

# Ethnobotanical Wild Edible Plants and Tradition Used in Vientiane Province, Lao P.D.R

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## Research

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# Abstract

**Background:** Local people harvested wild edible plants to provide food and cash income for indigenous people and are of good importance to guarantee global food security. Individuals also play a significant role in maintaining the productivity and stability of indigenous ecosystems. Vientiane province, the middle part of Laos, is regarded as the biodiversity hotspot. The people who are living there have consolidated traditional knowledge about plants used. Hence, with the developing country, wild edible plants are threatening, and the associated local knowledge is in danger of being lost. However, wild plants surveys were conducted to investigate and documented the wild edible plants indigenous experience used by local people.

**Methods:** Five-teen villages were carried out the field investigation. The information was collected using questionnaires, direct observation, individual discussion, semi-structured interviews, key informant interviews, group discussion, and participatory rural appraisal (PRA).

**Results:** In this research, information about 202 wild edible plant species in 150 genera of 83 families was recorded. Most species were edible fruits (55 species), followed by young leaves (48 species). The wild edible plants are sources or fresh markets for local people, especially those living in remote areas, to procure mineral elements and vitamins. In addition, were 79 species sold as a mixture at the market. Therefore, the utilization of wild edible plants related to knowledge was according swiftly, especially in an area with the livable transportation and booming traveler.

**Conclusion:** Local food, wild plant species are abundant and diverse in Vientiane province. The people provide food and proteins to remote areas people and also be a source of income. Hence, their associated traditional knowledge and wild edible plants are facing a variety of intimidation. So, preservation and sustainable utilization of these wild plants in this region are important. To document of these plant species might provide incipient information for conservation, probably further exploitation and will gather local indigenous knowledge.

## Introduction

More than ninety-thousand wild plant species have been regularly used for food, and medicines in the world [1]. Usually, wild edible plants refer to species that are harvested from their natural habitats and used as food for human consumption [2], [3], and are one of the primary sources of cash income for impoverished communities [4], [5]. The wild plants played a role in ensuring food security and improving the nutrients in many people's meals in developing countries [1], [5]. Residual plant diversity to the family food security and employ is survival during starvation, drought, shocks, and ricks [2]. The people supplement nutrition requirements due to their preferable nutritional value [2], [6].

Although domesticated plants are the primary sources of food and income for the local people, they cannot meet the annual food demands [7]–[9]. Hence, the harvested and consumption of wild edible plants has been a route of life to supplement dietary requirements for many people in rural areas

worldwide, especially in around Asia countries [7]. Therefore, due to social changes and cultural processes, traditional knowledge about the utilization of wild edible plant species is declining and even disappearing with modernization and expanding contacts with the western lifestyle [8], [9]. Meantime, the loss of indigenous knowledge has also been recognized as one of the major factors that harm the guardianship of biological diversity [8], [10]. However, it became instant to document and reinvigorate indigenous knowledge of wild edible plants to conserve genetic and cultural diversity [11], [12]. Laos is famous for using wild collection resources in the human diet, and many studies have focused on plants survey [15]–[23]. These plants surveys not only play an essential role in protecting indigenous knowledge associated with wild edible plants, but also encourage nutrients analysis of the ultimate widely used species [13]–[16]. Nutrients analyzes might provide essential documents for the utilization of these species that had the best nutrients values, accordingly helping to maintain alimentary diversity and improve local food security [3], [17], [18]. Indigenous ecological knowledge, the theory of evolution continuously adding lessons from the past to nowadays [3]. The initial acquisition of indigenous knowledge happens through innovation. If an area is far from city, with long distances to markets and forest product substitutes, indigenous eco-knowledge learning is a necessity [29]. The first steps in transfer of the knowledge and skills related to natural resources and their used include familiarity with the resource, playing, observing, and helping ripe [15], [19]. Knowledge is maintained, transferred, or exchanged, the knowledge that has a use or a value [31]. The local expertise depends on social transferable, through the family within a community [20].

