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Traditional Use of Wild Edible Plants of Wetland by Local People in the Lao People's Democratic Republic

Khambay Khamphilavong[1], Chittana Phompila[1*], Metmany Soukhavong[1], Yongxiang Kang[2]

Abstract

This study documents the traditional knowledge and utilization of wild edible plants (WEP) in wetland areas of Savannakhet and Champasack provinces, southern Lao PDR. Through participatory field collection, free listing, and semi-structured interviews with 104 local informants, we identified a total of 174 WEP species belonging to 55 families. A total of 43 plant families were recorded in Champasack and 49 plant families in Savannakhet. The common families a total of 42 families were found to be common to both provinces. Champasack had one unique family (Lycopodiaceae), and Savannakhet had 12 unique families. The study revealed that trees and grasses were the most common growth forms, while Poaceae and Fabaceae were the most species-rich families in both provinces. Plant parts most frequently used included young leaves and fruits, with notable regional variation: Champasack communities used a broader array of plant parts and species than those in Savannakhet. WEP was primarily consumed as vegetables and fruits, with raw and cooked preparations being most common. The study highlights WEP's ecological and cultural significance, its contribution to food security, and the erosion of traditional knowledge due to generational shifts and migration. Conservation of both plant diversity and indigenous knowledge is recommended to sustain local livelihoods and enhance nutritional resilience.

Keywords: Wetland; Traditional knowledge; Wild edible plants; Lao PDR

Introduction

Wetlands are complex ecosystems that provide many ecological, biological, and hydrological functions that are of great value to society [1]. In recent times, a greater scientific understanding of the role of wetlands in the sustainable management of ecosystems and improvement of rural livelihoods has increased public appreciation of wetlands. As a result, society in general is increasingly valuing wetland conservation over converting them for private economic use. Among aquatic systems, wetlands display the greatest seasonal variability of physical and chemical characteristics in response to terrestrial and climatic events [2]. Chemical uptake by salt marshes fluctuates seasonally due to cycles of plant growth and dieback. Plant photosynthesis and standing crop biomass exhibit dramatic seasonal changes in nearly all tidal freshwater vegetation communities. Long-term ecological succession can shift plant species composition in wetlands, altering phytoremediation characteristics. Hydroperiod, soil saturation levels, and submergence duration are main physical forces controlling plant species colonization and survival.

The harvesting and consumption of wild edible plants (WEP) from

Affiliation:
[1]Faculty of Forestry Science, National University of Laos, Don Noun, Laos

[2]College of Forestry, Northwest A and F University, Yangling, Shaanxi, China

***Corresponding author:**
Chittana Phompila, Faculty of Forestry Science, National University of Laos, Noun, Laos.

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agricultural and non-agricultural ecosystems has been documented in a few cultural contexts, illustrating their use and importance among farming households throughout the world [3]. The evidence to date suggests that gathering by farmers occurs in various environments, ranging from intensively farmed areas, to more subsistence oriented horticultural systems, and finally in more pristine areas such as forests. This is certainly the case of rice farmers in South Asia [4,5], in his research on flora from the paddy rice fields in Savannakhet, Laos, recorded 11 edible species from a total of 19 herbaceous useful plants, and 25 food trees out of 86 useful species, a total of 115 wild herbaceous species were observed in the paddy fields of two villages; 52 species found in fields, 95 on levees, and 63 on banks. The documentation of 'wild food plant' gathering and consumption in mainland Southeast Asia is still growing, however the literature is scattered across numerous disciplines [6].

Wild edible plants can be cultivated, but not all cultivated plants are domesticated. For most species, the transition from cultivation to domestication never happens. Human plant management does not necessarily move toward greater intensity and ultimately plant domestication. While some plants are moving towards domestication, other plants that used to be highly managed in the past could be only slightly tolerated and protected under current circumstances. Despite recognizing the important role that wild food plants play for farmers' livelihoods in the southern part of Lao PDR, information is rather scattered throughout different publications, mainly in the Lao language. There is no single study presenting not only an exhaustive list of species but also their local name and, botanical and cultural characteristics, which could serve as a baseline for future research in this area.

Wild edible plants in this study include species that are not locally domesticated, ranging from truly wild to wild but protected, cultivated and semi-domesticated plants that may be locally promoted in situ or ex situ [7]. While we include in our definition 'native' plants, locally domesticated plants are excluded. We use the term 'local' because, since the nature of this research is ethnobotanical, we based our research on these plants that are classified as 'wild' by local people. This is why some food plants that are regarded as 'wild' in Savannakhet and Champasack provinces might be treated as domesticated in other areas. However, our interests were not only on the utilization of foraging wild edible plant resources but also to understand patterns of plant parts used and use categories of wild edible plants by the communities. Besides, use of wild edible plants can illustrate the transition of gathering behavior which may contribute to food security or in some cases simply be a recreational activity. We also wanted to understand the distribution of traditional knowledge of wild edible plants in the population and how it is reflected in the cultural dynamics of the Savannakhet and Champasack. In that context, the research questions were: (1) What is the diversity of wild food plants used in two communities? 2) What is the pattern of plant parts used and what are the categories of these uses? 3) Are wild edible plant choice and use in two communities similar? and 4) Which socio-demographic factors affect the traditional knowledge about wild edible plants? This research is expected to add to the existing literature by providing a comprehensive botanical inventory of these wild plant foods to date with the botanical characteristics, namely growth form and life cycle along with the location of occurrence of the plants.

Materials and Methods

Study area

This research was conducted in four villages at Savannakhet and four villages at Champasack Province Southern part of Lao PDR to provide documentation that 'wild edible plants' are a critical component in the subsistence system of local farmers [8]. The wild edible plants are extremely important as food resource to the rural people comprised of farmers, given that the Southeast region is regarded as both Lao's largest and poorest part of the country.

Savannakhet province is located in the southern part of Lao PDR between 16° to 17° north latitude and 105° to 106° East longitude (Figure 1). Its total area is 21,774 square kilometers, and in the year 2000 it had an estimated population of 757,950, with an average population density of 35 persons per square kilometer [9]. Approximately 75 percent of the total population belongs to the Lao Loum ethnic group, and the rest to the Lao Theung. The topography varies from the low-lying floodplains of the Mekong River to the foothills and mountains of the Annamite chain. Annual rainfall averages approximately 1,440 millimeters per year, with rainfall in the eastern uplands substantially higher than in the lowlands, but periodic droughts and floods are common. Agricultural production is the primary activity in the province, and rice is the major crop grown in the area. According to the government's policy, the agriculture and forestry sectors are the most important to national economic development because they are responsible for carrying out five government aims, as follows [10]. Currently, Savannakhet Province has an estimated 116,809 hectares of rain-fed rice fields and 19,801 hectares of irrigated rice fields, which produce enough rice for both domestic consumption and for sale on the market. The situation is similar with other agricultural activities. For example, the number of domestic livestock being raised is increasing steadily, and presently there are seven buffalo and cattle farms, 79 pig farms, 19 poultry farms, 15,924 man-made fish ponds, and 259 natural fish ponds [10]. The province is also rich in forest resources. In 2000 it still had approximately 70 percent forest cover and included three national biodiversity conservation areas (NBCA): Phou Xang He (109,900 ha), Dong Phou Vieng

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(197,000 ha), and Xe Bang Noun (150,000 ha). In terms of the economic aspect, there are two state production forests in the province: Dong Ka Pho (9,600 ha) and Dong Si Thounh (212,000 ha) [10].

