Vegetation Structure Diversity and Value-Added Guideline Corresponding to Biodiversity for Phu Hung Community Forest, Thum Tong Subdistrict, Mueang Nan District, Nan Province, Thailand

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Abstract: Phu Hung community forest, Thum Tong Subdistrict, Mueang Nan District, Nan Province, Thailand currently meets with the situation of "forest surrounded by houses", it may finally deteriorate and transform. Therefore, guidelines on increasing economic plants and utilization corresponding to vegetation diversity was analyzed. The survey on the area focused on the temporary sample plot of 1ha obtained by subjective sampling. Value added and forest conservation to make this area perfectly livable for humans with the forest should be implemented in compliance with planting promotion policy for 58 species and the royal remarks of H.M. King Bhumibol Adulyadej about 3 Forests, 4 Benefits. It was found that the study area was a secondary mixed deciduous forest with 3crown classes. There were 424 plants from 59 species, 52 genuses, and 29 families. Lamiaceae had the most species, particularly Vitex canescens, the plant with the highest relative density, relative frequency, relative dominance, and importance value indices up to 19.10, 14.49, 15.07 and 48.66%, respectively. This area had species diversity index = 3.28, evenness index = 0.80. Key plants that should be promoted for planting included Grewia paniculate, Lamiaceae, Cassia fistula, Pterocarpus macrocarpus, Albizia lebbeck, and Lagerstroemia floribunda, Dipterocarpaceae and all species of bamboos

Index Terms: Community Forest Diversity, Mixed Deciduous Forest, Value Added, Forest Conversation

1. Introduction

Forests are precious natural resources that generate, create diversity of creatures and non-creatures for living together, and give benefits to humanity of all races. Forests are also the sources of collected biodiversity to support community living [1]. Current rapid increase of world population brings change of forest areas across the world to become larger agricultural and inhabitance areas [2]. Similar to the world situation, the increase of Thai population also affects higher forest invasion. For the survey on forest areas, it was found that there were only 16.32 Mha or 31.58% of the total areas in the country of forest areas left in Thailand between 2015 – 2016 [3]. Besides, it was also found that there were 6.18 Mha or 64.37% of forest areas in the northern region covering 9 provinces during the past 55 years (1973-2019). Watershed forest areas were invaded most (0.16%) [4]. Related human behavior does not only cause reduced forest areas but also floods and effects on biodiversity.

Due to the situation as aforementioned, the government aims to increase forest areas up to 1.37 Mha within 20 years [5] and has the resolution to drive 20,000 communities of the valuable tree project within 10 years in order to increase overall forest areas of the country as well as income of people [6] by focusing on natural resource management as the cooperation between the government and people sectors for higher implementation efficiency. It is predicted that this implementation will bring exuberance and sustainability of natural resources, environments, and biodiversity [7].

The area of Phu Hung community forest, Ban Wang Khong, Thum Tong Subdistrict, Mueang Nan District, Nan Province, covers 14.40 Mha. The community forest was established in Nam Yao and Nam Suad National Forest. This forest currently confronts with the situation of "forest surrounded by houses" as there are 100 households surrounding the forest (379 inhabitants) [8]. This situation causes this community forest to be gradually invaded and destroyed by inhabitants coming for more exploitation in terms of agriculture and foraging. It is predicted that if this area is still neglected, it may finally deteriorate and transform.

Therefore, this research studied plant diversity and analyzed guidelines on increasing economic plants and utilization corresponding to biodiversity so that the community will perceive the value, for conservation and cherish of the forest that still contains biodiversity. The guidelines obtained can be applied to plan for increasing economic plants so that the area of this forest will be utilized for future sustainability.

2. Research Objectives

This research aim to study vegetation diversity and analyze guidelines on increasing economic plants and utilization corresponding to biodiversity.

3. Research Methods

A. Area Scope

The study area covered 14.40 Mha of community forest area located in Ban Wang Khong, Thum Tong Subdistrict, Mueang Nan District, Nan Province. The area was in the west of the village and surrounded by utilized lands. The study of plant diversity chose the southeast of Phu Hung community forest (Coordinate: E 679232 N 2079285).