Vang Vieng district of Vientiane province, commonly known as the Eco-tourism city belong to the world-famous area (there are two types of communities urban and rural). Rural community have its own living enlargement, environment and believes [19], [21]. It is consisting of several tribes such as Lao Phuan, Tai Deang, Khmu and Hmong. So, depend of its complex photography and high diversity of climates, abundant plants and animal species are apportion in this area [13], [22]. Moreover, the cuisines of the local people differ somewhat that of small ethnic group in Vang Vieng region. The population living there have limited range of food choices. The raw material traditional meal includes natural resources [23]

## Materials And Methods

### Site description

This study was carried out in Vang Vieng district, Vientiane province middle part of Laos. The average elevation is relatively high in the northern and western regions, the mountainous areas, where the figure varies between 1,000 and 2,000 m. Vang Vieng is about 140 km from Vientiane capital city. This area, located in the upper part of the Num Ngum river, is the primary source of the people's income generation. The temperature is approximately 25°C, April is the hottest month to the end of the dry season on May to middle of June with a mean temperature around 28-35 °C, the mean monthly temperature drops to 18 °C at end of December to earlier in February which is the most pleasant time of year. The rainfall is high from near the end of July to August with a strong monsoon presence resulted in monthly rainfall about 700 mm, 90 % of the annual rainfall is concentrate in the four-month period from near the end of June to

October. Natural forest resources are almost all upper mixed deciduous forest, the forest is a degradation of dry evergreen forest following either cultivation. And another forest type: bamboo forest, fallow forest, and grassland.

Vang Vieng district, there are five sub-district, 72 villages: 13 villages belong to Phatang, 22 villages belong to Vang Vieng, 13 villages belong to Namuang, 15 villages belong to Namon, and 9 villages belong to Somboon sub-district [24]. In each sub-district only one leader to take responsibility for the rural development. The population is 47,861 people according to data from the Statistics Office in Vang Vieng district, it has density 23.9 person/sq.km, within an average of six person/household. And there are three ethnic groups: Lao Loum, Lao Thueng, and Lao Soung. The Lao Loum is highest proportion at 65.4 percent, Lao Theung is 27.3 percent, and Lao Soung is small at 7.3 percent respectively.

### **Field investigate and data collection**

This study, for informants are defined as knowledge persons about wild edible plants used and local condition. Field study were carried out during three visited in August 2018, February and December 2019. After considering the topography and climate condition, 15 villages belong to five Sub-districts (three villages in each) and located around their farmland, nearly forest and river were carried out wild edible plants investigation. Site study's total population is Three-hundred and forty-eight randomly selected households (five to ten persons per village) were interviewed. Then, ethnobotanical data were collected through different methods such as direct observation, key informant interviews, semi-structured interviews, individual discussions, group discussions, questionnaire and participatory rural appraisal (PRA) [25], [26].

In the first phase of the field study, participants were invited to list all wild edibles used. The interviews including relevant questions to detail documented information on all wild edibles including the source of knowledge about plant used. Every used report on edible plants include: 1) Number of useful plants mentioned and their botanical families; 2) Most frequently used plant parts; 3) Most cited species; 4) ways of consumption; and 5) Season of collection and habitats where they are collected. The second phase, were collect the wild edibles mention above with local gatherers, and participatory observation are utilization to secure the culture implication of the plant gathering, preparation, and distribution of wild edible plants. Name of all plants follows flora of Laos. The voucher specimens are deposits at the herbarium of the Faculty of Forestry Science, National University of Laos.

## **Result And Discussion**

### **Wild edible plant diversity and frequently used species**

This research area has a large number of useful wild edible plant species. The 202 species, 83 family, 150 genera, and unknown 10 species are distributed into different life forms, with tree 59 species (29%), grasses 52 species (26%), climbers 46 species (23%), shrubs 30 species (15%), Bamboo 10 species (5%), and fern 5 species (2%) was show in the figure 2. The plants mentioned only one responded are not

documented in this list. The most species similar to the investigation documented in Savannaket province [27] and other belong to the Mekong region [28]. The mainly of wild food plants belong to the Fabaceae and Poaceae (14 species in each), Arecaceae and Euphorbiaceae (11 species in each), Moraceae and Zingiberraceae (5 species in each), followed by Apocynaceae, Araceae, Asteraceae, Bignoniaceae, Combretaceae, Convolvulaceae, and Phyllanthaceae (4 species in each), and other families the number of species are less than three species (Table 1).

## Parts uses

This study was showed that, most frequently used part were fruits, young leaves, growing tip, and young shoots (Figure 3). The result was similar to other researches, such as a study of the medicinal plants used by Tharu community, Nepal [29], study in the Houaphun province, Lao PDR, southern of Yunnan, China [16], [30], [31]. Uttermost used are specific to the particular plant parts such as fruits, young leaves, and growing tip, albeit in a few cases a single plant part has difference uses, example., fruits of *Phyllanthus emblica* are eaten fresh or used to make local wine drink for tonic.

