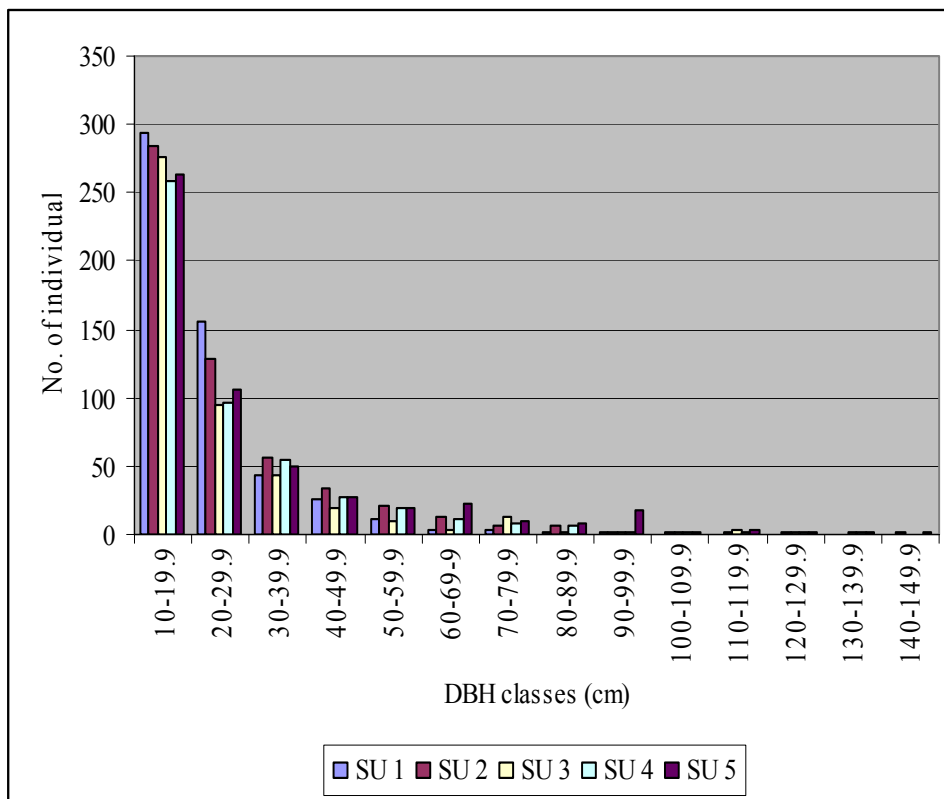


Figure 13 b. Population distribution by DBH classes for each sampling unit

Table 10. (b) Species density by DBH classes in the sampling units

DBH Class	SU 1	SU 2	SU 3	SU 4	SU 5	All
10-19.9	90	73	78	72	62	211
20-29.9	65	42	36	34	41	128
30-39.9	27	34	23	26	15	78
40-49.9	20	22	14	16	15	58
50-59.9	9	16	9	15	12	43
60-69.9	3	8	4	10	9	27
70-79.9	3	5	8	6	6	19
80-89.9	1	4	2	3	6	11
90-99.9	2	1	1	1	7	10
100-109.9	0	2	1	1	1	4
110-119.9	0	2	2	2	3	7
120-129.9	0	1	1	1	1	3
130-139.9	0		2	1	2	4
140-149.9	0	2	0	0	1	3
Total	113	97	105	89	81	257

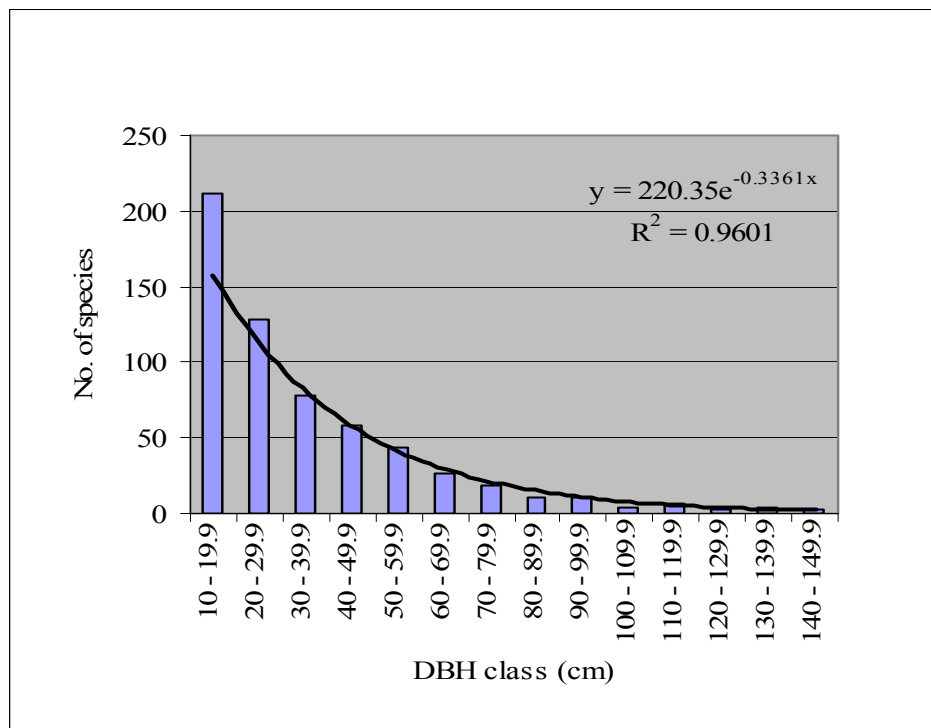


Figure 14. Species distribution by DBH classes.

#### 5.2.4. Distribution of population and species by height classes

Individual stem number in the study forest was concentrated in the lowest classes of 5-15 m height with 57% of the total. The stand density decreased with increasing height classes as shown in Figure 15 and Table 11. Number of the individual over 30 m height was rare with 6% coverage of the total.

The density of species composition in different height classes was very similar pattern with species distribution by DBH classes. 60% of the total was covered in 5-10 m height class while less than 7% was reached over 30 m height in the observed forest (Figure 16). The maximum height in sampling units was ranged from 12 m to 58 m with the tallest tree reaching 58 m of Taungthayet (*Sweintonia floribunda*). The species reached in the co-dominant layer of high structure over 40 m height were Gat net (*Amoora rohituka*). Hman pa (*Chaetocarpus castanocarpus*), Kadut (*Shorea cinerea*), Kanyin ywet thay (*Dipterocarpus costatus*), Taung thayet (*Sweintonia floribunda*), Thabye ni (*Eugenia oblata*) and Thit sho (*Pentace griffithii*) while most of the species found in lower and mid layer of the stand.

Table 11. Distribution of species and individual in Height classes: height  $\geq 5$  m (6.6 ha for all survey area)

Ht. classes (m)	NOS	%	NOI	%
5-9.9	172	60	831	29
10-14.9	155	54	797	28
15-19.9	106	37	553	19
20-24.9	92	32	345	12
25-29.9	63	22	191	7
30-34.9	38	13	82	3
35-39.9	20	7	47	2
40-44.9	11	4	20	1
45-49.9	7	2	10	0
50-54.9	3	1	3	0
55-59.9	2	1	2	0
60-64.9	1	0	1	0
65-69.9	1	0	1	0

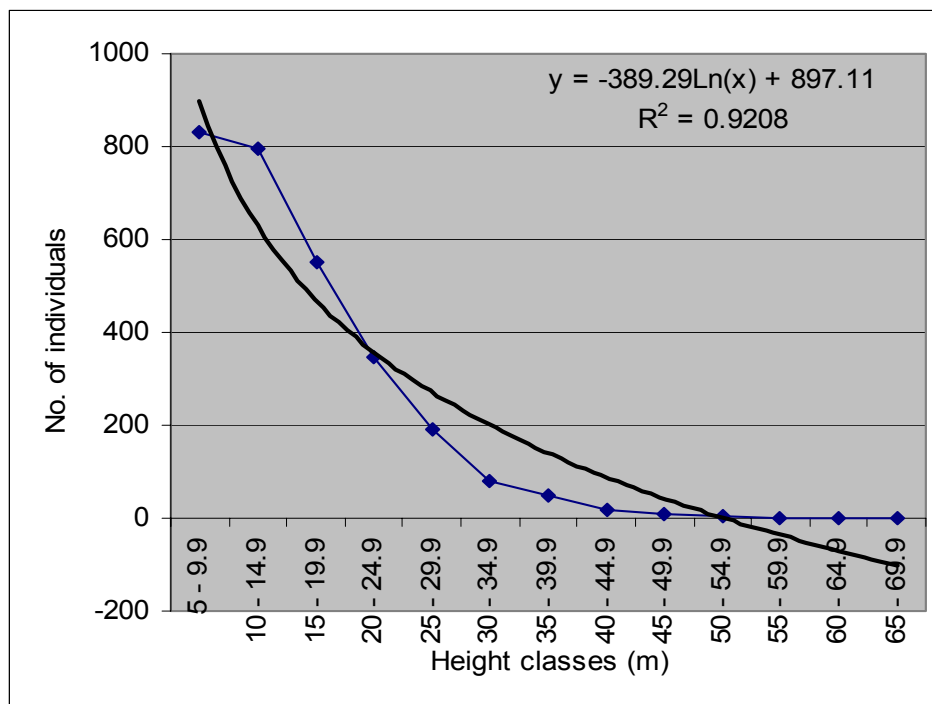


Figure 15. Population distribution by height classes in sampling units combined

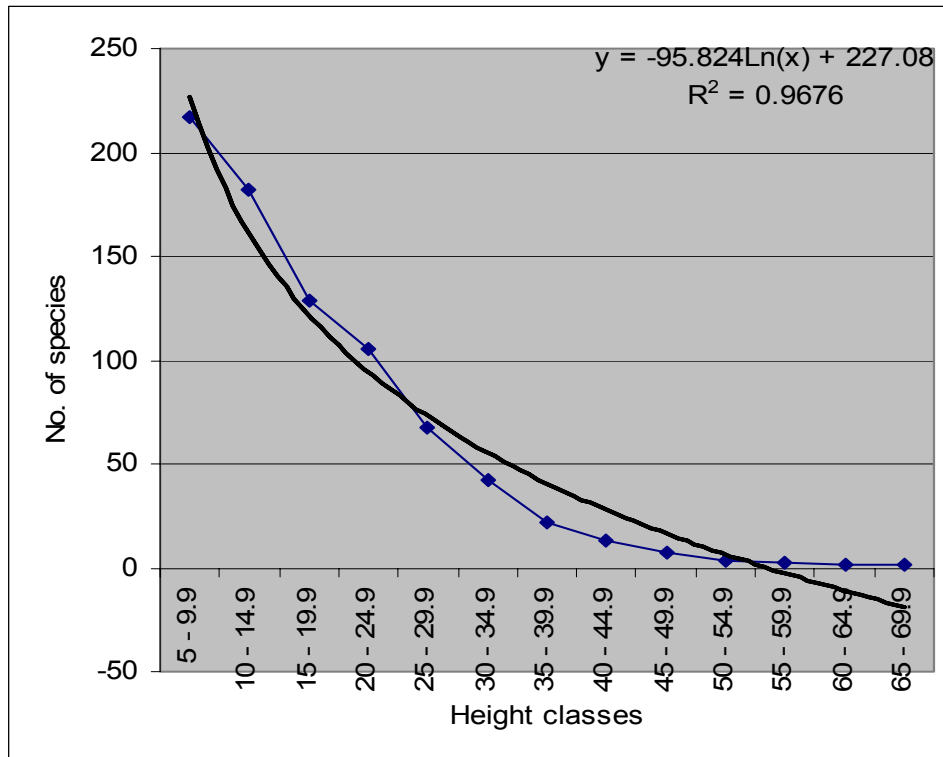


Figure 16. Species distribution by height classes

#### 5.2.5. Relation between diameter and mean height

The relation between diameter and mean height was presented in Figure 17. The curve shows that mean height increases with increasing diameter and closely correlated between height and diameter.

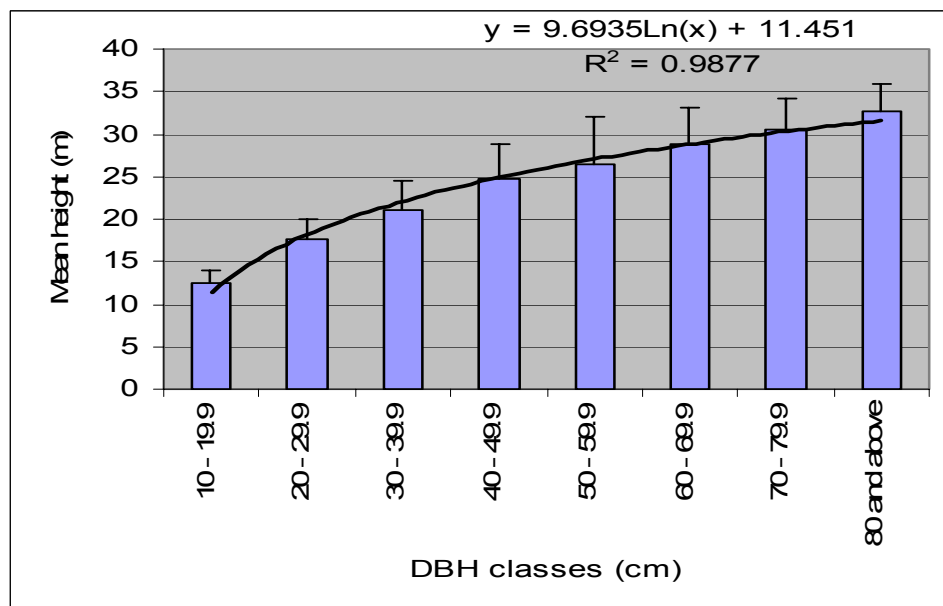


Figure 17. Relationship between diameter and height in the study site

### 5.2.6. Natural regeneration

The regeneration survey for all species was conducted in 56 subplots of 5m x 5m. And for all plants having DBH 5cm to 10 cm, it was also conducted in 56 subplots of 10m x 10m. The number of saplings (dbh  $\geq$  5cm) and seedlings (dbh  $\leq$  5cm or 30n cm height  $\geq$ ) were 535/ha and 17198/ha respectively while total number of regeneration was 17733/ha in the survey site (Table 12). The regeneration was considerably dense in most of the plots but some with a few numbers of seedlings and saplings or totally devoid of regeneration due to the seasonal forest fires in summer.

Table 12. Abundance of natural regeneration in the study site

Sampling unit	Sapling (10cm $\geq$ ---- $\geq$ 5cm (/ha.)	Seedling (5cm $\geq$ ----) (/ha.)	Sapling and Seedling (/ha.)
WP	875	18100	18975
HK	355	18073	18428
KST	600	12073	12673
ZBA	482	20000	20482
UK	364	17745	18109
Average	535	17198	17733

## 6. Discussion

Tropical forests are often referred to as one of the most species diverse terrestrial ecosystems. The current trend of forestry emphasizes on ecosystem management. One of its dimensions, biological diversity has two components: species richness and species evenness (Hunter, 1990). Species diversity in a forest community depends on the number of species richness and the distribution of individuals across species. The standard measure of species diversity, Shannon-Wiener Index and Shannon Evenness Index, were applied in this study. Summary of stand characteristics found in the study site is shown in Table 13.

Table 13. Summary of stand characteristics in the study site, TNRP.

Sampling units	SU 1	SU 2	SU 3	SU 4	SU 5	All (combined)	Mean
No. of species/ha.	81	75	81	69	62	74	74 ( $\pm$ 7)
Shannon Diversity Index (H')	4.03	3.83	3.76	3.9	3.53	4.43	3.81 ( $\pm$ 0.19)
Stem density/ha.	386	429	362	375	409	392	392 ( $\pm$ 22)
Basal area/ha (m <sup>2</sup> )	20.3	34.9	26.6	30.6	47.5	31.8	32 ( $\pm$ 8)
Plot size	1.4 ha	1.3 ha	1.3 ha	1.3 ha	1.3 ha	6.6 ha	-



Sampling units	SU 1	SU 2	SU 3	SU 4	SU 5	All (combined)	Mean
Altitude (m) (average)	281	317	252	132	208	-	-
Terrain (average slope degree)	24.8 steep	13.8 moderate	16.4 moderate	9.73 gentle	7.63 gentle	-	-
Evenness (E)	0.85	0.84	0.81	0.87	0.8	0.79	0.83 (±0.03)
Max.DBH (cm)(Std.)	59 (±21)	87 (±38)	64 (±43)	66 (±25)	102 (±27)	-	76 (±18)
Max.Height.(m)(Std.)	25 (±8)	37 (±9)	37 (±18)	31 (±12)	31 (±10)	-	32 (±5)
Natural regeneration (/ha. - <dbh 10cm)	18975	18428	12673	20482	18109	17733	17733

Apart from regeneration data, all other data are based on plant species of dbh  $\geq 10$  cm.

