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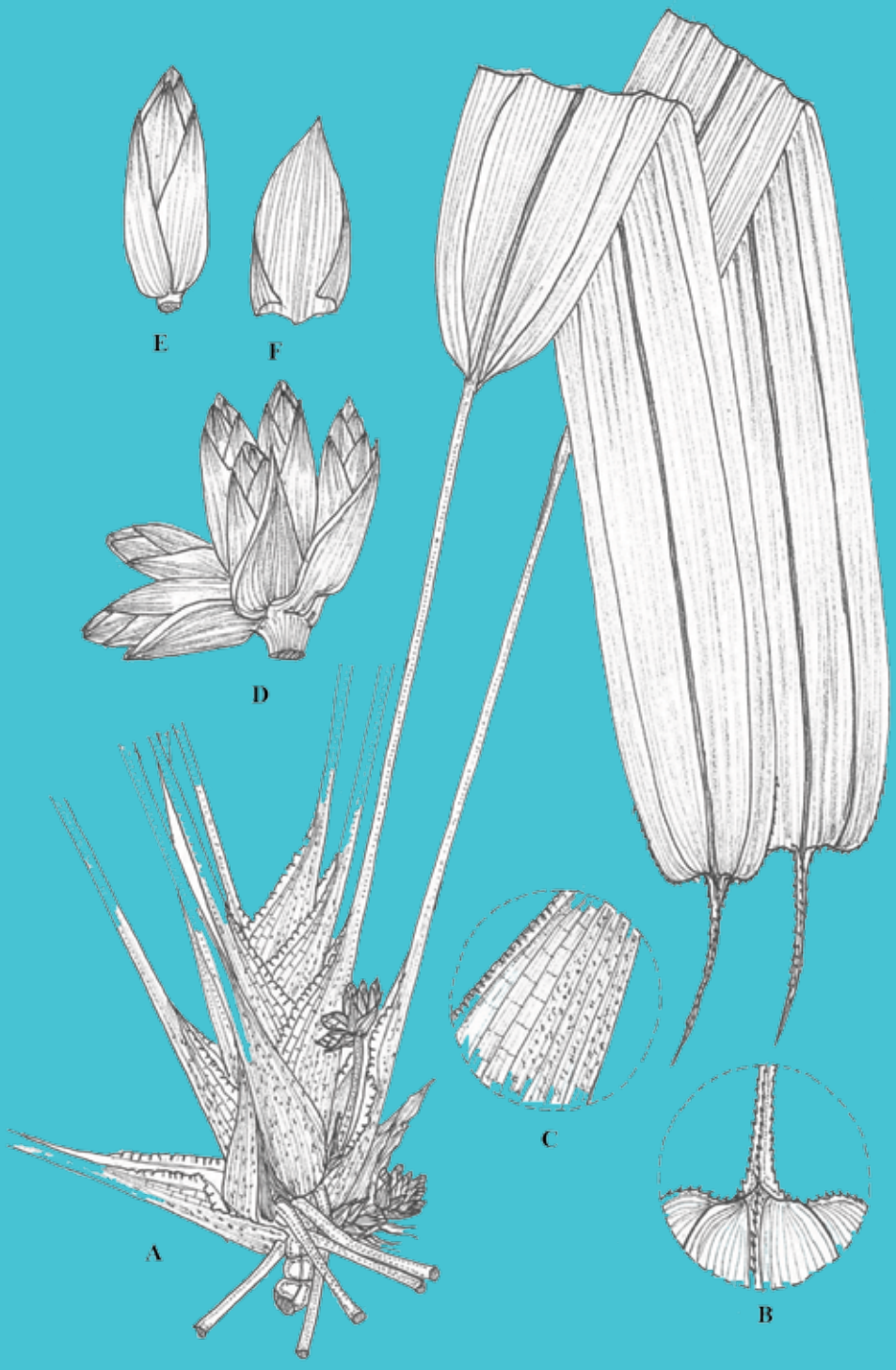

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DIVERSITY OF PLANTS USED FOR PLAITED CRAFTS BY THE DAYAK IBAN-DÉSA IN KABUPATEN SINTANG, KALIMANTAN BARAT, INDONESIA

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ABSTRACT
DEWI, A. P., ARIYANTI N. S. & WALUJO, E. B. 2016. Diversity of plants used for plaited crafts by the Dayak Iban-Désa in Kabupaten Sintang, Kalimantan Barat. *Reinwardtia* 15(2): 67 – 79. — Many plants are used for making plaited crafts such as basketry and woven mats by the Dayak Iban-Désa, a sub-tribe of the Dayak in Kalimantan Barat, Indonesia. The Dayak Iban-Désa gather the craft materials mostly from the plants in the forest. However, the habitats of these plants are being threatened by deforestation. The diversity of plants used for crafts is here documented. This study recorded the scientific names of plant species used for the craft plaiting, and observed abundance of plants used for craft. Information about the plants used were gathered using non-structural interview and focus group discussion (FGD) with the informants and participants. The abundance of plaited plants was observed in 46 plots of 10 × 10 m^2 plots by participative ecological method. Nineteen plants species were used as plaited material, belonging to four families: Arecaceae, Poaceae, Pandanaceae and Zingiberaceae. Two species of rattan (*Calamus* sp. and *Plectocomiopsis wrayi* Becc.) have the highest Index Cultural Significance (ICS) value. Those species were considered as the most valuable plant materials because of the quality of fiber, intensity on harvesting, and the resulting quality of plaited craft products. However, the demand for high quality products is not always supported by the availability of plant materials in the forest. Therefore, the cultural significance of plants (the ICS values) and their availability should be considered when determining the conservation strategy for each of these species.