In addition, our study was similar with the Mekuanent Tebkew and Yan Ju [31], [32] according to the species of wild plants and depend on season, some season we can eat the leaves and flowers another season we can eat fruits. Some of edible plants can be used many parts of them such as: Young leaves and flowers; *Cassia siamea*, *Azadirachta indica*, *Leucaena glauca*, mainly. Edible plants could be used several parts of them is *Passiflora hispida*, this species we can eat young leave, flower and fruit. Most wild plants were trees that we can use fruits such as *Sandoricum koetjape*, *Baccaurea sapida*, *Psidium guayava*; *Ficus glomerate*. Leaves use: *Careya sphaerica*, *Ficus altissima*, *Adenantha microsperma* [33]. Leaves and fruits both can used such as: *Garcinia oliveri*, *Spondias mangifera*, *Leucaena glauca*, *Garcinia oliveri*. Wild herbs used: *Colocasia esculenta*, *Lasia spinosa*, *Centella asiatica*, *Monochoria vaginalis*, *Spilanthes acmella*, *Houttuynia cordata*. And wild climbers that people only use as leaves: *Cissus repens*, *Tiliacora triandra*, *Melothria heterophylla*, *Erythralum scandens*, *Acacia pennata*, *Cyclea barbata*, and can use leaves and fruits: *Passiflora hispida*, *Zanthoxylum* sp was appeared of this study site. Most these wild edible plant also found in others regions north and south part of Laos, Yunnan, north of Thailand, Cambodia, and Indonesia [8], [16], [18], [27], [31]. Although local people have difference culture and hobbit deist so plant parts uses much difference.

The most of edible plants are used for raw salad or eaten fresh, mixed with the dishes like meat salad, meat curry and local dishes (called "Aoh", Ponh") such as *Zingiber rubens*, *Commelina*, *Marsilea quadrifolia*, *Centella asiatica*, *Eugenia zeylannica* [34]. And others studies were showed that use wild food plants were wild leaves such as *Melothria heterophylla*, *Acacia concinna*, *Cissus repens*, *Ipomoea chryseides*, *Lasia spinosa*, *Amarantus viridis*, *Hydrolea zeylanica*, are used for boiled or cooked dish. Edible fruits were *Salacia prinoides*, *Erioglossum rubiginosum*, *Bousigonia angustifolia*, *Uvuaria macrophylla*. And flowers were *Azadirachta indica*, *Dolichandrone rheedii*, *Stereospermum fimbriatum*, *Zingiber rubens*, all this plants used similar with Gisella, Cruz-Garcia and Lisa, was showed that methods

of cooking wild plants in Kalasin, Northeast Thailand. [16], [30], [35], all of these wild plants we found in study site (table 1).

In this study we founded, seventy-nine species of wild edible plants collected from remote areas by local people handle in local markets and also in the center markets, to provides the potentiality to increase income of local people with low cash income, such as *Houttuynia cordata*, *Spilanthes acmella*, *Mollugo oppositifolia*, *Centella asiatica*, and *Pteridium aquilinum* similar to Tureira-Garcia [34]. The Vang Vieng peoples still preferred to harvested wild plant species from the forest and a rounding their farmlands similar to what local people do in Cambodia, China, Thailand [30], [31], [34], [36]. Edible plants can provide resources for more exploitation of health foods. Like living standards improving, this is a global increased demand for healthy and food security [37]. Further study of the species can be done in nutrient composition and order to understand the cause for usage and development potential.

### Gathering and Use

Gathering of wild edible plants in fallow, riverine, green forest, savanna, and paddy field, was mainly conducted by woman and children on the ways to field or during agriculture activities [16], [38]. Wild edible plants were also always gathered from around the house before cooking, the local people allowed to gather wild vegetables everywhere and any time within their village's areas [37]. The people knew the place where wild plants were abundant, especially the perennial plants such as., *Leucaena glauca*, *Careya sphaerica*, *Azadirachta indica*. Some edible plants were gathering for selling and consumption by harvesters such as: *Limnophila geoffrayi*, *Limnocharis fava*, *Houttuynia cordafa*.

Mostly the people have three methods used to gather edible plants pick up the young leaves with knife, uprooting a whole plant manually and climb up the tree or use bamboo stems to gathering. In this study we agree with other study [3][36]. All of the gather edible plants regard of the species was collected to transport in a plastic basket and same bamboo or rattan basket. Wild edible plants are referred to use the all of Lao people "Phuck" and also be used to refer to cultivated vegetables. Some wild plant is called "Nya" which including the grasses are used as fodder for livestock: *Eleusine indica*, *Echinochloa Stagnina*, *Commelina diffusa*, *Euphorbia*, *Cassia tora*, *Ajamia*. The most popular Lao local people dish that are made from wild vegetables called "Soup Phuck" was cook by mixed boiling the wild vegetables were collect from field and mixed ginger, sesame and salt were add for flavoring, and chili powder was for desired.