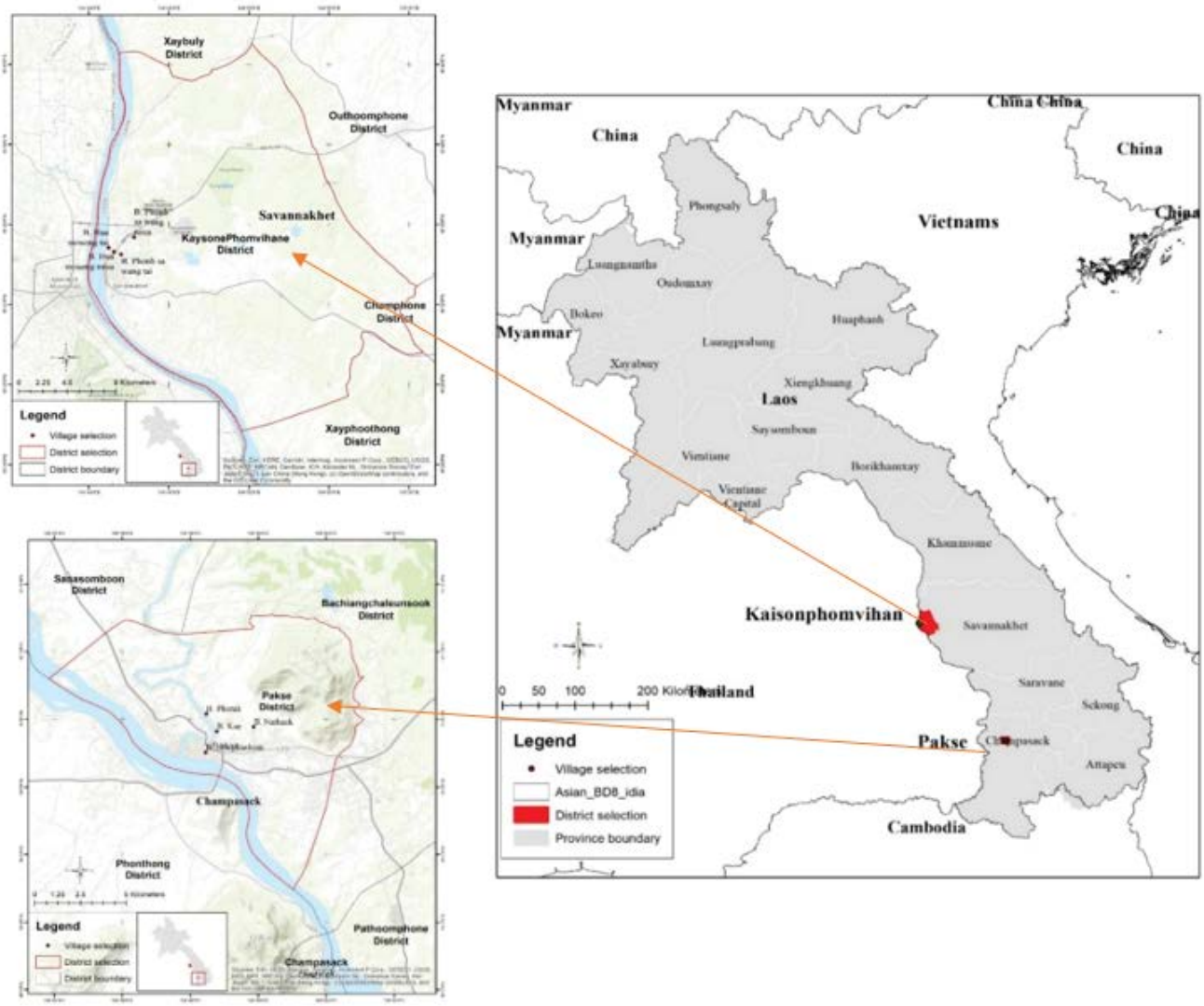

Figure 1: Location of the research areas.

Champasack province is situated in the south of Laos with a total area of 1,535,000 ha. The province is bordered by Salavan Province to the north, Sekong Province to the northeast, Attapeu Province to the east, Cambodia to the south, and Thailand to the west. The province is divided into two main geographic regions namely: the plains comprising an area of 1,135,000 ha that is suitable for rice cultivation and cash crops such as peanuts and other bean family; the mountainous region which includes an area of 400,000 ha, suitable for agricultural products such as coffee, fruits and vegetables and production forest. Champasak province contains abundant natural resources including: forests, mountains, rivers and rich mineral deposits. It boasts three national protected areas (NPA) namely: Sepian NPA, Donghouasao NPA and the Phou Xiengthong NPA. Alongside that it also consists of seven provincial protected areas that are rich in diverse species of fora and fauna. The province also has several historical and sacred sites as well as strong cultural traditions that has been passed down for many generations. The province has diverse ethnicity, comprising of eight ethnic tribes, namely Ya Hern, Pa Ko, La Vae, Laven, Ta Oy, Ka Tu and Ka Tung.

The wetland is the part of Houay Keelamang and Houayyang, its main river along the province which is known for its biodiversity including a great variety of vegetation types and plant species [11,12]. The surveyed villages are surrounded by river and rice fields. The basic information about the villages are given in Table 1. The village communities allow the villagers only gather wild edible plant from the in and around forest and their lands.

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Table 1: Baseline information for the Savannakhet and Champasack Province.

Province	Savannakhet				Champasack			
Village	Phonsavang N	Phonsavang S	Huomeung N	Huomeung S	Huy-Yangkham	Kea	Nahek	Pho-Tark
Religion	Buddhist	Buddhist	Buddhist	Buddhist	Buddhist	Buddhist	Buddhist	Buddhist
Population (female)	3359	6635	3065	2,693 (1,450)	4,092 (2,181)	1,470 (716)	2,749 (1,338)	525 (245)
	-1721	-3450	-1542					
Household	554	1140	498	408	704	310	464	126
(HH interview)	-13	-13	-13	-13	-13	-13	-13	-13

Field survey and data collection

We used free listing, participatory field collection, and direct observation between May to October 2023 to generate a list of wild edible plants that the local people gather around their villages. Subsequently, semi-structured interviews were conducted with 104 informants (age 20–65 years) following the methodology presented in Martin (2010). For each informant, the data collected included, gender, marital status, and level of education. Photographs of wild edible plants were been shown to the informants following [13]. Each informant provided local name, plant parts used, and mode of consumption. The ethnobotanical information was collected as use, each use referring to a particular use of a particular species by one informant in a village at a particular time. We divided the wild food plants into the following categories: vegetables, fruits, beverages, seasonings, and other uses following the categories suggested by Tardío and Pardo-de-Santayana [14]. Our category of vegetables included the vegetative parts or immature reproductive parts (inflorescences, fruits and seeds) while the category of fruit included the ripe fruit. Each species included in the plants list (prepared from key informant interviews) was categorized into one of five groups based on morphological and structural characteristics (trees, herbs, climbers, bamboo, and ferns). The parts of plant used were also categorized into six groups (young leaves, fruits, young shoots, flowers, and whole plants).

