

Potential Species as a Food Source in Wehea Forest, East Kalimantan

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ABSTRACT

Knowledge of species diversity in tropical forests is well known, but the information on plant species' food source potential in forest areas is still limited. The study was conducted in Nehas Liah Bing village and Wehea forest in August 2011 by interviews with local people and exploration in the forest. A total of 69 species of plants that have potential as a food source have been recorded in this research. It can be divided into three groups by the utilization: 51 species of fruits, 20 Species of vegetables and herbs, and groups producing starch/sago one species. Differences in local knowledge and experience and the condition of the landscape/habitat make differences in the diversity and number of species recorded.

Keywords: *Species Diversity, Tropical Forest, Wehea Forest, Food Source*

1. INTRODUCTION

Food security is one of climate change impact that has become a serious concern globally. High urbanizing rate and requirement for fast food that takes a short time to produce and consume also contribute to the less alternative and diversification of food source. As a result, many people have less diet and nutrition diversity and decrease food affordability in some communities, especially in the big city [1,2].

As one of eight plant genetic recourse centres, especially for tropical fruits [3], Indonesia has a potential natural resource as a food development centre globally. Kalimantan Island is rich in edible plant species and is already used by local people as a food source [4]. However, much of them are not recorded yet or developed well as a food source. On the other side, alternative food sources are essential to mitigate the world's food security problem.

Explored and investigated plant species from Kalimantan used by local people or had potential as food source had been conducted in some area [5,6]. However, in some remote places or with limited access, the investigation is still absent. This study aims to add data and information about native plant species from Kalimantan, mainly from East Kalimantan, which have potential as a food source. The data and information can

conserve and develop plant species, in cultivation or production, potentially as alternative food sources.

2. METHODS

The research was conducted in Nehas Liah Bing Village and Wehea Forest, East Kutai Regency, East Kalimantan from May to December 2011. Data collected through interviews with the selected local people (Key people) who know the edible plant species from the forest and following with exploration in the Wehea forest. In this research, we interviewed Mr. Ledjie Taq, Chief of Dayak Wehea dan Yatim, Petkuq Mehuey (Forest Ranger) Coordinator.

We collected information on species name (vernacular), edibility (fruits, herbs, vegetables, and starch), utilization, cultivation, and conservation efforts conducted by local people. The survey was conducted based on a plant name list (vernacular) from the interview and plant found in the field. Plant identification was performed in the field and Herbarium Wanariset Samboja (WAN). Plants collections were made during exploration and storage in the WAN. The plants were categorized based on the local people's utilization to get more specific information and understand the potential development for cultivation or production.

3. RESULT AND DISCUSSION

Nehas Leah Bing village (also known as Selabing) is the oldest Dayak Wehea village with 80 kilometres from Wehea Forest. The Dayak Wehea is classified in Apo Kayan Tribe from the Kayan River. After the migration into Wehea River, they were known as Dayak Wehea. Wehea Forest is a Dipterocarpaceae forest with elevation from 250 m asl in the east to 1750 m asl in the west, a mountain forest. More than 60% of Wehea forest has steep topography (30% - 40%), and the rest are hills and plain areas. The Dayak Wehea is still implementing

Table 1. Plants species that produce fruit were found in Wehea Forest

No.	Family	Species	Vernacular Name	Habitus
1	Anacardiaceae	<i>Dracontomelon dao</i>	Guaq san/ sengkung	Climber
2	Anacardiaceae	<i>Mangifera macrocarpa</i>	Sam las	Tree
3	Anacardiaceae	<i>Mangifera pajang</i>	sam nas	Tree
4	Anacardiaceae	<i>Mangifera torquenda</i>	Guaq sam/ Asam putar	Tree
5	Bombacaceae	<i>Durio dulcis</i>	Lejen	Tree
6	Bombacaceae	<i>Durio kutejense</i>	Lai	Tree
7	Bombacaceae	<i>Durio oxleyanus</i>	Lejien thong 2	Tree
8	Bombacaceae	<i>Durio</i> sp1	Lejen lehaq /Lahung	Tree
9	Bombacaceae	<i>Durio</i> sp2	Lejien thong/ Krantungan	Tree
10	Bombacaceae	<i>Durio zibethinus</i>	Le jen /Durian	Tree
11	Burseraceae	<i>Canarium</i> sp.	Guaq Ngen	Tree
12	Burseraceae	<i>Canarium odontophyllum</i>	Le ma	Tree
13	Burseraceae	<i>Dacryodes</i> sp.	Thong pot	Tree
14	Ebenaceae	<i>Diospyros</i> sp.	Thong pot 2	Tree
15	Euphorbiaceae	<i>Baccaurea angulata</i>	Guaq beag seling /belimbing hutan	Tree
16	Euphorbiaceae	<i>Baccaurea edulis</i>	Guaq puh/kapul	Tree
17	Euphorbiaceae	<i>Baccaurea lanceolata</i>	Guaq lep	Tree
18	Euphorbiaceae	<i>Baccaurea</i> sp1	Nyaq loq	Tree
19	Euphorbiaceae	<i>Baccaurea</i> sp2	Guaq nyiak lek	Tree