### Distribution of wild edible plants

In our investigation, highly species of the distribution were in fallow area, fallow and green forest, and follow by riverine (Figure 4), forty-three species found in fallow area, include *Dregea volubilis*, *Ipomoea vitifolia*, *Merremia sp*, *Momordica sp*, *Acacia pennata*, *Acacia concinna*, *Cissus repens*, *celastrus paniculate*, *Ipomaea chryseides*, *Machilus odoratissima*, *Paederia tomentosa*, *Dunbaria sp*, *Cyclea sp*, *Phyllanthus reticulatus* were climbers, *Saccharum sp*, *Saccharum arundinaceum*, *Eleusine indica*, were grasses, *Microdesmis caseariaefolia*, *Cassia tora L*, *Cipadessa sp*, *Sauropus androgynus*, *Colubrina*

*pubescens*, *Garcinia gracilis*, *Solanum sp*, *Connarus semidecandrus*, *Solanum sanitwongsei*, were shrubs, *Chaetocarpus sp*, *Cassia siamea*, *Bauhinia malabarica*, *Leucaena glauca*, *Rhus semialata*, *Dillenia indica*, *Ziziphus mauritiana*, *Zanthoxylum* were tree, and *Lycopodium cernuum* L was fern. Follow by thirty-one species in fallow and green forest such as, *Bauhinia sp*, *Uvuaria macrophylla*, *Bousigonia angustifolia*, *Zanthoxylum sp*, *Zanthoxylum sp*, *Rhapis subtilis*, were climbers. *Dracaena angustifolia*, *Antidesma thorelianum*, *Erioglossum rubiginosum*, were shrubs. *Peltophorum dasyrachis*, *Adenanthera microsperma*, *Dolichandrone rheedii*, *Stereospermum fimbriatum*, *Protium serratum*, *Xerospermum laevigatus*, *Garcinia oliveri*, *Artocarpus sp*, *Baccaurea sapida*, *Azelia xylocarpa*, *Castanea dentata*, *Zanthoxylum rhetsa*, *Schleichera trijuga*, were trees, and were bamboo is nice species, such as *Bambusa sp*, *Oxytenanthera parviflora*, *Bambusa tulda*, *Bambusa arundinacea*, *Dendrocalamus longifimbriatus*, *Oxytenanthera albociliata*, *Cephalostachyum virgatum*, *Indocalamus*, *Dendrocalamus hamiltonii*. And thirty in riverine, such as *Nasturtium indicum*, *Commelina diffusa*, *Euphorbia sp*, *Euphorbia parviflora* L, *Jussiaea repens* L, *Tacca laevis*, *Alocasia sp*, *Lasia spinosa*, *Neptunia oleracea*, *Nymphaea lotus*, *Monochoria vaginalis*, *Trapa natans*, *Trapa sp*, *Cephalostachyum virgatum*, *Monochoria cyanea*, *Limnophila geoffrayi*, *Echinochloa stagnina* were grasses. *Musa sp*, *Musa malaccensis* were shrubs. *Salaca thorelis*, *Xanthophyllum excelsum*, *Crataeva nurvala*, *Ficus hispida* L, *Ficus glomerata* were tree. And *Stenochlaena palustris*, *Pteridium aquilinum* were fern. However, plants are growing different areas, altitude and environmental condition was difference specie [16], [31], [39]. The living of these plants in different regions of the country demonstrates their ecological adaptation over a large geographical area and their edibility by different local ethnic groups.

In that study, we found that flavor is the first standard for all kinds of edible plants, in convention with other surveys [40]. Hence, flavor itself not good enough to construct a dependable priority list for future preservation, parenting and exploitation. Edible plant species are intimidate by many natural cause and human activities [5], [41]. Extreme weather caused by global climate change, such as heavy droughts and floods has resulted in the loss of many wild edible plant populations. From human activities such as land uses changing, over harvesting and other infrastructures. Nowadays, population increase needs more food, so harvesting edible plant species with a fair price is decreased. Intimidate are not only limited to wild edible plants, the indigenous knowledge.