In the study site, based on IVI values, ecological significant species are found to be Taung thayet (*Sweintonia floribunda*), Kyetmauk (*Nephelium* spp), Kywe thwee (*Myristica* spp.), Thit sho (*Pentace griffithi*), Kadut (*Parashorea stellata*). They can be assumed as indicator species for the site. However, the most dominant family in terms of highest number of species is *Dipterocarpaceae* in the study site (e.g., 15 species). According to the results of diversity index and evenness, species area curve, IVI value and frequency analysis, the study forest can be designated as heterogeneous forest community.

Tree species listed as globally threatened species (IUCN, 2006) include 5 critically endangered species and 5 endangered species in the study forest (Table 14).

Table 14. List of globally threatened Dipterocarp species in the study site

Sr.	Local name	Scientific name	Status
1	Kanyin pyan/Kanyin pyan ywet kyi/Kanyin ywet kyi	<i>Dipterocarpus kerrii</i> King	CR
2	Kanyin ni	<i>Dipterocarpus turbinatus</i> Gaertn. F.	CR
3	Taung thingan	<i>Shorea farinosa</i> Fischer	CR
4	Kaung hmu	<i>Anisoptera scaphula</i> (Roxb.) Pierre / <i>curtisii</i> Dyer	CR
5	Kanyin	<i>Dipterocarous dyeri</i> Pierre	CR
6	Kanyin phyu	<i>Dipterocarpus alatus</i> Roxb.	EN
7	Kanyin ywet thay/Kanyin si	<i>Dipterocarpus costatus</i> Gaertn. F.	EN
8	Kaban/Ban	<i>Anisoptera costata</i> Korth.	EN
9	Ban kaya	<i>Shorea gratissima</i> Dyer	EN
10	Kanyin kyaung che/Nay kyaung che/Kyaung che	<i>Vatica dyeri</i> King/maingayi Dyer	EN

EN - Endangered species; CR - Critically endangered species

The results of species-area curve and coefficient of Sorensen species similarity also support that the study site consisted of heterogeneous forest communities among the sampling units. Results of Student's t test indicated that species diversity in the sampling unit 1 Wanpo site was highly significant at both 1% and 5% level from the sampling unit 3, Kyauk Shut and unit 5 Ukyaing. However, at 5% level it was observed that sampling unit 1 was significant from all other sampling units. Hence, Wanpo forest site had the most diverse species among all sites (Table 15).

Table 15. Test of Significance among 5 Sampling Units

SU	Student's t test	
	1%	5%
1-2	ns	*
1-3	**	*
1-4	ns	*
1-5	**	*
2-5	ns	*
4-5	ns	*

One of the reasons why Wanpo site is the most heterogeneous site is due the following facts: Wanpo site is very close to village tracts and consequently highly prone to forest fires and logging annually and consequently transformed into semi-evergreen forest type. Figure 18 indicates that diversity of forest types in each sampling unit varies from site to site. Wanpo site constitutes of 3 forest types which are more or less comparable to each other indicating that the diversity of forest types is greatest when compared to other sites. On the contrary, Ukyaing site is dominated by evergreen forest type with a small a small portion of deciduous type which gives rise to less heterogeneity when compared to Wanpo site. Therefore, the reason is that Wanpo forest site lies in the transitional zone between deciduous and evergreen forest types that may give rise to the presence of more species compared to other sites.

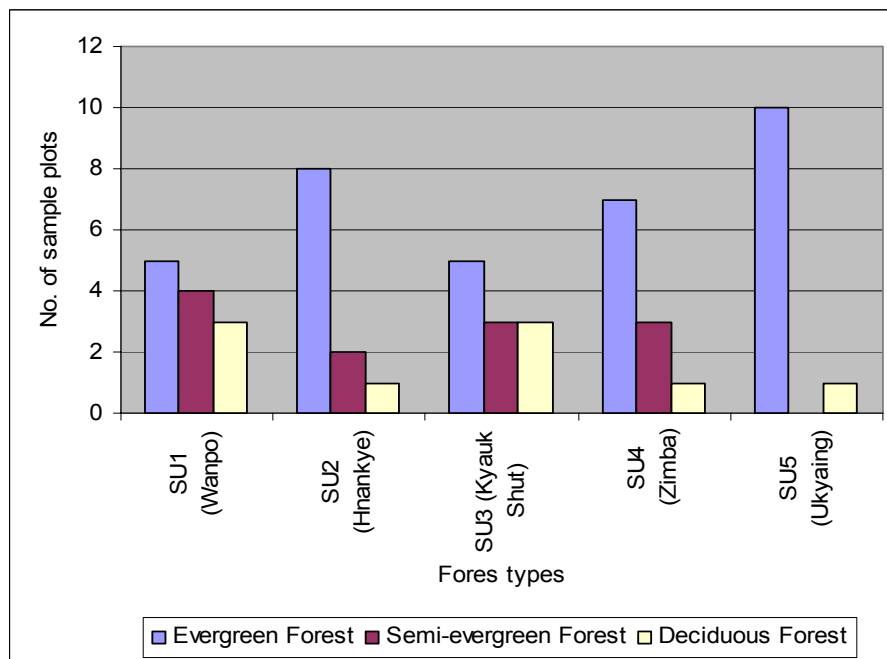


Figure 18. Different forest types in sample plots of each sampling unit

Fanglang et al.(1996) stated that to find out whether tropical forest communities are in a state of equilibrium or not, the species-areas curves should be fitted with “a power function”: if it is best fitted by power function the stand is in equilibrium state: the contrary would indicate that it may not be in equilibrium. When the species-area curve of the forests in this study area was fitted by a power function, the  $R^2$  value of 0.9869 indicated that the study forest is in the state of equilibrium (Figure 19).

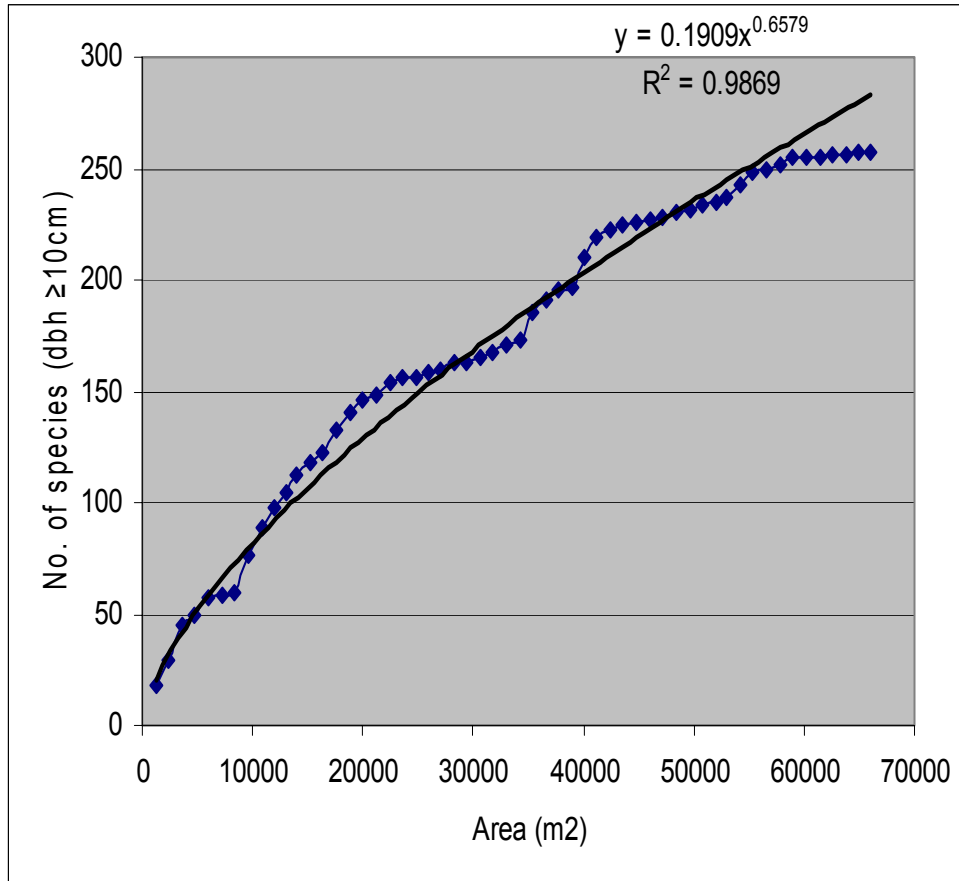


Figure 19. The species-area curves and fitted the power function for overall of the sampling units in study forest

Tree species diversity in the tropical areas varies greatly from place to place mainly due to variation in biogeography, habitat, and disturbance (Whitmore, 1998). Species diversity in the present study site ranging from 62 to 81 (dbh ≥ 10cm) is considerably greater than species diversity in natural teak forests reported by some researchers as shown in table 15.

Table 15. Comparison of Species richness, diversity and basal area in some forest of Myanmar

Forest	No. of species (/ha)	Basal area (m <sup>2</sup> /ha)	Shannon Index	Reference
Yedashay	12 (≥ 10cm)	-	2.08	Khin Thida Htun, 2006
Pyinmana	32 (≥ 10cm)	-	2.87	-do-
Taung Twin Gyi	42 (≥ 10cm)	-	3.42	-do-
Pauk khaung	57 (≥ 5cm)	32.1 (≥ 5cm)	3.45	Kyaw Lwin, 2001
Oaktwin	44 (≥ 5cm)	33.4 (≥ 5cm)	2.74	-do-

Forest	No. of species (/ha)	Basal area (m <sup>2</sup> /ha)	Shannon Index	Reference
Kyet shar	56 (≥ 10cm)	30.2 (≥ 10cm)	2.29	Kanzaki, 2003
Moe Shwe	71-86 (≥5cm)	10.3-31.7 (≥5cm)	3.18-3.74	Than Soe Oo, 2000
Katha	63-69 (≥5cm)	18.4-22.6 (≥5cm)	3.08-3.38	Than Soe Oo, 2003
TNRP	62-81 (≥10cm)	20.3-47.5 (≥10cm)	4.43	Present study, 2007

The range of tree species count per hectare in tropical rain forest is about 20 to a maximum of 223 (Whitemore, 1984 cited Hitendra P. et al, 2004). Tree species diversity, basal area and tree density of various tropical forests has also been compared with the present study (Table 16). Accordingly, species richness and basal area in the present study are closely similar with some of the forests in India and Andaman ranging from 58 to 89 species per hectare and 25.8 m<sup>2</sup> to 44.28 m<sup>2</sup> respectively.

Shannon diversity index and evenness index of species are found to be higher in the study site when compared with other study areas of natural teak forests stated by Myanmar researchers and also forests in India reported by Ashish Kumar et al. (2006) and Hitendra et al. (2004).

Table 16. Comparison of trees species diversity under various tropical forests (Cited from Hitendra Padalia et al, 2004)

Forest	Area (ha)	Basal area/ha	No. of trees/ha	No. of species/ha	No. of families/ha	Reference
Evergreen forest, Andaman	4.52	44.28	1137	58	20	Hitendra P. et al, 2004
Semi evergreen forest, Andaman	4	33.76	1027	58	18	Hitendra P. et al, 2004
Moist deciduous forest, Andaman	4	28.60	946	59	18	Hitendra P. et al, 2004
Evergreen forest, Kolli Hills	8	43.6	3825	78	36	Chittibabu, C.V et al. 2000
Semi evergreen forest Vellimalai; Kalrayan Hills, Eastern Ghats	4	25.8	367-667	89	39	Sukumar, R. et al., 1992
Semi deciduous Forest, North Western Argentina	5	21-31	247-337	40	25	Piers, J. M., 1953
TNRP	6.6	20.3-47.5	362-428	62-81	46 (/6.6 ha)	Present study

In addition to species diversity, size structure plays an important role in the diversity of tropical forest. Different size of plant species provides a variety of habitats in different level of vertical and horizontal structure for different flora and fauna. Tree diversity therefore provides habitat, shelter, and food for the sustainability of many other species in the forest (Hunter 1990, cited C. Denise Ingram, 1996). For this reason, stand structure, specifically population and species distribution in the different diameter classes and in different height classes were investigated.

Population density and species richness with size structure in all of individual units and all units combined consistently exhibited reverse J shaped structure in which larger number of species and stand density are distributed in lower size classes while a few reached higher size classes. Vertical stand structure apparently existed as several layers such as emergent, dominant, co dominant, middle, lower and ground vegetation in the forests of higher elevation areas. In contrast the forest in lower elevation areas and in the vicinity of the TNRP boundary had three strata of vegetation such as dominant, lower and undergrowth.

Comparison of stand density by diameter classes between 1926 (Smith, H. C.) and 2007 (present study) reveals there has been no commercial logging taken place over a time period of 80 years as the stocking is more or less in quite similar trend (Figure 20). Moreover, the insecure condition of the TNRP area including the survey area for decades may be one of the reasons why there are not much logging activities in the survey area.

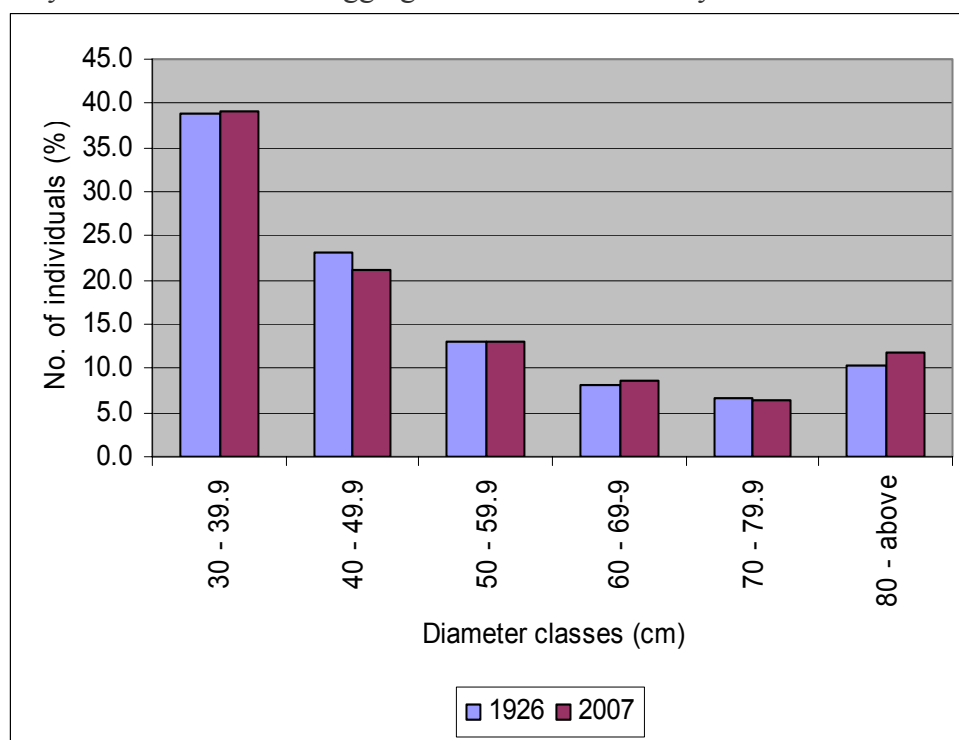


Figure 20. Comparison of stand composition by diameter class between 1926 and 2007

Due to time constraint detailed analysis on regeneration could not be conducted in this report. Regeneration in undergrowth layer was generally abundant and the density of regeneration in study forest was richer than the natural teak forest (Than Soe Oo, 2000, 2003). However, the undergrowth vegetation was completely lacking in some of the sample plots because of seasonal fire. If the seasonal forest fire could be controlled, the abundant regeneration especially of primary shade tolerance species will potentially developed into its successional stages which will enhance tree species richness and in the later stages having greater basal area. During the survey it was noticed that most of the canopy trees had mass flowering followed by mass fruiting in the study forest during March and April. It is in line with the mass flowering and fruiting behavior that takes place at irregular interval of 2 to 10 years in the aseasonal rain forest (Appanah, 1993). Some rattans, herbs and bamboo species also appeared as undergrowth of the study forest.

