Kasetsart J. (Nat. Sci.) 39 : 519 - 533 (2005)

Ethnobotany in Bung Khong Long Non-Hunting Area, Northeast Thailand

Siriwan Suksri[1], Siraprapha Premcharoen[2], Chitraporn Thawatphan[3] and Suvit Sangthongprow[4]

ABSTRACT

Bung Khong Long Non-Hunting Area is located in Nong Khai province, northeast Thailand. It has two forest areas: Don Sawan and Don Mor Thong, which are large lowland evergreen forests of this region. At least 4 villages, 364 households, and 2,566 people live around the two forests. This study focused on ethnobotanical knowledge of the villagers comprising list of useful plants and method of use. Data and plant specimens were collected by interviews with practitioners from 121 households (25%) and plant collecting trips during field studies, respectively, (April 2001, July 2001, November 2001, and April 2002). A total of 203 species, 128 genera, and 67 families were considered as ethnobotanical plants by the villagers. These species were divided into 4 categories (some species overlapped among these categories): 108 edibles (53%), 76 medicinals (37%), 14 construction materials (7%), and 40 for other purposes (20%). Leaf was the most frequently used plant part. Most medicinals were prepared by decoction and immersion in the liqueur for drinking. The villagers gathered the useful plants throughout the year. Most of the useful plants were collected for household uses and a few were collected for selling.

Key words: ethnobotany, lowland forest, Bung Khong Long

INTRODUCTION

Bung Khong Long Non-Hunting Area has been established since 1982. It is an important wetland of Thailand because it is the habitat of wildlife and birds, both resident and migrant non-breeder. It consists of a large swamp and two forests. The swamp has been announced as a Ramsar site (OEPP, 2002), while the forests are interesting because they are large lowland evergreen forests in the northeastern region of Thailand.

Lowland forest refers to the majority of tropical rainforest, that is, forest which grows on flat lands (ICUN, 1986). It has a greater diversity of fruiting trees; hence more animals specially adapted to feed on their fruits (WCMC, 1994). Lowland native forests generally have higher conservation value than higher altitude forest because they are located on fertile soils, in warmer climates and can thereby support higher biological diversity than forest at higher altitudes (Groombridge, 1992). The main tree species belong to the dipterocarpaceous and the leguminous families (The National Identity Office, 1998).

Ethnobotany is a part of ethnoecology,

1 Program of Economic Botany, Faculty of Liberal Arts and Science, Kasetsart University, Nakhon Pathom 73140, Thailand.
2 Zoology Section, Faculty of Liberal Arts and Science, Kasetsart University, Nakhon Pathom 73140, Thailand.
3 Botany Section, Faculty of Liberal Arts and Science, Kasetsart University, Nakhon Pathom 73140, Thailand.
4 Department of Forest Biology, Faculty of Forestry, Kasetsart University, Bangkok 10900, Thailand.

Received date : 01/12/04 Accepted date : 20/07/05

which concerns plants, and is referred to as the study of how people interact with all aspects of plants (Martin, 1995). This is because local people have accumulated the indigenous knowledge of collecting local natural resources, especially native plants to use in their life. They are the sources of food, medicine, materials and other purposes. Therefore, its basic tenets are botany and anthropology (Blick, 1996). Ethnobotany consists of collecting a list of plants from group of people and describing their uses. Researchers also use interview method for collecting qualitative data to test hypotheses about the interrelationship between plants and people (Gomez-Beloz, 2002). Questionnaire has been used to gather information on knowledge about population (Holl *et al*., 1999). It is a tool used for collecting qualitative data of researchers who should analyze and infer with reasonable accuracy about a population (Aday, 1989). However, ethnobotanical lists of useful medicinal plants were often inconsistent with information collected from informants (John *et al*., 1990).

This study, we focused on ethnobotany information comprising species list of the useful plants, parts of the plants used, and method of use. It is an important indigenous knowledge and can be the principle data for further researches in usefulness of Thai native plants and sustainable management of this area. This is because local knowledge on use and management of plants is a valuable source of information for designing conservation and social development strategies for the ecological reserve.

MATERIALS AND METHODS

Data and plant specimens were collected during field studies (April 2001, July 2001, November 2001, and April 2002). Fieldwork consisted of interviewing practitioners and plant collection.

Study area and local people

Bung Khong Long Non-Hunting Area is located at Bung Khong Long district, Nong Khai province, in the northeastern region of Thailand. It is at elevation of 155-160 m, 2-5% slope, 17° 50' N, 18° 03' N, and 103° 54' E, 104° 43' E (Wolstencroft *et* al., 1993). The soil at this site is alluvial soil with low to moderate fertility. The climate is tropical monsoon climate with an average annual rainfall of 1,367 mm (range 929-1,998), 87.5% of which falls during the southwest monsoon from May to October. The mean annual temperature is 26.8°C (maximum 43.9°C, minimum 2.5°C). The climate is characterized by a short cool season and longer, hotter dry season (OEPP, 2002). This Non-Hunting Area comprises two parts, swamp and forest. There are two forest areas, which one covers approximately 2.8 km^2 in the central part, called Don Sawan and the other covers approximately 2.5 km^2 in the northern part, called Don Mor Thong (Suebkha, 1997). The two forest areas are lowland evergreen forest which were dominated by main tree species: *Dipterocarpus turbinatus*, *Lagerstroemia calyculata*, *Irvingia malayana*, *Tetrameles nudiflora*, *Ficus altissima* and *Hopea odorata*; shrubs and undergrowth: *Alpinia zerumbet*, *Amomum villosum* var. xanthioides, *Amomum uliginosum*, and *Calamus* sp. The edges of the forest areas are flooded in the rainy season.