## Conclusion

This researched is the first ethnobotanical study of wild edible plants used by local people in Vang Vieng, Laos. Like plant resources in this area are somewhat abundant, and within influences of other ethnic groups, the local people not only cultivate variety of crops, but there are also collected wild edible plants as diet. In our investigation showed the plurality of wild edible plants and related traditional knowledge in this area. Different plant parts used by local people and the most frequently parts used were fruits, young leaves, and growing tip. These plants have different specific food uses, with leafy vegetable and add to soup uses being most frequently (leafy or young leaves can harvest and consumption whole years), following by fruits uses each species different season, by eaten rip fruits or young fruits. Wild edible plants provide nutrition to the rural communities, such as important amino acids, all kind vitamins and

minerals which are the body needed to keep healthy and supplement immunity against infection and diseases.

So, appropriately harvested wild plants could be the source of cash income for the rural people with poor family or low income, because they are delight in local people very much and consistently exchange in market. In order to suitably uses the wild edible plants our team have some suggestions: a) manage the natural resources habitat and environmental for wild plants; b) focus on research on wild plant resources because Laos are rich in plants diversity but very less in scientific research.

## Declarations

**Ethnic Approval:** The study were approved by Faculty of forestry Science, National University of Laos PDR & Northwest A&F University China. There is no human, animal and plant Subject involved in this study. The resources for conducting field survey provided by University of Laos PDR, and participants were voluntarily conducting the field survey.

**Consent for publication:** Not applicable

**Availability of data and material:** The total of 125 households were interviewed but we cannot share their personal information, plants information's were showed detail in table 1 in manuscript.

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**Competing interests:** The authors declare that they have no competing interests.

**Authors' contributions:** Khambay K conceived the study, participated in the fieldwork, analyzed the data and wrote manuscript, Zhang Lily and Muhammad Awais provided theoretical inputs, analyses data, Kang Yx and Nishantha revised and finalized the manuscript. All authors read and approved the final manuscript.

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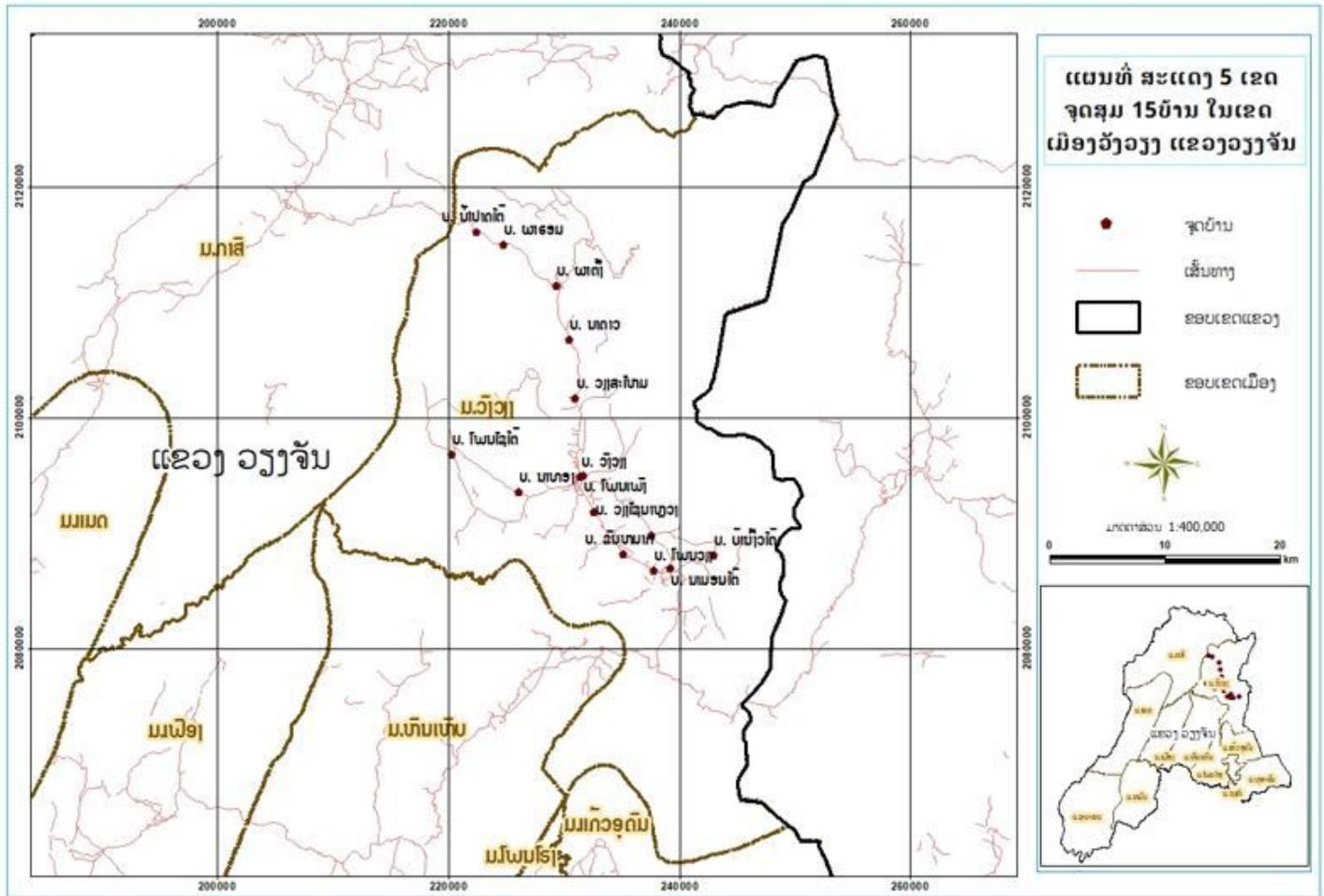
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## Tables