All plants species collected in the fields and around the villages were identified using herbarium vouchers specimens that were subsequently deposited at the Faculty of Forestry Herbarium National University of Laos. Family names and species names follow the checklist of plants in Lao PDR [15].

Result

Diversity of wild edible plants

A total of 174 plant species belonging to 55 families were documented, 93 species belong to 43 families, as shown in Table 1,2. Most of them including 29 species of trees, 25 species of grasses, 19 species of climbers, 12 species of shrubs, and 9 species of bamboo was recorded in Champasack Province. 81 species belong to 49 families, as shown in Table 3. Most of them including 21 species of grasses, 20 species of trees, 16 species of shrubs, 15 species of climbers, and 9 species of bamboo was recorded in Savannakhet Province. Champasack had 12 more species than Savannakhet. The dominant families by species number showed that: Poaceae 13 species; Fabaceae 8 species; Arecaceae 5 species; Zingiberaceae 4 species; and Araceae, Bignonaceae, Dioscoreaceae, Sapindaceae, and Asteraceae 3 species in each; and others families only two and one species were recorded in Champasack Province. In Savannakhet Province, the dominant families by species number were: Poaceae 13 species; Fabaceae 6 species; Zingiberaceae 3 species; Asteraceae, Combretaceae, Dioscoreaceae, Euphorbiaceae, Menispermaceae, and Phyllanthaceae 2 species in each; and others families only two and one species were recorded. Poaceae was the most species-rich family in both provinces, contributing 13 species each. Fabaceae ranked second in both sites but had more species in Champasack (8 species) than in Savannakhet (6 species). Several families in Champasack (e.g., Arecaceae, Araceae, Bignoniaceae, Dioscoreaceae) showed relatively higher species richness compared to Savannakhet. Although Savannakhet had a slightly lower total number of species, it had a greater variety of families (49 compared to 43 in Champasack). These can be categorized as 26% grass species, 25% of tree, 20 % shrub, 18% climber, and 11% bamboo in Savannakhet province, and 27%, 31%, 13%, 20%, 9% respectively in Champasak province (Figure 2).

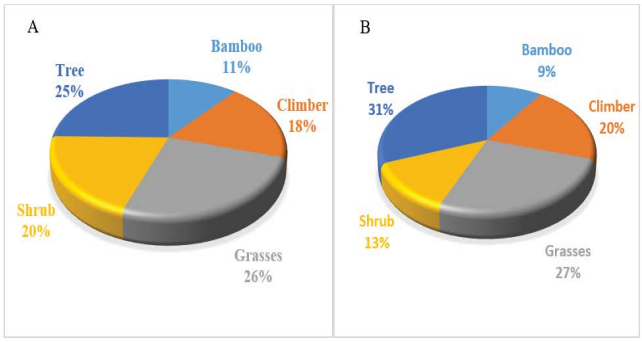

Figure 2: Distribution of wild edible plants in different plant type. A. Savannakhet Province, B. Champasack Province.

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Plant family richness between champasack and savannakhet province

Plant family richness reflects the ecological diversity and resource availability of a region. Understanding the similarities and differences in plant family composition between regions helps guide conservation efforts, sustainable use, and further botanical research. In this study, we compare the plant family richness between two provinces Champasack and Savannakhet. A total of 43 plant families were recorded in Champasack and 49 plant families in Savannakhet. The common families, a total of 42 families were found to common to both provinces. Champasack had one unique family (Lycopodiaceae), and Savannakhet had 12 unique families, including *Ancistrocladaceae*, *Asparagaceae*, *Burseraceae*, *Celastraceae*, *Dennstaedtiaceae*, *Fagaceae*, *Hydrocharitaceae*, *Myrsinaceae*, *Plumbaginaceae*, and *Rhamnaceae* among others. Both provinces show a high degree of similarity in plant family composition, sharing approximately 97% of Champasack's families and 86% of Savannakhet's families. The greater number of families in Savannakhet suggests slightly higher plant diversity, possibly due to ecological, climatic, or geographic differences. The presence of unique families in each province highlights localized diversity and suggests the importance of site-specific conservation strategies. This comparative analysis demonstrates strong botanical similarities between Champasack and Savannakhet while also revealing distinct family-level diversity. These findings support the need for continued botanical surveys and conservation planning tailored to local plant resources in Laos.

Plant parts used

The plant parts used for edible purposes reveals notable differences between Savannakhet and Champasack provinces. In both regions, young leaves are the most commonly used plant parts, accounting for 54.12% in Savannakhet and a significantly higher 79.05% in Champasack. Fruits are the second most utilized parts, with usage higher in Champasack (54.87%) compared to Savannakhet (30.34%). Other parts such as shoots, flowers, underground parts, and whole plants are also used more extensively in Champasack across all categories. For example, whole plants account for 10.23% in Champasack but only 3.28% in Savannakhet. This pattern suggests that people in Champasack rely more heavily on a broader range of plant parts, possibly reflecting richer biodiversity, cultural differences in plant use, or better availability of multipurpose plants. These differences highlight the importance of regional approaches in the conservation and sustainable use of wild plant resources (Figure 3). Some use was specific to the parts such as the young leaves of *Blainvillea acmella* (L.) Philipson were cooked, the flowers of *Heterophragma sulfureum* Kurz that were eaten raw or streamed eaten as vegetable, the underground part of *Dioscorea wallichii* Hook.f that were cooked as sweat dish, and the shoots of *Gigantochloa nigrociliata* (Büse) Kurz that were boiled and then cooked as soup. More than one part of the wild edible plants was used more than five cases. For example, flowers and young leaves of *Cratoxylon formossum* Bente. Et Hook. were eaten as raw vegetable or added to fish soup. Young leaves and fruits of *Leucaena leucocephala* (Lam.) de Wi. were eaten raw in the same way as *Momordica charantia* L. The wild edible plants were consumed in many ways and were prepared using different recipes that followed the local traditional. In terms of the used reports referred to consuming the raw plants, followed by the cooked (42%) of the used reports.