some of the traditions in their daily activity, in medication ritual, paddy cultivation and harvesting ceremony, and other traditional events. The village has a Chief of the village for the government administration purpose and a Chief of the Tribe for traditional activity [7].

There are 69 species of forest plants that local people use as food sources. Fifty species of the plants produced fruits (Table 1), 21 species were used as vegetables or herbs (Table 2), and one species have starch which is Aren (*Arenga pinnata*).

No.	Family	Species	Vernacular Name	Habitus
20	Euphorbiaceae	<i>Elateriospermum tapos</i>	Keje plaq	Tree
21	Flacourticeae	<i>Flacourtia</i> sp.	Em tan tuq	Tree
22	Guttiferae	<i>Garcinia mangostana</i>	Manggis hutan	Tree
23	Guttiferae	<i>Garcinia</i> sp1	Kebung besoq /manggis	Tree
24	Guttiferae	<i>Garcinia</i> sp2	Manggis hutan	Tree
25	Guttiferae	<i>Mammea acuminata</i>	Ptei las	Tree
26	Lauraceae	<i>Litsea garciae</i>		Tree
27	Leguminoceae	<i>Parkia</i> sp.	Ptuah/ Petai hutan	Tree
28	Marantaceae	<i>Donax caniformis</i>	Guaq welong/bemban	Herb
29	Meliaceae	<i>Lansium domesticum</i>	Guaq Leanghut/ Langsung	Tree
30	Moraceae	<i>Artocarpus heterophyllus</i>	Nekian/ nangka	Tree
31	Moraceae	<i>Artocarpus integer</i>	Nekian keje/ Cempedak	Tree
32	Moraceae	<i>Artocarpus lanceifolius</i>	Keh liang / kledang	Tree
33	Moraceae	<i>Artocarpus</i> sp1	Terap	Tree
34	Moraceae	<i>Artocarpus</i> sp2	a.w. Terap	Tree
35	Moraceae	<i>Ficus</i> sp.	Guaq gehaq / ara	Tree
36	Myristicaceae	<i>Knema latifolia</i>		Tree
37	Myristicaceae	<i>Myristica</i> sp.	Pala hutan	Tree
38	Palmae	<i>Borassodendron</i> sp.	Guaq ndiang/ wuul (umbut)/ kelapa hutan	Tree
39	Palmae	<i>Calamus ornatus</i>	Guai gethung/Rotan	Climber
40	Palmae	<i>Salacca affinis</i>	Salak hutan	Herb
41	Rosaceae	<i>Rubus moluccana</i>		Herb
42	Sapindaceae	<i>Lepisanthes alata</i>	Guaq saq	Tree
43	Sapindaceae	<i>Nephelium cuspidatum</i> var. <i>robustum</i>	Sibau	Tree
44	Sapindaceae	<i>Nephelium cuspidatum</i> var. <i>eripetalum</i>	Guaq geleng/rambutan	Tree
45	Sapindaceae	<i>Nephelium ramboutan-ake</i> .	Guaq deng/Meritam	Tree

No.	Family	Species	Vernacular Name	Habitus
46	Sapindaceae	Sp1	Bel tiq	Tree
47	Sapindaceae	Sp2	Sie tep	Tree
48	Sapindaceae	<i>Nephelium uncinatum</i>	Guaq lenum	Tree
49	Sapindaceae	<i>Pometia pinnata</i>	Gesie pelnuq	Tree
50	Zingiberaceae	<i>Hornstedtia</i> sp.	Guaq piss/Petete	Herb

Table 1 shows the fruit group is the most number of species found in Wehea Forest. It's related to Sidiyasa finding in Malinau and Berau Regency that found 110 species from 152 food plant species. There are 11 species that we found in Wehea that are not recorded there [8,9]. The 11 species are *Artocarpus heterophyllus*, *Baccaurea angulata*, *Baccaurea edulis*, *Calamus ornatus*, *Donax caniformis*, *Hornstedtia* sp., *Knema latifolia*, *Mammea acuminata*, *Mangifera macrocarpa*, *Myristica* sp., and *Nephelium uncinatum*.

