

# Plant diversity and nutrient substances of native edible plant: Case study in Suka Maju and Tamao Villages, Kapuas Hulu District, West Kalimantan, Indonesia

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Tel.: +62-561-7053252, Fax.: +62-5610-740187, \*email: sulvipurwayanti06@gmail.com

Manuscript received: 6 November 2019. Revision accepted: 31 January 2020.

**Abstract.** Purwayantie S, Suryadi UE. 2020. Plant diversity and nutrient substances of native edible plant: Case study in Suka Maju and Tamao Villages, Kapuas Hulu District, West Kalimantan, Indonesia. *Biodiversitas* 21: 842-852. The existence of plant diversity which is wild, indigenous and edibles, needs to be preserved. The research locations in Suka Maju and Tamao Village, Kapuas Hulu District, West Kalimantan, Indonesia were chosen based on population density. The purpose of this study was to determine the plant diversity and nutritional potential from both of regions. The study method used purposive sampling survey and the data were analyzed descriptively. The results showed that from a total of 110 plants, the three local plant names were subjected to one species and nine species were found in both locations. So that from 98 plants consisting of 44 fruits (14 of table fruits and 30 fruits of suka-suka), 30 vegetables and mushrooms, 14 seasonings, 7 nuts, 3 cereals, and tuber. The discovery of rare genera reported from West Kalimantan, they are *Hydnocarpus* sp, *Hodgsonia* sp, and *Hypoxylon* spp. The highest proximate content of carbohydrate is from *joluk kusuk* seeds (*C. lacryma jobil*), fats from *kepayang seeds* (*P. edule*) and *dangkuk* seeds (*Hydnocarpus* sp), protein from *sengkubak* leaves (*A. papuana*), ash from *keranji* (*Hypoxylon* spp) and *dangkuk*. The highest Fe and Zn mineral content were found from *sengkubak* fruit (*D. dao*) and *tepus* leaves (*E. foetidum*), respectively. The results of this survey became an initial recommendation in the development of local wisdom for local food security.

**Keywords:** Diversity, edible, indigenous, Kapuas Hulu, plant, wild

## INTRODUCTION

Kapuas Hulu Regency has been known as a conservation district (PERDA Kabupaten Kapuas Hulu No. 20 2015). This is supported by the existence of Sentarum Lake and Betung Kerihun National Park and included as part of the 'Heart of Borneo'. Progressive developments in almost live fields can affect the sustainability of biodiversity (Suhartini 2009) that still exist until now. One thing that threatened is biodiversity as the spearhead of the main part to meet their daily needs (foods, medicine, buildings, culture, cosmetics). Although stated as a conservation district, not all areas in this district still have primary forest (BPS KH 2018). This is due to civilization development often making people turn to used unoriginal biological sources introduced from outside Kapuas Hulu. The introduction plants as a source of food in some areas never are avoided, but the wild plants as part of local wisdom should be developed increasingly became plants that have a similar minimum economic value like the plant as a source of food.

Meanwhile, Kapuas Hulu Regency is included in the area of accelerating the development of underdeveloped regions in 2015-2019 (Perpres RI No. 21 2018). One of the solutions to improvement and utilization of the potential resources of the forest areas and critical land by taking into account the principle of sustainable development. In the case of follow-up, there has been no report related to any

action. This research was conducted to determine the potential of resources outside the forest area as a comparison, especially nutrient substances of native edible plant biological resources. It can be reported about the diversity of plants in the Kapuas Hulu Regency, few plants following the nutritional value relatively. Some survey reports on the same topic often mix between native edible and wild plants with the commerce food plants. e.g.: bananas, corn, kale, cassava, bitter melon, taro, etc. (Satrima et al. 2015; Haryanti et al. 2015; Pradityo et al. 2017). The Commerce of food sources is developed widely into the materials industry, so the existence of local wisdom based on the food sources needs to be informed about the benefits of it. Thus they could be developed into new food sources for the people of Indonesia. It is important to know that founding plant diversity has the potential to be developed into local food through cultivation and processing into economical food products.

For the global community, food based on local wisdom has become one of the requirements for of food in 2050 (Purwayantie 2019). Various food products based on local wisdom was developed into global products (Purwayantie 2019; Wibowo et al. 2019). The role of local universities together with the local community and the regional government of West Kalimantan is needed to highlight and develop the local wisdom to go international. Because of plant diversity from Kapuas Hulu's potential to promote to

be ingredients of international culinary, biopharmaceutical, cosmetics for global communities. The results of this study became the recommendations for relevant stakeholders in developing local food that have the potential to improve local and national food security.