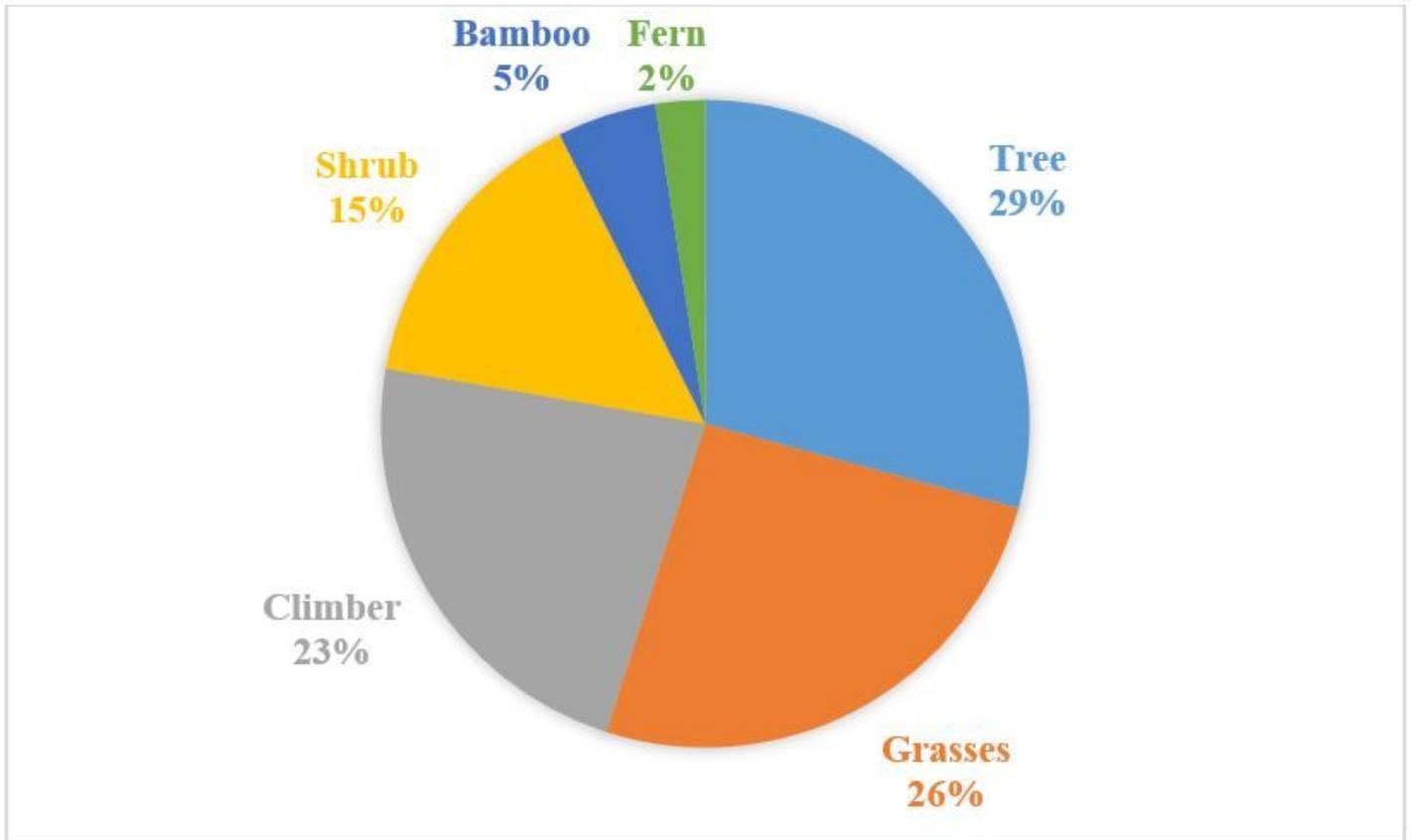
Due to technical limitations, table 1 is only available as a download in the Supplemental Files section.