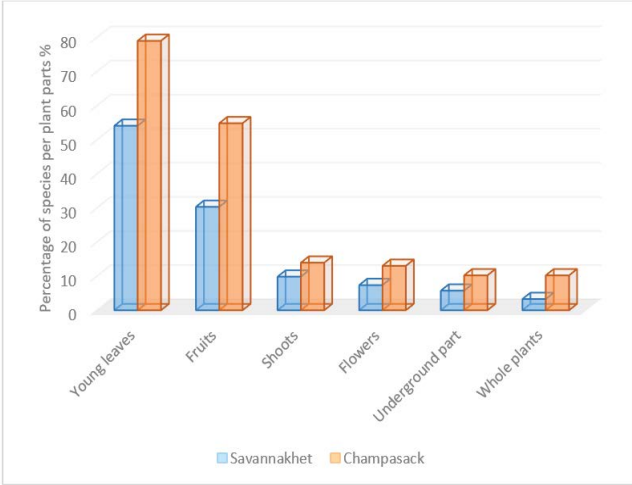

Figure 3: Comparison of wild edible plants parts collected by the local communities in Savannakhet and Champasack province.

Use categories of wild edible plants

A total of 93 species were recorded in Champasack province (Attachment 1) and 81 species in Savannakhet province (Attachment 2). We classified the wild edible plants in to Four categories with regard to their use; fruits, vegetables, plants used for seasoning, and plants used in other categories. Some edible species were also used for other purposes including more than ten species had medicinal uses.

Vegetable

The most (59%) species of wild edible plants were used as vegetables. In terms of habit, 34% of the vegetable species were trees followed by herbs 26%, climbers 18%, shrubs 14%, and others 7%. The most common preparation methods for vegetables was eaten raw as a snack or vegetables with others dish especially with “Lab or Ponh” (46%). It is Lao traditional food, followed by cook the plants (42%). In terms of habitat, wild vegetable species were collected from the forest, agricultural areas, streamlets, and nearby village areas. The wild vegetable more than 59 species were found in more than one habitat. Several wild vegetables were gathering from forest areas, for example: *Dracaena angustifolia* Roxb.,

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Argyreia laotica Gagnep., *Heterophragma sulfureum* Kurz., *Cipadessa cinerascens* (Pell.) Hamd. -Mazz., and *Memecylon edule* var. ovata C.B. Clarke. The wild vegetable was found in agricultural and streamlet areas, e.g., *Glinus oppositifolius* (L.) DC.; *Passiflora foetida* L.; *Momordica charantia* L.; and *Blainvillea acmella* (L.) Philipson. Many of the wild vegetable species were eaten raw or boiled eaten with chili paste and some species were prepared as a soup with meat and fish.

Fruits

Fruits represented 31% of the surveyed wild edible plants. The most used were Fabeceae family (5 species in Champasack and 2 species in Savannakhet); followed by Sapindaceae (3 species in Champasack and 1 specie in Savannakhet); Phyllanthaceae (2 species in both sites); and several families only one species (Table 2,3). The most of wild fruits species were gathered from forest and farmland, and most commonly consumed was raw eaten as a snack. In addition, some species were cooked for example, *Oroxylum indicum* (L.) Kurz and *Solanum torvum* Swartz. The wild fruits species *Schleichera oleosa* (Lour.) Oken*; Xerospermum laoticum* Gagnep.; *Ficus racemosa* L; and *Baccaurea sapida* Müll.Arg. were common around the study villages. Most of the fruits were consumed up to 4-5 time per year, for example: *Ficus racemosa* L. and *Leucaena leucocephala* (Lam.) de Wi. The fruit of *Gnetum gnemon* L. and *Hymenocardia punctata* Wall. ex Lindl. were eaten in the past 15 years ago when the informants were young. Nowadays, a few people eaten these kinds of fruits.

Seasoning

More than 10 species were used as seasoning to flavor a dish for a variety of taste, such as sour, aromatic, bitter, and spicy. Informants reported that young leaves of *Cratoxylum formosum* (Jack) Dyer was often used in fish soup instead of sourly taste as were also the young leaves and fruit of *Bauhinia malabarica* Roxb. The whole plant of *Limnophila geoffrayi* Bonat. were used in meat or fish soup instead of aromatic. The leaves and fruit of *Momordica charantia* L. were used to season for bitter taste.

Table 2: List of wild edible plants collected in Champasack province, Lao PDR.

Local name	Scientific name	Family	Category	Preparation	Part used	Plant type
Pak-Kan-Zhong	*Limnocharis flava* (L.) Buchenau	ALISMATACEACE	Vg	Cooked	Yl, Fw, Fr	Grasses
Pak-Hom-Kii-Gnoua	*Amaranthus lividus* L.	AMARANTHACEAE	Vg	Cooked	Yl	Grasses
Pak-Kan-Tun	*Alternanthera sessilis* (L.) R.Br. ex A.DC.	AMARANTHACEAE	Vg	Cooked	Yl	Grasses
Pak-Kok	*Spondias pinnata* (L.f.) Kurz	ANACARDIACEAE	Sn	Eaten raw	Fr	Tree
Pak-Nok	*Centella asiatica* Urb.	APIACEAE	Vg	Eaten raw/cooked	Whp	Grasses
Som-Lom	*Aganonerion polymorphum* Pierre ex Spire	APOCYNACEAE	Vg	Cooked	Yl	Climber
Pak-Khard	*Blainvillea acmella* (L.) Philipson.	ASTERACEAE	Vg	Cooked	Yl	Grasses
Pak-Hai-Kai	*Centipeda minima* A.Braun & Asch	ASTERACEAE	Vg	Cooked	Yl	Grasses
Pak-Heu-Hoc	*Crassocephalum crepidioides* (Benth.) S.Moore	ASTERACEAE	Vg	Cooked	Yl	Grasses
Pak-Narm	*Lasia spinosa* (L.) Thwaites.	ARACEAE	Vg	Cooked	Yl	Grasses
Pak-Ka-Book	*Amorphophallus laoticus* Hett.	ARACEAE	Vg	Cooked	Yl	Grasses
Pak-E-Lork	*Pseudodracontium harmandii* Engl.	ARACEAE	Vg	Cooked	Yl	Grasses
Wia-Na	*Calamus viminalis* Willd.	ARECACEAE	Ot	Cooked	Sh	Shrub
Yord-Tao	*Arenga westerhoutii* Griff.	ARECACEAE	Ot	Cooked	Sh	Shrub
Wia-Yea	*Calamus tenuis* Roxb.	ARECACEAE	Ot	Cooked	Sh	Climber
Wia-Khom	*Calamus rotang* L	ARECACEAE	Ot	Cooked	Sh	Climber
Wia-Hrome	*Calamus acanthospathus* Griff.	ARECACEAE	Ot	Cooked	Sh	Climber
Dok-Khea	*Heterophragma sulfureum* Kurz	BIGNONIACEAE	Vg	Boiled	Fw	Tree
Dok-Khea-Foy	*Stereospermum neuranthum* Kurz	BIGNONIACEAE	Vg	Boiled	Fw	Tree
Mark-Lin-Mai	*Oroxylum indicum* (L.) Kurz	BIGNONIACEAE	Vg	Boiled	Fr	Tree