Two villages, Ban Don Sawan (58 households) and Ban Bung Charoen (53 households) are adjacent to Don Sawan forest while two villages, Ban Khok Krasae (197 households) and Ban Non Yang Kham (167 households) are adjacent to Don Mor Thong forest. There are 2,566 people in the four villages comprising 1,199 in Ban Khok Krasae, 700 in Ban Non Yang Kham, 386 in Ban Don Sawan, and 281 in Ban Bung Charoen. Most of the households (88.26%) are agriculture specially rice cultivation and pastoral (Bung Khong Long District Health Office, 2002; Tambol Bung Khong Long

Administrative Organization, 2002). Headquarter of the Non-Hunting area is located in Don Sawan forest, therefore it is more protected than Don Mor Thong forest.

Study on ethnobotany

Ethnobotanical studies were conducted in four surrounding villages: Ban Don Sawan, Ban Bung Charoen, Ban Khok Krasae, and Ban Non Yang Kham. We randomly sampled 25% of all households in each village to interview the practitioners according to convenience sampling method, which is merely an available sampling with appears able to offer answers of interest (Baker, 1994). Thus, a total of 121 households of four villages were chosen for interviews consisting of 15 from Ban Don Sawan, 14 from Ban Bung Charoen, 50 from Ban Khok Krasae, and 42 from Ban Non Yang Kham. Field work was divided into two phases: 1) information gathering using data sheets, field notes, and audio cassette recording to document plant use and to compile a species list, and 2) field trips with practitioners to collect voucher specimens in the two forest areas.

The specimens were photographed, packed in the plastic bags for making dry herbarium mounts or kept in the bottles filled with 70% formaline aceto alcohol, FAA (50 parts 95% ethyl alcohol; 40 parts distilled water; 5 parts 38% formalin) (Savile, 1973) and taken to the laboratory for further identification. Plant specimens were identified as belonging to families and species based on Henderson (1959), Larsen *et al*. (1984), Nielsen (1985), Jain and De Fillipps (1991), and by specialists. The voucher specimens were deposited in herbarium of Botany section, Faculty of Liberal Arts and Science, Kasetsart University, Kamphaengsaen Campus, Nakhon Pathom province, Thailand.

RESULTS AND DISCUSSION

Ethnobotanical plants

Plants used by local people represented a wide range of genera and families. A total of 203 species, 128 genera, and 67 families of plants were specified as ethnobotanical plants by local people (Table 3). They were divided into 4 groups according to life form such as tree, shrub, herb, and vine. The useful plant species were mostly trees of 97 species (47%) whereas 36 were shrubs (18%), 36 were herbs (18%), and 34 were vines (17%) (Table 1). The ethnobotanical plants were distributed in several families, however nearly 38.4% of the total belonged to the following families: Euphorbiaceae (16 species), Annonaceae (12 species), Guttiferae (9 species), Moraceae (9 species), Rubiaceae (9 species), Papilionaceae (8 species), Zingiberaceae (8 species), and Dipterocarpaceae (7 species).

We divided the ethnobotanical plants into 4 categories according to their utilization such as edible, medicinal, construction material, and other

Table 1 Plants in Bung Khong Long Non-Hunting Area used by the villagers arranged by taxonomic rank, life form, and use category.

Category	Taxonomic rank			Number of species categorized by life form			
	Families	Genera	Species	Tree	Shrub	Herb	Vine
All ethnobotanical	67	128	203	97 (47%)	36 (18%)	36 (18%)	34 (17%)
Edible	44	84	108 (53.2%)	51	20	24	13
Medicinal	38	70	76 (37.4%)	24	19	14	19
Construction materials	9	13	14 (6.9%)	14	-	-	-
Other purposes	25	35	40 (19.7%)	24	-	4	5

Note: Some species overlapped among these four categories.

purposes. However, some species overlapped among these categories. Most of them, 108 species (53%) were used as edibles whereas 76 (37%) as medicinals, 14 (7%) as construction materials, and 40 (20%) for other purposes (Table 1). Some species were used in several ways depended on plant parts such as leaf, fruit, stem, flower, bark, root, seed, whole plant and others. Leaf is the most frequently utilized plant part (Table 2).

Edible plants

The edible plants (108 species) were distributed in 84 genera and 44 families. Parts of plants for edible are leaf, fruit, seed, stem (herb), branch, and rhizome. They were consumed as fresh, soft boiled, or grilled vegetables, and required cooking.

Of all edible species, 60 were consumed as fruits. Most of these (55 species) were eaten as fresh fruits (ripe or raw) such as *Syzygium polyanthum, Nephelium hypoleucum, Antidesma ghaesembilla, Willughbeia edulis,* and *Acronychia pedunculata.* Ripe fruits of *Syzygium polyanthum* are quite sweet mixed sour so they were consumed as fresh fruit, and were collected in its fruiting season for selling. Fruits of some species required cooking such as *Oroxylum indicum*, *Markhamia stipulata* var. stipulata, *Fernandoa adenophylla, Castanopsis acuminatissima,* and *Castanopsis tribuloides.* Pods of *Oroxylum indicum* were grilled, and then sliced for eating with sauce of chili, but sometimes they were eaten as soft boiled vegetable. In addition its flowers were consumed as fresh or soft boiled vegetable, which are quite bitter.

Leaves of 54 species were gathered as food, of which 33 were eaten as fresh vegetables such as *Syzygium gratum* var. gratum, *Sauropus androgynus, Cratoxylum formosum, Cratoxylum formosum* subsp. pruniflorum, and *Blumea napifolia*. Leaves of some species required cooking such as *Cleidion spiciflorum*, *Colubrina asiatica*, *Acacia concinna, Dalbergia stipulacea,* and *Garcinia gracilis*. Young fresh or soft boiled leaves of *Sauropus androgynus* were eaten with sauce of chili, and sometimes were cooked together with ant's eggs as a curry. Young leaves of *Limnophila aromatica* have special flavour, which were consumed as fresh or soft boiled vegetable and gathered for selling. Leaves of some tree species of genus Cratoxylum (Family Guttiferae) such as *C. formosum*, *C. formosum* subsp. pruniflorum, *C. cochinchinense* subsp. pruniflorum have sour taste, which were gathered as fresh vegetables for eating with minced meat. Green leaves of *Garcinia gracilis*, *Baccaurea ramiflora,* and *Acacia concinna* have sour taste so they were used as flavouring materials in curries or minced meat. Leaves of *Cissampelos pareira* var. hirsuta were squashed in water until it become gelatinous slime, which was used as main material in desserts or curries.