## Figures



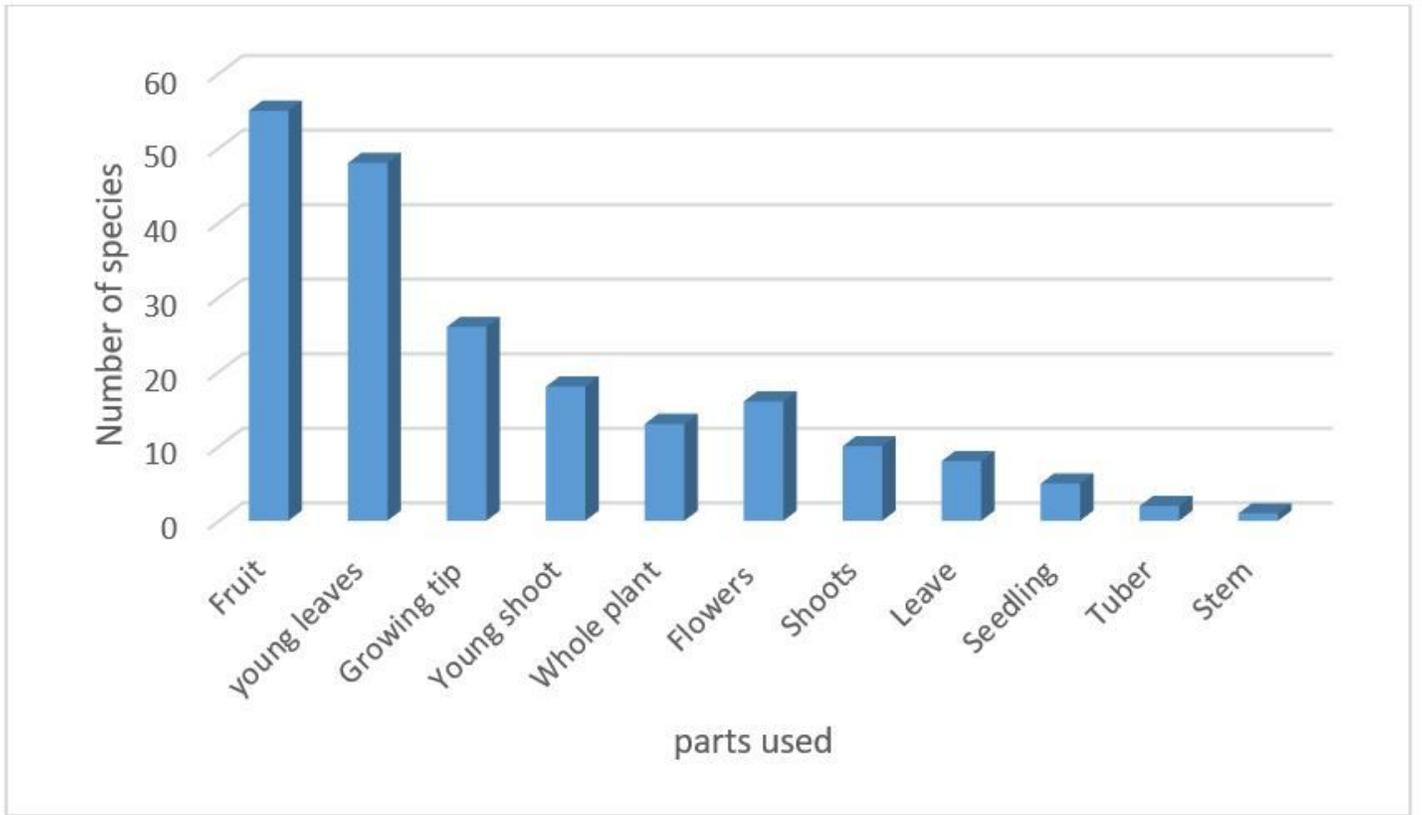
**Figure 1**

Location of the study sites in the Vang Vieng District, Vientiane Province Laos. Field investigate and data collection Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.