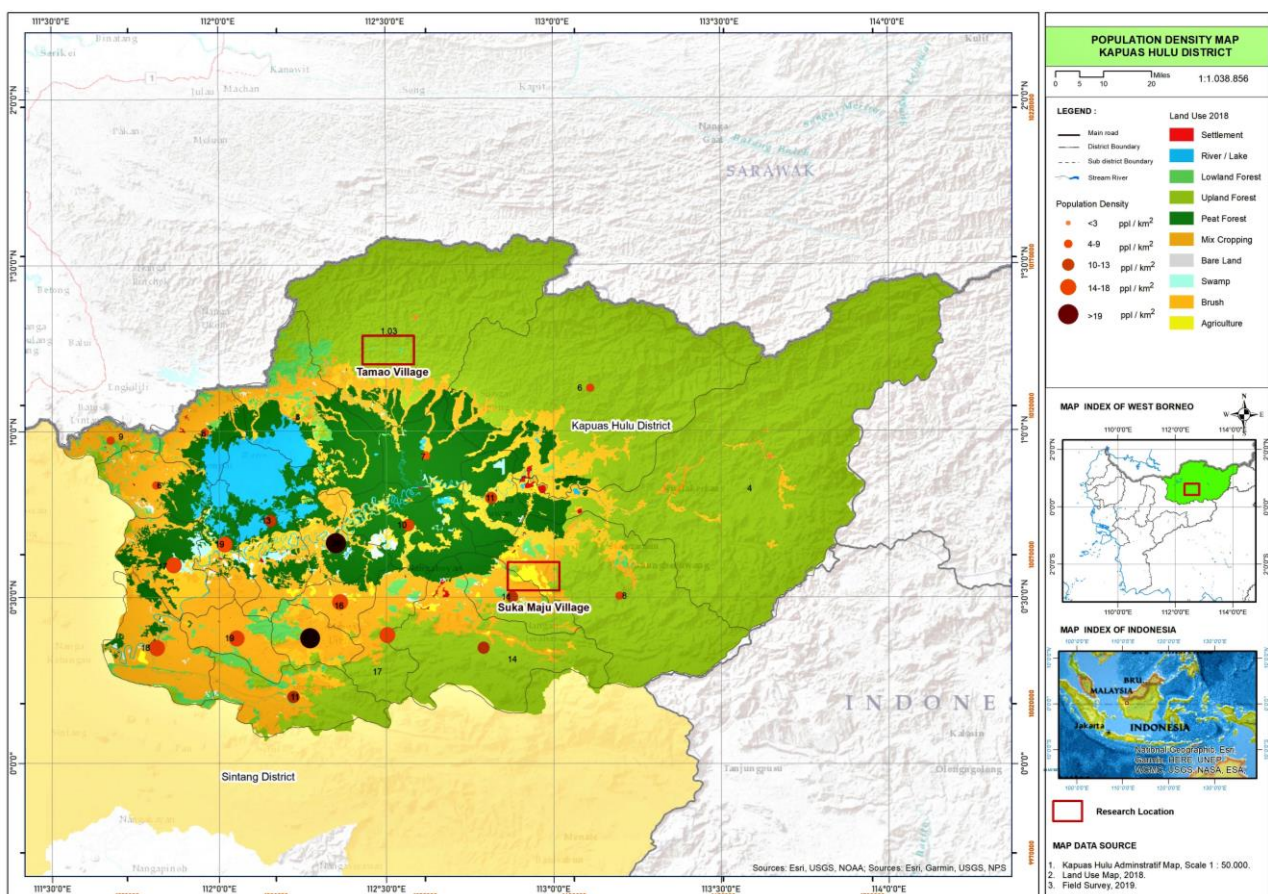
## MATERIALS AND METHODS

### Study area

Sampling locations were carried out by non-sampling surveys, namely in Suka Maju Village, Mentebah Sub-district and Tamao Village, Embaloh Hulu Sub-district, Kapuas Hulu District, West Kalimantan Province. Selecting a location based on the location of dense forests in Kapuas Hulu District because at the area is easy to find the diversity of plants and the area is not dense of population.

Based on the map of survey location (Figure 1), the dense population area can be shown in orange and yellow while the light green colors indicate the forest area. In this activity, the dense area is highly populated. Because of the dense area, there are a lot of agricultural lands were cultivated in that location. Therefore, the area was not chosen as the location of the activity. From Figure 1. it can be seen that the dense area starting from the border of

Sintang District to the Hulu Gurung Sub-district[W1] (pastel color, west and south of Kapuas Hulu ). Mentebah Sub-district is located near the middle of the Hulu Gurung Sub-district and Putussibau City, it is marked by light green area on the map, namely the dryland forest. The population density in Mentebah Sub-district, particularly in Suka Maju Village has a relatively moderate population density (17.47/km<sup>2</sup>; (BPS 2019) with a high population from residents in the Sub-district city. Suka Maju village located in 0711070 longitudes and 0058474 latitudes (49N). Generally, the plant diversity in adjacent areas has same plant diversity profile. Therefore, another sample from Embaloh Hulu Sub-district was taken further from location I (Mentebah). This Sub-district is an area in the wetland forest area and Tamao Village has the lowest population density (1.03/km<sup>2</sup>; BPS 2019) compared to other villages in the same of Sub-district (dark green color). Tamao village located in 0658091 longitudes and 0125041 latitudes (49N). The area at the center of the district, especially around the Sentarum Lake, was not selected as a survey area because it is a protected area, swamp, peat soils, and the materials for research difficult to find. Material collection in the two villages is not from the primary forest area or Forest Management Unit area but starts from the yard as the secondary forest.



**Figure 1.** Survey locations in Suka Maju Village (Mentebah Sub-district) and Tamao Village (Embaloh Hulu Sub-district), Kapuas Hulu District, West Kalimantan, Indonesia

### Selection of respondents

The selection of respondents is an important component of this activity. The respondents were determined based on recommendations from the local traditional leaders and all other information that found during the preliminary survey. In this activity, the respondent is the person who is asked to provide all the information concerning the intended plant including the location of the plant, utilization of the plant, local name, as well as all facts or opinions related to the intended plant. The information can be conveyed in written form when filling out a questionnaire or verbally. In addition to the answer to the questions from questionnaires given by respondents also followed by the survey team to inform and about the location of the plant growth is mentioned.

### Data collection techniques

This study used a survey method for conducting the research. The researcher collected the data collection. The data was taken from direct interviews, questionnaires, documentation, and identifying plants with help from Herbarium Bogoriense, Research Centre for Biology, Indonesian Institute of Sciences (LIPI), Cibinong, Bogor, Indonesia.

### Chemical analysis methods

The chemical analysis includes proximate (AOAC 2006), fiber (Sudarmadji 2007), calories (Sukasih and Setyadi 2017) and minerals using AAS (Subramanian et al. 2012). Not all proximate analysis is done because not all materials are available when the survey is conducted (not yet bearing fruit) or the quantity submitted by the community is not sufficient in quantity to be analyzed. The results of the proximate analysis are still rough because they do not directly reflect the intended nutrients. The value of protein produced through the Kjeldhal method calculates only the total value of N while the N in food does not only come from protein but includes N in the alkaloids and nucleotides. The value of fat produced through the Soxhlet method calculates as total lipids (all chemical compounds that are not soluble in water) without knowing the actual fat/oil content. The value of carbohydrates is produced from calculations by different material is considered to have a value of 100%, then the value of carbohydrates is 100% minus the percentage value of moisture, ash, fat, and protein.

The mineral analysis has functions specifically in the physiology of the human body such as macro minerals (P, Mg, Na, Ca) and micro minerals (Fe, Zn, Cu). The calories were measured by conversion factors for protein (4 kcal/g), fat (9 kcal/g) and carbohydrate (4 kcal/g).