Flowers of some species were consumed as fresh vegetables such as *Sterospermum cylindricum, Fernandoa adenophylla,* and *Markhamia stipulata* var. stipulata, whereas a few required cooking such as *Orxylum indicum* and *Acrocarpus fraxinifolius.*

Table 2 Plant parts gathered by the villagers collectively categorized.

Category	No. of species of plant parts												
	Root	Rhizome	Bark	Stem	Duramen	Gum	Branch	Leaf	Petiole	Flower	Fruit	Seed	Whole plant
Edible	2	1	-	3	-	-	-	54	2	6	60	2	-
Medicinal	12	3	7	37	7	3	9	29	-	-	3	-	1
Construction materials	-	-	-	14	-	-	-	-	-	-	-	-	-
Other proposes	-	-	7	17	-	1	7	3	-	6	9	-	2

Medicinal plants

The medicinal plants (76 species) were distributed in 70 genera and 38 families. Parts of plants were used in medicinal preparations including stem, leaf, root, branch, bark, duramen, rhizome, and gum. In some instances the whole plant was used with root included. The most frequently utilized plant part was the stem (37 species e.g., *Anamirta cocculus, Ficus foveolata, Ziziphus attopoensis, Combretum acuminatum,* and *Salacia verrucosa*), followed by the leaf (29 species e.g., *Actinosaphne henryi, Ziziphus attopoensis, Thunbergia laurifolia, Croton poilanei,* and *Croton robustus*) and the root (12 species e.g., *Cinnamomum porrectum, Hedychium coccineum, Ichnocarpus frutescens, Rothmannia wittii,* and *Xanthophyllum glaucum*). Mostly, they were prepared by decoction made with water to remedy chronic illnesses such as hypertension, stomach ulcers, diarrhea, muscle ache, and so on. The preparations were usually taken daily until the symptoms disappear. Some plants were freshly used and some were used in dried form. However, they were sun-dried, and then septarated into several small packages and stored for later use. Some medicinal plants are brought to plant in household's garden if they are often used.

Medicinal plants were often used in many households such as *Anamirta cocculus*, *Ficus foveolata*, and *Ziziphus attopoensis*. The most frequently utilized species was *Anamirta cocculus* because it can cure arthritis, hypertension, diabetes and muscle ache (body relaxing), as reported by The Medicinal Plant Information Center, Faculty of Pharmacy, Mahidol University (Bunyapraphatsara, 1996). Its fresh or dried stem was chopped and prepared by decoction, singly or mixed with other medicinal plants. However, stem of *Anamirta cocculus* has a bitter taste so it was mixed with bark of *Albizia myriophylla* which has a sweet taste. In addition, bark of *Albizia myriophylla* was also used to refresh bronchia. Some people immersed dried stems of *Albizia myriophylla* in the liqueur and stored for drinking. *Anamirta cocculus* was found in large quantities around these forest areas and had high market value. Therefore, this plant is stealthily harvested by some people for selling.

Stem of *Ficus foveolata* was chopped and prepared by decoction or immersing in the liqueur for drinking for body nourishment and body relaxing. It was immersed in the liqueur, singly or mixed with other medicinal plants especially stem of *Ziziphus attopoensis.* Some parts of *Ziziphus attopoensis* such as green leaf, stem, and root were prepared by decoction for body nourishment and body relaxing. These parts of it were used either fresh or dried. Some people prepared by chopping its stem and root, and then immersed in the liqueur for drinking like *Ficus foveolata*.

Construction material plants

At least 14 woody plants (diameter at breast high of stem about 13 cm up) distributed in 13 genera and 9 families such as family Dipterocarpaceae: *Anisoptera castata*, *Dipterocarpus alatus*, *Hopea ferrea*, *Hopea odorata*, and *Sindora siamensis*; family Papilionaceae: *Dalbergia oliveri* were used as construction and building materials in carpentry, woodwork, furniture making, and utensils. However, at present, these plants are protected by the Non-Hunting Area's regulations because they are mainly large trees in these forest areas.

Other purposes

At least 40 ethnobotanical species in 35 genera and 25 families were used for various purposes such as incense, worship, dye, fuel, crafts, feeds, regional belief and so on. Several parts of plants such as stem, fruit, branch, bark, flower, leaf, gum, and whole plant were gathered for use.

Barks of *Syzygium gratum* var. gratum and *Syzygium polyanthum* were used to dye nets to enhance the strength. Branches of *Aganonerion polymorphum* and *Alstonia scholaris* were used as

material for making tools for use in the house such as shuttles, spools of thread, and reels of weaving. Gum of *Dipterocarpus turbinatus* was used as fuel of torches because it is inflammable and low smoke. The gum was packed in the leaves of *Ancistrocladus tectorius*. Bark of *Diospyros transitoria* was air-dried, ripped until it became line, immersed in the water over night, and then sun-dried before use as rope. Branch of *Bridelia ovata* was used as main shaft of thatches. Fruits of some plants such as *Goniothalamus loaticus*, *Mallotus philippensis*, and *Clerodendrum colebrookianum* were harvested as feeds of cows and water buffaloes.

Most handicrafts were tools for fisheries use because the villages are located around Bung Khong Long reservoir. Stem of *Combretum pilosum*, and branch and stem of *Cleistanthus polyphyllus* were gathered as materials for making fish traps. A few fern species such as *Stenochlaena palustris* and *Lygodium microphyllum* were used for making small fish traps. Leaves of *Pandanus* sp1. were used as materials for weaving mat which has special fragrance.