B. Data Collection

The 1 ha of the temporary sample plots established by subjective sampling as Fig. 1. The study plots randomized for 100 square sample plots (10 x 10 m) according to the method of Kiratiprayoon [9] were field data collection. It was to collect number, species, and physical characteristics of plants with height ≥ 1.30 m. and diameter ≥ 14.5 cm. in each sample plot.

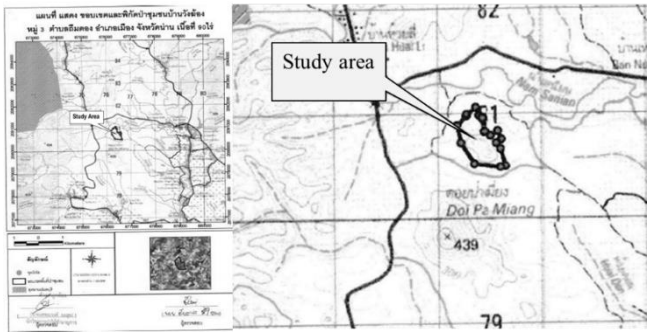

Fig. 1 Study Area

Data obtained from the field study was analyzed to find family level and species level, referred from the books called “Thai Plant Names” (botanical names – local names) [10] and “Northern Trees: Handbook for Studying Standing Timbers in Northern Forests of Thailand [11]. Physical characteristics of each species were also collected in the form of photos such as trunks, leaves, flowers, fruits, and canopy in order to prepare the name list of seedlings and to analyze species compositions.

For plant structuring and plant distribution analysis, it was to write stratification structure. The arrangement of the crown classes was presented based on height above ground level [12]. Total height, height to fresh branches, first branch, crown size, tree position, and tree characteristics were drawn. 20 x 50 m areas in the study plots were randomized. Vertical structure was acknowledged. Crown cover structure of every tree was written in horizontal structure.

C. Species Composition Analysis

Species composition analysis is to analyze quantitative ecological characteristics to find density, relative density, frequency, relative frequency, dominance, relative dominance, importance value index, species diversity index, and diversity [9, 13-14] as follows:

1. Density (D) and Relative density (RD)

$$D = \frac{T}{A}$$

When T = Total number of each species in the sample plots

number of vegetations)

A = Total units of the sample plot areas (ha)

$$RD(\%) = \frac{D_T}{D_{to}} \times 100$$

When D_T = Density of each species

D_{to}= Density of all species in the compositions

2. Frequency (F) and Relative frequency (RF)

$$F = \frac{P_t}{P_{to}} \times 100$$

When P_t = Number of the plots of each species (plot)

P_{to} = Total number of the plots (plot)

$$RF(\%) = \frac{F_t}{F_{to}} \times 100$$

When F_t = Frequency of each species

F_{to}= Frequency of all species in the compositions

3. Dominance (Do) and Relative Dominance (RDo)

$$Do = \frac{BA_t}{A}$$

When BA_t= Cross sectional area of each species (m^2)

A = Total units of the sample plot areas (Ha)

$$RDo(\%) = \frac{Do_t}{Do_{to}} \times 100$$

When Do_t = Dominance of each species

Do_{to} = Dominance of all species in the compositions

4. Importance Value Index (IVI)

$$IVI = RD + RDo + RF$$

5. Species diversity index

$$H' = -\sum_{i=1}^{S} (Pi\ ln\ P\ i)$$

When H' = Species diversity index of Shannon – Wiener

S = Number of species

Pi = Proportion of Species i / sum of all species in the compositions

6. Evenness indices (E)

$$E = \frac{H'}{ln(S)}$$

When E = Evenness of specie

S = Total number of species

D. Value Added and Conservation Guidelines

For guidelines on value added and conservation of Phu Hung community forest in this research, the analysis relied on the resolution of the cabinet *[6]* about driving the valuable tree project and on Forest Act, B.E. 2562 [7] about the cancellation of restricted trees in a land under ownership in compliance with the land code and lands permitted by the government for utilization, along with promoting the plantation of 58 species *[7]*. The selection of plant species was considered with correspondence of biodiversity in this forest and the royal remarks of H.M. King Bhumibol Adulyadej on 7 January 1980 about 3 Forests, 4 Benefits.