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Pak-Kum	*Crateva adansonii* DC.	CAPPARACEAE	Vg	Fermented	Yl	Tree
Mark-Kii-Norne	*Garcinia basacensis* Pierre	CLUSIACEAE	S	Eaten raw	Yl, Fr	Tree
Pak-Karp-Pii	*Commelina axillaris* (L.) D.Don	COMBRETACEAE	Vg	Cooked	Yl	Grasses
Kheu-Ji-Jor	*Argyreia laotica* Gagnep.	CONVALLARIACEAE	Vg	Cooked	Yl	Climber
Pak-Sai	*Momordica charantia* L.	CUCURBITACEAE	Vg, Sn	Eaten raw, Cooked	Yl, Fr	Climber
Koy	*Dioscorea hispida* Dennst.	DIOSCOREACEAE	Ot	Stream	Ung	Climber
Mun-Nok	*Dioscorea glabra* Roxb	DIOSCOREACEAE	Sw	Stream	Ung	Climber
Mun-Lium	*Dioscorea wallichii* Hook.f	DIOSCOREACEAE	Sw	Stream	Ung	Climber
Pak-Aom-Tro	*Claoxylon longifolium* (Blume) Endl.	EUPHORBIACEAE	Vg, Sn	Cooked, add to Soup	Yl	Shrub
Pak-Tang-Toun	*Chamaesyce thymifolia* (L.) Millsp	EUPHORBIACEAE	Vg	Eaten raw/cooked	Yl	Tree
Som-Poy	*Acacia concinna* (Willd.) A. DC	FABACEAE	Sn	Add to Soup	Yl	Climber
Khii-Leck	*Cassia javanica* subsp. *nodosa* (Roxb.)	FABACEAE	Vg	Cooked	Yl	Tree
Pak-Ka-Ya	*Caesalpinia mimosoides* Lam.	FABACEAE	Vg	Eaten raw	Yl	Climber
Mark-Kharm-Peab	*Pithecellobium dulce* (Roxb.) Benth.	FABACEAE	S	Eaten raw ripe fruits	Fr	Tree
Som-Syo	*Bauhinia malabarica* Roxb.	FABACEAE	Sn	Add to Soup	Yl, Fr	Tree
Pak-Ka-Tin	*Leucaena leucocephala* (Lam.) de Wi.	FABACEAE	Vg	Eaten raw	Yl, Fr	Tree
Mark-Kheang	*Dialium cochinchinense* Pierre	FABACEAE	S	Boiled	Fr	Tree
Kheu-Ta-Pa	*Derris scandens* (Roxb.) Benth.	FABACEAE	S	Eaten raw ripe fruits	Yl	Climber
Mark-Mouy	*Gnetum gnemon* L.	GNETHACEAE	S	Seed	Fr	Climber
Pak-Bii-E-ein	*Hydrolea zeylanica* Vahl	HYDROPHYLLACEAE	Vg	Boiled	Yl	Grasses
Pak-Hope-Hreb	*Ottelia alismoides* (L.) Pers.	HYDROCHARITACEAE	Vg	Eaten raw	Yl	Grasses
Som-Tew	*Cratoxylum formosum* (Jack) Dyer	HYPERICACEAE	Vg	Eaten raw, add to soup	Yl, Fw	Tree
Mark-Bok	*Irvingia malayana* Oliv.ex Bennett	IRVINGIACEAE	S	Seed	Fr	Tree
Pak-Ka-Don-Khork	*Careya arborea* Roxb.	LECYTHIDACEAE	Vg	Eaten raw	Yl	Tree
Pak-Ka-Don-Narm	*Barringtonia acutangula* (L.) Gaertn.	LECYTHIDACEAE	Vg	Eaten raw	Yl	Shrub
Kood-Gnong	*Lycopodiella cernua* (L.)	LYCOPODIACEAE	Vg	Cooked	Yl	Shrub
Pak-Vaenh	*Marsilea quadrifolia* L.	MARATTIAACEAE	Vg	Eaten raw	Yl	Grasses
Khom-Pea-Farn	*Cipadessa cinerascens* (Pell.) Hamd. -Mazz.	MELIACEAE	Vg	Eaten raw	Yl	Shrub
Mead-Air	*Memecylon edule* var. ovata C.B.Clarke	MELANTHIACEAE	Vg	Eaten raw	Yl	Tree
Khom-Ka-Dou	*Azadirachta indica* A. Juss.	MELIACEAE	Vg	Boiled	Fw	Tree
Ya-Nang	*Tiliacora triandra* (Colebr.) Diels	MENISPERMACEAE	Sn	Made water's bamboo soup	L	Climber
Mor-Noy	*Cissampelos pareira* L.	MENISPERMACEAE	Sw	Sweet	L	Climber
Pak-Dang-Khom	*Glinus oppositifolius* (L.) DC.	MOLLUGINACEAE	Vg, Sn	Add to Soup	Whp	Grasses
Pak-Hai	*Ficus alongensis* Gagnep.	MORACEAE	Vg	Eaten raw	Yl	Tree
Mark-Deu-Kieng	*Ficus racemosa* L.	MORACEAE	Vg	Eaten raw	Fr, Yl	Tree