Plants used for religious belief were *Fagraea fragrans*, *Kailasenia lineata*, and *Ixora ebarlanta*. Their flowers were used to worship the images of Buddha and offer to the monks. Flowers of *Schima wallichii* were used to predict rainfall quantities. If most of fallen flowers turn up, local people belief that there will be heavy rainfall in that year.

Table 3 Ethnobotanical plants in Bung Khong Long Non-Hunting Area used by the villagers.

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
1	Acanthaceae						
	1 *Andrographis paniculata*[*]	H		+			Stems were boiled with water for body relaxing.
	2 *Barleria strigosa* [*]	S	+	+			Roots, stems and leaves were boiled with water for curing abdominal pain; Grilled young leaves were eaten (Mar - Jun).
	3 *Sericocalyx schomburgkii* [*]	S	+				Ripe fruits were eaten (Apr - May).
	4 *Thunbergia laurifolia*[**]	V		+			Fresh leaves were boiled with water for curing poison.
2	Amaranthaceae						
	5 *Achyranthes aspera*	H		+			Whole parts were boiled with water for body relaxing.
3	Anacardiaceae						
	6 *Bouea macrophylla* [**]	T	+				Ripe fruits were eaten (Mar - Apr).
4	Ancistrocladaceae						
	7 *Ancistrocladus tectorius* [**]	S		+		+	Leaves for pack punks; Stems were boiled with water for curing purgative.
5	Annonaceae						
	8 *Alphonsea glarrifolia*	S	+				Ripe fruits were eaten (Aug- Nov).
	9 *Desmos cochinchinensis* [*]	S	+				Ripe fruits were eaten (Oct - Nov).
	10 *Goniothalamus laoticus*	T				+	Branches for bamboo sliver; Fruits as feeds. (Apr - Jul).
	11 *Polyalthia asteriella* [**]	T	+				Young leaves as fresh or soft boiled vegetables. (Sept - Oct); Ripe fruits were eaten (Sept- Oct).
	12 *Polyalthia cerasoides*	S		+			Stems and branches for curing crossbow.
	13 *Polyalthia debilis*[*]	S	+				Ripe fruits were eaten (Mar - May).
	14 *Polyalthia evecta*	T				+	Fruits as feeds (Mar - May).
	15 *Polyalthia suberosa* [*]	S	+				Young leaves as fresh vegetables (May - Aug).
	16 *Mitrephora vandaeflora* [**]	T	+				Ripe fruits were eaten (Jun- Oct).

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
	17 *Orophea polycarpa* *	S	+	+			Stems were boiled with water for diarrhea; Young leaves as fresh vegetables.
	18 *Uvaria pierrei*	V	+				Ripe fruits were eaten (Apr - May).
	19 *Uvaria rufa*	V	+				Dried fruits as betel palm. (Mar - Jul); Ripe fruits were eaten (Mar - May).
6	Apocynaceae						
	20 *Aganonerion polymorphum* *	V				+	Branches for spindles.
	21 *Alstonia scholaris* *	T				+	Stems and branches for bobbins and spindles.
	22 *Holarrhena curtisii* **	S				+	Flowers for worship monks and Buddha's images.
	23 *Parameria laevigata* **	V				+	Stems for making traps.
	24 *Ichnocarpus frutescens*	V		+			Dried roots for mixing with water for curing skin disease; Gum for curing mouth wound.
	25 *Willughbeia edulis* **	V	+				Ripe fruits were eaten (Mar - Apr).
7	Araceae						
	26 *Alocasia macrorrhizos**	H	+				Grilled young leaves and petiole were eaten.
	27 *Amorphophallus campanulatus*	H	+				Roots and petioles were cooked.
	28 *Colocasia esculenta*	H	+				Steamed young leaves as vegetables.
	29 *Pothos scandens*	H		+			Roots were boiled with water for gallstone; Stems were boiled with water for curing abdominal pain.
	30 *Scindapsus officinalis* *	V		+			Stems and leaves were boiled with water for body nourishment.
8	Bignoniaceae						
	31 *Fernandoa adenophylla* **	T	+				Flowers as fresh vegetables. (Oct- Nov); Grilled fruits were eaten (Nov - Dec).
	32 *Markhamia stipulata* ** var. stipulata	T	+				Flowers as fresh vegetables. (Oct- Nov); Fruits were cooked (Nov - Dec).
	33 *Orxylum indicum* **	T	+			+	Barks and stems for weaving mats; Flowers as fresh or soft boiled vegetables. (Mar - Jun); Grilled fruits were eaten (Mar - Jun).
	34 *Sterospermum cylindricum***	T	+				Flowers as fresh vegetables (Aug - Nov).
9	Bombacaceae						
	35 *Bombax anceps* var. *anceps*	T			+		Wood for constructions.
10	Boraginaceae						
	36 *Heliotropium indicum**	H		+			Stems and leaves were boiled with water for increasing mother milk.
11	Caesalpianiaceae						
	37 *Acrocarpus fraxinifolius* **	T	+	+			Stems and branches were boiled with water for curing stomach pain; Flowers as soft boiled vegetables.
	38 *Caesalpinia sappan* **	T		+			Duramen and branches were boiled with water for blood nourishment.
	39 *Cassia bakeriana*	T		+			Barks were boiled with water for curing stomach pain.
	40 *Dialium cochinchinensis* *	T	+				Ripe fruits were eaten (Aug- Nov).
	41 *Senna alata* **	T	+	+			Young leaves were boiled with water for soft purgative; Young leaves as vegetables.
12	Capparaceae						
	42 *Capparis micracantha*	S		+			Stems and branches were boiled with water for increasing mother milk.