4. Results

The survey on Phu Hung community forest, Ban Wang Khong, Thum Tong Subdistrict, Mueang Nan District, Nan Province, size 1Ha found 424 plants from 59 species, 52 genuses, and 29 families. The analysis of quantitative ecological characteristics of species compositions in this forest was in Table 1.

A. Importance of Plants

Vitex canescens was the plant with highest importance value index up to 48.66%, followed by Grewia paniculata, Canarium, Heteropanax fagrans, and Lamiaceae with the highest importance value indices up to 26.08, 20.21, 18.18, and 18.01%, respectively. As a consequence, all 5 species of these plants were the most important plants in this study area.

B. Distribution and Dominance

The importance value indices obtained were the sums from relative density, relative frequency, relative dominance. Despite the highest indices of these 5 plants as Fig. 2, when considering into separated parts, there were possibilities that these 5 plants would be dominant in terms of different relative density, relative frequency, relative dominance.

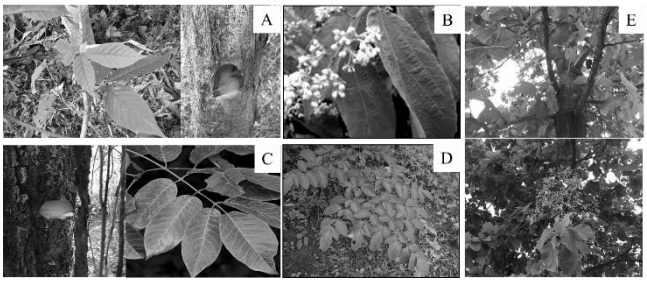

Fig. 2 Most Important Plants in The Study Area

(A = Vitex canescens, B = Grewia paniculate, C = Canarium, D = Heteropanax fragrans, E = Lamiaceae)

C. Density

Vitex canescens was the plant with the highest relative density (19.10%), followed by Grewia paniculata (10.61%), Heteropanax fragrans (6.13%), Paranephelium (4.72%), and Canarium (4.48%), respectively. Despite the importance of Lamiaceae in the top 5 ranks of the study area, the relative density was moderate (3.77%). Moreover, it was also found that Lamiaceae had the relative density in the top 5 ranks despite its less importance than the top 5 ranks. This revealed that Lamiaceae had less density per total density of all species in the study than paranephelium and the other 4 species as aforementioned.

D. Dominance

Despite the importance of Grewia paniculata and Heteropanax fragrans in the study area, when considering their dominance, it was found that both species were not included in the top 5 ranks of dominance. Those in the top 5 ranks were Vitex canescens, Lamiaceae, Canarium, Irvingia malayana, and Litsea glutinosa with their relative dominance of 15.07, 11.70, 11.02, 9.49, and 5.71%, respectively. Vitex canescens, Lamiaceae, and Canarium were the important and dominant plants in the study area. Despite the dominance of Irvingia malayana and Litsea glutinosa, they were not included in the top 5 ranks of importance due to their low relative density and relative frequency.

E. Diversity and Evenness of Species

Overall diversity index in the study area was 3.28 as well as this area had evenness of species = 0.80 of the area.

F. Plant Structuring

The study of crown cover and profile diagram as Fig. 3 revealed that the structure of the study area was in the form of distant crown, divided into 3 crown classes as follows:

1. Dominant

It was the crown class with height from 16 - 20 m. Plants in this class were branchless, with small density of crown cover. The key species were Canarium and Paranephelium longifoliolatum.