According to the information from interview with local people and field observation, most of the known tree species found in the survey area are flowering/fruited tree species. Of which, 57% can be utilized for timber, 25% for edible fruits especially for animals, 15% for fuel wood and the rest for minor use (Table 17, Figure 21 and Appendix D). The most common family for timber is *Dipterocarpaceae*. The information on forest utilization could be helpful in studying buffer zone management.

Table 17. The status of utilization on the species found in study site.

Utility	No. of species	%
Timber	97	49
Edible fruit	34	17
Fuelwood	30	15
Timber and edible fruit	16	8
Medicinal	4	2
Fibre	4	2
Edible leaf	4	2
General use	3	2
Furniture	2	1
Roof	2	1
Poison	1	1

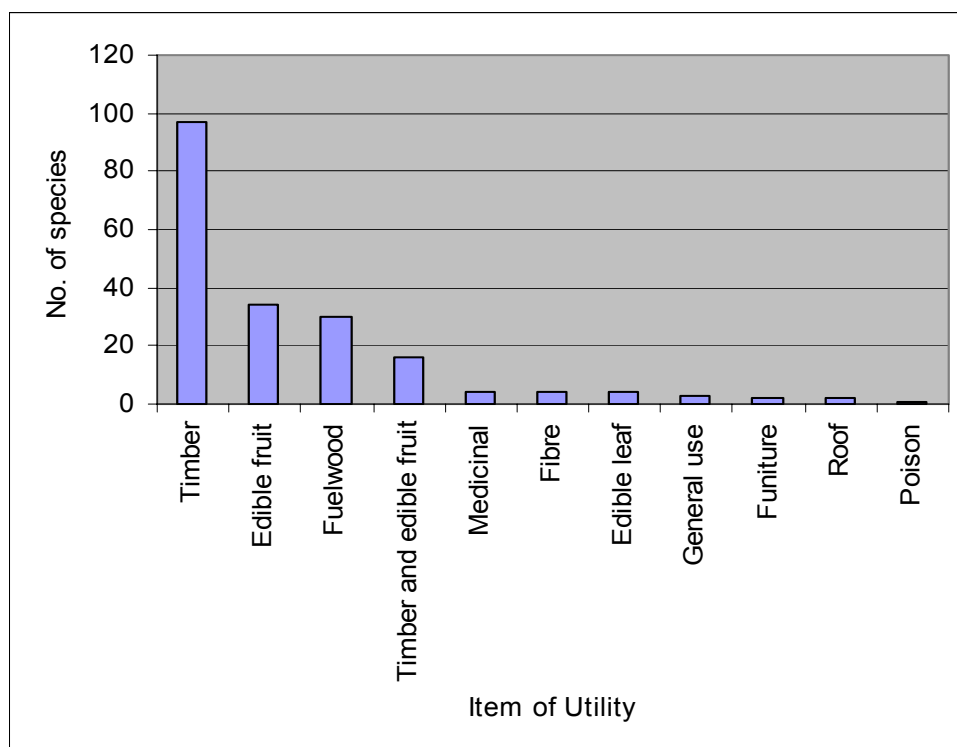


Figure 21. Forest utilization by local people in study forest.

In addition, during the fieldwork of the flora survey, animal's tracts and signs in terms of footprints, dung, nesting sites, scratching places and eating signs inside and outside of the

sample plots were recorded and briefly identified. About 28 mammals, 3 snakes, 3 tortoises and 13 birds species were found and shown in appendix E.

The factors affecting the ecology of the study site are seasonal fire, erosion in steep slope areas and frequent strong wind, landslides and sporadic gaps due to tree fall and broken crown. The fuel load for fire is provided by the leaves shed during the early part of the dry season and the ground cover of grasses, bamboos, herbs. Such ground fires appear to be difficult to control where human activities are quite significant particularly, in areas adjacent to the reserve. These fires will cause the seedlings and saplings to be completely dead and cause large trees firstly to defect, then fall and finally gone up in smoke. Activities such as illegal logging, hunting, land encroachment for establishment of plantations of rubber, betel nut and cashew are currently pressing issues in the study area which will have serious impact on the forest succession of the flora with consequent impact on species diversity, community structure, habitats of wildlife and ecological functions.

## 7. Conclusions

Sample plots were mostly located in the middle slope of the mountain ranges with a few number of plots situated in the lowland. Therefore physical condition of sample plots in the study forest is characterized by steep slope over 25 degree with the range of 58 m to 527 m in altitude. Generally the soil types are red and yellow brown in the sample plots located in high and middle slopes.

The forest types in the study area vary from dense evergreen in the highlands and inner part of TNRP, through semi-evergreen in the lower slopes to degraded semi-deciduous type in the lowlands. In each of the sampling unit, some plots dominated by the evergreen species are located at higher elevations with higher number of species and stand density. However, some are dominated by evergreen species with the association of deciduous species and bamboos near and along the streams such as Heinze, Zimba and Make streams. The patches of forests along the streams and near the TNRP boundary are open semi-evergreen forest, but the major portions of inner part of TNR are dense evergreen forest. Because the forests near the streams and along the boundary of TNRP are close to human settlements, they are subjected to human disturbances such as logging and seasonal fire. Even some patches of inner parts of the forest characterize the semi-deciduous type and some areas have been covered by very sparse vegetation with dense grasses where there had been human settlement and shifting cultivation in the past.

Species composition with dbh  $\geq 10$ cm in the study site is recorded as 257 species. The species and stand density per hectare ranges from 62 to 81 and 362 to 429 respectively. The most common species are Taung thayet (*Sweintonia floribunda*), Thit sho (*Pentace griffithi*), Kadut (*Parashorea stellata*), Kywethwe (*Myristica spp.*), Taung gangaw (*Mesua ferrea*), Kyetmauk (*Nephelium spp.*), Thabye (*Syzygium spp.*), Thitkauk (*Aporosa spp.*), and Zinbyun (*Dillenia parviflora*). So, the occurrence of species in studied plots has clearly indicates that the observed forest is almost the evergreen forest.

Stock of Kanyin (*Dipterocarpus spp.*), Thingan (*Hopea spp.*) Ban (*Anisoptera spp.*) and Kaung hmu (*Anisoptera scaphula*) belonging to *Dipterocarpaceae* family when compared to the status of Relative Abundance (RA) in 1926 (Table 18) appears to be quite stable except Thingan which is declining and likely to be extinct in the very near future. This fact is well supported by the list of *Dipterocarpaceae* family found in the present study and listed as

critically endangered (CR) and Endangered (ER). Therefore, special attention is needed to conserve not only the above mentioned species but also rare species with low population density.

Table 18. Comparison of Relative Abundance of Species in 1926 (Smith, H. C.) and 2007 (present study).

Species name	RA (%) in 1926	RA (%) in 2007	Remarks
Taungthayet	6.3	6.3	H.C. Smith (1926)
Tagatni	2.14	2.01	Present Study (2007)
Thitsho	4.4	2.86	
Thabye	4.4	5.14	
Kaban	3.46	2.314	
Kanyin	1.4	2.087	
Thingan	2.82	0.116	
Others	75.07	79.0	

Regarding the size structure of the study forest, the number of individuals and species decreases with the increase in dbh and height classes. The diameter and height distribution therefore is normal as in natural forests with least disturbances. The maximum height ranges from 12 m to 58 m and the DBH from 28 cm to 144 cm with the tallest and largest tree species of Taung thayet (*Sweintonia floribunda*). Basal area per hectare ranges from 20 to 47.6 m<sup>2</sup> with an average of 32 m<sup>2</sup>. Vertical stand structure in the dense evergreen forest consists of several layers of emergent, dominant, co dominant, middle, lower and ground vegetation in higher elevation, as opposed to the semi-evergreen, open forest in lower elevation. However, near the TNRP boundary it forms into three strata of vegetation namely dominant, lower and undergrowth. Regeneration in undergrowth layer is abundant because of massive flowering and fruiting of canopy trees this year. And some of rattan, herb and bamboo species also appear but undergrowth vegetation is completely lack in some of the sample plots because of seasonal fire.

Because of its usefulness in many aspects, the study forest is highly been under pressure. At present, the factors affecting the ecology of the study site are encroachments for logging, hunting and plantations of rubber, betel nut and cashew, seasonal fire, erosion, landslides in steep slope areas and strong wind. Consequently these kinds of disturbances are very sensitive to stand dynamics, species diversity and population development, community structure, habitats of wildlife and with the ultimate environmental degradation in terms of soil and water depletion. It should be noted that even if a small area is destroyed or one species becomes extinct, other interrelated species and dependent species will follow in extinction as the web life of ecosystem breaks down and deteriorates (Daniel, H., undated).

The results in terms of species diversity stand structure, habitats and ecosystems, general findings of wildlife and forest use, the study area can be assessed to be in a relatively good state. Therefore, the results of analyses on vegetation of the present study, both species diversity and forest community structure help develop the evaluation and monitoring of habitat structure and dynamics for sustainable management and conservation of the biodiversity and rain forest ecosystems in the nature reserve of TNRP. In short, quantitative and qualitative information of species diversity and habitat structure will be the vital indicators which can be used in designing management plan for conservation of specific host



population for native wildlife in TNRP. However, it would be too difficult to generalize the whole TNRP based on the findings from the present study.

## **8. Recommendations**

The findings on rare and common species in the study plots contribute to the management of wildlife habitat as well as cultural resources values of these species. The higher proportion of the species in lower frequency class which indicated a number of rare species is much more than common species. In other words, the study site is a heterogeneous community in terms of species composition. Hence, more attention is needed to control disturbances in the study area, otherwise rare species may decline leading to reduction of individuals or local extinction. Therefore, the rare species need proper attention for conservation. Mapping the location of the concentration areas of rare species and studies on their key ecological and cultural functions should have to be carried out for conservation actions and determination of habitats for the wildlife species that may depend on them in TNR.

The results of this survey explained the species diversity and community structure for the study area only. However, the knowledge on the forest dynamics is crucial for the management of biodiversity and ecosystem conservation. Therefore, permanent sample plots should be established at different ecological conditions for long term monitoring studies of forest dynamics.

According to the general findings obtained during the field observations and from interviews with the villagers, it is learnt that traditional shifting cultivation had been practiced in some lowland part of the project area during the past decades. Regarding forest utilization in the TNRP, local residents extracted mainly timber, as well as firewood, bamboo, rattan, medicinal plants and roofing leaves and practiced hunting and fishing before the area is notified as a nature reserve. This is one of main issues to be taken into consideration and alternative ways should be sought out to meet the needs for the forest products of the local people to achieve the goal of TNRP.

Seasonal forest fire invasions near the boundary of TNRP due to human activities and encroachment mainly for rubber plantations have been observed in accessible parts of the TNRP area. Both disturbances can contribute to serious and negative impacts on the conservation of the rain forest ecosystem and its biodiversity of TNRP. It is therefore strongly recommended that these issues should be urgently addressed for the fact that species diversity is determined by the quality of maintenance and stability of ecological process of the forest community.

It is a great concern to educate both local community and authorities around TNRP about the values of forest, biodiversity and environment and their linkage because participation of those people is the vital role to achieve the goal of TNRP. At the same time, community based management programs in terms of community forestry establishment, enhancement of agro-forestry technology, land development for private plantations, and creation of income generation for socio-economic development and livelihood of local community should be implemented.

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**Appendix. A. List of sample plots and its characteristics in study of flora survey**

No.	Unit no.	Plot no.	Latitude	Longitude	Slope Degree	Aspect	Elev. (m)	Forest Type
1	SU 1	WP 1	14° 22' 30.1"	98° 11' 30.5"	N (+ 22°)	West	142	Semi-evergreen
2		WP 2	14° 22' 01.3"	98° 11' 30.6"	N (+25°)	S-W	230	Semi-evergreen
3		WP 3	14° 22' 26.1"	98° 11' 29.7"	N (-25°)	N-E	265	Evergreen
4		WP 4	14° 22' 53.0"	98° 11' 30.2"	N (-25°)	N-W	216	Semi-evergreen (open)
5		WP 5	14° 23' 18.7"	98° 11' 30.1"	N (+17°)	West	229	Deciduous
6		WP 6	14° 21' 30.2"	98° 11' 48.9"	N (+15°)	N-W	329	Deciduous (open)
7		WP 7	14° 22' 01.4"	98° 11' 49.1"	N (+21°)	West	479	Semi-evergreen
8		WP 8	14° 22' 28.6"	98° 11' 45.7"	N (-18°)	N-W	414	Evergreen
9		WP 9	14° 22' 53.6"	98° 11' 48.5"	N (+34°)	S-E	411	Evergreen
10		WP 10	14° 23' 17.9"	98° 11' 49.1"	N (-30°)	N-W	482	Evergreen
11		WP T <sub>1</sub>	14° 22' 44.6"	98° 11' 27.8"	N (+35°)	West	95	Evergreen
12		WP T <sub>2</sub>	14° 22' 50.2"	98° 11' 14.4"	N (+31°)	West	84	Deciduous
13	SU 2	HK 1	14° 27' 09.8"	98° 11' 58.4"	N (-16°)	S-E	394	Semi-evergreen
14		HK 2	14° 27' 11.9"	98° 12' 23.8"	N (-10°)	N-E	335	Evergreen
15		HK 3	14° 27' 10.9"	98° 12' 50.2"	N (-23°)	N-E	344	Evergreen
16		HK 4	14° 27' 14.4"	98° 13' 20.1"	N (-5°)	N-E	317	Evergreen
17		HK 5	14° 27' 11.8"	98° 13' 43.8"	N (-21°)	N	424	Evergreen
18		HK 6	14° 27' 24.6"	98° 12' 05.7"	N (+2°)	S-E	527	Semi-evergreen
19		HK 7	14° 27' 32.2"	98° 12' 24.0"	N (+26°)	S-E / N-E	378	Deciduous
20		HK 8	14° 27' 29.3"	98° 12' 50.6"	N (-30°)	N-E	173	Evergreen
21		HK 9	14° 27' 29.5"	98° 13' 17.9"	N (-15°)	N-E	190	Evergreen
22		HK 10	14° 27' 33.1"	98° 13' 41.4"	N (-2°)	S-E	164	Evergreen
23		HK T <sub>1</sub>	14° 27' 24.6"	98° 12' 20.4"	N (+7°)	N-E	246	Evergreen
24	SU 3	KST 1	14° 34' 35.3"	98° 12' 45.5"	N (-21°)	N-E	116	Deciduous
25		KST 2	14° 34' 58.7"	98° 12' 47.7"	N (+9°)	N-E	114	Deciduous
26		KST 3	14° 35' 26.0"	98° 12' 45.1"	N (-25°)	N-E	273	Semi-evergreen
27		KST 4	14° 35' 52.8"	98° 12' 46.9"	N (+3°)	N-W	267	Semi-evergreen
28		KST 5	14° 36' 18.8"	98° 12' 47.2"	N (-31°)	N-E	274	Evergreen (open)
29		KST 6	14° 34' 32.9"	98° 13' 06.9"	N (-10°)	N-W	125	Deciduous
30		KST 7	14° 35' 02.7"	98° 13' 06.0"	N (+4°)	S-E	211	Semi-evergreen