### Data analysis

In this study, the researcher used some technique for processing the data, there are editing (reducing) the data, and displaying the data descriptively.

## RESULTS AND DISCUSSION

### Plant identification

The identification of plant diversity wild plant and native edible plants in two villages was found a total of 24 genera, 70 species, and 11 unidentified plants. In Mentebah Sub-district has been found unknown 17 genera, 55 species and 11 of plants, while from Embaloh Hulu Sub-district, there are unknown 7 genera, 15 species and 5 of plants. This result based on the example of bark specimens that cannot be tested at LIPI as an alternative to immature fruit. From the two districts, there are 9 species that are same, they are *patikala/kecombrang* (*E. elatior*) sour fruits, *tepus* (*E. foetidum*) leaf, *tugu/sengkubak* (*A. papuana*) leaf, *empakan/papakan* (*D.kutejensis*), *mawang/imbawang* (*M. panjang*) sour fruit, *keriang/riang* acid leaf, *kuranji* (*D. indum*) sour fruit, *cengkodok* (*M. malabatricum*), *cempedak* (*A. champeden*). From the total 101 of wild plants, native edible plants has been found, classified into 5 of food groups (Figure 2).

According to residents, there is a fruit group that can be consumed when in the forest, field farms or by hunter, they do not bring at home or sold. The fruit group was called the 'suka-suka' fruits, so the total number of food groups were 6 groups. The complete number of plants found can be seen in Table 1. There are 98 species were found and unreported from West Kalimantan are *dangkuk* fruit (*Hydnocarpus* sp.), *dendang* pumpkin (*Hodgsonia macrocarpa*), and mushrooms (*Hypoxylon* sp.) (Figure 3, 4 and 5). There has been reported in Flora Malesiana that only one species *Hodgsonia macrocarpa* in Borneo (de Wilde and Duyfjes 2010) but there is no explanation that the species found in west, centre, south or east of Borneo (Kalimantan). These three genera are only found in Mentebah Sub-district, both types of fruit and mushrooms are used by a few people and some never known, while the *keranji* mushroom is eaten by some residents who are going to the forest every day.

Mushroom types from genera *Hypoxylon* and *Xylaria* have been reported to be found in Malaysia with each *Hypoxylon* (17 sp.) and *Xylaria* (47 sp.) spread across the peninsula of Malacca to Sarawak. Some names of *Hypoxylon* fungi are combined with the name *Xylaria*, for example, *H. avellana* same as *X. avellana* (Lee et al. 2012).

### Proximate and calories

The nutritional composition of several wild plants, indigenous, edible and wild biodiversity found in The Mentebah Sub-district and Embaloh Hulu Sub-district can be seen in Table 2.

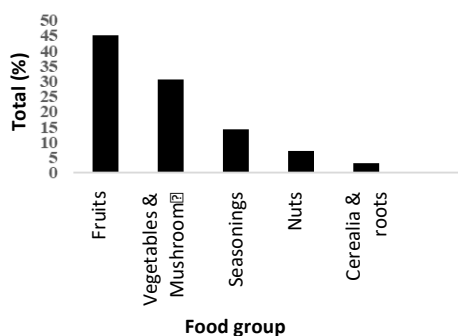
### Mineral composition

Mineral composition derived from the ash content. The specific mineral compositions in several wilds, native edible plants edible from Suka Maju and Tamao Villages can be seen in Table 4.

**Table 1.** The genera and species found in Suka Maju and Tamao Villages, Kapuas Hulu District, West Kalimantan, Indonesia