Table 1 Plant Name List

Family Name	Scientific Name	Habit	Number of species (tree)	Number of plots (plot)	D (tree/ha(	F (plot/plot)	Do (m^2/ha(	RD (%)	RF (%)	RDo (%)	IVI
ANNONACEAE	*Polyalthia viridis* Craib.	T	1.00	1.00	1.00	0.36	4.00×10^{-4}	0.24	0.36	0.02	0.62
APOCYNACEAE	*Wrightia tomentosa* Roem. & Schult.	ST	4.00	4.00	4.00	1.45	8.00×10^{-3}	0.94	1.45	0.35	2.74
	Holarrhena pubescens Wall. ex G. Don.	ST	1.00	1.00	1.00	0.36	8.00×10^{-4}	0.24	0.36	0.04	0.64
ARALIACEAE	*Heteropanax fragrans* (Roxb. ex DC.) Seem.	ST	26.00	22.00	26.00	7.97	8.00×10^{-2}	6.13	7.97	4.08	18.18
BIGNONIACEAE	*Stereospermum cylindricum* Pierre ex P. Dop.	T	1.00	1.00	1.00	0.36	6.00×10^{-4}	0.24	0.36	0.29	0.89
	Markhamia stipulata (Wall.) Seem. var. stipulate	T	7.00	5.00	7.00	1.81	1.00×10^{-2}	1.65	1.81	0.50	3.96
	Fernandoa adenophylla (Wall. ex G.Don) Steenis	T	2.00	2.00	2.00	0.72	2.00×10^{-3}	0.47	0.72	0.09	1.29
	Oroxylum indicum Vent.	ST	13.00	10.00	13.00	3.62	3.00×10^{-2}	3.07	3.62	1.46	8.15
BURSERACEAE	*Canarium subulatum* Guillaumin	T	19.00	13.00	19.00	4.71	2.40×10^{-1}	4.48	4.71	11.02	20.21
	Protium serratum Engl.	T	1.00	1.00	1.00	0.36	1.00×10^{-3} 1.00×10^{-3}	0.24	0.36	0.04	0.64
CELASTRACEAE	*Siphonodon celastrineus* Griff.	T	2.00	1.00	2.00	0.36	1.30×10^{-4}	0.47	0.36	0.06	0.90
COMBRETACEAE	*Terminalia nigrovenulosa* Pierre ex Laness.	T	6.00	3.00	6.00	1.09	2.00×10^{-2}	1.42	1.09	0.79	3.30
	Terminalia bellirica (Gaertn.) Roxb	T	3.00	1.00	3.00	0.36	3.80×10^{-2}	0.71	0.36	1.76	2.83
CRYTERONIACEAE	*Crypteronia paniculata* Blume	T	16.00	13.00	16.00	4.71	5.20×10^{-2}	3.77	4.71	2.38	10.86
DATISCACEAE	*Tetrameles nudiflora* R.Br.	T	1.00	1.00	1.00	0.36	1.40×10^{-3}	0.24	0.36	0.07	0.67
DIPTEROCAPACEAE	*Vatica cinerea* King	T	2.00	2.00	2.00	0.72	2.40×10^{-3}	0.47	0.72	0.11	1.31
EBENACEAE	*Hubera cerasoides* (Roxb.) Chaowasku	ST	4.00	3.00	4.00	1.09	4.20×10^{-3}	0.94	1.09	0.19	2.22
	Diospyros montana Roxb.	T	6.00	5.00	6.00	1.81	1.20×10^{-2}	1.42	1.81	0.54	3.76
	Diospyros fulvopilosa Fletcher	T	1.00	1.00	1.00	0.36	8.00×10^{-4}	0.24	0.36	0.04	0.63
EUPHORBIACEAE	*Croton oblongifolius* Roxb.	T	1.00	1.00	1.00	0.36	1.00×10^{-2}	0.24	0.36	0.47	1.07
	Bridelia ovata Decne.	ST	1.00	1.00	1.00	0.36	2.60×10^{-3}	0.24	0.36	0.12	0.72
	Mallotus philippensis (Lam.) Müll.Arg.	ST	2.00	1.00	2.00	0.36	1.20×10^{-3}	0.47	0.36	0.06	0.89
	Baccaurea ramiflora Lour.	T	2.00	1.00	2.00	0.36	9.00×10^{-4}	0.47	0.36	0.04	0.87
	Aporosa villosa (Wall. ex Lindl.) Baill.	ST	3.00	2.00	3.00	0.72	2.80×10^{-3}	0.71	0.72	0.13	1.56
HYPERICACEAE	*Cratoxylum formosum* Dyer subsp. pruniflorum Gogel.	T	1.00	1.00	1.00	0.36	3.20×10^{-3}	0.24	0.36	0.15	0.75
IXONANTHACEAE	*Macaranga gigantea* (Rchb.f. & Zoll.) Mull. Arg.	T	10.00	6.00	10.00	2.17	1.40×10^{-2}	2.36	2.17	0.63	5.16
	Irvingia malayana Oliv. Ex A. Benn.	T	4.00	4.00	4.00	1.45	2.10×10^{-1}	0.94	1.45	9.49	11.88
LAMIACEAE	*Tectona grandis* Linn. f.	T	16.00	7.00	16.00	2.54	2.50×10^{-1}	3.77	2.54	11.70	18.01