**Appendix. A. List of sample plots and its characteristics in study of flora survey**

No.	Unit no.	Plot no.	Latitude	Longtude	Slope Degree	Aspect	Elev. (m)	Forest Type
31		KST 8	14° 35' 26.5"	98° 12' 58.2"	E (-27°)	N-W	368	Evergreen
32		KST 9	14° 35' 51.9"	98° 13' 07.12"	N (-11°)	N-E	365	Evergreen
33		KST 10	14° 36' 18.8"	98° 13' 01.6"	N (+21°)	N-E	347	Evergreen
34		KST T1	14° 35' 44.5"	98° 12' 55.8"	N (+18°)	S-W	316	Evergreen
35	SU 4	ZBA 1	14° 43' 40.3"	98° 12' 42.5"	N (+10°)	S-E	71	Semi-evergreen
36		ZBA 2	14° 43' 41.6"	98° 13' 09.8"	N (+31°)	E	187	Semi-evergreen
37		ZBA 3	14° 43' 38.4"	98° 13' 41.6"	N (+4°)	S - W	171	Evergreen (primary)
38		ZBA 4	14° 43' 36.8"	98° 14' 02.8"	N (+8°)	N - W	79	Evergreen (open)
39		ZBA 5	14° 43' 41.5"	98° 14' 31.3"	N (-0°)	Flat	73	Evergreen(lowland)
40		ZBA 6	14° 43' 22.0"	98° 12' 44.5"	N (-0°)	S - E	58	Deciduuous
41		ZBA 7	14° 43' 22.7"	98° 13' 38.7"	N (+12°)	S - W	189	Semi-evergreen
42		ZBA 8	14° 43' 19.6"	98° 13' 33.9"	N (-10°)	N-E	296	Evergreen
43		ZBA 9	14° 43' 22.4"	98° 14' 07.8"	N (-22°)	N-E	194	Evergree
44		ZBA 10	14° 43' 22.8"	98° 14' 30.2"	N (-0°)	Flat	79	Semi-evergreen
45		ZBA T1	14° 43' 20.3"	98° 14' 20.2"	W (+10°)	S - E	58	Evergreen
46	SU 5	UK 1	14° 39' 54.7"	98° 19' 39.2"	N (+5°)	N-E	205	Evergreen
47		UK 2	14° 40' 18.0"	98° 19' 41.2"	N (+2°)	S-E	247	Evergreen
48		UK 3	14° 40' 43.1"	98° 19' 40.9"	N (+10°)	S-E	336	Evergreen
49		UK 4	14° 39' 24.1"	98° 19' 20.6"	N (+20)	N-E	242	Evergreen
50		UK 5	14° 39' 03.4"	98° 19' 19.9"	N (-0°)	Almost Flat	53	Evergreen
51		UK 6	14° 39' 28.2"	98° 19' 41.3"	N (-16)	N-E	276	Evergreen
52		UK 7	14° 40' 44.9"	98° 19' 16.3"	N (-5°)	S - W	226	Evergreen
53		UK 8	14° 40' 22.7"	98° 19' 20.2"	N (-12°)	N-E	175	Deciduous
54		UK 9	14° 39' 57.6"	98° 19' 21.9"	N (+18°)	S - E	161	Evergreen
55		UK 10	14° 39' 27.7"	98° 19' 38.0"	E (-5)	N-E	214	Evergreen
56		UK T1	14° 39' 46.1"	98° 19' 37.9"	NE (+9°)	S - E	157	Evergreen

**Appendix. B. Species list found in flora survey area of TNRP ( dbh ≥10 cm )**

No.	Local Name	Scientific Name	Family Name	Life Form
1	Bamboo wabo	<i>Dendrocalamus calostachyus</i> (Kurz) Kurz	Poaceae	B
2	Bamboo wanet	<i>Dendrocalamus longispathus</i> (Kurz) Kurz	Poaceae	B
3	Ban kaya	<i>Shorea gratissima</i> Dyer	Dipterocarpaceae	T
4	Ban phut	?	Dipterocarpaceae	T
5	Ban shwe wa	<i>Hopea</i> spp.	Dipterocarpaceae	T
6	Banbwe/Bu	<i>Careya arborea</i> Roxb.	Lecythidaceae	T
7	Bigyan	<i>Castanopsis</i> spp.	Fagaceae	T
8	Bok saga/Taung saga	<i>Magnolia lilifera</i> (L.) Baill.	Magnoliaceae	T
9	Bok (Annonaceae)/Taung bok ywet thay/Taw saga sein lay	<i>Polyalthia simiarum</i> Benth. & Hook. F. ex Hook. F.	Annonaceae	T
10	Bok (Annonaceae)/Taw saga sein gyi	<i>Polyalthia hookeriana</i> King	Annonaceae	T
11	Bok/Bok (Diospyros)	<i>Diospyros peregrina</i> (Gaertn.) Gurke	Ebenaceae	T
12	Chin byit	<i>Bauhinia malabarica</i> Roxb.	Caesalpiniaceae	T
13	Dauk yat	<i>Putrajiva roxburghii</i> Wall	Euphorbiaceae	T
14	Don shaw	<i>Sterculia ornata</i> Wall. Ex Kurz	Sterculiaceae	T
15	Gat net	<i>Amoora rohituka</i> Wight & Arn.	Meliaceae	T
16	Gat ni	<i>Amoora wallichii</i> King	Meliaceae	T
17	Gat ni ywet kyi	<i>Dysoxylum grande</i> Hiern	Meliaceae	T
18	Gat phwe	<i>Dysoxylum procerum</i> Hiern	Meliaceae	T
19	Gat phyu	<i>Chisocheton paniculatus</i> Hiern	Meliaceae	T
20	Gat thitto	<i>Aglaia andamanica</i> Hiern	Meliaceae	T
21	Gat ywet thay	?	Meliaceae	T
22	Gaung kwe	<i>Helicia</i> spp.	Proteaceae	T
23	Gon hnyin nwe	<i>Entada pursaetha</i> DC.	Mimosaceae	C
24	Gu bauk/Gu bok/Yin khu lay	<i>Bhesa robusta</i> (Roxb.) Ding Hou	Celastraceae	T
25	Gu ywet thay/Gu yaing	<i>Litsea monopetala</i> (Roxb.) Pers.	Lauraceae	T
26	Gwe	<i>Spondias pinnata</i> (L.) Kurz	Anacardiaceae	T
27	Gyit	<i>Pandanus odoratissimus</i> L.f.	Pandanaceae	T
28	Hman ni/Thit ni	<i>Gardenia erythroclada</i> Kurz	Rubiaceae	T
29	Hman par	<i>Chaetocarpus castanocarpus</i> Thwaites	Euphorbiaceae	T
30	Hman thin	<i>Cinnamomum pachyphyllum</i> Kosterm.	Lauraceae	T
31	Hmaw/Minbaw	<i>Wallichia disticha</i> T. Anderson	Arecaceae	P
32	Hnyin twe le	<i>Parkia leiophylla</i> Kurz	Mimosaceae	T
33	Hta min sok	<i>Glochidion fagifolium</i> Miq.	Euphorbiaceae	T
34	Htein	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	T
35	Htein kala	<i>Nauclea sessilifolia</i> Roxb.	Rubiaceae	T
36	J shin	<i>Arenga saccharifera</i> Labill.	Arecaceae	P
37	Jet shin/ Parawa	<i>Garcinia speciosa</i> Wall.	Hypericaceae	T
38	Kaban/Ban	<i>Anisoptera costata</i> Korth.	Dipterocarpaceae	T
39	Kadut net	<i>Parashorea stellata</i> Kurz	Dipterocarpaceae	T
40	Kadut phwe	<i>Parashorea</i> spp.	Dipterocarpaceae	T
41	Kadut/Ka dauk	<i>Shorea cinerea</i> Fischer	Dipterocarpaceae	T
42	Kalagi ywet kyi	<i>Barringtonia cymosa</i> Fischer	Lecythidaceae	T
43	Kalagi ywet thay	<i>Barringtonia angusta</i> Kurz	Lecythidaceae	T
44	Kalaw	<i>Hydnocarpus macrocarpa</i> Bedd.	Flacourtiaceae	T
45	Kalawe/Kala phwe	<i>Cinnamomum multiflorum</i> Wight	Lauraceae	T
46	Kan zo	<i>Heritiera javanica</i> (Blume) Kosterm.	Sterculiaceae	T
47	Kanaso	<i>Baccaurea sapida</i>	Euphorbiaceae	T

**Appendix. B. Species list found in flora survey area of TNRP ( dbh ≥10 cm )**

No.	Local Name	Scientific Name	Family Name	Life Form
48	Kant that nyaung	<i>Alangium chinense</i> (Lour.) Harms	Alangiaceae	T
49	Kant that nyaung/Taw po sa	<i>Pterocymbium macranthum</i> Kosterm.	Sterculiaceae	T
50	Kant that/Bon lon	<i>Morus laevigata</i> Wall.	Moraceae	T
51	Kanyin	<i>Dipterocarous dyeri</i> Pierre	Dipterocarpaceae	T
52	Kanyin kyaung che/Nay kyaung che/Kyaung che	<i>Vatica dyeri</i> King/maingayi Dyer	Dipterocarpaceae	T
53	Kanyin ni	<i>Dipterocarpus turbinatus</i> Gaertn. F.	Dipterocarpaceae	
54	Kanyin phyu	<i>Dipterocarpus alatus</i> Roxb.	Dipterocarpaceae	T
55	Kanyin pyan/Kanyin pyan ywet kyi/Kanyin ywet kyi	<i>Dipterocarpus kerrii</i> King	Dipterocarpaceae	T
56	Kanyin ywet thay/Kanyin si	<i>Dipterocarpus costatus</i> Gaertn. F.	Dipterocarpaceae	T
57	Kaung hmu	<i>Anisoptera scaphula</i> (Roxb.) Pierre / <i>curtisii</i> Dyer	Dipterocarpaceae	T
58	Kha aung/On pin	<i>Ficus hispida</i> L.f.	Moraceae	T
59	Khet lan	<i>Hydnocarpus</i> spp.	Flacourtiaceae	T
60	Khon pin	?	Rutaceae	T
61	Kokko/Kat gu	<i>Albizia lebbek</i> (L.) Benth	Mimosaceae	T
62	Kyaung dauk	<i>Pajanelia longifolia</i> (Willd.) K. Schum.	Bignoniaceae	T
63	Kyaung shar	<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	T
64	Kyaung shar bo	<i>Heteropanax fragrans</i> (Roxb. Ex.DC.) Seem.	Araliaceae	T
65	Kyaung yi	<i>Phoebe lanceolata</i> (Nees) Nees	Lauraceae	T
66	Kyet mauk pyun che/Ye kyet mauk	<i>Nephelium</i> spp.	Sapindaceae	T
67	Kyet mauk yaing	<i>Nephelium laurinum</i> Blume	Sapindaceae	T
68	Kyet mauk/Kyet mauk chaw	<i>Xerospermum noronhianum</i> (Blume) Blume	Sapindaceae	T
69	Kyet tet su	<i>Flacourtia cataphracta</i> Roxb.	Flacourtiaceae	T
70	Kyet yo	<i>Vitex quinata</i> (Lour.) F.N. Willd./V. <i>coriacea</i> C.B. Clarke	Verbenaceae	T
71	Kyi	<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae	T
72	Kyize	?	Combretaceae	T
73	Kyize ni	?	Combretaceae	T
74	Kyize phyu/Taung kala	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	T
75	Kyize ywet thay	<i>Actinodaphne</i> spp.	Lauraceae	T
76	Kyun lan	<i>Premna integrifolia</i> L.	Verbenaceae	T
77	Kywe danyin	<i>Callerya atropurpurea</i> (Wall.) Schot	Fabaceae	T
78	Kywe thone baung	<i>Garcinia pedunculata</i> Roxb.	Hypericaceae	T
79	Kywe thwee ni	<i>Myristica angustifolia</i> Roxb.	Myristicaceae	T
80	Kywe thwee phyu/Kywe thwee khaung laung	<i>Myristica conferta</i> King	Myristicaceae	T
81	Kywe thwee ywet thay	<i>Myristica malabarica</i> Lam.	Myristicaceae	T
82	Le min	<i>Cleidion spiciflorum</i> Merr.	Euphorbiaceae	T
83	Let khok	<i>Sterculia foetida</i> L.	Sterculiaceae	T
84	Leza	<i>Lagerstroemia tomentosa</i> Presl	Lythraceae	T
85	Leza phyu	<i>Lagerstroemia calyculata</i> Kurz	Lythraceae	T
86	Ma htan kye	<i>Dalbergia stipulacea</i> Roxb.	Fabaceae	C,Liana
87	Ma laing ni/ Ta maling ni/Dan lei ni	<i>Dalbergia</i> spp.	Fabaceae	C
88	Mabe/Be bya	<i>Cratoxylum nerifolium</i> Kurz	Hypericaceae	T
89	Magyi me	<i>Ammora</i> spp.	Meliaceae	T



**Appendix. B. Species list found in flora survey area of TNRP ( dbh ≥10 cm )**

No.	Local Name	Scientific Name	Family Name	Life Form
90	Mani aw ga/Yat/Taung yat	<i>Carallia brachiata</i> Lour.) Merr.	Rhizophoraceae	T
91	Mason taywet son taywet	?	Rubiaceae	T
92	Mayan/Taung mayan	<i>Bouea burmanica</i> Griff.	Anacardiaceae	T
93	Moe	<i>Pterocymbium</i> spp.	Sterculiaceae	T
94	Myauk lok	<i>Artocarpus lakoocha</i> Roxb.	Moraceae	T
95	Myet na pan	<i>Pavetta indica</i> L.	Rubiaceae	T
96	Myet na pan bo	<i>Alstonia rostrata</i> Fischer	Apocynaceae	T
97	Nabe/Lan phe	<i>Lannea coromandelica</i> (Houtt.) Merr.	Anacardiaceae	T
98	Nagye gale	<i>Pterospermum cinnamomeum</i> Kurz.	Sterculiaceae	T
99	Nalin kyaw	<i>Cinnamomum nitidum</i> Blume	Lauraceae	T
100	Ngu shwe war	<i>Cassia fistula</i> L.	Caesalpiniaceae	T
101	Nwar le pyin	<i>Pterospermum javanicum</i> Jungh.	Sterculiaceae	T
102	Nyaung kyat	<i>Ficus obtusifolia</i> Roxb.	Moraceae	T
103	Nyaung/Nyaung nwe	<i>Ficus</i> spp.	Moraceae	T
104	On don/Tagu/Gu	<i>Litsea glutinosa</i> (Lour.) C.B.Rob.	Lauraceae	T
105	On za	<i>Derris</i> spp.	Fabaceae	St
106	Padauk	<i>Pterocarpus macrocarpus</i> Kurz	Fabaceae	T
107	Pan let pyin	?	Combretaceae	T
108	Pan ma	?	Theaceae	T
109	Pangan/Pinle bok	<i>Sageraea bracteolata</i> Parker	Annonaceae	T
110	Phan kha	<i>Terminalia chebula</i> Retz.	Combretaceae	T
111	Phet than	<i>Heterophragma adenophylla</i> (Wall.) Seem. ex Benth. & Hook.	Bignoniaceae	T
112	Phet wun	<i>Mallotus cochinchinensis</i> Lour.	Euphorbiaceae	T
113	Phet wun gyi	<i>Talipariti macrophyllum</i> (Roxb. Ex Hornem.) Fryxell	Malvaceae	T
114	Pwin set	<i>Engelhardtia spicata</i> Blume	Juglandaceae	T
115	Pyinma phyu	<i>Lagerstroemia floribunda</i> Jack	Lythraceae	T
116	Pyinma ywet kyi	<i>Lagerstroemia macrocarpa</i> Kurz	Lythraceae	T
117	Pyinma/Pyinma ywet thay	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	T
118	Sa phyu/Thit kauk hnyin	<i>Ulmus lancifolia</i> Roxb.	Ulmaceae	T
119	Seik nan ywet the	<i>Phoebe</i> spp.	Lauraceae	T
120	Shaw pin	<i>Sterculia coccinea</i> Jack	Sterculiaceae	T
121	Shin lun san/Taung thit si	<i>Melanorrhoea glabra</i> Wall.	Anacardiaceae	T
122	Shit kale/Taw tha yet	<i>Mangifera</i> spp.	Anacardiaceae	T
123	Shit sha/Zi phyu	<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	T
124	Sin pa di	<i>Sapindus rarak</i> DC.	Sapindaceae	T
125	Sit	<i>Albizia procera</i> (Roxb.) Benth	Mimosaceae	T
126	Ta gu yo ni/Yin khu gyi	<i>Litsea grandis</i> (Nees) Hook. f.	Lauraceae	T
127	Taung bok	<i>Diospyros crumentata</i> Thwaites	Ebenaceae	T
128	Taung gangaw/Thabye gangaw	<i>Mesua nervosa</i> L.	Hypericaceae	T
129	Taung htan	<i>Livistona speciosa</i> Kurz	Arecaceae	P
130	Taung kaye	<i>Dialium indum</i> L.	Caesalpiniaceae	T
131	Taung malaka	<i>Syzygium polyanthum</i> (Wight) Merr. & L.M. Perry	Myrtaceae	T
132	Taung pauk	?	Combretaceae	T
133	Taung peinne	<i>Artocarpus chaplasha</i> Roxb.	Moraceae	T
134	Taung pyin po	<i>Tristaniopsis</i> spp	Myrtaceae	T
135	Taung saga/Saga/Saga ye paw	<i>Michelia champaca</i> L.	Magnoliaceae	T
136	Taung tamar	<i>Dracontomelon dao</i> (Blume) Merr. & Rolfe	Anacardiaceae	T