Local/vernacular name	Genera or species name	Famili	Location
Abok putih	<i>Ipomea cf. gracilis</i> R. Brown.	Convolvulaceae	Mentebah
Asam kala/patikala fruit	<i>Etlingera elatior</i> (Jack) R. M. Smith.	Zingiberaceae	Mentebah
Kandis acid fruit	<i>Garcinia xanthochymus</i> Hook. f. ex T. Anderson	Clusiaceae	Mentebah
Keriang acid leaf	<i>Begonia bracteata</i> Jack.	Begonia ceae	Mentebah
Pelanduk acid fruit	<i>Baccaurea racemose</i> Muell. Arg.	Phyllanthaceae	Mentebah
Tabar acid fruit	<i>Costus</i> sp.	Zingiberaceae	Mentebah
Kerangi acid fruit	<i>Dialium indum</i> L., Mant.	Caesalpinioideae	Mentebah
Mawang acid fruit	<i>Mangifera pajang</i> Kostermann.	Anacardiaceae	Mentebah
Kepayang seeds	<i>Pangium edule</i> Reinw.	Achariaceae	Mentebah
Kerantik seeds	<i>Lepisanthes</i> sp.	Sapindaceae	Mentebah
Kenual seeds	-	-	Mentebah
Bebek fruit	<i>Saurauia nudiflora</i> DC.	Actinidiaceae	Mentebah
Engkuis/Cat eye fruit	<i>Dimocarpus longan</i> Lour.	Sapindaceae	Mentebah
Kumpang fruit	<i>Horsfieldia irya</i> (Gaertn.) Warb.	Myristicaceae	Mentebah
Laki fruit	-	-	Mentebah
Lemba fruit	<i>Curculigo latifolia</i> Dryand.	Hypoxidaceae	Mentebah
Lepang fruit	<i>Gymnopetalum cochinesis</i> (Lour) Kurz	Cucurbitaceae	Mentebah
Lupun fruit	-	-	Mentebah
Ombak fruit	<i>Baccaurea macrocarpa</i> (Miq.) Mull. Arg.	Phyllanthaceae	Mentebah
Rumbai fruit	-	Phyllanthaceae	Mentebah
Sengkuang fruit	<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe.	Anacardiaceae	Mentebah
Sindu akar fruit	<i>Scorodocarpus borneensis</i> Becc.	Olacaceae	Mentebah
Sindu api fruit	<i>Scorodocarpus borneensis</i> Becc.	Olacaceae	Mentebah
Temeranau fruit	<i>Durio dulcis</i> Becc.	Malvaceae	Mentebah
Cengkodok fruit	<i>Melastoma malabatricum</i> L.	Melastomaceae	Mentebah
Cempedak fruit	<i>Artocarpus champeden</i> (Lour.) Stokes.	Moraceae	Mentebah
Cuncun fruit	<i>Zingiber</i> sp.	Zingiberaceae	Mentebah
Dadak	<i>Sloetia elongata</i> Koord.	Moraceae	Mentebah
Dangkuk seeds	<i>Hydnocarpus</i> sp.	Achariaceae	Mentebah
Kesepang leaf	<i>Antidesma</i> sp.	Phyllanthaceae	Mentebah
Kondang leaf	<i>Ficus variegata</i> Blume.	Moraceae	Mentebah
Sengkubak leaf	<i>Albertia papuana</i> Becc.	Menispermaceae	Mentebah
Tepus leaf	<i>Eryngium foetidum</i> Linn.	Apiaceae	Mentebah
Engkala fruit	<i>Litsea garciae</i> Vidal.	Lauraceae	Mentebah
Empakan fruit	<i>Durio kutejensis</i> Hassk. Becc.	Bombacaceae	Mentebah
Empauh fruit	<i>Baccaurea lanceolata</i> (Miq.) Müll. Arg.	Phyllanthaceae	Mentebah
Emperingat fruit	<i>Rubus moluccanus</i> Linn.	Rosaceae	Mentebah
Enceriak fruit	-	-	Mentebah
Jambu monyet fruit	<i>Bellucia pentamera</i> Naudin.	Melastomataceae	Mentebah
Joli' kujuk seeds	<i>Coix lacryma-jobi</i> Linn.	Poaceae	Mentebah
Jewawut seeds	<i>Setaria</i> sp.	Poaceae	Mentebah
Kasai fruit	<i>Pometia pinnata</i> Forst & Forst.	Sapindaceae	Mentebah
Kecombrang flower	<i>Etlingera elatior</i> (Jack) R. M. Smith.	Zingiberaceae	Mentebah
Kemayong fruit	<i>Salacca</i> sp.	Arecaceae	Mentebah
Kemayao fruit	<i>Dacryodes rostrate</i> Blume.	Burseraceae	Mentebah
Kelampai seeds	<i>Elateriospermum tapos</i> Blume.	Euphorbiaceae	Mentebah
Beruk mushroom	<i>Stereum</i> spp.	Stereaceae	Mentebah
Gelang mushroom	<i>Lentinus sajorajaju</i> (Fr.) Fr.	Polyporaceae	Mentebah
Black mushroom	<i>Lentinus</i> spp.	Polyporaceae	Mentebah
Insang mushroom	<i>Tremella</i> spp.	Tremellaceae	Mentebah
Kerangi mushroom	<i>Hypoxylon</i> spp.	Hypoxylaceae	Mentebah
Korup mushroom	<i>Auricularia delicata</i> (Fr.) Henn.	Auriculariaceae	Mentebah
Embibir mushroom	<i>Auricularia auricula-judae</i> (Bull.)	Auriculariaceae	Mentebah
Lapek mushroom	<i>Auricularia polytricha</i> Linn.	Auriculariaceae	Mentebah
Honey mushroom	<i>Xeromphalina</i> spp.	Tricholomataceae	Mentebah
Cup mushroom	<i>Cookeina sulcipes</i> (Berk.) Kuntze.	Sarcoscyphaceae	Mentebah
Sweet mushroom	-	-	Mentebah
Fish eye mushroom	-	-	Mentebah
Nyamuk mushroom	<i>Marasmius</i> spp.	Marasmiaceae	Mentebah
Nyonya mushroom	<i>Laetiporus</i> spp.	Fomitopsidaceae	Mentebah
White mushroom	<i>Pleurotus astreatus</i> (Jacq.) P. Kumm.	Pleurotaceae	Mentebah
Tawon mushroom	<i>Schizophyllum commune</i> Fries.	Schizophyllaceae	Mentebah
Labu dendang seeds	<i>Hodgsonia macrocarpa</i> Blume	Cucurbitaceae	Mentebah