	Vitex peduncularis Wall. ex Schauerr	T	2.00	1.00	2.00	0.36	8.00×10^{-4}	0.47	0.36	0.04	0.87
	Callicarpa arborea Roxb.	S/ST	2.00	1.00	2.00	0.36	7.00×10^{-3}	0.47	0.36	0.32	1.16
	Vitex canescens Kurz	T	81.00	40.00	81.00	14.49	3.30×10^{-1}	19.10	14.49	15.07	48.66
LAURACEAE	*Phoebe paniculata* Nees	T	1.00	1.00	1.00	0.36	9.00×10^{-4}	0.24	0.36	0.04	0.64
	Litsea glutinosa (Lour.) C.B.Robinson	T	17.00	9.00	17.00	3.26	1.20×10^{-1}	4.01	3.26	5.71	12.98
LEGUMINOSAE – CAESALPINIOIDEAE	*Albizia odoratissima* (L.f.) Benth.	T	19.00	14.00	19.00	5.07	1.10×10^{-1}	4.48	5.07	5.11	14.66
	Cassia timoriensis DC.	ST	3.00	3.00	3.00	1.09	1.30×10^{-2}	0.71	1.09	0.59	2.39
	Cassia fistula Linn.	T	6.00	5.00	6.00	1.81	2.70×10^{-2}	1.42	1.81	1.23	4.46
LEGUMINOSAE – MIMOSOIDEAE	*Albizia chinensis* Merr.	T	1.00	1.00	1.00	0.36	2.00×10^{-2}	0.24	0.36	0.94	1.54
	Albizia lebbeck (L.) Benth.	T	1.00	1.00	1.00	0.36	3.50×10^{-2}	0.24	0.36	1.63	2.22
	Adenanthera pavonina Linn.	T	5.00	4.00	5.00	1.45	2.40×10^{-2}	1.18	1.45	1.08	3.71
	Acacia catechu Willd.	T	1.00	1.00	1.00	0.36	4.00×10^{-3}	0.24	0.36	0.19	0.78
LEGUMINOSAE – PAPILIONOIDEAE	*Dalbergia cultrata* Graham ex Benth.	T	4.00	4.00	4.00	1.45	4.80×10^{-3}	0.94	1.45	0.22	2.61
	Erythrina subumbrans Merr.	T	1.00	1.00	1.00	0.36	1.80×10^{-3}	0.24	0.36	0.08	0.68
	Pterocarpus macrocarpus Kurz	T	3.00	3.00	3.00	1.09	1.10×10^{-1}	0.71	1.09	5.08	6.88
LYTHRACEAE	*Lagerstroemia floribunda* Jack	T	8.00	6.00	8.00	2.17	8.70×10^{-3}	1.89	2.17	0.40	4.46
MALVACEAE	*Berrya mollis* Wall. ex Kurz	T	4.00	1.00	4.00	0.36	5.10×10^{-3}	0.94	0.36	0.23	1.54
MELIACEAE	*Sandoricum koetjape* Merr.	T	1.00	1.00	1.00	0.36	6.20×10^{-3}	0.24	0.36	0.29	0.89
MORACEAE	*Artocarpus heterophyllus* Lamk.	ExT	1.00	1.00	1.00	0.36	5.20×10^{-3}	0.24	0.36	0.24	0.84
	Ficus benjamina Linn.	T	3.00	1.00	3.00	0.36	4.80×10^{-3}	0.71	0.36	0.22	1.29
	Broussonetia papyrifera (L.) Vent.	ST	3.00	2.00	3.00	0.72	4.20×10^{-2}	0.71	0.72	2.02	3.45
	Ficus hispida L.f.	ST	14.00	12.00	14.00	4.35	3.00×10^{-2}	3.30	4.35	1.38	9.03
PHYLLANTHACEAE	*Cleistanthus gracilis* Hook.f.	S/ST	2.00	2.00	2.00	0.72	9.00×10^{-4}	0.47	0.72	0.04	1.24
RUBIACEAE	*Mitragyna brunonis* Craib	T	4.00	3.00	4.00	1.09	3.40×10^{-3}	0.94	1.09	0.16	2.19
	Oxyceros horridus Lour.	ST	2.00	2.00	2.00	0.72	1.70×10^{-3}	0.47	0.72	0.08	1.27
SALICACEAE	*Casearia grewiifolia* Vent. var.grewiifolia	ST	1.00	1.00	1.00	0.36	2.90×10^{-3}	0.24	0.36	0.13	0.73
SAPINDACEAE	*Schleichera oleosa* (Lour.) Merr.	T	1.00	1.00	1.00	0.36	1.10×10^{-3}	0.24	0.36	0.05	0.65
	Paranephelium longifoliolatum Lec.	T	20.00	7.00	20.00	2.54	6.60×10^{-2}	4.72	2.54	3.03	10.29
TILIACEAE	*Grewia paniculata* Roxb.	T	45.00	27.00	45.00	9.78	1.10×10^{-1}	10.61	9.78	5.69	26.08
	Colona flagrocarpa Craib.	T	10.00	4.00	10.00	1.45	2.90×10^{-2}	2.36	1.45	1.34	5.15
VERBENACEAE	*Gmelina arborea* Roxb.	T	2.00	2.00	2.00	0.72	1.60×10^{-2}	0.47	0.72	0.76	1.95