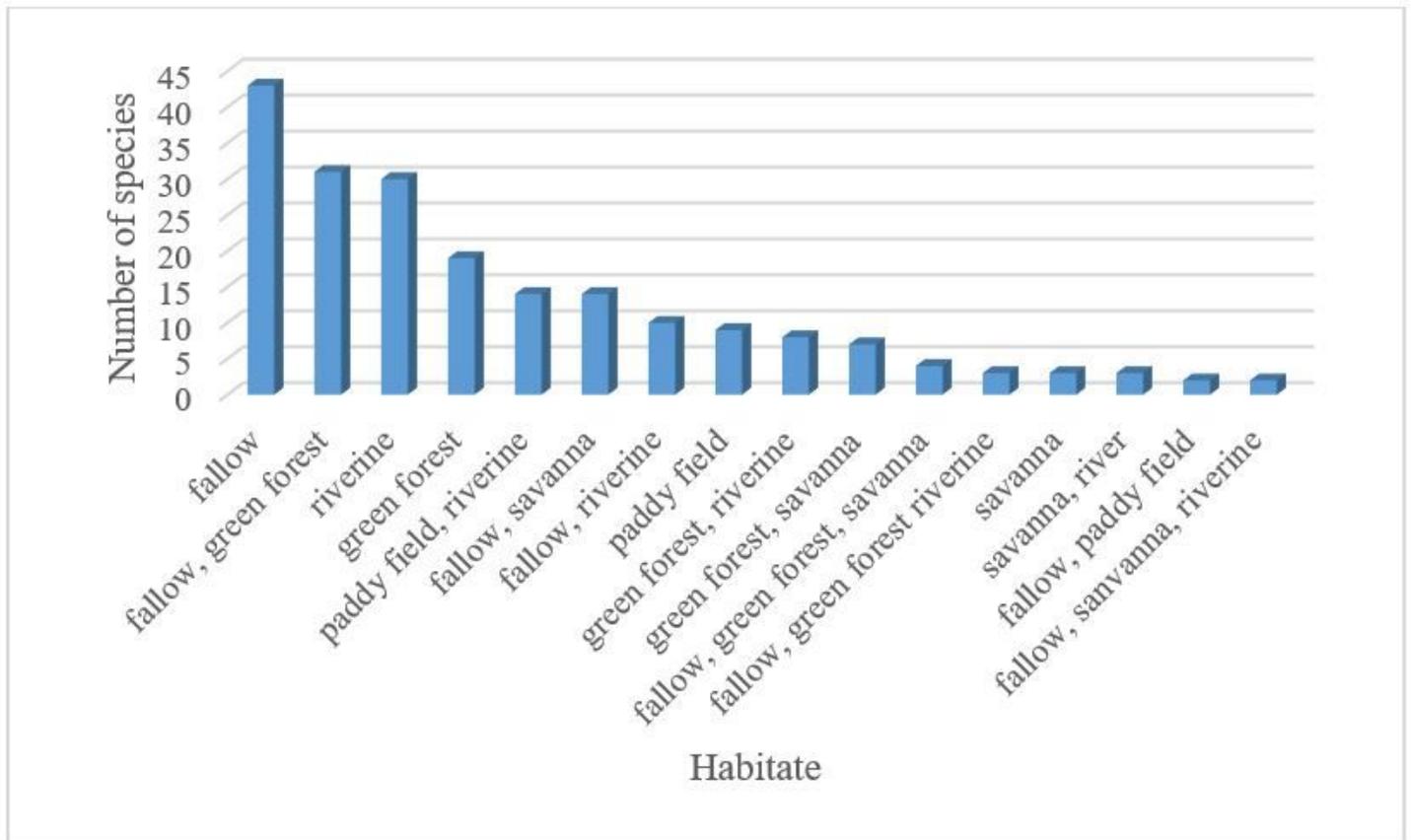
**Figure 2**

Plant forms for wild edible plants in the study area, Vang Vieng District, Vientiane Laos.



**Figure 3**

Use frequency of wild edible plant parts of species used by the Vang Vieng region, Vientiane Province Laos.



**Figure 4**

Habitat distribution of wild edible plants used in the Vang Vieng region, Vientiane Province, Laos.

## Supplementary Files

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