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
13	Celastraceae						
	43 *Salacia chinensis* *	S		+			Fresh fruits for curing purgative.
	44 *Salacia verrucosa* **	S	+	+			Roots, stems and branches were boiled with water for curing purgative; Ripe fruits were eaten (Mar - May).
14	Chrysobalanaceae						
	45 *Parinari anamense*	T		+			Leaves were boiled with water for curing stomach pain.
15	Combretaceae						
	46 *Combretum acuminatum* **	V		+			Stems and leaves were boiled with water for body nourishment.
	47 *Combretum pilosum* **	V				+	Stems for making traps.
	48 *Getonia floribunda*	V		+			Leaves for curing wound.
	49 *Terminalia alata*	T		+	+		Wood for constructions; Barks, stems and branches were boiled with water for curing vomit.
	50 *Terminalia bellirica* **	T		+			Fresh fruits for curing cough (Aug - Jan).
16	Compositae						
	51 *Acmella oleracea* **	H	+				Young leaves as vegetable.
	52 *Blumea napifolia* **	H	+				Young leaves as fresh vegetables (Jan - Sept).
	53 *Chromoleana odoratum* *	H		+			Fresh leaves for curing wound.
	54 *Emilia sonchifolia* *	H	+				Fresh stems, leaves and young leaves as vegetables.
	55 *Laggera alata*	H		+			Stems and leaves were boiled with water for body relaxing.
	56 *Synedrella nodiflora* **	H	+				Young leaves as fresh vegetables.
17	Convallariaceae						
	57 *Aspidistra sutepensis* *	H	+				Young leaves as fresh vegetables.
18	Costaceae						
	58 *Costus speciosus* *	H	+				Steamed young leaves and fruits as vegetables.
19	Cyperaceae						
	59 *Cyperus rotundus*	H				+	Whole parts as animal feeds.
20	Datiscaceae						
	60 *Tetrameles nudiflora*	T				+	Stems for making containers for steaming rice.
21	Dipterocarpaceae						
	61 *Anisoptera castata*	T			+		Wood for constructions.
	62 *Dipterocarpus alatus*	T			+		Wood for constructions.
	63 *Dipterocarpus turbinatus*	T				+	Gum for punks.
	64 *Hopea ferrea*	T			+		Wood for constructions.
	65 *Hopea odorata*	T			+		Wood for constructions.
	66 *Shorea roxburghii*	T		+			Duramen and barks for clean foot.
	67 *Sindora siamensis*	T			+		Wood for constructions.
22	Ebenaceae						
	68 *Diospyros transitoria* *	T				+	Barks as rope to tie the thatches.
23	Elaeocarpaceae						
	69 *Elaeocarpus hygrophilus*	T	+				Ripe fruits were eaten (Aug- Nov).
	70 *Elaeocarpus hainanensis* **	S		+			Stems were boiled with water for increasing mother milk.
24	Ericaceae						
	71 *Lyonia foliosa* **	S	+				Young leaves as fresh or soft boiled vegetables (Apr - Oct).

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
25	Euphorbiaceae						
	72 *Antidesma acidum*	T	+				Ripe fruits were eaten (Mar- Sept).
	73 *Antidesma ghaesembilla* **	S	+	+			Young leaves were boiled with water for blood nourishment; Ripe fruits were eaten (Mar- Sept).
	74 *Aporosa ficifolia*	T	+				Young leaves as fresh vegetables. (Mar- Apr); Ripe fruits were eaten (Apr- Nov).
	75 *Baccaurea ramiflora* **	T	+		+		Young leaves as fresh vegetables (Mar- Apr); Wood for constructions.
	76 *Bridelia ovata* *	S		+		+	Branches as main structure of thatches; Barks were boiled with water for blood nourishment.
	77 *Bridelia stipularis* *	V				+	Stems for making traps.
	78 *Cleistanthus polyphyllus* **	S				+	Stems for making traps.
	79 *Cleidion spiciflorum* *	T	+				Young leaves were grilled or soft boiled as vegetables.
	80 *Croton acutifolius* *	T	+				Ripe fruits were eaten (Apr).
	81 *Croton poilanei* *	T		+			Pound leaves for curing wound.
	82 *Croton robustus* *	T		+			Warmed leaves for curing wound.
	83 *Glochidion sphaerogynum*	T			+		Wood for constructions.
	84 *Hymenocardia wallichii*	T	+				Fresh fruits were eaten (Mar - Jun).
	85 *Mallotus philippensis*	T				+	Fruits as animal feeds (Sept - Nov).
	86 *Sauropus androgynus* **	S	+				Young leaves as fresh or soft boiled vegetables.
	87 *Suregada multiflorum*	T	+				Ripe fruits were eaten (May - Jun).
26	Fagaceae						
	88 *Castanopsis acuminatissima*	T	+				Grilled or soft boiled fruits were eaten (Jul- Aug).
	89 *Castanopsis tribuloides*	T	+				Grilled or soft boiled fruits were eaten (Jul- Aug).
27	Flacourtiaceae						
	90 *Hydnocarpus ilicifolius*	T		+			Stems for mixing with other medicinal plants.
28	Gentianaceae						
	91 *Fagraea fragrans*	T				+	Stems for chopping block; Flowers for worship monks and Buddha's images (Mar - Apr).
	92 *Fagraea racemosa*	T			+	+	Wood for constructions; Stems for chopping block; Flowers for worship monks and Buddha's images (Apr- Jun).
29	Gnetaceae						
	93 *Gnetum latifolium* var. funiculare	V	+				Ripe fruits were eaten (Apr - Nov).
	94 *Gnetum macrostachyum*	V		+			Stems were boiled with water for blood nourishment.
30	Guttiferae						
	95 *Cratoxylum cochinchinense* subsp. pruniflorum **	T	+				Young leaves as fresh vegetables.
	96 *Cratoxylum formosum* **	T	+				Young leaves as fresh vegetables.
	97 *Cratoxylum formosum* subsp. pruniflorum **	T	+				Young leaves as fresh vegetables.
	98 *Cyrtococcum patens* *	H	+				Leaves were cooked.
	99 *Garcinia cowa* **	T	+				Young leaves for sour taste (Aug - Sept); Ripe fruits were eaten (Apr- Jun).
	100 *Garcinia gracilis* **	S	+				Ripe fruits were eaten (Mar - May); Leaves for sour taste.
	101 *Garcinia schomburgkiana* *	T	+				Ripe fruits were eaten (Jun- Jul).
	102 *Garcinia speciosa*	T	+				Ripe fruits were eaten (Apr - May).