**Appendix. B. Species list found in flora survey area of TNRP ( dbh ≥10 cm )**

No.	Local Name	Scientific Name	Family Name	Life Form
137	Taung thabye/Taung pyin	<i>Tristaniaopsis burmanica</i> (Griff.) P.G. Wilson & J.T. Waterh.	Myrtaceae	T
138	Taung thale	<i>Garcinia cowa</i> Roxb.	Hypericaceae	T
139	Taung thayet phyu	<i>Swintonia schwenkii</i> (Teijsm. & Binn.) Teijsm. & Binn.	Anacardiaceae	T
140	Taung thayet/Taung thayet ni	<i>Swintonia floribunda</i> Griff.	Anacardiaceae	T
141	Taung thingan/Kyauk thingan	<i>Shorea farinosa</i> Fischer	Dipterocarpaceae	T
142	Taw danyin	<i>Abarema bigemina</i> (L.) Kosterm.	Mimosaceae	T
143	Taw gyi thit kauk	<i>Symplocos sumuntia</i> Buch.-Ham.	Symplocaceae	T
144	Taw kyet mauk/Kyet mauk kyan	<i>Nephelium lappaceum</i> L.	Sapindaceae	T
145	Taw min gut	<i>Garcinia heterandra</i> Wall.	Hypericaceae	T
146	Taw phet sut	<i>Turpinia cochinchinensis</i> (Lour.) Merr.	Staphyleaceae	T
147	Tayaw	<i>Grewia rothii</i> DC.	Tiliaceae	T
148	Thabye	<i>Syzygium</i> spp.	Myrtaceae	T
149	Thabye be o kale	<i>Eugenia</i> spp.	Myrtaceae	T
150	Thabye bebala/Tha bye phyu/Tha bye pya	<i>Syzygium</i> spp.	Myrtaceae	T
151	Thabye dubye/Duubye	<i>Eugenia claviflora</i> Roxb.	Myrtaceae	T
152	Thabye htattaya	<i>Eugenia</i> spp.	Myrtaceae	T
153	Thabye ni/Tha bye ywet thay	<i>Eugenia oblata</i> Roxb.	Myrtaceae	T
154	Thabye ywet kyi	<i>Syzygium grande</i> (Wight) Walp	Myrtaceae	T
155	Than phu/Baing	<i>Tetrameles nudiflora</i> R. Br.	Datisceae	T
156	Than that/Than de	<i>Stereospermum colais</i> (Buch.-Ham. Ex Dillwyn) Mabb.	Bignoniaceae	T
157	Tharaphi	<i>Calophyllum kunstleri</i> King	Hypericaceae	T
158	Thayet	<i>Mangifera caloneura</i> Kurz	Anacardiaceae	T
159	Thayet che	<i>Gluta tavoyana</i> Wall.	Anacardiaceae	T
160	Thet yin gale	<i>Croton joufra</i> Roxb.	Euphorbiaceae	T
161	Thet yin gyi	<i>Croton roxburghianus</i> N.P. Balakr.	Euphorbiaceae	T
162	Thingan hkyauk	<i>Litsea</i> spp.	Lauraceae	T
163	Thit cha	<i>Lithocarpus lappaceus</i> Roxb.) Rehd.	Fagaceae	T
164	Thit kazaw	<i>Duabanga grandiflora</i> (Roxb. Ex DC.) Walp.	Lythraceae	T
165	Thit kha	<i>Pentace burmanica</i> Kurz	Tiliaceae	T
166	Thit khauk	<i>Aporusa villosula</i> Kurz	Euphorbiaceae	T
167	Thit khauk chaw/Thit khauk phyu	<i>Aporusa roxburghii</i> Baill.	Euphorbiaceae	T
168	Thit khauk ywet gyi/Ye main	<i>Aporusa villosa</i> Baill.	Euphorbiaceae	T
169	Thit kyabo	<i>Euonymus javanicus</i> Blume	Celastraceae	T
170	Thit kyet u/Kala padauk	<i>Dalbergia sisoo</i> Roxb.	Fabaceae	T
171	Thit mee	<i>Theobroma</i> spp.	Sterculiaceae	T
172	Thit min	<i>Podocarpus wallichianus</i> Presl	Podocarpaceae	T
173	Thit noat/Ma ya nin su bauk	<i>Acrocarpus fraxinifolius</i> Wight ex Arn.	Caesalpiniaceae	T
174	Thit phyu/Te yaing/Thitwa	<i>Homalium grandiflorum</i> Benth.	Flacourtiaceae	T
175	Thit sho	<i>Pentace griffithii</i> King	Tiliaceae	T
176	Thit yaa	<i>Schima wallichii</i> (DC.) Korth.	Theaceae	T
177	Thitto	<i>Sandoricum koetjape</i> (Burm. f.) Merr.	Meliaceae	T
178	U kha	<i>Nauclea orientalis</i> L.	Rubiaceae	T
179	Wet shaw	<i>Firmiana colorata</i> (Roxb.) R. Br.	Sterculiaceae	T
180	Wet thitcha	<i>Lithocarpus wrayi</i> (King) A. Camus	Fagaceae	T
181	Wet thitta	<i>Castanopsis rhamnifolia</i> A.DC.	Fagaceae	T

**Appendix. B. Species list found in flora survey area of TNRP ( dbh ≥10 cm )**

No.	Local Name	Scientific Name	Family Name	Life Form
182	Yan ka man	<i>Milliusa spp.</i>	Annonaceae	T
183	Ye tha phan/On ya	<i>Ficus glomerata Roxb.</i>	Moraceae	T
184	Ye thit min	<i>Podocarpus neriifolius D. Don</i>	Podocarpaceae	T
185	Yin htaik	<i>Dalbergia cultrata Grah.</i>	Fabaceae	T
186	Yin khat	<i>Gardenia sootepensis Hutch.</i>	Rubiaceae	T
187	Yin khu	<i>Actinodaphne spp.</i>	Lauraceae	T
188	Yin zat	<i>Dalbergia fusca Pierre</i>	Fabaceae	T
189	Zinbyun	<i>Dillenia parviflora Griff.</i>	Dilleniaceae	T
190	Zin ngo	<i>Vitex peduncularis Wall.</i>	Verbenaceae	T
191	Zin zway	<i>Payena paralleloneura Kurz.</i>	Sapotaceae	T
192	Gyaw nwe	?	?	C
193	Kyar ma naing	?	?	C
194	Kyize ywet gyi/Kyize wa	?	?	T
195	Nwar pin	?	?	T
196	Nwar ywet	?	?	T
197	Po za	?	?	T
198	Taung byu	?	?	T
199	Taung lan thaw	?	?	T
200	Taung pan thee	?	?	T
201	Taung tayaw	?	?	T
202	Thagya phyu	?	?	T
203	Thagya/Thagya ywet kyi	?	?	T
204	The thu di	?	?	T
205	The yi tho	?	?	T
206	Thit khét	?	?	T
207	Thit megyi	?	?	T
208	Thit phayaung	?	?	T
209	Unknown 1-10-2	?	?	T
210	Unknown 1-10-3	?	?	T
211	Unknown 1-3-1`	?	?	T
212	Unknown 1-4-1	?	?	T
213	Unknown 1-8-10	?	?	T
214	Unknown 1-8-8	?	?	T
215	Unknown 1-8-9	?	?	T
216	Unknown 1-T1-12	?	?	T
217	Unknown 1-T1-4	?	?	T
218	Unknown 1-T1-8	?	?	T
219	Unknown 2-10-2	?	?	T
220	Unknown 2-10-3	?	?	T
221	Unknown 2-3-10	?	?	T
222	Unknown 2-3-11	?	?	T
223	Unknown 2-3-12	?	?	T
224	Unknown 2-3-8	?	?	T
225	Unknown 2-3-9	?	?	T
226	Unknown 2-6-1	?	?	St
227	Unknown 2-6-2	?	?	T
228	Unknown 3-10-8	?	?	T
229	Unknown 3-3-6	?	?	T
230	Unknown 3-5-5	?	?	T
231	Unknown 3-5-6	?	?	T
232	Unknown 3-7-10	?	?	T

**Appendix. B. Species list found in flora survey area of TNRP ( dbh ≥10 cm )**

No.	Local Name	Scientific Name	Family Name	Life Form
233	Unknown 3-7-11	?	?	T
234	Unknown 3-7-12	?	?	T
235	Unknown 3-7-14	?	?	T
236	Unknown 3-7-9	?	?	T
237	Unknown 3-8-6	?	?	T
238	Unknown 3-8-7	?	?	T
239	Unknown 3-9-2	?	?	T
240	Unknown 3-T1-15	?	?	T
241	Unknown 3-T1-16	?	?	T
242	Unknown 3-T1-17	?	?	T
243	Unknown 3-T1-19	?	?	T
244	Unknown 3-T1-20	?	?	T
245	Unknown 3-T1-21	?	?	T
246	Unknown 3-T1-25	?	?	T
247	Unknown 3-T1-27	?	?	T
248	Unknown 3-T1-6	?	?	T
249	Unknown 3-T1-7	?	?	T
250	Unknown 4-9-6	?	?	T
251	Unknown 5-10-2	?	?	C
252	Unknown 5-1-7	?	?	T
253	Unknown 5-2-5	?	?	C
254	Unknown 5-2-7	?	?	C
255	Unknown 5-2-8	?	?	T
256	Unknown 5-2-9	?	?	T
257	Wan the che	?	?	T

**Summary of species list**

1	No. of family	46
2	No. of Identified family	191
3	No. of Identified species	182
4	No. of Unidentified but known local name	18
5	No. of Unidentified species	48
6	Total number of species	257

**Appendix. C. Species ranking by number of individual in the flora survey area of TNRP**  
(Survey area was 6.6 ha.)

No.	Local name	Scientific Name	Family Name	No. of stem
1	Bamboo wabo	<i>Dendrocalamus calostachyus</i> (Kurz) Kurz	Poaceae	1
2	Bamboo wanet	<i>Dendrocalamus longispathus</i> (Kurz) Kurz	Poaceae	1
3	Ban kaya	<i>Shorea gratissima</i> Dyer	Dipterocarpaceae	1
4	Ban phut	?	Dipterocarpaceae	1
5	Ban shwe wa	<i>Hopea</i> spp.	Dipterocarpaceae	1
6	Banbwe/Bu	<i>Careya arborea</i> Roxb.	Lecythidaceae	1
7	Chin byit	<i>Bauhinia malabarica</i> Roxb.	Caesalpiniaceae	1
8	Don shaw	<i>Sterculia ornata</i> Wall. Ex Kurz	Sterculiaceae	1
9	Gat ni ywet kyi	<i>Dysoxylum grande</i> Hiern	Meliaceae	1
10	Gat ywet thay	?	Meliaceae	1
11	Gaung kwe	<i>Helicia</i> spp.	Proteaceae	1
12	Gyaw nwe	?	?	1
13	Gyit	<i>Pandanus odoratissimus</i> L.f.	Pandanaceae	1
14	J shin	<i>Arenga saccharifera</i> Labill.	Arecaceae	1
15	Kadut net	<i>Parashorea stellata</i> Kurz	Dipterocarpaceae	1
16	Kant that nyaung/Taw po sa	<i>Pterocymbium macranthum</i> Kosterm.	Sterculiaceae	1
17	Kanyin ni	<i>Dipterocarpus turbinatus</i> Gaertn. F.	Dipterocarpaceae	1
18	Kyar ma naing	?	?	1
19	Kyaung dauk	<i>Pajanelia longifolia</i> (Willd.) K. Schum.	Bignoniaceae	1
20	Kyaung shar bo	<i>Heteropanax fragrans</i> (Roxb. Ex.DC.) Seem.	Araliaceae	1
21	Kyaung yi	<i>Phoebe lanceolata</i> (Nees) Nees	Lauraceae	1
22	Kyi	<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae	1
23	Kyize phyu/Taung kala	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	1
24	Kyun lan	<i>Premna integrifolia</i> L.	Verbenaceae	1
25	Kywe thwee ywet thay	<i>Myristica malabarica</i> Lam.	Myristicaceae	1
26	Leza	<i>Lagerstroemia tomentosa</i> Presl	Lythraceae	1
27	Magyi me	<i>Ammora</i> spp.	Meliaceae	1
28	Nabe/Lan phe	<i>Lannea coromandelica</i> (Houtt.) Merr.	Anacardiaceae	1
29	Nagye gale	<i>Pterospermum cinnamomeum</i> Kurz	Sterculiaceae	1
30	Nalin kyaw	<i>Cinnamomum nitidum</i> Blume	Lauraceae	1
31	Ngu shwe war	<i>Cassia fistula</i> L.	Caesalpiniaceae	1
32	Nwar pin	?	?	1
33	Nyaung kyat	<i>Ficus obtusifolia</i> Roxb.	Moraceae	1
34	Phan Kha	<i>Terminalia chebula</i> Retz.	Combretaceae	1
35	Phet wun	<i>Mallotus cochinchinensis</i> Lour.	Euphorbiaceae	1
36	Seik nan ywet the	<i>Phoebe</i> spp.	Lauraceae	1
37	Shaw pin	<i>Sterculia coccinea</i> Jack	Sterculiaceae	1
38	Taung htan	<i>Livistona speciosa</i> Kurz	Arecaceae	1
39	Taung pyin po	<i>Tristaniopsis</i> spp	Myrtaceae	1
40	Taung tamar	<i>Dracontomelon dao</i> (Blume) Merr. & Rolfe	Anacardiaceae	1

**Appendix. C. Species ranking by number of individual in the flora survey area of TNRP**  
(Survey area was 6.6 ha.)

No.	Local name	Scientific Name	Family Name	No. of stem
41	Taung tayaw	?	?	1
42	Taung thale	<i>Garcinia cowa Roxb.</i>	Hypericaceae	1
43	Taw phet sut	<i>Turpinia cochinchinensis (Lour.) Merr.</i>	Staphyleaceae	1
44	Tayaw	<i>Grewia rothii DC.</i>	Tiliaceae	1
45	Thabye be o kale	<i>Eugenia spp.</i>	Myrtaceae	1
46	Thayet	<i>Mangifera caloneura Kurz</i>	Anacardiaceae	1
47	The yi tho	?	?	1
48	Thet yin gyi	<i>Croton roxburghianus N.P. Balakr.</i>	Euphorbiaceae	1
49	Thit kyet u/Kala padauk	<i>Dalbergia sisoo Roxb.</i>	Fabaceae	1
50	U kha	<i>Nauclea orientalis L.</i>	Rubiaceae	1
51	Unknown 1-10-2			1
52	Unknown 1-10-3			1
53	Unknown 1-4-1			1
54	Unknown 1-8-10			1
55	Unknown 1-8-8			1
56	Unknown 1-8-9			1
57	Unknown 1-T1-12			1
58	Unknown 1-T1-4			1
59	Unknown 1-T1-8			1
60	Unknown 2-10-2			1
61	Unknown 2-10-3			1
62	Unknown 2-3-11			1
63	Unknown 2-3-12			1
64	Unknown 2-3-9			1
65	Unknown 2-6-1			1
66	Unknown 2-6-2			1
67	Unknown 3-10-8			1
68	Unknown 3-3-6			1
69	Unknown 3-5-5			1
70	Unknown 3-5-6			1
71	Unknown 3-7-10			1
72	Unknown 3-7-11			1
73	Unknown 3-7-12			1
74	Unknown 3-7-14			1
75	Unknown 3-8-6			1
76	Unknown 3-8-7			1
77	Unknown 3-9-2			1
78	Unknown 3-T1-15			1
79	Unknown 3-T1-16			1
80	Unknown 3-T1-17			1
81	Unknown 3-T1-19			1
82	Unknown 3-T1-20			1
83	Unknown 3-T1-21			1
84	Unknown 3-T1-25			1
85	Unknown 3-T1-27			1
86	Unknown 3-T1-6			1
87	Unknown 3-T1-7			1
88	Unknown 5-10-2			1