Lagan	<i>Plagiostachys crocydocalyx</i> (K.Schum.)	Zingiberaceae	Mentebah
Lasikan	<i>Baccaureae macrophylla</i> (Müll.Arg.)	Phyllanthaceae	Mentebah
Linang fruit	-	-	Mentebah
Malamun	<i>Nepthellium</i> sp.	Sapindaceae	Mentebah
Mentawak fruit	<i>Artocarpus anisophyllus</i> Miq.	Moraceae	Mentebah
Mintau fruit	-	-	Mentebah
Pelajau seeds	<i>Pentaspadon motley</i> Hook.f.	Anacardiaceae	Mentebah
Petai aek seeds	<i>Archidendron fagifolium</i> Miq.	Fabaceae	Mentebah
Bamboo shoots	<i>Dendrocalamus asper</i> (Schult. & Schult. f.)	Poaceae	Mentebah
White tampoi fruit	<i>Baccaurea macrocarpa</i> (Miq.) Müll.Arg.	Phyllanthaceae	Mentebah
Tebu telo'	<i>Saccharum edule</i> Hasskarl.	Poaceae	Mentebah
Acid Terong (yellow)	<i>Solanum ferox</i> Linn.	Solanaceae	Mentebah
Oval Terong (white)	<i>Solanum melongena</i> Linn.	Solanaceae	Mentebah
Purple Terong (small)	<i>Solanum melongena</i> Linn.	Solanaceae	Mentebah
Timau	<i>Ficus uncinata</i> (King) Becc.	Moraceae	Mentebah
Ubar	<i>Syzygium polyanthum</i> (Wight) Walp.	Myrtaceae	Mentebah
Ubar Serai	-	-	Mentebah
Umbing fruit	<i>Baccaurea angulata</i> Merr.	Phyllanthaceae	Mentebah
Rotan shoots	<i>Dendrocalamus latiflorus</i> Munro.	Poaceae	Mentebah
Kelapa mushroom	-	-	Mentebah
Pelanduk eye mushroom	<i>Calostoma</i> spp.	Calostomaceae	Mentebah
Andunge fruit	<i>Salacca</i> sp.	Palmae/Aracaceae	Tamao
Aratak binung	<i>Abelmoschus esculentus</i> (L.) Moench.	Malvaceae	Tamao
Riang acid leaf	<i>Begonia bracteata</i> Jack.	Begoniaceae	Tamao
Kandis acid fruit	<i>Garcinia xanthochymus</i> Hook.f.	Clusiaceae	Tamao
Aung fruit	<i>Mangifera</i> sp.	Sapindaceae	Tamao
Kembayau seeds	<i>Dacryodes rostrate</i> (Blume) H.J.Lam.	Burseraceae	Tamao
Litakan fruit	<i>Willughbeia angustifolia</i> Miq.	Apocynaceae	Tamao
Suntet fruit	-	-	Tamao
Cempedak fruit	<i>Artocarpus champeden</i> (Lour.) Stokes.	Moraceae	Tamao
Dabai/Pansaan seeds	<i>Canarium odontophyllum</i> Miq.	Burseraceae	Tamao
Buas-buas/singkil leaf	<i>Premna cordiflora</i> Roxb.	Lamiaceae	Tamao
Pengo leaf	-	-	Tamao
Tepus leaf	<i>Eryngium foetidum</i> Linn.	Apiaceae	Tamao
Tugu leaf	<i>Albertisia papuana</i> Becc.	Menispermaceae	Tamao
Garinis leaf	<i>Licuala</i> sp.	Palmae	Tamao
Imbawang fruit	<i>Mangifera pajang</i> Kostermann.	Anacardiaceae	Tamao
Kalong mangoa fruit	<i>Nepthellium</i> sp.	Sapindaceae	Tamao
Basi mushroom	-	-	Tamao
Talingo balau mushroom	<i>Auricularia fuscusuccinea</i> (Mont.) Henn.	Auriculariaceae	Tamao
Lalis leaf	<i>Plectocomiopsis geminiflora</i> (Griff.) Becc.	Palmae	Tamao
Limudan fruit	<i>Salacca</i> sp.	Palmae/Arecaceae	Tamao
Mao fruit	-	-	Tamao
Papa Ulu fruit	-	Palmae/Aracaceae	Tamao
Papakan fruit	<i>Durio kutejensis</i> Hassk. Becc.	Bombacaceae	Tamao
Tatolok fruit	<i>Garcinia dioica</i> Bluem.	Clusiaceae	Tamao
Tambuk payang fruit	<i>Mangifera</i> sp.	Anacardiaceae	Tamao
Kecombrang flower	<i>Etlintera elatior</i> (Jack) R. M. Smith.	Zingiberaceae	Tamao
Kala acid fruit	<i>Etlintera elatior</i> (Jack) R. M. Smith.	Zingiberaceae	Tamao



**Figure 2.** Total of wild plants, native edible plants from Suka Maju and Tamao Villages, Kapuas Hulu District, Indonesia

## Discussion

### Identification of plant diversity

The number of species found in the Mentebah Sub-district is greater than the Embaloh Hulu Sub-district. This is due to the limitation survey area in Embaloh Hulu because the observation area is located in the Forest Management Unit so the observation is only around the yard of the house. However, all plant diversity found in Tamao Village according to the author is the result of in situ conservation because the residents say that someday the residents will run out of the substances. To overcome the situation seeds are taken from the forest and planted in the yard. The resident-only planted the seeds and not taking care of them. Moreover, the location of the yard becomes a

secondary forest.

Due to the plant diversity types are almost similar in both villages, only a few species were not found in Suka Maju Village, moreover, the researcher thought from Table 1 the biodiversity types that are rarely reported from Kapuas Hulu District. Except for the three genera mentioned before, the same type of plant diversity of food crops has been widely reported from Kapuas Hulu District but there is no data of nutritional content (Satrima et al. 2015; Haryanti et al. 2015; Pradityo et al. 2017).

**Dangkuk fruit (*Hydnocarpus* sp.)**

In the beginning, people ignore *dangkuk* fruit because they do not know the benefits of it. In fact, the existence in that area is abundant according to the story, from the people who consumed the fruit. The team tried the fruit and the taste like coconut, they did not feel any side effects from consuming the fruit, so the samples can be sent to LIPI. This type of *Hydnocarpus* sp is rarely published from Kapuas Hulu District. *Hydnocarpus* sp species *H. woodii*, *H. kunstleri*, *H. anomala*, *H. gracilis* were reported in East Kalimantan (Kartawinata et al. 2006) including *H. heterophylla* and *H. polypetala* (Angriyanti 2010). Species

of *Hydnocarpus* sp. also found in Central Kalimantan and referred to orangutan food (Nayasilana et al. 2017).

The *Hydnocarpus* species produces *chaulmoogra* oil for healing leprosy and other skin diseases (Rameshkumar et al. 2011; Parascandola 2003; Cole 1933). The species that have high content of *chaulmoogra* oil are from *H. wightianus* species. Besides *Hydnocarpus* seeds producing oil, it was reported by (Dhathri 2011) that *H. petandara* oil can be made into biodiesel. Dhanasekaran et al. (2013) also mentioned that seeds of the genera *Hydrocarpus* sp. are rich in nutrients and phytochemicals (sterols, flavonoids, flavonolignans). The type of flavonolignan is *hydnocarpin* which has been reported to have antimicrobial, antitubercular, antipsoriatic, antirheumatic, hypolipidemic, antidiabetic, anti-inflammatory, and antanthidid activity. In addition to the seeds, leaves of the *H. petandra* by Kekuda et al. (2017) reported that it has contained phytochemicals such as essential oils, alkaloids, tannins, triterpenes, phenolics. Mentioned in Varghese et al. (2016) the genera *Hydrocarpus* is generally used to prevent skin diseases. Therefore, the *hydrocarpus* type of Kapuas Hulu is worthy of research and development into functional food and medicinal ingredients.