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Kouy-Pa	*Musa paradisiac* L.	MUSACEAE	Ot	Cooked	Fw	Shrub
Mark-Varh	*Syzygium cinereum* (Kurz) Chantaran. & J.Parn.	MYRTACEAE	S	Eaten raw	Fr	Tree
Pak-Sa-Mek	*Syzygium zeylanicum* (L.) DC.	MYRTACEAE	Vg	Eaten raw	Yl	Tree
Boua-Kii-Bea	*Nymphea lotus* L.	NYMPHAEACEAE	Vg	Eaten raw/cooked	Fw	Grasses
Pak-Pord	*Ludwigia adscendens* (L.) H.Hara.	ONAGRACEAE	Vg	Eaten raw	Yl	Grasses
Pak-E-ein	*Ludwigia octovalvis* (Jacq.) P.H.Raven	ONAGRACEAE	Vg	Boiled	Yl	Grasses
Pak-Vranh	*Melientha suavis* Pers.	OPILIACEAE	Vg	Cooked	Yl	Tree
Pak-Bouang	*Passiflora foetida* L.	PASSIFLORACEAE	Vg	Cooked	Yl	Climber
Mark-Kharm-Pome	*Phyllanthus emblica* L.	PHYLLANTHACEAE	S	Eaten raw	Fr	Tree
Mark-Fai	*Baccaurea sapida* Müll.Arg.	PHYLLANTHACEAE	S	Eaten raw ripe fruits	Fr	Tree
Pak-Nang-Lerd	*Piper massiei* DC.	PIPERACEAE	Vg, Sn	Eaten raw, Cooked	Yl	Grasses
Nor-Or	*Arundo donax* L.	POACEAE	Ot	Cooked	Sh	Shrub
Nor-Khem	*Thysanolaena latifolia* (Hornem.) Honda	POACEAE	Ot	Cooked	Sh	Grasses
Nor-Lou	*Saccharum arundinaceum* Retz.	POACEAE	Ot	Cooked	Sh	Shrub
Nor-Ka-Sa	*Bambusa chunii* L.C.Chia & H.L.Fung	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Mai-Zhod	*Vietnamosasa ciliata* (A.Camus) T.Q.Nguyen	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Bong	*Bambusa tulda* Roxb	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Phai-Mun-Moo	*Bambusa bambos* (L.) Voss	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Lai	*Gigantochloa nigrociliata* (Büse) Kurz	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Loy	*Indocalamus petelotii* (A.Camus) Ohrnb.	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Hye	*Cephalostachyum virgatum* Kurz	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Chord	*Oxytenanthera thwaitesii* Munro	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Ka-Sean	*Neohouzeaua mekhongensis* A.Camus	POACEAE	Ot	Cooked	Sh	Bamboo
Ya-Pak-Khouy	*Dactyloctenium aegyptium* (L.) Willd.	POACEAE	Vg	Cooked	Yl	Grasses
Som-Seang	*Xanthophyllum flavescens* Roxb.	POLYGALACEAE	Vg	Eaten raw	Yl	Tree
Pak-Bong-Keu	*Portulaca oleracea* L.	PORTULACACEAE	Vg	Boiled	Whp	Grasses
Mark-Khean	*Zanthoxylum rhetsa* (Roxb.) DC	RUTACEAE	Vg	Cooked	Fr	Climber
Kheu-Tod-Ma	*Paederia linearis* Hook.f.	RUBIACEAE	Vg	Eaten raw	Yl	Climber
Mark-Ken	*Flacourtia rukam* Zoll.-Moritzi	SALICACEAE	S	Eaten raw ripe fruits	Fr	Tree
Mark-Houad-Noy	*Lepisanthes rubiginosa* (Roxb.) Leenh.	SAPINDACEAE	S	Eaten raw ripe fruits	Fr	Tree
Mark-Khore-Som	*Schleichera oleosa* (Lour.) Oken	SAPINDACEAE	S	Eaten raw	Fr	Tree
Mark-Kho-Lean	*Xerospermum laoticum* Gagnep.	SAPINDACEAE	S	Eaten raw ripe fruits	Fr	Tree
Pak-Ka-Yeang	*Limnophila geoffrayi* Bonat	SCROPHULARIACEAE	Sn	Add to Soup	Whp	Grasses
Dok-Phoung-Phing	*Clerodendrum colebrookianum* Walp.	VERBENACEAE	Vg	Boiled	Fw	Shrub
Kha-Pa	*Alpinia malaccensis* (Burm.f.) Roscoe	ZINGIBERRACEAE	Vg	Boiled	Ung	Shrub
Dok-Ka-Jyo-Khao	*Curcuma comosa* Roxb.	ZINGIBERRACEAE	Vg	Boiled	Fw	Grasses
Dok-Ka-Jyo-Deang	*Curcuma angustifolia* Roxb.	ZINGIBERRACEAE	Vg	Boiled	Fw	Grasses
Dok-Deang	*Zingiber rubens* Roxb.	ZINGIBERRACEAE	Vg	Boiled	Fw	Grasses

Note: Part used: Fw = flower, Fr = fruit, L = leaf, Sh = Shoot, Yl = young leaf, Se = seed
Category: Vg = vegetable, Sn = seasoning, Ft = fruit, Sw = sweet, S = snack, and Ot = other

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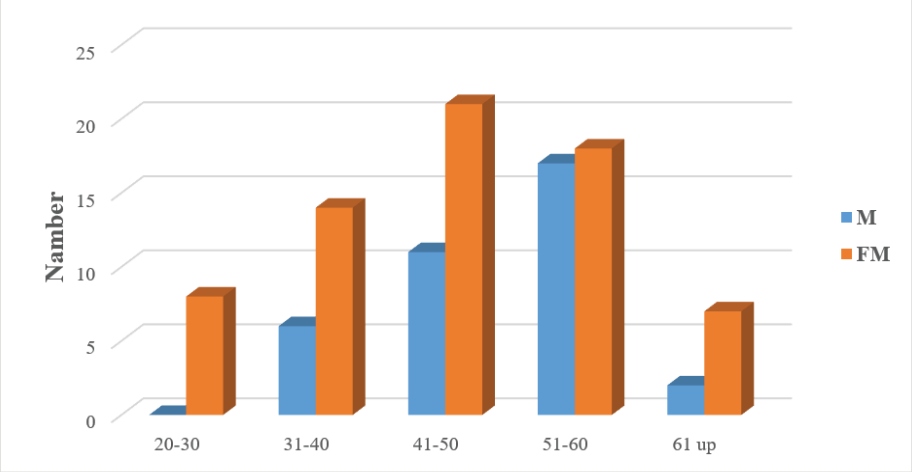

Figure 4: The age structure of 104 key informants.

Table 3: List of wild edible plants collected in Savannakhet province, Lao PDR.

Local name	Scientific name	Family	Category	Preparation	Part used	Plant type
Pak-Kan-Zhong	*Limnocharis flava* (L.) Buchenau	ALISMATACEACE	Vg	Cooked	Yl, Fw, Fr	Grasses
Pak-Kan-Tun	*Alternanthera sessilis* (L.) R.Br. ex A.DC.	AMARANTHACEAE	Vg	Cooked	Yl	Grasses
Pak-Kok	*Spondias pinnata* (L.f.) Kurz	ANACARDIACEAE	Vg,Sn	Eaten raw, seasoning	Yl, Fr	Tree
Mark-Khai-Kao	*Uvaria fauveliana* (Finet & Gagnep.) Pierre ex Ast & Jovet.	ANCISTROCLADACEAE	S	Eaten raw	Fr	Climber
Pak-Nok	*Centella asiatica* Urb.	APIACEAE	Vg	Eaten raw, Cooked	Whp	Grasses
Som-Lom	*Aganonerion polymorphum* Pierre ex Spire	APOCYNACEAE	Ot	Seasoning	Yl	Climber
Ka-Book	*Amorphophallus laoticus* Hett.	ARACEAE	Vg	Cooked	Yl	Grasses
Yoed_Khone-Kaen	*Dracaena angustifolia* (Medik.) Roxb	ASPARAGACEAE	Vg	Cooked	Ys	Shrub
Yord-Tao	*Arenga westerhoutii* Griff.	ARECACEAE	Ot	Cooked	Sh	Shrub
Pak-Heu-Hoc	*Crassocephalum crepidioides* (Benth.) S.Moore	ASTERACEAE	Vg	Cooked	Yl	Grasses
Pak-Khard	*Blainvillea acmella* (L.) Philipson.	ASTERACEAE	Vg	Cooked	Yl	Grasses
Dok-Khae	*Heterophragma sulfureum* Kurz	BIGNONIACEAE	Vg	Cooked	Fw	Tree
Mark-Fan	*Protium serratum* (Wall. & Colebr.) Engl.	BURSERACEAE	S	Eaten raw	Fr	Tree
Pak-Koum	*Crateva adansonii* DC.	CAPPARACEAE	Vg	Fermentate	Yl	Tree
Mark-Ta-Kouang	*Salacia cochinchinensis* Lour.	CELASTRACEAE	S	Eaten raw	Fr	Climber
Mark-Paem	*Garcinia gracilis* Pierre	CLUSIACEAE	S	Eaten raw	Yl, Fr	Shrub
Som-Mro	*Terminalia chebula* Retz	COMBRETACEAE	S	Eaten raw	Fr	Tree
Pak-Karp-Pii	*Commelina axillaris* (L.) D.Don	COMBRETACEAE	Vg	Cooked	Yl	Grasses
Pak-Bong	*Argyreia lanceolata* Choisy	CONVALLARIACEAE	Vg	Cooked	Yl	Grasses
Pak-Sai	*Momordica charantia* L.	CUCURBITACEAE	Vg	Eaten raw, Cooked	Yl	Climber