**Appendix. C. Species ranking by number of individual in the flora survey area of TNRP**  
(Survey area was 6.6 ha.)

No.	Local name	Scientific Name	Family Name	No. of stem
89	Unknown 5-1-7			1
90	Unknown 5-2-5			1
91	Unknown 5-2-7			1
92	Unknown 5-2-8			1
93	Unknown 5-2-9			1
94	Unknown-1-3-1`			1
95	Unkown 2-3-8			1
96	Unnown 2-3-10			1
97	Yin htaik	<i>Dalbergia cultrata</i> Grah.	Fabaceae	1
98	Yin khu	<i>Actinodaphne</i> spp.	Lauraceae	1
99	Zin ngo	<i>Vitex peduncularis</i> Wall.	Verbenaceae	1
100	Gat thitto	<i>Aglaia andamanica</i> Hiern	Meliaceae	2
101	Gon hnyin nwe	<i>Entada pursaetha</i> DC.	Mimosaceae	2
102	Gu ywet thay/Gu yaing	<i>Litsea monopetala</i> (Roxb.) Pers.	Lauraceae	2
103	Hman ni/Thit ni	<i>Gardenia erythroclada</i> Kurz	Rubiaceae	2
104	Htein	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	2
105	Htein kala	<i>Nauclea sessilifolia</i> Roxb.	Rubiaceae	2
106	Kanaso	<i>Baccaurea sapida</i>	Euphorbiaceae	2
107	Kant that/Bon lon	<i>Morus laevigata</i> Wall.	Moraceae	2
108	Kanyin	<i>Dipterocarous dyeri</i> Pierre	Dipterocarpaceae	2
109	Kha aung/On pin	<i>Ficus hispida</i> L.f.	Moraceae	2
110	Khon pin	?	Rutaceae	2
111	Kokko/Kat gu	<i>Albizia lebbek</i> (L.) Benth	Mimosaceae	2
112	Kyaung shar	<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	2
113	Kyize ni	?	Combretaceae	2
114	Nwar ywet	?	?	2
115	On za	<i>Derris</i> spp.	Fabaceae	2
116	Padauk	<i>Pterocarpus macrocarpus</i> Kurz	Fabaceae	2
117	Pan ma	?	Theaceae	2
118	Pwint set	<i>Engelhardtia spicata</i> Blume	Juglandaceae	2
119	Pyinma ywet ky	<i>Lagerstroemia macrocarpa</i> Kurz	Lythraceae	2
120	Taung malaka	<i>Syzygium polyanthum</i> (Wight) Merr.&L.M. Perry	Myrtaceae	2
121	Taung thayet phyu	<i>Swintonia schwenkii</i> (Teijsm.&Binn.) Teijsm.&Binn.	Anacardiaceae	2
122	Thagya phyu	?	?	2
123	Tharaphi	<i>Calophyllum kunstleri</i> King	Hypericaceae	2
124	The thu di	?	?	2
125	Thit kha	<i>Pentace burmanica</i> Kurz	Tiliaceae	2
126	Thit khet	?	?	2
127	Thitto	<i>Sandoricum koetjape</i> (Burm. f.) Merr.	Meliaceae	2
128	Unknown 3-7-9			2
129	Unknown 4-9-6			2
130	Wet thitta	<i>Castanopsis rhamnifolia</i> A.DC.	Fagaceae	2
131	Yin zat	<i>Dalbergia fusca</i> Pierre	Fabaceae	2
132	Bok saga/Taung saga	<i>Magnolia lilifera</i> (L.) Baill.	Magnoliaceae	3
133	Bok (Annonaceae)/Taw saga seir	<i>Polyalthia hookeriana</i> King	Annonaceae	3
134	Hmaw/Minbaw	<i>Wallichia disticha</i> T. Anderson	Arecaceae	3

**Appendix. C. Species ranking by number of individual in the flora survey area of TNRP**  
(Survey area was 6.6 ha.)

No.	Local name	Scientific Name	Family Name	No. of stem
135	Kadut phwe	<i>Parashorea</i> spp.	Dipterocarpaceae	3
136	Kanyin kyaung che/Nay kyaung c	<i>Vatica dyeri</i> King/maingayi Dyer	Dipterocarpaceae	3
137	Kanyin phyu	<i>Dipterocarpus alatus</i> Roxb.	Dipterocarpaceae	3
138	Kyet tet su	<i>Flacourtia cataphracta</i> Roxb.	Flacourtiaceae	3
139	Kyize ywet thay	<i>Actinodaphne</i> spp.	Lauraceae	3
140	Kywe thone baung	<i>Garcinia pedunculata</i> Roxb.	Hypericaceae	3
141	Leza phyu	<i>Lagerstroemia calyculata</i> Kurz	Lythraceae	3
142	Mabe/Be bya	<i>Cratoxylum neriifolium</i> Kurz	Hypericaceae	3
143	Nyaung/Nyaung nwe	<i>Ficus</i> spp.	Moraceae	3
144	Po za	?	?	3
145	Sit	<i>Albizia procera</i> (Roxb.) Benth	Mimosaceae	3
146	Taung saga/Saga/Saga ye paw	<i>Michelia champaca</i> L.	Magnoliaceae	3
147	Taung thingan/Kyauk thingan	<i>Shorea farinosa</i> Fischer	Dipterocarpaceae	3
148	Than that/Than de	<i>Stereospermum colais</i> (Buch.-Ham. Ex Dillwyn) Mabb.	Bignoniaceae	3
149	Thayet che	<i>Gluta tavoyana</i> Wall.	Anacardiaceae	3
150	Thit kyabo	<i>Euonymus javanicus</i> Blume	Celastraceae	3
151	Thit magyi	<i>Theobroma</i> spp.	Sterculiaceae	3
152	Wet shaw	<i>Firmiana colorata</i> (Roxb.) R. Br.	Sterculiaceae	3
153	Yan ka man	<i>Milliusa</i> spp.	Annonaceae	3
154	Mason taywet son taywet	?	Rubiaceae	4
155	Myauk lok	<i>Artocarpus lakoocha</i> Roxb.	Moraceae	4
156	Taw gyi thit kauk	<i>Symplocos sumuntia</i> Buch.-Ham.	Symplocaceae	4
157	Thabye dubye/Duubye	<i>Eugenia claviflora</i> Roxb.	Myrtaceae	4
158	Than phu/Baing	<i>Tetrameles nudiflora</i> R. Br.	Datisceae	4
159	Thit khauk ywet gyi/Ye mein	<i>Aporosa villosa</i> Baill.	Euphorbiaceae	4
160	Thit min	<i>Podocarpus wallichianus</i> Presl	Podocarpaceae	4
161	Thit noat/Mayanin su pauk	<i>Acrocarpus fraxinifolius</i> Wight ex Arn.	Caesalpiniaceae	4
162	Thit phayaung	?	?	4
163	Ye thit min	<i>Podocarpus neriifolius</i> D. Don	Podocarpaceae	4
164	Yin khat	<i>Gardenia sootepensis</i> Hutch.	Rubiaceae	4
165	Dauk yat	<i>Putrajiva roxburghii</i> Wall	Euphorbiaceae	5
166	Gat phwe	<i>Dysoxylum procerum</i> Hiern	Meliaceae	5
167	Gwe	<i>Spondias pinnata</i> (L.) Kurz	Anacardiaceae	5
168	Kant that nyaung	<i>Alangium chinense</i> (Lour.) Harms	Alangiaceae	5
169	Kyize ywet gyi/Kyize wa	?	?	5
170	Le min	<i>Cleidion spiciflorum</i> Merr.	Euphorbiaceae	5
171	Mani aw ga/Yat/Taung yat	<i>Carallia brachiata</i> (Lour.) Merr.	Rhizophoraceae	5
172	Mayan/Taung mayan	<i>Bouea burmanica</i> Griff.	Anacardiaceae	5
173	Myet na pan po	<i>Alstonia rostrata</i> Fischer	Apocynaceae	5
174	Phet than	<i>Heterophragma adenophylla</i> (Wall.) Seem. ex Benth. & Hook.	Bignoniaceae	5
175	Shin lun san/Taung thit si	<i>Melanorrhoea glabra</i> Wall.	Anacardiaceae	5
176	Thingan kyauk	<i>Litsea</i> spp.	Lauraceae	5
177	Thit kazaw	<i>Duabanga grandiflora</i> (Roxb. Ex DC.) Walp.	Lythraceae	5
178	Gu bauk/Gu bok/Yin khu lay	<i>Bhesa robusta</i> (Roxb.) Ding Hou	Celastraceae	6



**Appendix. C. Species ranking by number of individual in the flora survey area of TNRP**  
(Survey area was 6.6 ha.)

No.	Local name	Scientific Name	Family Name	No. of stem
179	Kaung mu	<i>Anisoptera scaphula</i> (Roxb.) Pierre / <i>curtisii</i> Dyer	Dipterocarpaceae	6
180	Kyet mauk yaing	<i>Nephelium laurinum</i> Blume	Sapindaceae	6
181	Ma htan kye	<i>Dalbergia stipulacea</i> Roxb.	Fabaceae	6
182	Moe	<i>Pterocymbium</i> spp.	Sterculiaceae	6
183	Phet wun gyi	<i>Talipariti macrophyllum</i> (Roxb. Ex Hornem.) Fryxell	Malvaceae	6
184	Sa phyu/Thit kauk hnyin	<i>Ulmus lancifolia</i> Roxb.	Ulmaceae	6
185	Thet yin gale	<i>Croton joufra</i> Roxb.	Euphorbiaceae	6
186	Hman par	<i>Chaetocarpus castanocarpus</i> Thwaites	Euphorbiaceae	7
187	Hnyin twe le	<i>Parkia leiophylla</i> Kurz	Mimosaceae	7
188	Kyet yo	<i>Vitex quinata</i> (Lour.) F.N. Willd. / <i>coriacea</i> C.B. Clarke	Verbenaceae	7
189	Pyinma/Pyin ma ywet thay	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	7
190	Wan the che			7
191	Ye tha phan/On ya	<i>Ficus glomerata</i> Roxb.	Moraceae	7
192	Kaban/Ban	<i>Anisoptera costata</i> Korth.	Dipterocarpaceae	8
193	Kan zo	<i>Heritiera javanica</i> (Blume) Kosterm.	Sterculiaceae	8
194	Pyinma phyu	<i>Lagerstroemia floribunda</i> Jack	Lythraceae	8
195	Taung pan thee	?	?	8
196	Taw min gut	<i>Garcinia heterandra</i> Wall.	Hypericaceae	8
197	Thit cha	<i>Lithocarpus lappaceus</i> Roxb.) Rehd.	Fagaceae	8
198	Hman thin	<i>Cinnamomum pachyphyllum</i> Kosterm.	Lauraceae	9
199	Hta min sok	<i>Glochidion fagifolium</i> Miq.	Euphorbiaceae	9
200	Ta gu yo ni/Yin khu gyi	<i>Litsea grandis</i> (Nees) Hook. f.	Lauraceae	9
201	Thabye ywet kyi	<i>Syzygium grande</i> (Wight) Walp	Myrtaceae	9
202	Jet shin/Parawa	<i>Garcinia speciosa</i> Wall.	Hypericaceae	10
203	Thit phyu/Te yaing/Thit wa	<i>Homalium grandiflorum</i> Benth.	Flacourtiaceae	10
204	Let khok	<i>Sterculia foetida</i> L.	Sterculiaceae	11
205	Ma laing ni/ Ta maling ni/Dan lei	<i>Dalbergia</i> spp.	Fabaceae	11
206	Pangan/Pinle bok	<i>Sageraea bracteolata</i> Parker	Annonaceae	11
207	Bok (Annonaceae)/Taung bok yw	<i>Polyalthia simiarum</i> Benth.&Hook. F. ex Hook. F.	Annonaceae	12
208	Khet lan	<i>Hydnocarpus</i> spp.	Flacourtiaceae	12
209	Taung bok	<i>Diospyros crumentata</i> Thwaites	Ebenaceae	12
210	Taung kaye	<i>Dialium indum</i> L.	Caesalpiniaceae	12
211	Taung peinne	<i>Artocarpus chaplasha</i> Roxb.	Moraceae	12
212	Wet thitcha	<i>Lithocarpus wrayi</i> (King) A. Camus	Fagaceae	12
213	Gat phyu	<i>Chisocheton paniculatus</i> Hiern	Meliaceae	14
214	Nwar le pyin	<i>Pterospermum javanicum</i> Jungh.	Sterculiaceae	14
215	Shit kale/Taw tha yet	<i>Mangifera</i> spp.	Anacardiaceae	15
216	Kyet mauk pyun che/Ye kyet mau	<i>Nephelium</i> spp.	Sapindaceae	16
217	On don/Tagu/Gu	<i>Litsea glutinosa</i> (Lour.) C.B.Rob.	Lauraceae	16

**Appendix. C. Species ranking by number of individual in the flora survey area of TNRP (Survey area was 6.6 ha.)**

No.	Local name	Scientific Name	Family Name	No. of stem
218	Gat net	<i>Amoora rohituka</i> Wight&Arn.	Meliaceae	17
219	Shit sha/Zi phyu	<i>Emblca officinalis</i> Gaertn.	Euphorbiaceae	17
220	Taung gangaw/Thabye gangaw	<i>Mesua nervosa</i> L.	Hypericaceae	17
221	Taw danyin/Danyin	<i>Abarema bigemina</i> (L.) Kosterm.	Mimosaceae	18
222	Kanyin pyan/Kanyin pyan ywet ky	<i>Dipterocarpus kerrii</i> King	Dipterocarpaceae	20
223	Taung byu	?	?	20
224	Taung pauk	?	Combretaceae	20
225	Myet na pan	<i>Pavetta indica</i> L.	Rubiaceae	21
226	Thit yaa	<i>Schima wallichii</i> (DC.) Korth.	Theaceae	21
227	Thit khauk chaw/Thit khauk phyu	<i>Aporusa roxburghii</i> Baill.	Euphorbiaceae	22
228	Bigyan	<i>Castanopsis</i> spp.	Fagaceae	23
229	Sin pa di	<i>Sapindus rarak</i> DC.	Sapindaceae	24
230	Kanyin ywet thay/Kanyin si	<i>Dipterocarpus costatus</i> Gaertn. F.	Dipterocarpaceae	25
231	Kalawe/Kala phwe	<i>Cinnamomum multiflorum</i> Wight	Lauraceae	26
232	Thabye bebala/Thabye phyu/Tha	<i>Syzygium</i> spp.	Myrtaceae	26
233	Taw kyet mauk/Kyet mauk kyan	<i>Nephelium lappaceum</i> L.	Sapindaceae	27
234	Kyize	?	Combretaceae	29
235	Thit mee	?	?	31
236	Kalagi ywet thay	<i>Barringtonia angusta</i> Kurz	Lecythidaceae	32
237	Kywe danyin	<i>Callerya atropurpurea</i> (Wall.) Schot	Fabaceae	33
238	Zin zway	<i>Payena paralleloneura</i> Kurz	Sapotaceae	36
239	Kywe thwee phyu/Kywe thwee kl	<i>Myristica conferta</i> King	Myristicaceae	37
240	Thagya/Thagya ywet kyi	?	?	37
241	Thabye htattaya	<i>Eugenia</i> spp.	Myrtaceae	38
242	Pan let pyin	?	Combretaceae	41
243	Taung thabye/Taung pyin	<i>Tristaniaopsis burmanica</i> (Griff.) P.G. Wilson&J.T. Waterh.	Myrtaceae	42
244	Kalaw	<i>Hydnocarpus macrocarpa</i> Bedd.	Flacourtiaceae	47
245	Kadut/Ka dauk	<i>Shorea cinerea</i> Fischer	Dipterocarpaceae	48
246	Thit khauk	<i>Aporusa villosula</i> Kurz	Euphorbiaceae	48
247	Kalagi ywet kyi	<i>Barringtonia cymosa</i> Fischer	Lecythidaceae	49
248	Zinbyun	<i>Dillenia parviflora</i> Griff.	Dilleniaceae	50
249	Gat ni	<i>Amoora wallichii</i> King	Meliaceae	52
250	Thabye	<i>Syzygium</i> spp.	Myrtaceae	58
251	Taung lan thaw	?	?	66
252	Bok/Bok (Diospyros)	<i>Diospyros peregrina</i> (Gaertn.) Gurke	Ebenaceae	72
253	Thit sho	<i>Pentace griffithii</i> King	Tiliaceae	74
254	Thabye ni/Thabye ywet thay	<i>Eugenia oblata</i> Roxb.	Myrtaceae	75
255	Kywe thwee ni	<i>Myristica angustifolia</i> Roxb.	Myristicaceae	150
256	Taung thayet/Taung thayet ni	<i>Swintonia floribunda</i> Griff.	Anacardiaceae	168
257	Kyet mauk/Kyet mauk chaw	<i>Xerospermum noronhianum</i> (Blume) Blume	Sapindaceae	218