Keywords: Dayak Iban-Désa, Index Cultural Significance, plaited crafts, plant diversity.

ABSTRAK
DEWI, A. P., ARIYANTI N. S. & WALUJO, E. B. 2016. Keanekaragaman tumbuhan yang digunakan sebagai bahan anyaman oleh masyarakat subsuku Dayak Iban-Désa di Kabupaten Sintang, Kalimantan Barat. *Reinwardtia* 15(2): 67 – 79. — Tumbuhan anyaman adalah tumbuhan yang digunakan untuk membuat aneka produk anyaman seperti keranjang dan tikar anyaman. Subsuku Dayak Iban-Désa di Kalimantan Barat adalah salah satu suku yang masih memanfaatkan tumbuhan sebagai bahan baku untuk membuat anyaman. Sebagian besar tumbuhan anyaman yang digunakan adalah tumbuhan liar yang terdapat di hutan. Keanekaragaman jenis tumbuhan anyaman yang digunakan masyarakat Dayak Iban-Désa belum pernah didokumentasikan, sementara habitat tumbuhan anyaman tersebut mulai terancam oleh deforestasi. Penelitian ini bertujuan untuk mengetahui jenis-jenis tumbuhan yang digunakan sebagai bahan anyaman. Penelitian ini juga bertujuan untuk mengobservasi ketersediaan tumbuhan anyaman di habitatnya. Informasi keanekaragaman jenis dan produk anyaman diperoleh melalui wawancara non-struktural bersama informan, pengamatan langsung proses produksi anyaman dan *focus group discussion* (FGD). Observasi kelimpahan jenis tumbuhan anyaman dilakukan dengan metode sampling ekologi partisipatif pada 46 plot berukuran 10 × 10 m^2 yang melibatkan informan kunci. Tumbuhan anyaman yang digunakan oleh masyarakat Dayak Iban-Désa meliputi 19 jenis berasal dari empat suku (Arecaceae, Poaceae, Pandanaceae dan Zingiberaceae). Dua jenis rotan (*Calamus* sp. dan *Plectocomiopsis wrayi* Becc.) adalah tumbuhan yang memiliki nilai kepentingan budaya (*Index Cultural Significance*/ ICS) yang tertinggi. Kedua jenis tersebut merupakan jenis bahan anyaman yang paling unggul menurut masyarakat Dayak Iban-Désa dalam hal kualitas keutamaan bahannya, intensitas pemanenan dan kekuatan seratnya. Akan tetapi, pemanfaatan tumbuhan anyaman dengan nilai kegunaan yang tinggi tidak didukung dengan ketersediaannya di lapangan. Hubungan antara nilai ICS dengan ketersediaan tumbuhan di habitat dapat menentukan strategi konservasi yang tepat untuk diterapkan pada masing-masing jenis tumbuhan bahan anyaman.

Kata kunci: Dayak Iban-Désa, Nilai Kepentingan Budaya, keanekaragaman tumbuhan, produk anyaman.

INTRODUCTION

Plants have been important for our livelihood over thousands of years, being used for foods, medicines, clothes, furniture, and other purposes. As early as 1741, the famous book *Herbarium Amboinense* dealing with useful plants for Ambonense people (Rumphius, 2011). Then in 1916/1917, book "*de Nuttige Planten van Nederlandsch-Indie*" was written by Heyne. He recorded at least 3500 species of useful plants in Indonesia (Heyne, 1987). The plants which were traditionally used for plaited crafts are listed among those records.

Dayak is a native tribe in Borneo which has many sub-tribes, not only in Kalimantan, but also in Malaysia and Brunei Darussalam. Plaited crafts produced by the Dayaks are among the best plaited crafts in the world (Sellato, 2013). They use various plants available in the nearby forests as the raw material of the plaited products. Research on the plaited crafts made by different sub-tribes of the Dayak have been conducted, such as, at the Iban and Kelabit (Christensen, 2002), the Bidayuh (Mashman & Nayoi, 2013) in Sarawak, Malaysia; the Kayan Mendalam (Ngo, 2013), the Uut Danum (Couderc, 2013), and the Benuaq (Hendra, 2009) in East Kalimantan, Indonesia. Nevertheless, each sub-tribe produces different plaited crafts and use different plants species. It may depend on the availability of plants and their knowledge on plaiting, inherited from their ancestors.

The diversity of plants used for plaited crafts made by the Dayak Iban-Désa had not been reported previously. Unfortunately, the forests where the Dayak Iban-Désa gather the plaiting materials are currently threatened by deforestation. Knowledge of the diversity of plants used for plaited crafts is important so that measures can be taken to modify and/ or reduce the deforestation process to ensure the conservation of these culturally important plants.