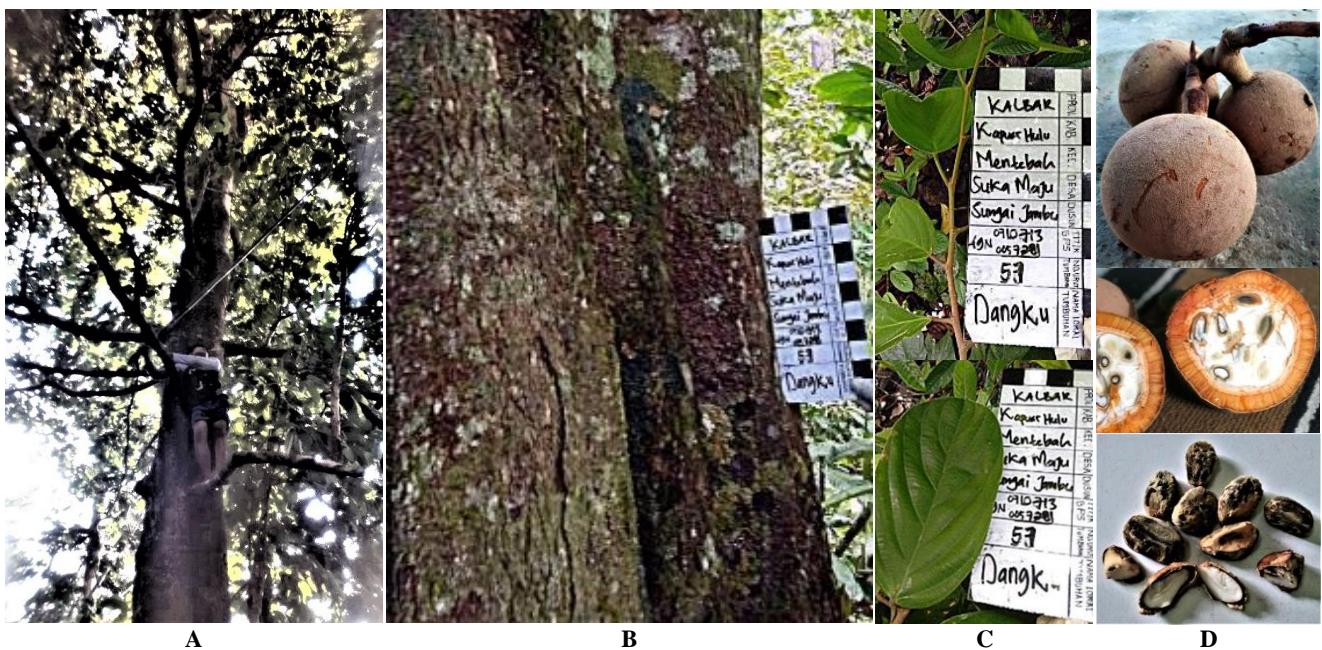


Figure 3. A. *Dangkuk* (*Hydnocarpus* sp.) trees, B. Bark, C. Leaves, D. Young fruit and seeds



Figure 4. A. *Dendang* (*Hodgsonia macrocarpa*) pumpkin, B-C. Young fruits, D. Seeds



**Figure 5.** A. *Keranji* mushroom (*Hypoxylon* spp); white (young mushroom, red arrow) and black (old mushroom, yellow arrow), and profiles in oven-dried young mushrooms; B. *Xylaria fockei* and C. *Xylaria schweinitzii*

**Table 2.** *Hypalon* and *Xylaria* mushroom types found in Malaysia (Lee et al. 2012)

Hypoxyloaceae	Xylariaceae		
<i>H. anthracodes</i>	<i>X. acicula</i>	<i>X. fissilis</i>	<i>X. oligotoma</i>
<i>H. approximans</i>	<i>X. acicularis</i>	<i>X. fockei</i>	<i>X. plebeja</i>
<i>H. coelatum</i>	<i>X. allantoidea</i>	<i>X. fraseri</i>	<i>X. polyclada</i>
<i>H. cohaerens</i>	<i>X. avellana</i>	<i>X. furcate</i>	<i>X. polymorpha</i>
<i>H. comedens</i>	<i>X. axifera</i>	<i>X. gigantea</i>	<i>X. rhizocola</i>
<i>H. howeanum</i>	<i>X. berkeleyi</i>	<i>X. gracilis</i>	<i>X. rhizomorphs</i>
<i>H. lenormandii</i>	<i>X. caespitulosus</i>	<i>X. guepinii</i>	<i>X. ridleyi</i>
<i>H. macrocenangium</i>	<i>X. complanata</i>	<i>X. guianensis</i>	<i>X. schweinitzii</i>
<i>H. microsporum</i>	<i>X. corniformis</i>	<i>X. holobapha</i>	<i>X. scopiformis</i>
<i>H. ochraceum</i>	<i>X. cupressiformis</i>	<i>X. hypxylon</i>	
<i>H. paucillum</i>	<i>X. cynoglossa</i>	<i>X. ianthinoveluntina</i>	
<i>H. pseudotubulina</i>	<i>X. deserticola</i>	<i>X. intermedia</i>	
<i>H. rubiginosum</i>	<i>X. dichotoma</i>	<i>X. kedahae</i>	
<i>H. stygium</i>	<i>X. digitata</i>	<i>X. maraca</i>	
<i>H. subgilvum</i>	<i>X. emerici</i>	<i>X. masuula</i>	
<i>H. tinctor</i>	<i>X. exalbata</i>	<i>X. multiplex</i>	
<i>H. tormentosum</i>	<i>X. feejeensis</i>	<i>X. obovata</i>	

### Dendang pumpkin (*Hodgsonia* sp.)

Most villagers from Suka Maju did not know the benefits of dendang pumpkin seed. However, in Air Besar Sub-district, Landak District, West Kalimantan, this fruit is called the *gamang ghost* fruit, a passion fruit-like plant but fruit such as pumpkin (*Cucurbita moschata*). This plant is easy to find around the riverside. Some residents consume these seeds by burning and the seeds have a slightly bitter taste. For Malaysian, dendang pumpkin is called the root of kepayang or *kadam* seed and pork lard plant.

There are many species of *Hodgsonia* (about forty species; Sahoo et al. 2014) including 2 species, namely *Hodgsonia macrocarpa* and *H. heteroclyta*. The species of *H. heteroclyta* are unknown but have economic value and

as a medicinal plant in India. Therefore, in Semwal et al. (2014) mentioned that *Hodgsonia* in tropical forests of Asia is increasingly scarce due to exploitation for medicinal purposes. Talambedu et al. (2017) also reported that the *H. heteroclyta* fruit pulpy has the potential to be antidiabetic, and by Swargiary and Brahma (2017) also referred to having antioxidant activity.