2. Codominant

It was the crown class with height from 10 - 15 m. Outstanding plants in this class included Lamiaceae, Litsea glutinosa, Gmelina arborea, Albizia odoratissima, Paranephelium longifoliolatum, Crypteronia paniculate, Terminalia nigrovenulosa, Colona flagrocarpa, Heteropanax fragrans, Cassia fistula, Grewia paniculate, and Lagerstroemia floribunda.

3. Overtopped/Suppressed

It was the crown class with height from 2 - 9 m. Most species in this class included Grewia paniculata, Tetrameles nudiflora, Litsea glutinosa, Paranephelium longifoliolatum, Heteropanax fragrans, Vitex canescens, Lagerstroemia floribunda, Macaranga gigantean, Markhamia stipulate, Protium serratum, Wrightia tomentosa, Ficus hispida, Holarrhena pubescens, Baccaurea ramiflora, Fernandoa adenophylla, Mitragyna brunonis, Aporosa villosa, and Oroxylum indicum.

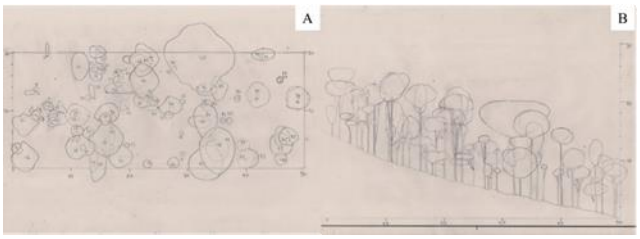

Fig. 3 Horizontal Structure (A) and Vertical Structure (B)

5. Discussions

A. Study Area Characteristics

Overall diversity index in the study area was higher than the mixed deciduous forest of Si Lanna National Park, Chiang Mai Province [15]. However, the study area had similar diversity index to the mixed deciduous forest of Chaloem Phrakiat Thai Prachan National Park, Ratchaburi Province, studied by National Park Research [16].

This area had evenness index revealed that plants with rather high distribution represented rather equal distribution of the number of trees of each species in this area. It also represented growth suitability of undergrowth plants. Fruits falling to the ground can grow.