MATERIALS AND METHODS

Study Area

The Dayak Iban-Désa, a sub-tribe of the Dayak, is a large community of about ± 40.000 indigenous people. They inhabit the following regions of Kalimantan Barat: Kabupaten Sintang, Sanggau, Sekadau, and Kapuas Hulu. However, most of the Dayak Iban-Désa lives in Kabupaten Sintang (Alloy *et al.*, 2008). The Dayak Iban-Désa are closely related to the Dayak Iban of Sarawak, Malaysia, one of the largest group of Dayak (Mackinnon *et al.*, 2000).

The research was conducted from April to May 2014 in Desa Ensaid Panjang (Fig. 1). Desa Ensaid Panjang covered an area approximately

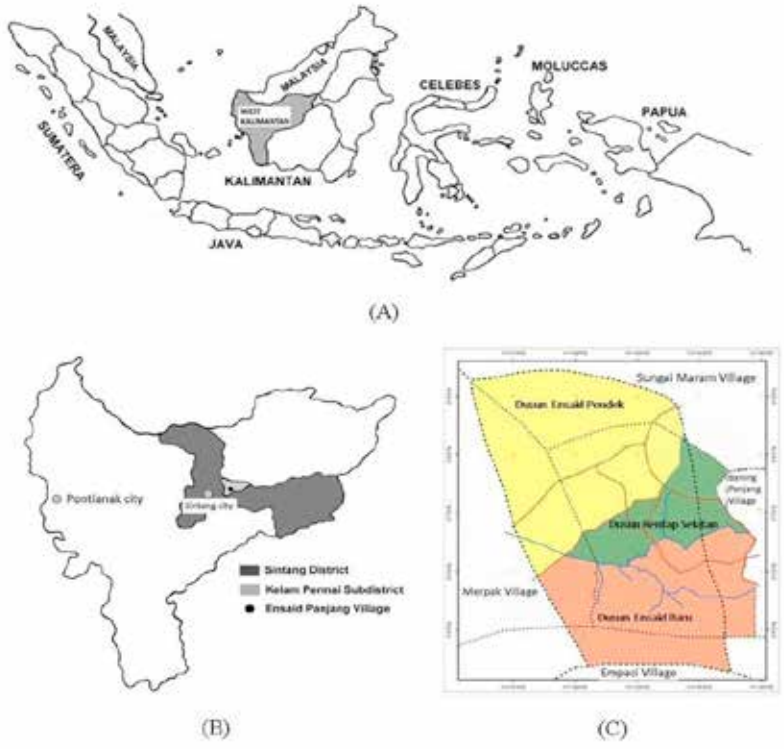

Fig. 1. Location of West Kalimantan in Indonesia on grey color (A); Location of study site Desa Ensaid Panjang (B); The Desa Ensaid Panjang (C).

±22 km^2, including forest (about ±189 hectares), which consists of 778 inhabitants of 132 families. Desa Ensaid Panjang is divided into three hamlets: Ensaid Baru, Rentap Selatan and Ensaid Pendek. However, the study was undertaken in the *betang panjang* longhouse at Rentap Selatan. The *betang panjang* was inhabited by 96 persons (representing 29 families). It is the place where the sub-tribes undertake their activities, such as weaving clothes, producing plaited craft, conducting some ceremonies, and other activities.

Sampling Method

The information on the species used for plaiting and the resultant plaited crafts were obtained through three different methods: 1) conducted personal interviews with the Ensaid Panjang village headman and the Dayak Iban-Désa head of customs, and open-ended interviews with a craftsman (respondent); 2) observed the production process of the plaited crafts; 3) confirmed the accuracy of the information obtained from personal interviews through Focus Group Discussions (FGD) with all respondents. The most prolific craft technicians were selected as the respondents, from among the Dayak Iban-Désa in Ensaid Panjang. There were sixteen persons selected as respondents, nine male and seven female.

The information which was gathered from interviews were about the plant materials in term of their quality value (either as the main material or the substitute material) and the intensity value (the harvesting intensity of the plants materials) in the field. That information was confirmed in the Focus Group Discussion (FGD). FGD was done to reaffirm the information from the personal communication and to score the strength of the plaited plants. The scores were converted into exclusivity value (the crafts technicians preference based on the strength of the plaited plants). The categories for quality value, intensity value and exclusivity value are as follow (modification from Turner, 1988).

Quality value (q):
- 4, if the plant was selected as the main plant for plaited materials and it could not be substituted by another plant.
- 3, if the plant can be used as the main plant or as a substitution for plaited materials.
- 2, if the plant is used only as a substitution plant for the plaited materials
- 1, if the plants can be used as the substitution plant for plaited materials, but preferable for other purposes.