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
1	Bamboo wabo	<i>Dendrocalamus calostachyus (Kurz) Kurz</i>	Poaceae	Fr.	Genral use
2	Bamboo wanet	<i>Dendrocalamus longispathus (Kurz) Kurz</i>	Poaceae	Fr.	Genral use
3	Ban kaya	<i>Shorea gratissima Dyer</i>	Dipterocarpaceae	F, Fr.,Winged	Timber
4	Ban phut	?	Dipterocarpaceae	F, Fr.,Winged	Timber
5	Ban shwe wa	<i>Hopea spp.</i>	Dipterocarpaceae	F, Fr.,Winged	Timber
6	Banbwe/Bu	<i>Careya arborea Roxb.</i>	Lecythidaceae	F, Fr.	Timber
7	Bigyan	<i>Castanopsis spp.</i>	Fagaceae	F,Fr. Nut	Animal eat fr. but Human not
8	Bok/Taung bok ywet thay/Taw saga sein lay	<i>Polyalthia simiarum Benth.&amp;Hook. F. ex Hook. F.</i>	Annonaceae	F, Fr.	Timber
9	Bok/Taw saga sein gyi	<i>Polyalthia hookeriana King</i>	Annonaceae	F, Fr.	Timber
10	Bok saga/Taung saga	<i>Magnolia lilifera (L.) Baill.</i>	Magnoliaceae	F, Fr.	Timber
11	Bok/Bok (Diospyros)	<i>Diospyros peregrina (Gaertn.) Gurke</i>	Ebenaceae	F, Fr	Wild cat eat fruit
12	Chin byit	<i>Bauhinia malabarica Roxb.</i>	Caesalpiniaceae	F, Fr.	Human&Animal eat fruit and Timber
13	Don shaw	<i>Sterculia ornata Wall. Ex Kurz</i>	Sterculiaceae	F, Fr	Use fiber for string
14	Gat net	<i>Amoora rohituka Wight&amp;Arn.</i>	Meliaceae	F, Fr.	Timber, Heardwood fragrant
15	Gat ni	<i>Amoora wallichii King</i>	Meliaceae	F, Fr. Red Fruit	Timber
16	Gat ni ywet kyi	<i>Dysoxylum grande Hiern</i>	Meliaceae	F, Fr.	Timber
17	Gat phwe	<i>Dysoxylum procerum Hiern</i>	Meliaceae	Fr.	Fuelwood
18	Gat phyu	<i>Chisocheton paniculatus Hiern</i>	Meliaceae	F, Fr.	Timber
19	Gat thitto	<i>Aglaia andamanica Hiern</i>	Meliaceae	F, Fr.	Timber
20	Gat ywet thay	?	Meliaceae	F, Fr.	Timber
21	Gaung kwe	<i>Helicia spp.</i>	Proteaceae	F, Fr.	Human&Animal Eat fruit
22	Gon hnyin nwe	<i>Entada pursaetha DC.</i>	Mimosaceae	F, Fr.	Medicinal use for burning
23	Gu bauk/Gu bok/Yin khu lay	<i>Bhesa robusta (Roxb.) Ding Hou</i>	Celastraceae	F, Fr.	Fuelwood
24	Gu ywet thay/Gu yaing	<i>Litsea monopetala (Roxb.) Pers.</i>	Lauraceae	F, Fr.	Fuelwood
25	Gwe	<i>Spondias pinnata (L.) Kurz</i>	Anacardiaceae	F, Fr.	Bark deer,Sambur&wild cat eat fr.
26	Gyaw nwe	?	?	F, Fr.	String

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
27	Gyt	<i>Pandanus odoratissimus</i> L.f.	Pandanaceae	F, Fr.	Fuelwood
28	Hman ni/Thit ni	<i>Gardenia erythroclada</i> Kurz	Rubiaceae	F, Fr.	Timber and fuelwood
29	Hman par	<i>Chaetocarpus castanocarpus</i> Thwaites	Euphorbiaceae	F, Fr.	Timber and fuelwood
30	Hman thin	<i>Cinnamomum pachyphyllum</i> Kosterm.	Lauraceae	F, Fr.	Timber
31	Hmaw/Minbaw	<i>Wallichia disticha</i> T. Anderson	Arecaceae	F, Fr.	Elephant food
32	Hnyin twe le	<i>Parkia leiophylla</i> Kurz	Mimosaceae	F, Fr.	Edible fruit and Timber
33	Hta min sok	<i>Glochidion fagifolium</i> Miq.	Euphorbiaceae	F, Fr.	Fuelwood
34	Htein	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	F, Fr.	Timber
35	Htein kala	<i>Nauclea sessilifolia</i> Roxb.	Rubiaceae	F, Fr.	Timber
36	J shin	<i>Arenga saccharifera</i> Labill.	Arecaceae	F, Fr.	Roof, Edible tender shoot
37	Jet shin/ Parawa	<i>Garcinia speciosa</i> Wall.	Hypericaceae	F, Fr.	Animal edible fruit and Timber
38	Kaban/Ban	<i>Anisoptera costata</i> Korth.	Dipterocarpaceae	Fr. Winged	Timber
39	Kadut net	<i>Parashorea stellata</i> Kurz	Dipterocarpaceae	F, Fr.	Timber
40	Kadut phwe	<i>Parashorea</i> spp.	Dipterocarpaceae	F, Fr.	Edible fruit and Timber
41	Kadut/Ka dauk	<i>Shorea cinerea</i> Fischer	Dipterocarpaceae	F, Fr.	Timber
42	Kalagi ywet kyi	<i>Barringtonia cymosa</i> Fischer	Lecythidaceae	F, Fr.	Porcupine eat fruit and Timber
43	Kalagi ywet thay	<i>Barringtonia angusta</i> Kurz	Lecythidaceae	F, Fr.	Edible fruit
44	Kalaw	<i>Hydnocarpus macrocarpa</i> Bedd.	Flacourtiaceae	F, Fr.	Timber
45	Kalawe/Kala phwe	<i>Cinnamomum multiflorum</i> Wight	Lauraceae	F, Fr.	Timber
46	Kan zo	<i>Heritiera javanica</i> (Blume) Kosterm.	Sterculiaceae	F, Fr.	Edible fruit
47	Kanaso	<i>Baccaurea sapida</i>	Euphorbiaceae	F, Fr.	Edible fruit for Human & Animal
48	Kant that nyaung	<i>Alangium chinense</i> (Lour.) Harms	Alangiaceae	F, Fr.	Fuelwood
49	Kant that/Bon lon	<i>Morus laevigata</i> Wall.	Moraceae	F, Fr.	Timber
50	Kanyin	<i>Dipterocarous dyeri</i> Pierre	Dipterocarpaceae	Fr. Winged	Timber
51	Kanyin kyaung che/Nay kyaung che/Kyaung che	<i>Vatica dyeri</i> King/maingayi Dyer	Dipterocarpaceae	Fr. Winged	Timber
52	Kanyin ni	<i>Dipterocarpus turbinatus</i> Gaertn. F.	Dipterocarpaceae	Fr. Winged	Timber
53	Kanyin phyu	<i>Dipterocarpus alatus</i> Roxb.	Dipterocarpaceae	Fr. Winged	Timber
54	Kanyin pyan/Kanyin pyan ywet kyi/Kanyin ywet kyi	<i>Dipterocarpus kerrii</i> King	Dipterocarpaceae	Fr. Winged	Timber

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
55	Kanyin ywet thay/Kanyin si	<i>Dipterocarpus costatus</i> Gaertn. F.	Dipterocarpaceae	Fr. Winged	Timber, Oil extraction
56	Kaung hmu	<i>Anisoptera scaphula</i> (Roxb.) Pierre / <i>curtisii</i> Dyer	Dipterocarpaceae	Fr. Winged	Timber
57	Kha aung/On pin	<i>Ficus hispida</i> L.f.	Moraceae	Fr.	Fuelwood
58	Khon pin	?	Rutaceae	F, Fr	Fuelwood
59	Kokko/Kat gu	<i>Albizia lebbek</i> (L.) Benth	Mimosaceae	F, Fr.	Fuelwood
60	Kyar ma naing	?	?	?	Medicinal use
61	Kyaung dauk	<i>Pajanelia longifolia</i> (Willd.) K. Schum.	Bignoniaceae	F, Fr.	Timber
62	Kyaung shar	<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	F, Fr.	Edible fruit
63	Kyaung shar bo	<i>Heteropanax fragrans</i> (Roxb. Ex.DC.) Seem.	Araliaceae	F, Fr.	Fuelwood
64	Kyaung yi	<i>Phoebe lanceolata</i> (Nees) Nees	Lauraceae	F, Fr.	Edible tender leaf
65	Kyet mauk pyun che/Ye kyet mauk	<i>Nephelium</i> spp.	Sapindaceae	F, Fr.	Timber
66	Kyet mauk yaing	<i>Nephelium laurinum</i> Blume	Sapindaceae	F, Fr.	Edible fruit and Timber
67	Kyet mauk/Kyet mauk chaw	<i>Xerospermum noronhianum</i> (Blume) Blume	Sapindaceae	F, Fr.	Edible fruit and Timber
68	Kyet tet su	<i>Flacourtia cataphracta</i> Roxb.	Flacourtiaceae	F, Fr.	Edible fruit
69	Kyet yo	<i>Vitex quinata</i> (Lour.) F.N. Will./V. <i>coriacea</i> C.B. Clarke	Verbenaceae	F, Fr.	Timber
70	Kyi	<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae	F, Fr.	Fuelwood
71	Kyize	?	Combretaceae	F, Fr.	Timber
72	Kyize ni	?	Combretaceae	F, Fr.	Timber
73	Kyize phyu/Taung kala	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	F, Fr.	Chopped pieces for cheroot
74	Kyize ywet gyi/Kyize wa	?	?	F, Fr.	Timber
75	Kyize ywet thay	<i>Actinodaphne</i> spp.	Lauraceae	F, Fr.	Timber
76	Kyun lan	<i>Premna integrifolia</i> L.	Verbenaceae	F	Medicinal use
77	Kywe danyin	<i>Callerya atropurpurea</i> (Wall.) Schot	Fabaceae	F, Fr.	Edible tender leaf
78	Kywe thone baung	<i>Garcinia pedunculata</i> Roxb.	Hypericaceae	F, Fr.	Edible fruit

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
79	Kywe thwee ni	<i>Myristica angustifolia</i> Roxb.	Myristicaceae	F, Fr.	Animal edible fruit and Timber
80	Kywe thwee phyu/Kywe thwee khaung laung	<i>Myristica conferta</i> King	Myristicaceae	F, Fr.	Animal edible fruit and Timber
81	Kywe thwee ywet thay	<i>Myristica malabarica</i> Lam.	Myristicaceae	F, Fr.	Animal edible fruit and Timber
82	Le min	<i>Cleidion spiciflorum</i> Merr.	Euphorbiaceae	F, Fr.	Pole
83	Let khok	<i>Sterculia foetida</i> L.	Sterculiaceae	F, Fr.	Timber, use for boat
84	Leza	<i>Lagerstroemia tomentosa</i> Presl	Lythraceae	F, Fr.	Timber
85	Leza phyu	<i>Lagerstroemia calyculata</i> Kurz	Lythraceae	F, Fr.	Timber
86	Ma htan kye	<i>Dalbergia stipulacea</i> Roxb.	Fabaceae	Fr.	Fuelwood
87	Ma laing ni/ Ta maling ni/Dan lei ni	<i>Dalbergia</i> spp.	Fabaceae	F, Fr.	String
88	Mabe/Be bya	<i>Cratoxylum neriifolium</i> Kurz	Hypericaceae	F, Fr.	Timber
89	Magyi me	<i>Ammora</i> spp.	Meliaceae	F, Fr.	Edible fruit for Human&Animal
90	Mani aw ga/Yat/Taung yat	<i>Carallia brachiata</i> Lour.) Merr.	Rhizophoraceae	F, Fr.	Timber and Bark deer eat leaf
91	Mason taywet son taywet	?	Rubiaceae	F, Fr.	Fuelwood
92	Mayan/Taung mayan	<i>Bouea burmanica</i> Griff.	Anacardiaceae	F, Fr.	Edible fruit for Human&Animal
93	Moe	<i>Pterocymbium</i> spp.	Sterculiaceae	F, Fr.	Timber, Medicinal use
94	Myauk lok	<i>Artocarpus lakoocha</i> Roxb.	Moraceae	F, Fr.	Animal edible fruit and Timber
95	Myet na pan	<i>Pavetta indica</i> L.	Rubiaceae	F, Fr.	Use for handiwork-materials
96	Myet na pan bo	<i>Alstonia rostrata</i> Fischer	Apocynaceae	F, Fr.	Use for handiwork-materials
97	Nabe/Lan phe	<i>Lannea coromandelica</i> (Houtt.) Merr.	Anacardiaceae	F, Fr.	Timber
98	Nagye gale	<i>Pterospermum cinnamomeum</i> Kurz	Sterculiaceae	F, Fr.	Timber
99	Nalin kyaw	<i>Cinnamomum nitidum</i> Blume	Lauraceae	F, Fr.	Timber
100	Ngu shwe war	<i>Cassia fistula</i> L.	Caesalpiniaceae	F, Fr.	Medicinal use
101	Nwar le pyin	<i>Pterospermum javanicum</i> Jungh.	Sterculiaceae	F, Fr.	Timber
102	Nwar pin	?	?	F, Fr.	Fuelwood
103	Nwar ywet	?	?	F, Fr.	Poison for fish
104	Nyaung kyat	<i>Ficus obtusifolia</i> Roxb.	Moraceae	F, Fr.	Bird eat fruit

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
105	Nyaung/Nyaung nwe	<i>Ficus spp.</i>	Moraceae	F, Fr.	Bird eat fruit
106	On don/Tagu/Gu	<i>Litsea glutinosa (Lour.) C.B.Rob.</i>	Lauraceae	F, Fr.	Bark for shanpoo
107	On za	<i>Derris spp.</i>	Fabaceae	F, Fr.	Fuelwood
108	Padauk	<i>Pterocarpus macrocarpus Kurz</i>	Fabaceae	F, Fr.	Timber
109	Pan let pyin	?	Combretaceae	F, Fr.	Timber
110	Pan ma	?	Theaceae	F, Fr.	Timber
111	Pangan/Pinle bok	<i>Sageraea bracteolata Parker</i>	Annonaceae	F, Fr.	Fuelwood
112	Phan kha	<i>Terminalia chebula Retz.</i>	Combretaceae	F, Fr.	Bark deer eat fruit and Timber
113	Phet than	<i>Heterophragma adenophylla (Wall.) Seem. ex Benth.&amp;Hook.</i>	Bignoniaceae	F, Fr.	Edible fruit and flower for Human&Animal
114	Phet wun	<i>Mallotus cochinchinensis Lour.</i>	Euphorbiaceae	F, Fr.	Fuelwood
115	Phet wun gyi	<i>Talipariti macrophyllum (Roxb. Ex Hornem.) Fryxell</i>	Malvaceae	F, Fr.	Fuelwood
116	Pwin set	<i>Engelhardtia spicata Blume</i>	Juglandaceae	F, Fr.	Timber
117	Pyinma phyu	<i>Lagerstroemia floribunda Jack</i>	Lythraceae	F, Fr.	Timber
118	Pyinma ywet kyi	<i>Lagerstroemia macrocarpa Kurz</i>	Lythraceae	F, Fr.	Timber
119	Pyinma/Pyinma ywet thay	<i>Lagerstroemia speciosa (L.) Pers.</i>	Lythraceae	F, Fr.	Timber
120	Sa phyu/Thit kauk hnyin	<i>Ulmus lancifolia Roxb.</i>	Ulmaceae	F, Fr.	Timber
121	Shaw pin	<i>Sterculia coccinea Jack</i>	Sterculiaceae	F, Fr.	Use fiber for string
122	Shin lun san/Taung thit si	<i>Melanorrhoea glabra Wall.</i>	Anacardiaceae	F, Fr.	Timber
123	Shit kale/Taw tha yet	<i>Mangifera spp.</i>	Anacardiaceae	F, Fr.	Timber
124	Shit sha/Zi phyu	<i>Emblica officinalis Gaertn.</i>	Euphorbiaceae		Edible fruit
125	Sin pa di	<i>Sapindus rarak DC.</i>	Sapindaceae	F, Fr.	Timber
126	Sit	<i>Albizia procera (Roxb.) Benth</i>	Mimosaceae	F, Fr.	Timber
127	Ta gu yo ni/Yin khu gyi	<i>Litsea grandis (Nees) Hook. f.</i>	Lauraceae	F, Fr.	Use bark
128	Taung bok	<i>Diospyros crumentata Thwaites</i>	Ebenaceae	F, Fr.	Timber
129	Taung byu	?	?	F, Fr.	Fuelwood