Data of species compositions and plant structuring revealed that this study area was a secondary forest under recovery, with pioneer species that could grow in gaps. The ones found included 5 species: Tiliaceae (Grewia paniculate and Colona flagrocarpa); Euphorbiaceae (Macaranga gigantean); Leguminosae–mimosaideae (Albizia lebbeck and Albizia chinensis); Verbenaceae (Gmelina arborea); and Lamiaceae (Vitex canescens). This corresponded to the study of Sriwattanatham [17] on structures and components of species in the mixed deciduous forest of Doi Suthep-Pui National Park, Chiang Mai Province. Original species such as Vitex canescens, Lamiaceae, and Lagerstroemia floribunda were also found.

B. Value Added and Conservation Guidelines

For the preparation of species data and the analysis of species compositions in the area of Phu Hung community forest the basic data obtained could support participatory area management planning for utilization of precious community re

sources for sustainability, along with conservation of some engendered species.

The increase of economic plants in Phu Hung community forest in compliance with planting promotion policy for 58 species [4] corresponding to plants from the analyzed species compositions in the study area was found that key plants that should be promoted for planting included Grewia paniculate, Lamiaceae, Cassia fistula, Pterocarpus macrocarpus, Albizia lebbeck, and Lagerstroemia floribunda. However, because of the study area being the mixed deciduous forest, not only 6 species as aforementioned should be promoted but also a great number of economic species that can be promoted for planting in this forest as well such as Dipterocarpaceae and all species of bamboos.

The promotion can be conducted by planting in gaps, with local eatable mushrooms according to the methods of how to use Mycorrhizai Mushroom and Amanita citrine for improving the efficiency of Dipterocarpaceae planting [18] in order to correspond to the royal idea of “Rehabilitate Forest, Generate Income” [19]. It can be a food source for the community in the future. Bamboo planting promotion in the study area does not only to generate the food source for the community like planting trees with mushrooms, but the community can also sell them as construction materials, furniture production, and chopstick production [20]. They can also be brought for low-resistance biochar (≤ 100 ohm), with special property of generating and releasing negative ions and far infrared ray for input to cosmeceutical industry [21]. It is the assembly of community enterprise members for value added products, with linking production processes and interdependence in term of transport to external markets [22].

Furthermore, eatable fruit crop (Baccaurea ramiflora) can also be promoted, along with other plants for utilization (Holarrhena pubescens and Schleichera oleosa) and for construction (Lamiaceae, Pterocarpus

macrocarpus, and Gmelina arborea), corresponding to 3 Forests, 4 Benefits according to the royal remarks of H.M. King Bhumibol Adulyadej on 7 January 1980.

6. Recommendations

1. This research focus on only big vegetations, therefore, the next research should be designed for collecting all size of trees.

2. Value added and conservation guideline were considered with the royal remarks of H.M. King Bhumibol Adulyadej about 3 Forests, 4 Benefits. For the next research, the value of direct and indirect such as the abundance and value of economic species, of medical plants, of food plant species and of carbon stock should be investigated.

7. Conclusion

In brief, the study area according to Species composition analysis revealed that the study area was a secondary mixed deciduous forest with 3 crown classes. There were 424 plants from 59 species, 52 genuses, and 29 families. Lamiaceae had the most species, particularly, Vitex canescens, the plant with the highest relative density, relative frequency, relative dominance, and importance value indices up to 19.10, 14.49, 15.07, and 48.66, respectively. This study area had species diversity index = 3.28 and evenness index = 0.80. Value added and forest conservation should be implemented in compliance with planting promotion policy for 58 species and 3 Forests, 4 Benefits, i.e., Grewia paniculate, Lamiaceae, Cassia fistula, Pterocarpus macrocarpus, Albizia lebbeck, Lagerstroemia floribunda, Baccaurea ramiflora, Wrightia tomentosa, Schleichera oleosa, Lamiaceae, Gmelina arborea, all species of bamboo, and Dipterocarpaceae. These plants under the promotion corresponded to biodiversity of the study area.

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