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Pak-Kood	*Pteridium aquilinum* (L.) Kuhn. R. H. MARRS	DENNSTAEDTIACEAE	Vg	Cooked	Yl	Shrub
Hua-Koy	*Dioscorea hispida* Dennst.	DIOSCOREACEAE	Ot	Steamed	Ung	Climber
Man-Noke	*Dioscorea glabra* Roxb	DIOSCOREACEAE	Ot	Steamed	Ung	Climber
Pak-Oam-Tor	*Claoxylon longifolium* (Blume) Endl.	EUPHORBIACEAE	Vg	Cooked	Yl	Shrub
Tang-Teeb	*Chamaesyce thymifolia* (L.) Millsp	EUPHORBIACEAE	Vg	Cooked	Yl, Fw	Tree
Mark-Kharm-Peab	*Pithecellobium dulce* (Roxb.) Benth.	FABACEAE	S	Eaten raw	Fr	Tree
Som-Poy	*Acacia concinna* (Willd.) A. DC	FABACEAE	Sn	Add to Soup	Yl	Climber
Khii_Leck	*Cassia javanica* subsp. *nodosa* (Roxb.)	FABACEAE	Ot	Cooked	Yl	Tree
Pak-Ka-Ya	*Caesalpinia mimosoides* Lam.	FABACEAE	Vg	Eaten raw	Yl	Climber
Som-Syo	*Bauhinia malabarica* Roxb.	FABACEAE	Sn	Add to Soup	Yl	Tree
Kheu-Ta-Pa	*Derris scandens* (Roxb.) Benth.	FABACEAE	Sw	Eaten raw	Fr	Climber
Kor-Narm	*Castanea mollissima* Blume	FAGACEAE	S	Boiled	S	Tree
Mark-Mouy	*Gnetum gnemon* L.	GNETHACEAE	S	Boiled seed	Fr	Climber
Pak-Liin-Farn	*Hydrocharis asiatica* Miq.	HYDROCHARITACEAE	Vg	Eaten raw	Yl	Grasses
Pak-Bii-E-ein	*Hydrolea zeylanica* Vahl	HYDROPHYLLACEAE	Vg	Cooked	Yl	Grasses
Tew-Som	*Cratoxylum formosum* (Jack) Dyer	HYPERICACEAE	Vg,Sn	Eaten raw, Cooked	Yl, Fw	Tree
Mark-Bork	*Irvingia malayana* Oliv.ex Bennett	IRVINGIACEAE	S	Eaten raw	Fr	Tree
Pak-Ka-Don-Narm	*Barringtonia acutangula* (L.) Gaertn.	LECYTHIDACEAE	Vg	Eaten raw	Yl	Shrub
Pak-Vaenh	*Marsilea quadrifolia* L.	MARATTIAACEAE	Vg	Eaten raw	Yl	Grasses
Meud-Air	*Memecylon edule* var. ovata C.B.Clarke	MELANTHIACEAE	Vg	Eaten raw	Yl	Tree
Khom-Pea-Farn	*Cipadessa cinerascens* (Pell.) Hamd. -Mazz.	MELIACEAE	Vg	Eaten raw	Yl	Shrub
Ya-Nang	*Tiliacora triandra* (Colebr.) Diels	MENISPERMACEAE	Sn	Seasoning	Yl	Climber
Mor-Noy	*Cissampelos pareira* L.	MENISPERMACEAE	Sw	Cooked	L	Climber
Pak-Dang-Khom	*Glinus oppositifolius* (L.) DC.	MOLLUGINACEAE	Vg,Sn	Cooked	Whp	Grasses
Pak-Hai	*Ficus alongensis* Gagnep.	MORACEAE	Vg	Eaten raw	Yl	Tree
Kouy-Pa	*Musa paradisiac* L.	MUSACEAE	Ot	Cooked	Fw	Shrub
Teen-Cham	*Ardisia helferiana* Kurz	MYRSINACEAE	Vg	Eaten raw	Yl	Shrub
Pak-Sa-Mek	*Syzygium zeylanicum* (L.) DC.	MYRTACEAE	Vg	Eaten raw	Yl	Tree
Boua-Khii-Bea	*Nymphea lotus* L.	NYMPHAEACEAE	Vg	Cooked, Eaten raw	Ys	Grasses
Pak-Pord	*Ludwigia adscendens* (L.) H.Hara	ONAGRACEAE	Vg	Eaten raw	Yl	Grasses
Pak-Vranh	*Melientha suavis* Pers.	OPILIACEAE	Vg	Cooked	Yl	Tree
Mark-Nort	*Passiflora edulis* Sims.	PASSIFLORACEAE	S	Eaten raw ripe fruit	Fr	Climber