Different forest conditions and knowledge of key person should be the cause of this difference.

Durio dulcis can live in the swamp area and become a unique species from the East Kalimantan swamp area [10]. Fruits have antioxidants that good for the health of human skin [11,12]. Some species like *Nephelium cuspidatum*, *Durio zibethinus*, and *D. kutejensis* are common in the farm or yard by local people in East Kalimantan, and the harvest season is sold in the local market.

Table 2. Plants species were found in Wehea Forest used as vegetables or herbs

No.	Family	Species	Vernacular Name	Habitus
1	Athyriaceae	<i>Diplazium esculentum</i>	Pka/pakis	Fern
2	Blechnaceae	<i>Stenochlaena palustris</i>	Pka 2/ Pakis	Fern
3	Burseraceae	<i>Santiria</i> sp.	Sal/kayu bawang	Tree
4	Guttiferae	<i>Garcinia becarii</i>	Guaq des/asam kandis	Tree
5	Leeaceae	<i>Leea indica</i>	Sung tem lai leng	
6	Melastomataceae	<i>Melastoma malabathricum</i>	Lebeng	Shrub
7	Menispermaceae	<i>Pycnarrhena tumefacta</i>	Vetsin Hutan /Mekai (Kenyah)	Herb, Climber
8	Moraceae	<i>Artocarpus heterophyllus</i>	Nekian/ nangka	Tree
9	Musaceae	<i>Musa borneensis</i> .	Baq teyak/pisang hutan	Herb
10	Myristicaceae	<i>Embelia</i> sp.	Sung sam	Shrub
11	Olacaceae	<i>Scorodocarpus borneensis</i>	Seda/ kayu bawang	Tree
12	Palmae	<i>Licuala valida</i> .	Kejiang / daun biru	Tree
13	Palmae	<i>Borassodendron borneensis</i>	Guaq ndiang/ wuul (umbut)/ kelapa hutan	Tree

No.	Family	Species	Vernacular Name	Habitus
14	Palmae	<i>Calamus</i> sp.	Guai neaq leang/rotan	Climber
15	Sapindaceae	<i>Lepisanthes alata</i>	Guaq saq	Tree
16	Solanaceae	<i>Solanum torvum</i>	(Takokak/Terung pipit)	Shrub
17	Solanaceae	<i>Solanum</i> sp.	(Terung asam)	Shrub
18	Symplocaceae	<i>Symplocos</i> sp.	Keje lengeh	Shrub
19	Zingiberaceae	<i>Etingera elatior</i>	Song wai	Herb
20	Zingiberaceae	<i>Plagiostachys</i> sp1	Pos	Herb
21	Zingiberaceae	<i>Plagiostachys</i> sp2	Pos 2	Herb

Some of the plant species used as vegetables or herbs by the Dayak Wehea community are common plants that also used widespread Kalimantan, or in the more global area, Malesiana. The ferns, Jackfruit (*Artocarpus heterophyllus*), *Solanum torvum*, and all Palmae and Zingiberaceae species are common to use and commonly found in the market or department store. However, some species used only by local people in the East Kalimantan, such as *Symplocos* sp., *Pycnarrhena tumefacta*, or *Lepisanthes alata* as vegetables or herbs. For the first time, we also found that the shoot of *Melastoma malabathricum* could be used as vegetables, both raw or cooked.

There are 17 species of plant in Vegetables and herbs groups found in the Wehea forest, with nine species found in Sidiyasa [9]. The different species are *Artocarpus heterophyllus*, *Garcinia becarii*, *Leea indica*, *Lepisanthes alata*, *Melastoma malabathricum*, *Plagiostachys* sp1., *Plagiostachys* sp2., *Santiria* sp. and *Symplocos* sp. In Sidiyasa [9], *Leea indica*, *Lepisanthes alata*, *Melastoma malabathricum* is recorded in the fruits group. It shows the different people's knowledge in the use of plant species present in their area.