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
	103 *Ichnanthus vicinus*	H				+	Whole parts as feeds.
31	Irvingiaceae						
	104 *Irvingia malayana* **	T	+				Pan-broiled seeds were eaten.
32	Labiatae						
	105 *Clerodendrum colebrookianum*	T	+			+	Fruits as feeds (Apr- Oct); Stems and leaves as fresh vegetables.
	106 *Vitex quinata* *	T	+				Ripe fruits were eaten (May - Sept).
33	Lauraceae						
	107 *Actinodaphne henryi* **	T		+			Leaves were boiled with water for curing insect toxin and for body relaxing.
	108 *Cinnamomum porrectum* **	T		+			Roots, stems and leaves were boiled with water for curing abdominal pain.
	109 *Cinnamomum subsvenium* **	T		+			Barks were boiled with water for curing abdominal pain.
	110 *Litsea glutinosa*	T				+	Pound leaves mixed water from washing rice as shampoo.
34	Lecythidaceae						
	111 *Barringtonia acutangula*	T	+				Ripe fruits were eaten (Mar- Apr).
35	Lythraceae						
	112 *Lagerstroemia calyculata* *	T			+		Wood for constructions.
36	Melastomataceae						
	113 *Melastoma malabathricum* subsp. malabathricum	S	+	+			Roots were boiled with water for curing dysentery; Ripe fruits were eaten.
	114 *Melastoma saigonense*	S	+				Ripe fruits were eaten.
	115 *Memecylon edule*	T	+				Young leaves as fresh or soft boiled vegetables.
	116 *Memecylon obovatum*	T	+				Ripe fruits were eaten (Mar - May).
37	Meliaceae						
	117 *Aglaia rubiginosa*	T	+				Ripe fruits were eaten (Mar- Apr).
	118 *Aphanamixis polystachya*	T				+	Fruits as animal feeds (Apr).
	119 *Sandoricum koetjape* **	T	+				Ripe fruits were eaten (Mar - Apr).
	120 *Walsuru trichostemon* **	T	+				Ripe fruits were eaten (Sept- Oct).
38	Menispermaceae						
	121 *Anamirta cocculus* **	V		+			Stems and leaves were boiled with water for body nourishment.
	122 *Cissampelos pareira* var. hirsuta *	V	+	+			Leaves for mixing with other medicinal plants; Leaves were cooked.
	123 *Stephania pierrei*	V		+			Dried roots were boiled with water for body nourishment.
	124 *Tinospora crispa* *	V		+			Stems were boiled with water for curing cough.
	125 *Tiliacora triandra* **	V	+				Stems and leaves were cooked.
39	Mimosaceae						
	126 *Acacia concinna* **	V	+				Leaves for sour taste.
	127 *Albizia myriophylla* **	V		+			Stems were boiled with water for body nourishment.
40	Moraceae						
	128 *Artocarpus lacucha* *	T	+				Young leaves for sour taste (Mar - Jun).
	129 *Antiaris toxicaria*	T		+			Gum was boiled with water for curing liver cancer.
	130 *Broussonetia papyrifera*	T				+	Barks as rope to tie the thatches.
	131 *Ficus altissima*	T				+	Fruits as animal feeds.
	132 *Ficus foveolata* *	V		+			Stems were immersed in the liqueur or were boiled with water for body relaxing.

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
	133 *Ficus hirta*	T	+				Ripe fruits were eaten (May - Jun).
	134 *Ficus hispida*	T	+				Ripe fruits were eaten (May - Jun).
	135 *Ficus nervosa*	T	+				Ripe fruits were eaten (May - Jun); Young leaves as fresh vegetables (May. - Aug).
	136 *Streblus asper*	T		+		+	Leaves for clean fish. Branches for clean tooth; Warmed barks for tooth filled.
41	Myristicaceae						
	137 *Knema furfuracea*	T		+			Stems, branches, duramen and leaves were boiled with water for blood nourishment.
42	Myrsinaceae						
	138 *Ardisia helferiana* *	T	+				Ripe fruits were eaten (Mar - Jun); Young leaves as fresh or soft boiled vegetables (Mar- Sept).
	139 *Ardisia longipedicellata* *	S	+				Young leaves as fresh vegetables (Mar- Jun); Ripe fruits were eaten (Mar- Jul).
43	Myrtaceae						
	140 *Syzygium angkae* subsp. angkae	T			+	+	Wood for constructions; Barks for dyeing nets; Fruits as feeds.
	141 *Syzygium claviflorum*	T				+	Barks for dyeing nets. Fruits as feeds.
	142 *Syzygium gratum* var. gratum**	T	+			+	Barks for dyeing nets; Young leaves as fresh vegetables; Ripe fruits were eaten (Apr - May).
	143 *Syzygium polyanthum* **	T	+			+	Barks for dyeing nets; Ripe fruits were eaten (Apr - Jun).
44	Ochnaceae						
	144 *Gomphia serrata* *	S		+			Stems and leaves for mixing with other medicinal plants.
45	Oleaceae						
	145 *Chionanthus callophyllus* *	S	+	+			Stems were immersed in the liqueur for body nourishment; Young leaves as soft boiled vegetables (Mar - Nov).
46	Onagraceae						
	146 *Justicia fragilis*	S		+			Stems and leaves boiled with water for body relaxing.
47	Palmae						
	147 *Calamus* sp.1	S	+	+		+	Stems for bloom; Stems were boiled with water for curing purgative; Young leaves as fresh or soft boiled vegetables.
	148 *Calamus* sp.2	H	+				Young leaves as fresh or soft boiled vegetables.
	149 *Caryota urens*	S	+				Young leaves as soft boiled vegetables; Dried fruits as betel palm.
48	Pandanaceae						
	150 *Pandanus* sp1.	S				+	Leaves for making mats.
49	Papilionaceae						
	151 *Collerya atropurpurea*	T	+				Steamed fruits were eaten (Apr- Jun).
	152 *Dalbergia oliveri*	T			+		Wood for constructions.
	153 *Dalbergia stipulacea* **	V	+				Leaves and young leaves were cooked.
	154 *Dalbergia velutina*	T		+			Duramen was boiled with water for curing partial paralysis.
	155 *Desmodium triflorum*	H		+			Leaves for curing wound.
	156 *Derris alborubra*	V		+			Stems were boiled with water for curing gastritis.
	157 *Derris elliptica* **	V		+			Stems for kill fish.
	158 *Uraria crinita* *	S		+			Leaves for curing fresh wound.