For researchers from China, this plant has the potential to developed because it has high oil content and large seeds (Chien 1963). It is same as North India, according to Semwal et al. (2014), *H. heteroclyta* is a plant that has potential to be commercialized because of its high oil content. Furthermore, this oil is known as lard nut oil because it has seeds and the oil has taste like a lard. The oil

content in dendang pumpkin seeds is  $\pm$  65% (dry weight) (Sugiyono 2008) and can reach 70% (Bo et al. 2007); 71.65% (dry weight) (Cao and Zhang 2015); 62-77% (Semwal et al. 2014). based on (Bo et al. 2007) The highest content of fatty acids in Hodgsonia seed oil is linoleic acid. The type of fatty acid that is highest in corn oil (Carrillo et al. 2017). Therefore, this oil is often used as a substitute for coconut oil in India. Hodgsonia seed oil has the potential to be developed into biodiesel in Indonesia with 65% biodiesel yield from *H. macrocarpa* (Wirawan 2007), for biodiesel in China based on (Bo et al. 2007); 95.46% (Cao and Zhang 2015).

*Hodgsonia macrocarpa* had been reported from East Kalimantan by Susiarti and Setyowati 2005). It was stated that there was dendang pumpkin in West Kalimantan, especially in Sambas. For the people of East Kutai, dendang pumpkin seeds are used as a flavoring. In addition, the citizens of southeast India also sell seeds for various dishes and medicine. For Thai people, the seeds are eaten by roasting until they release the aroma of lard or curry dishes, whereas in southeastern India the roasted seeds are made into chutney which is eaten with dried fish (Kharshandi et al. 2015) including for cakes and drinks (Semwal et al. 2014). In addition to seeds, fruit pulp is reported to reduce blood glucose level in mice that may be

derived from antioxidant compounds which their contain (Talambedu et al. 2017). In 2007, when the researcher did survey it was mentioned that consuming raw *Hogsonia* seeds is not allowed, there were possible any side effects of it, but no one had tested the poisonous nature of the seeds to date (Schreiter et al. 2007). Thus, *Hogsonia* seeds should be preserved and developed because it can become a new alternative food from the Kapuas Hulu District.

KerANJI mushroom (*Hypoxylon* sp.) the type of fungus of the genera *Hypoxylon* is still rarely analyzed qualitatively or quantitatively in publications related to native Indonesian fungi. Mushroom's shape is very small, the width about 1 cm with a shape like a *kerANJI* sour fruit, and having like a stick attached to the surface of the wood and a little hard but easy to cut. This type of fungus is found living on dead wood trunks with a rather moist environment and rarely exposed to sunlight. According to residents, young mushrooms that are still white are better than old mushrooms, because its cap is white with a non-hard texture while old ones have brown mushroom cap and the texture is rather hard. The residents consumed these mushrooms by washing, soaking them briefly and then sauteed or for vegetable soup ingredients. Some residents said that consuming the mushroom with excessive amounts, can make you drunk.

**Table 3.** Proximate nutrients of some wild plants, indigenous and edible biodiversity from Suka Maju and Tamao Villages, Kapuas Hulu District, West Kalimantan, Indonesia

Plant diversity		Moisture (%)	Ash (%)	Protein (%)	Fat (%)	Carbohydrate (%)	Calories (kcal/g)
Local name	Scientific name						
Dangkuk seeds	<i>Hydnocarpus</i> sp.	2.15	6.49	22.17	34.92	34.27	540.03
Kepayang seeds	<i>Pangium edule</i>	8.82	2.52	21.32	38.78	28.56	546.51
Jali seeds	<i>Coix lacryma-jobi</i>	13.43	2.71	17.91	12.57	53.38	396.31
Kerantik seeds	<i>Lepisanthes</i> sp.	51.76	5.5	4.98	1.45	36.31	194.73
White Abok	<i>Ipomea</i> cf. <i>gracilis</i>	77.88	2.15	0.36	2.24	17.37	70.29
Buas-buas leaf	<i>Premna cordiflora</i>	11.53	6.09	14.5	13.35	54.53	396.2
Sengkubak leaf	<i>Albertisia papuana</i>	22.26	2.58	23.03	14.76	37.37	374.4
Patikala sour fruit	<i>Etlingera elatior</i>	57.74	4.21	16.2	6.11	15.74	182.7
Bamboo shoots	<i>Dendrocalamus latiflorus</i>	91.6	1.72	0.14	2.87	3.67	23.58
Mangkok mushroom	<i>Cookeina sulcipes</i>	71.29	1.55	0.78	8.54	17.84	68.35
White mushroom	<i>Pleurotus astreatus</i>	62.55	6.32	0.41	12.25	18.47	69.30
Golang mushroom	<i>Lentinus sajorcaju</i>	14.91	2.88	3.81	12.21	66.19	178.76
KerANJI mushroom	<i>Hypoxylon</i> spp.	8.81	7.64	4.24	12.32	66.99	167.39
Tawon mushroom	<i>Schizophyllum commune</i>	13.44	4.71	3.64	16.86	61.35	201.25
Litakan fruit	<i>Willughbeia angustifolia</i>	74.3	0.22	4.26	20.39	0.83	203.86

**Table 4.** Mineral content of some wild plants, indigenous and edible biodiversity from Suka Maju and Tamao Villages, Kapuas Hulu District, West Kalimantan, Indonesia

Plant diversity		Minerals							
Local name	Scientific name	P (%)	K (%)	Na (%)	Ca (%)	Mg (%)	Fe (ppm)	Cu (ppm)	Zn (ppm)
Engkala fruit	<i>Litsea garciae</i>	0.43	0.87	0.04	0.08	0.01	30.77	0.42	9.35
Sengkuang fruit	<i>Dracontomelon dao</i>	0.23	03.4	0.19	0.33	0.19	934.33	18.36	14.75
Aratak binung	<i>Abelmoschus esculentus</i>	2.08	3.28	0.16	0.39	0.2	99.34	21.11	51.24
Tepus leaf	<i>Eringium foetidum</i>	0.74	2.48	0.13	0.29	0.26	14.61	14.61	231.89
Lepang fruit	<i>Gymnopetalum cochinchensis</i>	1.41	2.01	1.56	ud	0.08	13.94	ud	30.23