Only one species is used to produce stretch/sago, *Arenga pinnata*, or Aren. In Wehea forest, none of the sago palm (*Metroxylon sago*) individuals were recorded, even there is some swamp area known as the habitat. *Arenga pinnata* can be developed in the cultivation system in a large area, and almost all parts of this plant can be used. The leaves are used as the house roof and vein for the broomstick. Local people derived palm sugar from sap extracted from the flower stalk and local wine (Tuak) from the sap's fermentation process. Sidiyasa [9] notes seven species produce stretch/ sago, *Arenga pinnata*, *Arenga undulatifolia*, *Caryota* sp., *Eugeissona utilis*, *Metroxylon sago*, *Oncosperma horridum*, and *Oncosperma* sp. In Wehea forest, these

species were not found, but some *Caryota* sp. was found along the street from the village to the district city.

According to live form or habitus, the trees group are the many species as food plants found in Wehea forest, 53 species. Shrubs are ten species, and herbs are five species, and climber three species. Only three species were found in primary forest, 22 species were in secondary forest, 23 species were found in primary and secondary forest, two species were in an open area, and one species was found in the farm area. *Pycnarrhena tumefacta* is a primary forest species that a villager in his back yard has cultivated and used as herbs. The species is famous for any food mixing, however recently is replaced by synthetic food flavor. Investigation in the *P. tumefacta* leaves' chemical compound indicated that the species has antioxidant, antidiabetic, and antimalaria compounds [13-15].

Some of the fruit species not edible as fresh fruits but also as vegetables or herbs. Young fruit of *Artocarpus* spp. (breadfruit group) is widely known to use as vegetables [16], and some *Garcinia* spp. (sour fruit) use as herbs. Table 3 shows the organs used from the plants' species found in Wehea Forest.

Table 3. Organs of Plant Used in Wehea Forest

Groups of utilization	Part of plants used			
	Fruits	Leaves	Young stem or shoot	Stem
Fruits	50	0	0	0
Vegetables and Herbs	6	9	6	0
Strech/Sago	0	0	0	1

Different knowledge and experience of each local community are also found in plant use as a medicinal plant, as same as the use of food plants. Not only the plant species, but the use and part of the plant that use also could also be different among the local community in Kalimantan [7,17,18]. This condition is the chance for the scientist to explore plant species usage in several use and technic. Some species can be used in a community, but not in others. Some parts of the plant are used in a community, and other parts are used in others. This is a heritage of knowledge that can be developed to find alternative food sources.

High pressure in the forest area caused by illegal logging, land conversion, and other use is the main threat for plant diversity in the forest, where the potential food plant is included. Protection of the forest area, low impact of forest management, and conservation of species are the effort we can make to protect the plant diversity, especially the potential plant as a food source. The traditional system from local people known as forest garden or Agroforestry is an initiative from the local people in plant conservation to adapt and develop for means [6,16,19]. Sastradipradja proposes "one village one species" as a conservation effort at the grass-root level. The villager chooses a species with a village mascot and plant, at least 50 of the species [4].

Some forest plant has cultivated in the Wehea villagers yard such as *Durio kutejense*, *Durio zibethinus*, *Garcinia mangostana*, *Litsea garciae*, *Parkia* sp., *Lansium domesticum*, *Artocarpus heterophyllus*, *Artocarpus integer*, *Nephelium cuspidatum* var. *eripetalum*, *Nephelium ramboutan-ake*, *Pycnarrhena tumefacta*, *Santiria* sp., *Solanum* sp., *Etlingera elatior*. Some species' growth rate and productivity even can give economic value to the villagers in the mass harvest season [4].

4. CONCLUSION

Wehea forest has planted species that potential as an alternative food source. Of 69 species found in the area, some species are commonly known and widely cultivated in the Kalimantan. However, some species are potential as a food source, however not grown yet. This is an opportunity for researchers to develop a cultivation system and introduce the species to the public.

Dayak Wehea people's effort to protect the forest is A good start to conserve plant species, especially the species potentially as a food source. The high rate of change of forest area into plantation and mining in East Kalimantan also threat the habitat and the species at the same time. With this information's documentation, we have strong bases to protect the forest and give the

community an alternative for life by diversification of alternative food and economic value potential.

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