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Mark-Hoo-Ling	*Hymenocardia punctata* Wall. ex Lindl.	PHYLLANTHACEAE	Sw	Eaten raw	Fr	Shrub
Mark-Fai	*Baccaurea sapida* Müll.Arg.	PHYLLANTHACEAE	Sn	Eaten raw	Fr	Tree
Pak-Nang-Lerd	*Piper massiei* DC.	PIPERACEAE	Vg,Sn	Eaten raw, Seasoning	L, Yl	Grasses
Pid-Pii-Din	*Plumbago zeylanica* L.	PLUMBAGINACEAE	Vg	Cooked	Fw	Shrub
Nor-Mai-zhod	*Vietnamosasa ciliata* (A.Camus) T.Q.Nguyen	POACEAE	Ot	Cooked	Sh	Shrub
Nor-Khem	*Thysanolaena latifolia* (Hornem.) Honda	POACEAE	Ot	Cooked	Sh	Shrub
Nor-Or	*Arundo donax* L.	POACEAE	Ot	Cooked	Sh	Shrub
Nor-Lou	*Saccharum arundinaceum* Retz.	POACEAE	Ot	Cooked	Sh	Shrub
Nor-Ka-Sa	*Bambusa chunii* L.C.Chia & H.L.Fung	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Bong	*Bambusa tulda* Roxb	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Phai-Man-Moo	*Bambusa bambos* (L.) Voss	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Lai	*Gigantochloa nigrociliata* (Büse) Kurz	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Loy	*Indocalamus petelotii* (A.Camus) Ohrnb.	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Hye	*Cephalostachyum virgatum* Kurz	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Chord	*Oxytenanthera thwaitesii* Munro	POACEAE	Ot	Cooked	Sh	Bamboo
Nor-Ka-Sean	*Neohouzeaua mekhongensis* A.Camus	POACEAE	Ot	Cooked	Sh	Bamboo
Gna-Pak-Khouy	*Dactyloctenium aegyptium* (L.) Willd.	POACEAE	vg	Cooked	Yl	Grasses
Som-Seang	*Xanthophyllum flavescens* Roxb..	POLYGALACEAE	Vg	Cooked	Yl	Tree
Pak-Nong-Keu	*Portulaca oleracea* L.	PORTULACACEAE	Vg	Cooked	Whp	Grasses
Mark-Ka-Tun	*Ziziphus jujuba* Mill.	RHAMNACEAE	S	Eaten raw	Fr	Tree
Keuy-Tod-Ma	*Paederia linearis* Hook.f.	RUBIACEAE	Vg	Eaten raw	L	Climber
Mark-Khean-Kheuy	*Zanthoxylum rhetsa* (Roxb.) DC	RUTACEAE	Vg	Cooked	Yl, Fr	Climber
Mark-Ken	*Flacourtia rukam* Zoll.-Moritzi.	SALICACEAE	S	Eaten raw	Fr	Tree
Mark-Houad-Noy	*Lepisanthes rubiginosa* (Roxb.) Leenh.	SAPINDACEAE	S	Eaten raw	Fr	Shrub
Pak-Ka-Yeang	*Limnophila geoffrayi* Bonat	SCROPHULARIACEAE	Sn	Seasoning	Whp	Grasses
Dok-Phoung-Phing	*Clerodendrum colebrookianum* Walp.	VERBENACEAE	Vg	Cooked	Fw	Shrub
Kha-Pa	*Alpinia malaccensis* (Burm.f.) Roscoe	ZINGIBERRACEAE	Vg	Cooked	Sh, Ung	Shrub
Dok-Ka-Jyo	*Curcuma comosa* Roxb.	ZINGIBERRACEAE	Vg	Boiled	Fw	Grasses
Dok-Ka-Jyo-Deang	*Curcuma angustifolia* Roxb.	ZINGIBERRACEAE	Vg	Boiled	Fw	Grasses

Part used: Fw = flower, Fr = fruit, L = leaf, Sh = Shoot, Yl = young leaf, Se = seed
Category: Vg = vegetable, Sn = seasoning, Ft = fruit, Sw = sweet, S = snack, and Ot = other

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Discussion

The communities in the study area consuming a great variety of wild edible plant species, depend on plant habits or growth form we found that trees had most used species, which is similar to what was found in Bali, Indonesia where most wild edible plants were trees [16,17] but different from the case in northeast part of Thailand [18] also different from the case in north part of Laos [19], Yunnan [20], and Himalaya [21], where most wild edible plants were herbs.

The leaf and young shoot parts of wild edible plants over the underground parts is the prevailing trend for ethnic groups in Thailand, China, and Cambodia [18,22,23]. The green parts of the plant have preferences that are used for food [24]. However, different parts used in different categories also depend on the number of habits of wild edible plant species [25]. The people in this region still preferred to collect wild edible species from nearby forest, riverine, and inside the forest similar to what local communities do in Thailand and China [24,25], also most common way of preparing was to cook them similar to these studies too. For the wild fruits, the eaten pattern found in this study that are usually raw eaten similar to what is found in Thailand [18].

All the informants in Savannakhet and Champhasack agreed that they consumed a smaller number of wild edible plants compared to the previous decades, because Climate change and seasonal variability affect plant growth cycles and reduce the reliability of wild plant availability. Our results indicate the younger people almost could not identify, gather and process these species. Similarly, many middle-aged informants regarded the consumption of wild edible plants as a symbol of poverty as they consumed these wild edible plants during the time of scarcity. Concurrent to our results, differences in the knowledge of wild edible plants among different age groups is reported in Tibetans of Gongba Valley, Gansu, China [24]. A study conducted in a Caribbean village indicates that older individuals are less influenced by external socio-cultural changes and are therefore more likely to retain and apply traditional knowledge related to wild edible plants [26]. In Southern part of Laos, many young people have migrated to outside cities to search for employment and education in recent decades. According to our informants, such migration severely disrupted the transfer of local wild edible plants knowledge between generations and led to the loss of traditional knowledge.

Conclusion

We found 175 wild edible plant species belong to 89 families. The most plant type of wild edible plant were tree, 31% found in Champasack and 25% found in Savannakhet Province. Among the 89 families, those with the most species (15 species) of wild edible were Poaceae family, followed by Fagaceae (6 species), Euphorbiaceae and Zingiberrceae (4 species), and other families had a few species. The traditional knowledge of wild edible plants among the wetland local communities in Southern part of Lao PDR is rich and apparently intact. The commonly used part of the wild edible plants were young leaves and fruits, young leaves were used as cooked and fruit was eaten without preparation.

Generally, the local communities have maintained a rich traditional knowledge of high number of wild edible plants many of which have medicinal values, which was although not studied in this study. The traditional knowledge of wild edible plants is important for maintaining food security, healthy, and socioeconomic change. The gathering of wild edible plants is commonly practiced in Savannakhet and Champasack Province where the communities have even transitioned to home gardens by domestication and cultivation instead of wild collection only. However, such valuable indigenous knowledge is being eroded as young generation were found not aware about it and hence efforts are needed to conserve indigenous knowledge on wild edible plants. Rural communities and government should participate and promote indigenous knowledge and learning from those who possess a large part of the resource. Medicinal values of these plants should be fully explored as the health benefits of these plants and indigenous food may lead to not only for local food security but also to out scale the promotion of these plants due to their nutritional value.

Supplementary Materials: The following supporting information can be downloaded at:

Author Contributions: Khambay Khamphilavong and Chittana Phompila conceived and designed the research. Khambay Khamphilavong and Metmany Soukhavong collected data and took photographs. Yongxiang Kang and Khambay Khamphilavong provided the botanical identification. Khambay Khamphilavong and Metmany Soukavong analyzed the data and prepared manuscript, and Chittana Phompila and Youngxiang Kang reviewed the manuscript. All authors read and approved the final manuscript.

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Conflicts of Interest: We are certifying that there is no competing interest with any financial organization regarding the material discussed in the manuscript.

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