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
130	Taung gangaw/Thabye gangaw	<i>Mesua nervosa L.</i>	Hypericaceae	F, Fr.	Timber
131	Taung htan	<i>Livistona speciosa Kurz</i>	Arecaceae	F, Fr.	Roof
132	Taung kaye	<i>Dialium indum L.</i>	Caesalpiniaceae	F, Fr.	Timber
133	Taung lan thaw	?	?	F, Fr.	Timber
134	Taung malaka	<i>Syzygium polyanthum (Wight) Merr. &amp; L.M. Perry</i>	Myrtaceae	F, Fr.	Timber
135	Taung pan thee	?	?	F, Fr.	Timber
136	Taung pauk	?	Combretaceae	F, Fr.	Fuelwood
137	Taung peinne	<i>Artocarpus chaplasha Roxb.</i>	Moraceae	F, Fr.	Use for boat, Edible fruit
138	Taung pyin po	<i>Tristanopsis spp</i>	Myrtaceae	F, Fr.	Pole & Post
139	Taung saga/Saga/Saga ye paw	<i>Michelia champaca L.</i>	Magnoliaceae	F	Timber
140	Taung tamar	<i>Dracontomelon dao (Blume) Merr. &amp; Rolfe</i>	Anacardiaceae	F, Fr.	Timber
141	Taung thabye/Taung pyin	<i>Tristanopsis burmanica (Griff.) P.G. Wilson &amp; J.T. Waterh.</i>	Myrtaceae	F, Fr.	Pole & Post
142	Taung thale	<i>Garcinia cowa Roxb.</i>	Hypericaceae	F, Fr.	Edible fruit and Timber
143	Taung thayet phyu	<i>Swintonia schwenkii (Teijsm. &amp; Binn.) Teijsm. &amp; Binn.</i>	Anacardiaceae	F, Fr.	Timber
144	Taung thayet/Taung thayet ni	<i>Swintonia floribunda Griff.</i>	Anacardiaceae	F, Fr.	Timber
145	Taung thingan/Kyauk thingan	<i>Shorea farinosa Fischer</i>	Dipterocarpaceae	Fr. Winged	Timber
146	Taw danyin	<i>Abarema bigemina (L.) Kosterm.</i>	Mimosaceae	F, Fr.	Edible fruit
147	Taw gyi thit kauk	<i>Symplocos sumuntia Buch.-Ham.</i>	Symplocaceae	F, Fr.	Pole & Charcoal
148	Taw kyet mauk/Kyet mauk kyan	<i>Nephelium lappaceum L.</i>	Sapindaceae	F, Fr.	Edible fruit and Timber
149	Taw min gut	<i>Garcinia heterandra Wall.</i>	Hypericaceae	F, Fr.	Edible fruit
150	Taw phet sut	<i>Turpinia cochinchinensis (Lour.) Merr.</i>	Staphyleaceae	F, Fr.	Fuelwood



**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
151	Tayaw	<i>Grewia rothii</i> DC.	Tiliaceae	F, Fr.	Genral use and timber
152	Thabye	<i>Syzygium</i> spp.	Myrtaceae	F, Fr.	Edible fruit and Timber
153	Thabye be o kale	<i>Eugenia</i> spp.	Myrtaceae	F, Fr.	Edible fruit
154	Thabye bebala/Tha bye phyu/Tha bye pya	<i>Syzygium</i> spp.	Myrtaceae	F, Fr.	Animal edible fruit and Timber
155	Thabye dubye/Duubye	<i>Eugenia claviflora</i> Roxb.	Myrtaceae	F, Fr.	Timber
156	Thabye htattaya	<i>Eugenia</i> spp.	Myrtaceae	F, Fr.	Edible fruit
157	Thabye ni/Tha bye ywet thay	<i>Eugenia oblata</i> Roxb.	Myrtaceae	F, Fr.	Timber
158	Thabye ywet kyi	<i>Syzygium grande</i> (Wight) Walp	Myrtaceae	F, Fr.	Timber
159	Thagya phyu	?	?	F, Fr.	Edible fruit and Timber
160	Thagya/Thagya ywet kyi	?	?	F, Fr.	Edible fruit and Timber
161	Than phu/Baing	<i>Tetrameles nudiflora</i> R. Br.	Datiaceae	F, Fr.	Timber
162	Than that/Than de	<i>Stereospermum colais</i> (Buch.-Ham. Ex Dillwyn) Mabb.	Bignoniaceae	F, Fr.	Fuelwood
163	Tharaphi	<i>Calophyllum kunstleri</i> King	Hypericaceae	F, Fr.	Timber
164	Thayet	<i>Mangifera caloneura</i> Kurz	Anacardiaceae	F, Fr.	Edible fruit
165	Thayet che	<i>Gluta tavoyana</i> Wall.	Anacardiaceae	F, Fr.	Edible fruit and Timber
166	Thet yin gale	<i>Croton joufra</i> Roxb.	Euphorbiaceae	F, Fr.	Fuelwood
167	Thet yin gyi	<i>Croton roxburghianus</i> N.P. Balakr.	Euphorbiaceae	F, Fr.	Fuelwood
168	Thingan hkyauk	<i>Litsea</i> spp.	Lauraceae		
169	Thit cha	<i>Lithocarpus lappaceus</i> Roxb.) Rehd.	Fagaceae	F, Fr.,nut	Edible fruit
170	Thit kazaw	<i>Duabanga grandiflora</i> (Roxb. Ex DC.) Walp.	Lythraceae	F, Fr.	Timber
171	Thit kha	<i>Pentace burmanica</i> Kurz	Tiliaceae	F, Fr	Timber
172	Thit khauk	<i>Aporusa villosula</i> Kurz	Euphorbiaceae	F, Fr	Timber
173	Thit khauk chaw/Thit khauk phyu	<i>Aporusa roxburghii</i> Baill.	Euphorbiaceae	F, Fr	Timber

**Appendix. D. Utilization list of species found in flora survey area of TNRP**

( dbh ≥10 cm )

No.	Local Name	Scientific Name	Family Name	Flower/Fruit (F, Fr.)	Utility
174	Thit khauk ywet gyi/Ye main	<i>Aporosa villosa</i> Baill.	Euphorbiaceae	F, Fr	Timber
175	Thit kyabo	<i>Euonymus javanicus</i> Blume	Celastraceae	F, Fr	Timber
176	Thit kyet u/Kala padauk	<i>Dalbergia sisoo</i> Roxb.	Fabaceae	F, Fr.	Fence Pole
177	Thit mee	<i>Theobroma</i> spp.	Sterculiaceae	F, Fr.	Edible fruit and Timber
178	Thit min	<i>Podocarpus wallichianus</i> Presl	Podocarpaceae	F, Fr.	Timber
179	Thit noat/Ma ya nin su bauk	<i>Acrocarpus fraxinifolius</i> Wight ex Arn.	Caesalpiniaceae	F, Fr.	Fuelwood
180	Thit phyu/Te yaing/Thitwa	<i>Homalium grandiflorum</i> Benth.	Flacourtiaceae	F, Fr.	Timber
181	Thit sho	<i>Pentace griffithii</i> King	Tiliaceae	Fr	Timber,
182	Thit yaa	<i>Schima wallichii</i> (DC.) Korth.	Theaceae	Fr	Timber
183	Thitto	<i>Sandoricum koetjape</i> (Burm. f.) Merr.	Meliaceae	Fr	Animal edible fruit and Timber
184	U kha	<i>Nauclea orientalis</i> L.	Rubiaceae	F, Fr.	Fuelwood
185	Wet shaw	<i>Firmiana colorata</i> (Roxb.) R. Br.	Sterculiaceae	F, Fr.	Timber
186	Wet thitcha	<i>Lithocarpus wrayi</i> (King) A. Camus	Fagaceae	F, Fr. Nuts	Edible fruit
187	Wet thitta	<i>Castanopsis rhamnifolia</i> A.DC.	Fagaceae	F, Fr.	Edible fruit
188	Yan ka man	<i>Milliusa</i> spp.	Annonaceae	F, Fr.	Fuelwood
189	Ye tha phan/On ya	<i>Ficus glomerata</i> Roxb.	Moraceae	F, Fr.	Fuelwood
190	Ye thit min	<i>Podocarpus nerifolius</i> D. Don	Podocarpaceae	F, Fr.	Timber
191	Yin htaik	<i>Dalbergia cultrata</i> Grah.	Fabaceae	F, Fr.	Timber
192	Yin khat	<i>Gardenia sootepensis</i> Hutch.	Rubiaceae	F, Fr.	Fence pole & Edible fruit
193	Yin zat	<i>Dalbergia fusca</i> Pierre	Fabaceae	F, Fr.	Timber
194	Zin ngo	<i>Vitex peduncularis</i> Wall.	Verbenaceae	F, Fr.	Post
195	Zin zway	<i>Payena paralleloneura</i> Kurz	Sapotaceae	F, Fr.	Edible fruit
196	Zinbyun	<i>Dillenia parviflora</i> Griff.	Dilleniaceae	F, Fr.	Edible fruit for Barking deer and Sambur
197	Wan the she	?	?	F, Fr.	Fuelwood

**Appendix. E. List of Fauna found in TNRP during the fieldwork of the Flora survey**

No.	Date	Common name	Position		Sign	Remarks
			Lat.	Lon.		
1	29.3.07	Sun Bear	14°22' 26.1"	98°11'29.4"	Track	Climbing the tree
2	29.3.07	Wild cat/Civet	14°22' 44.7"	98°11'31.1"	Track	
3	30.3.07	Sambur Deer	14°23' 19.1"	98°11'45.0"	Track	Feeding ground
4	30.3.07	Sun Bear	14°23' 17.0"	98°11'49.7"	Track and scratch	Climbing the tree
5	30.3.07	Sun Bear	14°23' 21.0"	98°11'16.2"	Track and scratch	Climbing the tree
6	30.3.07	Sun Bear	14°23' 16.8"	98°11'51.1"	Track	Digging ground
7	30.3.07	Pangolin	14°23' 18.2"	98°11'55.1"	Track	Underground
8	31.3.07	Barking Deer	14°22' 50.4"	98°11'30.8"	Track	
9	31.3.07	Wild cat/Civet	14°22' 51.2"	98°11'37.1"	Track	
10	31.3.07	Sun Bear	14°22' 54.7"	98°11'49.3"	Scratch	Climber the tree
11	31.3.07	Wild cat/Civet	14°22' 55.1"	98°11'48.8"	Scat	On Rock
12	1.4.07	Wild cat/Civet	14°22' 25.2"	98°11'42.2"	Scat	
13	1.4.07	Barking Deer	14°22' 27.4"	98°11'45.0"	Scat	
14	1.4.07	Wild Boar	14°22' 19.4"	98°11'40.2"	Track	
15	1.4.07	Serow	14°22' 16.7"	98°11'39.1"	Dung	
16	2.4.07	Barking Deer	14°21' 30.8"	98°11'43.7"	Track, Dung	
17	11.4.07	Serow	14°35' 02.7"	98°13'06.0"	Track	On the ridge
18	11.4.07	Wild Boar	14°35' 01.2"	98°13'05.8"	Track and digging	
19	19.4.07	Wild Boar	14°27' 10.8"	98°12'50.2"	Track and digging	
20	19.4.07	Black giant squirrel	14°27' 11.9"	98°12'50.9"	Visible	On the tree
21	21.4.07	Wild boar	14°27' 14.2"	98°13'20.4"	Track, Nest	
22	28.4.07	Wild Elephant	14°40' 23.6"	98°19'04.1"	Track	Feeding and resting ground
23	28.4.07	Porcupine	14°40'09.8"	98°19'13.8"	Track and digging	
24	28.4.07	Python	14°40'46.3"	98°19'20.3"	Visible	
25	1.5.07	Wild Boar	14°39'49.7"	98°19'18.8"	Track	
26	2.5.07	Lizard	14°39'21.5"	98°19'47.0"	Visible	
27	2.5.07	Lizard	14°40'50.6"	98°18'59.7"	Visible	
28	7.5.07	Tortoise	—	—	Visible	Security Camp
29	9.5.07	Toitose	14°43'23.6"	98°13'06.2"	Visible	
30	10.5.07	Tortoise	14°44'09.1"	98°12'56.2"	Visible	In stream
31	11.5.07	Wild Elephant	14°43'23.5"	98°14'31.8"	Track and scat	

**Appendix. E. List of Fauna found in TNRP during the fieldwork of the Flora survey**

No.	Date	Common name	Position		Sign	Remarks
			Lat.	Lon.		
32	12.5.07	Snake	14°43'22.4"	98°14'07.8"	Visible	On the tree
33	13.5.07	Snake	14°43'41.5"	98°14'31.3"	Visible	On the tree
34	7.5.07 - 13.5.07	Greater coucal				No. 33 to 45 were Bird species found on the way of TEPM service track
35		Spotted Dove				
36		Oriental pied Horn bill				
37		Lesser-necklaced launghing thrush				
38		Greater-necklaced launghing thrush				
39		Grey-headed parakeet				
40		Greater golden-back woodpecker				
41		Indian Roller				
42		Grackle/Hill Myna				
43		Heron				
44		King fisher				
45		Eagle				
46		Red jungle fowl				

**Appendix. F. Photo records during the fieldwork of Flora Survey from 27<sup>th</sup>  
March to 14<sup>th</sup> May, 2007**



**Photo. 1. Overview of the Rain Forest in TNRP area**



**Photo. 2. Overview of the Degraded Forest in TNRP area**



**Photo. 3. Camping site in the forest for Flora Survey**



**Photo. 4. Record the plot position using GPS**





**Photo. 5. Wooden Post at the starting point of a sample plot**



**Photo. 6. Sample plot setting and record the slope inclination**



**Photo. 7. Diameter measurement of the Buttress tree in sample plot**



**Photo. 8. Field activities for height measurement using clinometer, DBH measurement, and record in the field sheet**





**Photo. 9. Height measurement using Range Finder**



**Photo. 10. Regeneration record for seedlings and saplings in the first 10m x 10m subplot of a sample plot**



**Photo. 11. Height measurement of the seedlings in 5m x 5m subplot**

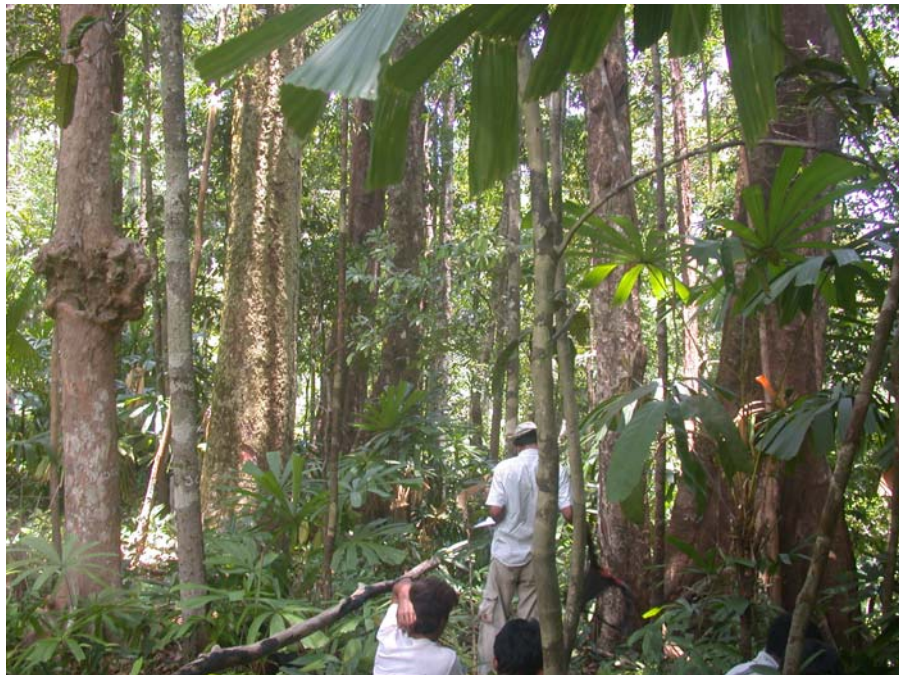


**Photo. 12. Specimens identification in Camp**





**Photo. 13. Structure of the Rain Forest in TNRP area**



**Photo. 14. Structure of the Mature Rain Forest in TNRP area**





**Photo. 15. Structure of the Rain Forest in TNRP area**



**Photo. 16. Undergrowth of Rattan in the Rain Forest of TNRP area**





**Photo. 17. Structure of the Deciduous Forest in TNRP area**



**Photo. 18. Structure of the Degraded Deciduous Forest in TNRP area**



**Photo. 19. Old logging in TNRP area**



**Photo. 20. Litter in the forest floor**





**Photo. 21. Ground fire in TNRP area**



**Photo. 22. Land slide in the steep slope of TNRP area**



**Photo. 23. Tortoise in TNRP area**



**Photo. 24. Python in TNRP area**





**Photo. 25. Fresh dung of Wild Elephant in TNRP area**



**Photo. 26. Lizard in TNRP area**





**Photo. 27. Foot print of Sambur in TNRP**



**Photo. 28. Flora Survey Team after completion of the fieldwork**