Intensity value (i):
- 3, if the harvesting intensity for the crafts raw material occur throughout the year (very often)
- 2, if the harvesting intensity for the crafts raw material occur occasionally every one to two years (often)
- 1, if the harvesting intensity for the crafts raw material occur less often than every two years (rarely)

Exclusivity value (e):
- 2, if more than 50% respondents suggest that the plant is very strong
- 1, if more than 50% respondents suggest that the plant is less strong
- 0.2, if more than 50% respondents suggest that the plant is weak

The multiplication of these three components give the value of Index Cultural Significance (ICS) for each plants species, as shown in the formula below.

$$ICS = q \times i \times e$$

Plants availability in the habitat. Participative plot sampling method which involves a guide and an informant (Walujo, 2004) was conducted to observe the plant's habitat. Plots sites were determined by the purposive sampling (Fachrul, 2007) based on harvesting location of each plant species. Two replication of 10 × 10 m^2 plots were made in all 23 point location, resulting 46 plots studied. The 46 plots established in three harvesting locations consist of 15 point locations (30 plots) in the Tawang Mersibung indigenous forest, three point locations (six plots) in the abandoned land near the *betang panjang* longhouse, and five point locations (ten plots) in the Rentap foothills. The number of individuals or clumps of plants and the presence of plant species in the plot were counted to determine the importance value index (IVI). Voucher herbarium specimens were collected, identified and deposited in the Herbarium Bogoriense (BO) LIPI, Cibinong.

RESULTS

Diversity of Plants

The Dayak Iban-Désa uses 21 species, one variety and one sub-variety of plants for producing plaited crafts. Those plants belong to *Arecaceae* (13 species, one variety, one sub-variety of rattans and one species of palm), *Poaceae* (four species), *Pandanaceae* (three species) and *Zingiberaceae* (one species called *senggang*) (Table 1).

The plaited plants used by the Dayak Iban-Désa are consisted of five groups: rattans, bamboos, pandans, palms and gingers. Five genera of rattans are widely used by the Dayak Iban-Désa for the plaited material, namely *Calamus, Daemonorops, Korthalsia, Plectocomiopsis* and *Ceratolobus* (Table 1). Rattans are used to make any components of plaited crafts (the body,

Table 1. The diversity of plants used for the crafts material by the Dayak Iban-Désa at Sintang District, West Kalimantan, Indonesia

Family name / species name	Vernacular name (the Dayak Iban Désa – Bahasa Indonesia – English name)
ARECACEAE	
Calamus axillaris Becc.	wi tapah – rotan sega air – rattan
Calamus blumei Becc.	wi entibab – rotan tukas – rattan
Calamus javensis Blume var. *peninsularis* Becc.	wi nakung – rotan lilin – rattan
Calamus javensis Blume var. *peninsularis* Becc. subvar. *polyphyllus* Becc.	wi seni'k – rotan lilin – rattan
Calamus rugosus Becc.	wi tunggal – rotan perut ayam – rattan
Calamus speciosissimus Furtado	wi sega' balau – rotan sega badak –rattan
Calamus zonatus Becc.	wi antu'k – rotan perdas – rattan
Calamus sp.	wi minyak – rotan minyak – rattan
Ceratolobus concolor Blume	wi pelanduk – rotan mata pelanduk – rattan
Daemonorops oligophylla Becc.	wi keli' – rotan keli' – rattan
Korthalsia echinometra Becc.	wi seru'k – rotan meiya – rattan
Korthalsia flagellaris Miq.	wi danan – rotan dahanan – rattan
Licuala sp.	jaung – palem – palm
Plectocomiopsis wrayi Becc.	wi lambang – rotan pepe – rattan
POACEAE	
Dendrocalamus asper (Schult.) Backer *ex* Heyne	buluh pering – bambu betung – bamboo
Gigantochloa hasskarliana (Kurz) Backer *ex* Heyne	buluh munti' – bambu lengka tali – bamboo
Schizostachyum brachycladum Kurz with yellow culms	buluh bala' – bambu gading – bamboo
Schizostachyum brachycladum Kurz with green culms	buluh – bambu lemang – bamboo
Schizostachyum lima (Blanco) Merr.	buluh temiang – bambu toi – bamboo
PANDANACEAE	
Pandanus sp. 1	ndas – pandan – pandan
Pandanus sp. 2	tandoh – pandan – pandan
Pandanus sp. 3	perupuk – pandan – pandan
ZINGIBERACEAE	
Hornstedtia reticulata (K. Schum) K. Schum	senggang – jahe liar – wild ginger

frames, and string for tightening crafts). They are preferred for the crafts because they are stronger and more flexible than bamboos. Various farming tools, for example baskets for carrying heavy loads, are usually made of rattan stems as the main material. Three genera of bamboos used by the Dayak Iban-Désa are *Dendrocalamus, Gigantochloa* and *Schizostachyum* (Table 1). Although the bamboo culms are less flexure than the rattans, they are preferred for making specific plaited craft product which is used in the water. The bamboos are commonly used for making fishing tools (*bubu putut, sangkar ikan*). There are three species of *Pandanus* used by the Dayak Iban-Désa. The pandans are mainly used for producing household furnishings, such as mats, fans, little containers, and sun-hats. The leaves of pandans are woven for the crafts body. However, it can not be used for the craft's string or frames, because it is easily ripped and hence, less durable. This is somewhat similar to the leaf of the palm *Licuala* sp., that is used as the body of sun-hat craft but it is not used as the craft string nor frames. The wild ginger called "*senggang*" is the only species of ginger (*Zingiberaceae*) used for making plaited crafts by the Dayak Iban-Désa. The leaf sheath of *senggang* is stronger and more durable than the pandan leaves. It is commonly plaited for the crafts body, the main body of non-patterned crafts, and the inner layer of the patterned crafts.