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
50	Piperaceae						
	159 *Peperomia pellucida*	H	+				Stems, young leaves and leaves as soft boiled vegetables.
	160 *Piper aurantiacum* *	H	+				Leaves as fresh vegetables.
51	Polygalaceae						
	161 *Polygala arillata*	S		+			Roots, stems and branches were boiled with water for curing diarrhea.
52	Pteridaceae						
	162 *Stenochlaena palustris* **	H	+			+	Stems for making traps; Young leaves as fresh vegetables.
53	Rhamnaceae						
	163 *Colubrina asiatica* **	S	+				Young leaves as soft boiled vegetables.
	164 *Vntilago denticulata*	H		+			Roots and stems were boiled with water for body relaxing.
	165 *Ziziphus attopoensis* **	V		+			Roots, stems and leaves were boiled with water for body nourishment.
	166 *Zizyphus cambodiana* *	V	+				Ripe fruits were eaten (Apr).
	167 *Zizyphus oenoplia* *	S	+				Ripe fruits were eaten.
54	Rhizophoraceae						
	168 *Carallia brachiata*	T	+	+			Barks and duramen were boiled with water for curing jaundice; Ripe fruits were eaten (Jun- Aug).
55	Rubiaceae						
	169 *Catunaregam tomentosa*	T		+		+	Fruits as soaps; Stems and branches were boiled with water for represent fireplace after childbirth.
	170 *Ixora ebarlanta* *	T				+	Flowers for worship monks and Buddha's images (Oct).
	171 *Kailasenia lineata* *	S				+	Flowers for worship monks and Buddha's images (Apr).
	172 *Morinda coreia*	T		+			Leaves were boiled with water for curing parasite.
	173 *Nauclea orientalis*	T		+	+		Wood for constructions; Duramen and branches were boiled with water for curing jaundice.
	174 *Oxyceros horridus*	V		+			Roots were boiled with water for curing tuberculosis.
	175 *Parthenocissus quinguefolia* *	V		+			Stems for mixing with other medicinal plants.
	176 *Rothmannia wittii*	T	+	+			Roots were boiled with water for blood nourishment; Ripe fruits were eaten (Apr - Aug).
	177 *Wendlandia tinctoria*	S		+			Duramen for mixing with other medicinal plants.
56	Rutaceae						
	178 *Acronychia pedunculata* *	T	+				Ripe fruits were eaten (Mar- Jul).
	179 *Micromelum minutum*	S		+			Stems were boiled with water for body relaxing.
	180 *Uncaria homomalla*	V		+			Stems were boiled with water for body nourishment.
	181 *Zanthoxylum limonella*	T	+				Pound seeds as condiment.
57	Sapindaceae						
	182 *Lepisanthes rubiginosa* **	T	+				Ripe fruits were eaten (Apr - Aug).
	183 *Nephelium hypoleucum* **	T	+				Ripe fruits were eaten (Mar - Apr).
58	Schizaeaceae						
	184 *Lygodium microphyllum* **	H	+			+	Stems for making traps; Young leaves as fresh vegetables.
59	Scrophulariaceae						
	185 *Adenosma indiana*	H		+			Stems and leaves were boiled with water for blood nourishment.

Table 3 (Continued).

	Family / Species	Life form	Category				Plant parts / Application
			Ed	Md	Co	Ot	
	186 *Limnophila aromatica* **	H	+				Young leaves and leaves as fresh or soft boiled vegetables (Nov).
60	Smilaceae						
	187 *Smilax davidiana* *	V	+			+	Stems for handicraft; Fresh fruits were eaten (Mar - Jun).
	188 *Smilax glabra*	V	+	+			Stems were boiled with water for curing hemorrhoids; Fresh fruits were eaten (Mar - May).
	189 *Smilax siamensis* *	V	+				Fresh fruits were eaten (Mar - May).
61	Sterculiaceae						
	190 *Pterospermum acerifolium*	T				+	Stems and branches are use as charcoal.
62	Theaceae						
	191 *Schima wallichii* *	T				+	Flowers for predicting rainfall.
63	Tiliaceae						
	192 *Microcos tomentosa*	T	+				Ripe fruits were eaten (Aug- Nov).
64	Umbelliferae						
	193 *Centella asiatica* **	H	+				Fresh young leaves as vegetables.
65	Vitaceae						
	194 *Tetrastigma obovatum*	V	+				Leaves for sour taste.
66	Xanthophyllaceae						
	195 *Xanthophyllum glaucum* *	T	+	+			Roots were boiled with water for curing fever; Steamed young leaves as vegetables (Sept - Oct).
67	Zingiberaceae						
	196 *Alpinia galanga* **	H	+				Fresh young leaves as vegetables.
	197 *Alpinia malaccensis* **	H	+	+			Rhizomes were boiled with water for curing abdominal pain; Fresh young leaves as vegetables (Mar - Jun).
	198 *Alpinia zerumbet* *	H	+				Young leaves and flowers as fresh or soft boiled vegetables; Ripe fruits were eaten (Mar - Jun).
	199 *Amomum uliginosum* **	H	+	+			Ripe fruits were eaten; Stems for mixing with other medicinal plants; Young leaves were cooked (Jun-Aug).
	200 *Amomum villosum* var. xanthioides **	H	+	+			Fruits were boiled with water for curing abdominal pain. (Aug - Nov); Rhizomes as fresh or soft boiled vegetables (Aug - Nov).
	201 *Globba schomburghii* *	H	+				Fresh or steamed young leaves as vegetables (Jun - Aug).
	202 *Hedychium coccineum* **	H	+	+			Rhizomes were boiled with water for curing abdominal pain; Young leaves as fresh vegetables.
	203 *Kaempferia pulchra*	H		+			Steamed rhizomes, stems and leaves for curing wound.