Note: ud: undetected

*Hypoxylon* type was found physically similar to *Xylaria schweinitzii* found in Bosque Húmedo Tropical Amazónico National Park, Bosque Piemontano Occidental, Bosque Montano Oriental, Ecuador or similar to *Xylaria fockei* from Thailand. Between the genera, *Hypoxylon* and *Xylaria* are very closely related because they are both in one order, *Xylariales*. *Hypoxylon/Xylaria* is a fungus ascomycete, including large fungi (macrofungi). A comparison of these two types of mushrooms with *keranji* mushrooms can be seen in Figure 5. The results of research related to *Hypoxylon* from Indonesia, *Biscogniauxia nummularia* var. *pseudopachyloma* with the synonym name *Hypoxylon pseudopachyloma* = *H. nummularium* found in Java. The *H. tortysporum* species is said to originate from the North Sulawesi, Indonesia (Hellwig et al. 2005). According to Smith and Hyde (2001), it is said a species similar to *Hypoxylon* was found in Indonesia (northern Sulawesi) under the name *H. kretzschmaria*, and *H. maculosum*. The Indonesian Ministry of Forestry also reported to FAO that *Entoleuca mammata* with another Latin name of *Hypoxylon mammatum* / *H. pauperatum* / *H. morsei* / *H. blakei* / *H. holwayi* is found in Indonesia's forests. This type of *Hypoxylon* canker is known as a *black stem canker* (FAO 2007). *Hypoxylon lenormandii* is also called in (Kuhnert et al. 2015) originated from Indonesia. *Hypoxylon* growth is reported in the dry season more commonly found in Nigerian tropical forests in lignin-rich habitats (Adeniyi et al. 2018). *Hypoxylon oceanicum* has been reported by Jones and Kuthubutheen (1989) is a type of *Hypoxylon* that grows in mangrove areas. *Hypoxylon* publications from Indonesia in 1980-2017 showed that no explanation *Hypoxylon* existed from West Kalimantan.

When compared with *Hypoxylon*, many reports from Indonesia about *Xylaria* (Yulianti 2017; Li et al. 2017) are similar due to the nature of essence of xylarioidness' which is found in many tropical regions (Rogers et al. 1987). Sunariyati et al. (2016) also reported the results of his research that found *Xylaria* sp. in Central Kalimantan as the karamu fungus used as a cancer drug. Besides that, *X. polymorpha* was also found in Central Kalimantan (Noor and Saridan 2013). Type *X. polymorpha* and *X. tabacina* described are types of *Xylaria* that live on dead wood and can be eaten from East Kalimantan (Mardji and Noor 2009). Based on the research results about *Xylaria* in Indonesia there are no publications related to *X. schweinitzii* or *X. fockei* from Indonesia. Linh et al. (2014) mentioned that *X. schweinitzii* from Vietnam's national park has activities as an anticancer. A similar report from Thailand also mentioned the type of fungus *Xylaria* spp showed antibacterial and anticancer activities but it was not specifically mentioned the name of the species except as *Xylaria* code TR25 (Orachaiunlap et al. 2015). Type *X. fockei* is also found in Mexico (Medel et al. 2010), Papua including Sabah (Dennis 1974), Ecuador and Puerto Rico (Lodge 2008).

### Proximate, calories and minerals

Based on Table 2, the highest protein source is from *sengkubak* / *tugu* leaves, *dangkuk* and *kepayang* with an average level > 20%. The highest source of fat comes from *dangkuk* seed, *kepayang*, and *litakan* fruit, with an average level > 20%. According to Ayu et al. (2017) and Atabani et al. (2015), *kepayang* seeds can produce vegetable oils meanwhile Hoe and Siong (1999) has been reported that the fat content of *P. edule* from Sarawak was 20.2%. Fat content of *litakan* fruits is reported for the first time from this research result and no reported about it until now except about the rubber-like latex (Lim et al. 2012). From Table 2 too, it showed that the higher of fat and the higher of carbohydrate as the higher of the calories.

The sources of carbohydrates with levels > 50% are *joli kujuk* (*jali*) and mushrooms especially *keranji*, *golang* and *tawon*. According to Grubben and Partohardjono (1996), the range carbohydrate content of *jali* (*C. jobi*) are between 58.3 until 77.2 so that the carbohydrate of *C. jobi* from Kapuas Hulu district was lower. We think the lower content because the plant is wild that there is no added fertilizer. The higher fiber from mushrooms because generally edible mushrooms are rich in polysaccharides that some of them were fiber (Cheung 2013). According to Vázquez et al. (2018), *Hypoxylon* sp. is rich in lignin which is fiber. Those cases due to *jali* and mushroom reserves are a source of food, especially as dietary fiber. There is connection between sources of higher fat

In conclusion, there are 98 types of plant diversity, wild plants and native edible plants in Suka Maju Village, Mentebah District and Tamao Village, Embaloh Hulu District, at Kapuas Hulu Regency. Based on the calories content and mineral the plants that have potential to be developed as a food, medicine or industrial are *joluk kujuk* seeds (*Coix lacryma jobii*), *kepayang* seeds (*Pangium edule*), *dangkuk* seeds (*Hodgsonia* sp.), *dendang* pumpkin seeds (*Hydnocarpus* sp.), *tugu/sengkubak* leaves (*Albertisia papuana*), *tepus* leaves (*Eryngium foetidum*), *sengkung* fruits (*Dracontomelon dao*). Types of plant diversity that unknown from West Kalimantan and found in Kapuas Hulu Regency are *Hodgsonia* sp., *Hydnocarpus* sp. and *Hypoxylon* spp. According to the results from this survey, it is expected that the Agriculture and the Forestry Agency of Kapuas Hulu Regency will begin to socialize the importance of local wisdom in supporting national food security, and prioritize the development of local food sources became economic sources of the community through further research related to potential development into commercial products.

### ACKNOWLEDGEMENTS

The team of authors would like to thank The Food Agency of West Kalimantan Province in 2018 for funding a survey of biodiversity, edible and wild species so that the data referred to in this article can be obtained.

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