Diversity of Plaited Products

There are 26 products made by the Dayak Iban-Désa for farming tools, household furnishings, fishing tools, animal husbandry tools, children toys and ritual equipment (Table 2).

Farming is the main activity of the Dayak Iban-Désa, therefore nearly half of the craft products are farming tools. Various baskets (*empajang, takin, tengkalang,* and *sedong/tungking*) for carrying heavy loads, a grain container (*cupai*), a bag (*renjung* and *rujuh*) for carrying personal belonging or farming equipment to the fields; trays (*capan* and *pengindang*) for winnowing and sieving grains, and a sun-hat (*tudung*) are kind of farming tools made by the Dayak Iban-Désa (Table 2). Household furnishings produced by the Dayak Iban-Désa (Table 2) are used for common

Table 2. The usage categories, plaited-craft products and descriptions of the plaited products made by the Dayak Iban-Désa at Kabupaten Sintang, Kalimantan Barat, Indonesia

Usage categories of products	Plaited-craft products	Descriptions of the products
Farming tools	*Capan*	winnowing trays
	Cupai	grain container
	Empajang	basket for carrying heavy load
	Kelayak	special mats for drying paddy
	Keranjang	basket put on motorcycle to carry the resin from rubber trees
	Pengindang	sieve trays
	Renjung	bag for carrying personal farming tools
	Rujuh	bag for carrying personal farming tools
	Sedong/tungking	basket for carrying heavy loads of woods and fruits taken from the forests
	Takin	small basket for carrying rice grains
	Tengkalang	basket for carrying heavy loads of woods and fruits taken from the forests. Physically, *tengkalang* is the same as *sedong/ tungking*, except it is longer than *sedong/tungking*
	Tudung	sun-hats worn to cover the head
Households furnishings	*Bakul*	rice container
	Engkidung	container to place betel-pepper, yarn or another weaving tools
	Penidit ngelipan	pandan fan
	Penyipat lalat	the flies bat
	Tabung bulat	spherical bag for carrying supplies (meals, drink) to the fields, the *tabung bulat* made with pattern used as the ritual equipment in wedding ceremony
	Tabung pipih	spherical bag for carrying supplies (meals, drink) to the fields, the *tabung pipih* made with pattern used as the ritual equipment in wedding ceremony
	Tikar	mats
Fishing tools	*Bubu putut*	fish traps, usually put in the river for a few days
	Kemansai	basket for collecting and carrying fishes and shrimps
Animal husbandry tools	*Kerungan manuk*	cage for egg-laying hens
	Sangkar ikan	cage for cultivating fishes in rivers
Ritual equipment	*Ketapu laung*	hats used by the customary heads during the ritual ceremony
	Rancak	container for serving foods, goods, and others to the spirits
Toys	*Buah raga*	children toy, looks like a ball

activities such as a bag for personal belongings (*tabung bulat* or *tabung pipih*), a little container to hold weaving tools (*engkidung*), fans (*penidit ngelipan*) and mats (*tikar*). Fishing tools include a fish trap (*bubu putut*) and baskets (*kemansai*) to collect fishes and shrimps in the river. The Dayak Iban-Désa make *kerungan manuk*, a cage for raising the chicken, and *sangkar ikan,* a cage for raising fish. The *sangkar ikan* has been rarely produced since the Dayak Iban-Désa cultivate the fish such as carp, catfish, and tilapia, in fishponds. The *buah raga* ball, is the only traditionally made toy. Synthetic modern toys are preferred to traditional toys and this may be the reason why others handmade toys are not produced. Other important plaited crafts that are produced daily include *rancak* and *ketapu laung* (Table 2). The *rancak* is a container made of rattans and bamboos, and used by the Dayak in the ritual ceremony to serve meals or goods to the spirits of their ancestors. The *ketapu laung* is a hat made of bamboos. The hat worn by customary heads of the Dayak Iban-Désa during ritual ceremonies.

Index Cultural Significance (ICS) of Plaited Plants Used By the Dayak Iban-Désa

The utilization of a plant by a society determines the importance of that plant for those people. The value of every plant will be different among different societies. The ICS values of each species used by the people are summarized in Table 3.