Note: Life form: T=tree, S=shrub, H=herb, V=vine; Category: Ed=edible, Md=medicinal, Co=construction materials, Ot=other purposes; Frequency of gathering and using: (*) common, (**) most common.

CONCLUSION

From our finding, it is evident that this region is a valuable ethnobotanical heritage. Plants used by the villagers represented a wide range of genera and families. Useful plants was for household consumption more than selling. These two forest areas were the most important source of plant materials to the villagers, which gathered the useful plants for the whole year. The Don Mor Thong forest was less protected than the Don Sawan forest because the headquarter of Non-Hunting Area is stationed at Don Sawan forest. The results of this study can be the principle data for further researches and sustainable management of this area because plant utilization is related to biological conservation. We recommend that phytochemical and pharmacological studies should be carried out in order to confirm the validity of the medicinal plant use.

ACKNOWLEDGEMENTS

This work was supported by the TRF/ BITEC Special Program for Biodiversity Research and Training grant BRT T_144011. We thank the staff of Bung Khong Long Non-Hunting Area for their help in the field. In particular our thanks go to two specialists who provided assistance in the identification of vouchers: Asst. Prof. Somnuek Pongumphai and Asst. Prof. Wichan Eidthong (The Faculty of Forestry, Kasetsart University). We also are grateful to Dr. Chavalit Vidthayanon (WWF International Thailand Programme) for his introduction of this area. Last but not least we would like to thank the villagers for sharing their ethnobotanical knowledge.

LITERATURE CITED

Aday, L.A. 1989. **Designing and Conducting Health Surveys**. Jossey-Bass Inc., San Francisco. 253 p.

Baker, T. L. 1994. **Doing Social Research**. McGraw-Hill Book Inc., Singapore. 499 p.

Blick, M.J. 1996. Transforming Ethnobotany for the New Millennium Andes of Northern Chile**. Economic Botany** 37(1): 120-135.

Bung Khong Long District Health Office. 2002. **Annual Report Year 2002 of Bung Khong Long District Health Office**. Bung Khong Long District, Nong Khai. (*in Thai*)

Bunyapraphatsara, N. 1996. **Medicinal Plants of the Region Vol. 4**. The Medicinal Plant Information Center, Faculty of Pharmacy, Mahidol Univ., Bangkok. 895 p. (*in Thai*)

Gomez-Beloz, A. 2002. Plant use knowledge of the Winkina Warao: The case for questionnaires in Ethnobotany. **Economic Botany** 56(3): 231-241.

Groombridge, B. 1992. **Global Biodiversity: Status of the Earth's Living Resources / A Report Complied by the World Conservation Monitoring Centre**. Chapman & Hall Publ., London. 585 p.

Henderson, M.R. 1959. **Malayan Wild Flowers**. Part 1. Kelly & Walsh Ltd., Singapore. 450 p.

Holl, K.D., G.C. Daily, S.C. Daily, P.R. Erlich, and S. Bassin. 1999. Knowledge of the altitudes toward population growth and the environment: university students in Costa Rica and the United States. **Environment Conservation** 26(1): 66-74.

ICUN. 1986. **Plant in Danger: What Do We Know?** Gland, Switzerland. 40 p.

Jain, J.K. and R.A. De Fillipps. 1991. **Medicinal Plants of India**. Vol. 1-2. Algonac, UK. 849 p.

Johns, T., J.O. Kokwaro and E.K. Kimanani. 1990. Herbal remedies of the Luo of Siya District, Kenya: Establishing Quantitative Criteria for Consensus. **Economic Botany** 44: 368-381.

Larsen, K., S.S. Larsen and J.E. Vidal. 1984. Leguminosae-Caesalpinioideae. **Flora of Thailand**. 4(1): 1-130.

Martin, G.J. 1995. **Ethnobotany: A Methods**

Manual. Chapman & Hall, London. 268 p.

Nielsen, I.C. 1985. Leguminosae-Mimosoideae. **Flora of Thailand**. 4(2): 131-222.

OEPP. 2002. **Biodiversity in Bung Khong Long Wetlands**. Office of Environmental Policy and Planning, Ministry of Science Technology and Environment, Bangkok. 76 p. (*in Thai*)

Savile, D.B.O. 1973. **Collection and Care of Botanical Specimens**. Ottawa, Canada. 128 p.

Suebkha, S. 1997. **Non-hunting area in Thailand.** Wildlife Conservation Division, Natural Resources Conservation Office, Royal Forest Department, Bangkok. 101 p. (*in Thai*)

Tambol Bung Khong Long Administrative Organization. 2002. **Annual Report Year 2002 of Tambol Bung Khong Long Administrative Organization**. Bung Khong Long District, Nong Khai. *(in Thai)*

The National Identity Office. 1998. **Evaluating Status of National Parks, Wildlife Conservation Areas, and Other Protected Areas in Thailand**. Amarin Printing and Publ., Bangkok. 141 p. (*in Thai*)

WCMC. 1994. **Biodiversity Data Sourcebook**. World Conversation Press, Cambridge, UK.