The ICS value was ranged from 1.2 to 24. There were 11 species, including one varieties and one sub-variety with high cultural significance (ICS > 10), that is *Calamus* sp., *Plectocomiopsis wrayi, C. javensis* var. *peninsularis, C. speciosissimus, C. blumei, C. javensis* var. *peninsularis* subvar. *polyphyllus, K. flagellaris, K. echinometra, C. concolor* (the rattans), *D. asper, S. brachycladum* with green culms (the bamboos), *Pandanus* sp. 1. (the pandan) and *H. reticulata* (wild ginger). Generally, the plants with high ICS values were used as the irreplaceable main material or

Table 3. Index Cultural Significance (ICS) plaited plant in the Dayak Iban-Désa based on quality value (q), intensity value (i) and exclusivity value (e)

Scientific name	q	i	e	ICS	Category
Calamus sp.	4	3	2	24	Main plaited material, harvested throughout the year (very often) and very strong
Plectocomiopsis wrayi	4	3	2	24	
Calamus javensis var. *peninsularis*	3	3	2	18	Main and substitute plaited material, harvested throughout the year (very often) and very strong
Calamus speciosissimus	3	3	2	18	
Korthalsia flagellaris	3	3	2	18	
Korthalsia echinometra	3	3	2	18	
Pandanus sp. 1	3	3	2	18	
Hornstedtia reticulata	3	3	2	18	
Calamus blumei	3	3	2	18	
Calamus javensis var. *peninsularis* subvar. *polyphyllus*	3	3	2	18	
Dendrocalamus asper	4	2	2	16	Main plaited material, harvested every one to two years (often) and very strong
Ceratolobus concolor	4	3	1	12	Main plaited material, harvested every one to two years (often) and less strong
Schizostachyum brachycladum with green culms	3	2	2	12	Main and substitute plaited material, harvested in one to two years (often) and very strong
Calamus rugosus	3	3	1	9	Main and substitute plaited material, harvested along the year (very often) and less strong
Calamus axillaris	3	3	1	9	
Daemonorops oligophylla	3	3	1	9	
Pandanus sp. 2	3	3	1	9	
Pandanus sp. 3	3	3	1	9	
Gigantochloa hasskarliana	2	2	1	4	Substitute plaited material, harvested every one to two years (often) and very strong
Schizostachyum lima	1	2	2	4	Only a substitute material and it can be used to another utilization, harvested every one to two years (often) and very strong
Schizostachyum brachycladum with yellow culms	1	2	2	4	
Licuala sp.	3	1	1	3	Main and substitute plaited material, harvested less often than every 2 years (very rare) and less strong.
Calamus zonatus	3	2	0.2	1.2	Main and substitute plaited material, harvested in one to two years (often) and not strong

both main and substitute material, harvested throughout the year, and have very strong fiber. Ten species have low cultural significance (ICS < 10), that is *Calamus rugosus, C. axillaris, C. zonatus, Daemonorops oligophylla* (the rattans), *G. hasskarliana, S. lima, S. brachycladum* with yellow culms (the bamboos), *Pandanus* sp. 2, *Pandanus* sp. 3 (the pandans) and *Licuala* sp. (the palm). Those plants are generally used as the substitute material or both main and substitute material, harvested often to very rare (once per year or only every two or more years) and have less strong fibers than those plants with ICS > 10.

Ecological Status of Plaited Plant

Harvesting sites of plants used for plaiting

The plants used for plaiting occur in two types of habitat with three harvesting sites. The habitats are secondary forest (located at the Tawang Mersibung customary forest and the foothills of Rentap hills), and open vegetation (at abandoned land near the *betang panjang*) (Fig. 2). Different species were harvested at each of the localities. All of the *Arecaceae* (the rattans and palms) and *Pandanus* sp. 1 were harvested from naturally occurring plants in the Tawang Mersibung customary forest. *Pandanus* sp. 3 (cultivated) and *senggang* were harvested on the abandoned land. The bamboos were harvested from protected forest at the Rentap foothill, including the Sungai Maram and Baning Panjang village. Prior to early 2000, the Rentap hill was used by the people as the location of shifting cultivation. After the Ministry of Forestry Decree No. 259/KPTS-II 2000 was published on 23 August 2000, the Rentap Hill became a protected forest and shifting cultivation stopped.

The important value index (IVI) of the plaited plants

The IVI value provides information about availability of plants in the harvesting location (Table 4). There were ten species, including one

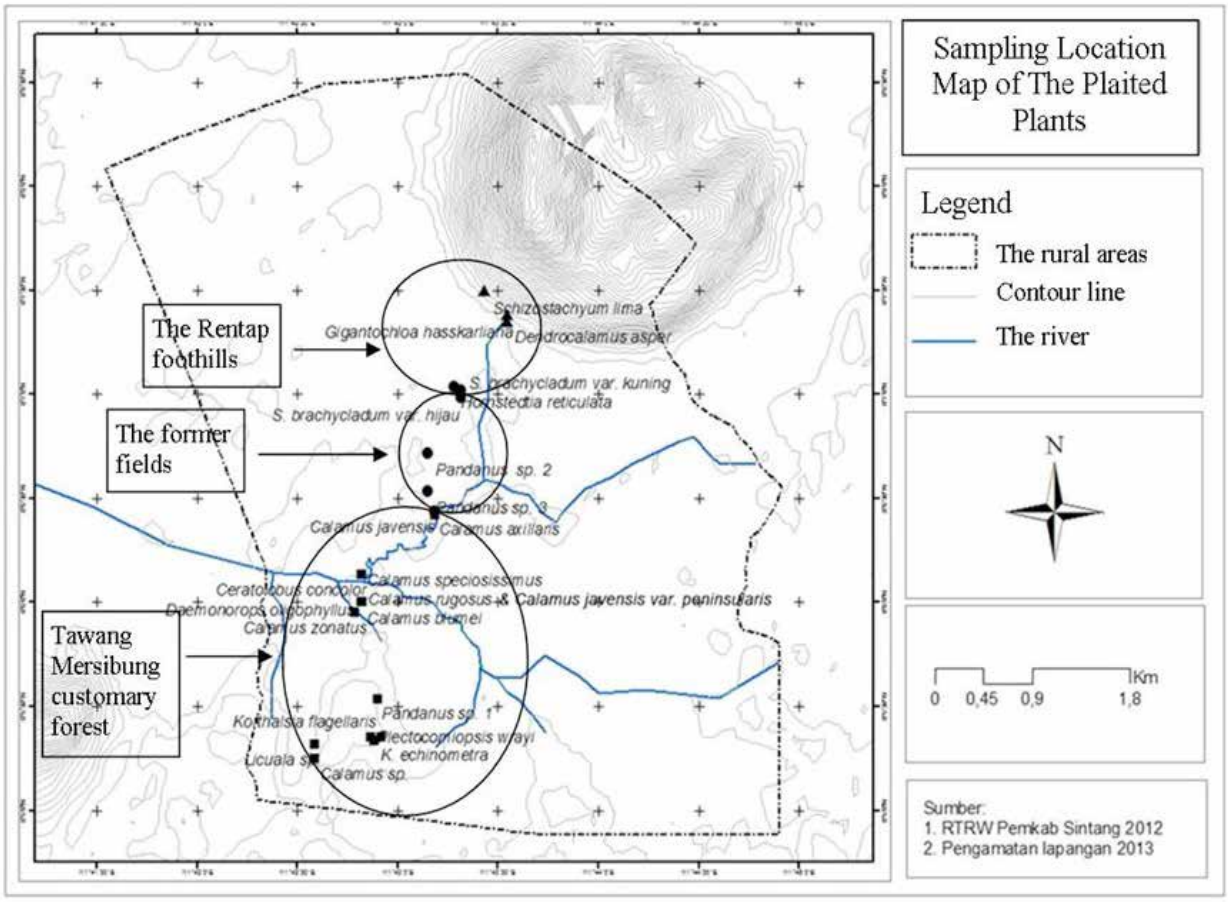

Fig. 2. The plaited plants harvesting location. All species belong to Arecaceae and one of the pandan (*Pandanus* sp. 1) were harvested on the Tawang Mersibung customary forest; the other pandans and *Hornstedtia reticulata* were harvested on the former fields; the bamboos were harvested on the Rentap foothills.

Table 4. The IVI value of plaited plants harvested in the Tawang Mersibung indigenous forest

Scientific name	Total individuals/ clumps*	Total presences plot of the plants (from 30 plots established)	Relative density	Relative frequency	IVI
Plectocomiopsis wrayi	40	2	23.12	5.71	28.83
Pandanus sp. 1	35	2	20.23	5.71	25.94
Calamus rugosus	15	4	8.67	11.42	20.09
Calamus blumei	22	2	12.71	5.71	18.43
Calamus javensis var. *peninsularis*	7	4	4.04	11.42	15.47
Calamus zonatus	6	4	3.46	11.42	14.89
Calamus javensis var. *peninsularis* subvar. *polyphyllus*	10	3	5.78	8.57	14.35
Daemonorops oligophylla	14	2	8.09	5.71	13.8
Calamus speciosissimus	8	3	4.62	8.57	13.19
Ceratolobus concolor	9	2	5.2	5.71	10.91
Calamus axillaris *	2	2	1.15	5.71	6.87
Korthalsia echinometra *	2	2	1.15	5.71	6.87
Korthalsia flagellaris *	1	1	0.57	2.85	3.43
Calamus sp. *	1	1	0.57	2.85	3.43
Licuala sp. *	1	1	0.57	2.85	3.43

Table 5. The IVI value of plaited plants harvested in the abandoned land near the *betang panjang* long house

Scientific name	Total individu/ clump*	Total presences plot of the plants (from 6 plots established)	Relative density	Relative frequency	IVI
Pandanus sp. 3	9	2	47.37	40	87.37
Hornstedtia reticulata	9	2	47.37	40	87.37
Pandanus sp. 2 *	1	1	5.26	20	25.26

Table 6. The IVI value of plaited plants harvested in the Rentap foothills

Scientific name	Total individu/ clump*	Total presences plot of the plants (from 10 plots established)	Relative density	Relative frequency	IVI
Gigantochloa hasskarliana	7	4	63.64	50	113.64
Dendrocalamus asper	1	1	9.09	12,5	21.59
Schizostachyum lima	1	1	9.09	12,5	21.59
Schizostachyum brachycladum with yellow culms	1	1	9.09	12,5	21.59
Schizostachyum brachycladum with green culms	1	1	9.09	12,5	21.59

variety and one subvariety of plaited plants with high IVI value (IVI > 10) found in the Tawang Mersibung indigenous forest, that is *P. wrayi, Pandanus* sp. 1, *C. rugosus, C. blumei, C. javensis* var. *peninsularis, C. zonatus, C. javensis* var. *peninsularis* subvar. *polyphyllus, C. speciosissimus, D. oligophylla* and *C. concolor* (Table 4). In the abandoned land harvesting location, *Pandanus* sp. 3 and *H. reticulata* had a high IVI value (Table 5, IVI = 87.37), and the bamboo *G. hasskarliana* in the Rentap foothills (Table 6 IVI = 113.64) also had a high IVI value. The plaited plants with high IVI value had more than 5 individuals/clumps and were found at least in two plots.

DISCUSSION

The role of plants on plaited crafts production by the Dayak Iban-Désa

Rattans

There are 312 species (in seven genera) of rattans in Indonesia (Jasni & Krisdianto, 2012). Rattans are important in plaited production in the Dayak Iban-Désa community. Almost all of the rattan species have higher ICS values than other plants used for plaited crafts. Rattans have been used for a wide variety of purposes, ranging from basket-ware, cords, toys, furniture and houses (Dransfield, 1979). In the early 19th century, the King of Kutai encouraged rattan cultivation among the Dayak farmers (López & Shanley, 2005) of Barito, Kapuas and Kaharjan in Kalimantan (Mackinnon *et al.,* 2000). The rattans were harvested and traded in the international market, mostly for the furniture manufacturers (López & Shanley, 2005). The rattans exported from Indonesia are regarded as the best quality cane in the world. Those rattans with good quality are mostly from *Calamus*, such as *C. caesius, C. scipionum, C. tumidus* and *C. leiocaulis* (Sanusi, 2012). Unfortunately, none of these species are recognized by the Dayak Iban-Désa. It may be due to the species are not available in the forest where the Dayak Iban-Désa harvest rattans. The Dayak Iban-Désa recognize other species of *Calamus* with good quality, namely *C. javensis, C. speciosissimus, C. blumei* and *Calamus* sp. and also the following other genera *Korthalsia flagellaris, K. echinometra* and *Plectocomiopsis wrayi.* The Dayak Iban-Désa do not sell the cane as a trading commodity, but rather they utilize the cane for producing their own tools. Other species of *Calamus* that have low quality cane include *C. exilis* and *C. hispidulus*. These species are not resistant to powder-post beetles attack (Jasni & Roliadi, 2011). The Dayak Iban-Désa people regard *Calamus zonatus* as a rattan with nonperishable fiber because the cane easily rot when exposed to water. Therefore, this species was not made into burden baskets or plaited products soaked in water such as *bubu putut, kemansai* and *sangkar ikan*. It was used to make crafts with minor utilization, such as little containers (*engkidung* and *cupai*) which was used for carrying lighten goods.

Rattans are mainly used as the material for making various farming baskets that requires material with strength, flexibility, and light. They are used for making most of the plaited crafts produced by the Dayak Iban-Désa. The plaited

crafts usually use more than one species of rattans in one plaited craft product, depending on the component of the craft: body, string or frame. Rattans with smooth and strong fiber, such as *Korthalsia echinometra* and *Plectocomiopsis wrayi*, are plaited for the craft body. The rattans fiber with smooth surface are preferred by the craftsman because they are easy to split and easier to handle. Rattans with a small diameter (< 0.5 cm) such as *C. javensis, C. Rugosus* and *D. oligophylla* are used as string to bind the craft body and frame. Those rattans are not split into parts, but are plaited as a whole cane. Rattans with wide diameter (> 0.5 cm) and rough fiber such as *K. flagellaris* and *C. axillaris* are used as the plaited craft frame. Those rattans are used as a whole or split cane. The Dayaks preferred the rattans to make the plaited crafts, over others material. Likewise, other tribes in Indonesia, such as Anak Dalam in Jambi (Jumiati *et al*., 2012) and Sunda in West Java (Wardah *et al*., 2005) also prefer rattans.

Bamboos

Bamboos are known as an important organic building material throughout South, East, and Southeast Asia. They are used to build over 70% of houses in rural area (Rao & Sastry, 1995). Indigenous people also use bamboos for many other purposes, such as to make paper, musical instruments, baskets, furniture, and handicraft. The bamboo shoots are also cooked as vegetable (Dransfield & Widjaja, 1995).

The diversity of bamboos in Kalimantan which comprises 23 species are lower than those in the other Indonesian islands (80 spp. in Sumatra, 58 spp. in Java, 44 spp. in Bali, 31 spp. in Papua and 25 spp. in Sulawesi) (Widjaja, 2012). However, there are only four species of bamboos found in the Ensaid Panjang village. The Dayak Iban-Désa use all of those four species for making plaited crafts, but the products are less varied than the product of rattans. The bamboos used for plaiting baskets have specific criteria such as small diameter, thick walls, long internode, and easy to split (Dransfield & Widjaja, 1995; Lenjau *et al.,* 2013). However, the Dayak Iban-Désa do not have specific criteria for using bamboos. They frequently use the bamboos for making tools used in water such as fishing tools, because it is more durable than rattans and others. *Dendrocalamus asper* are used as the main material of fishing traps, whereas the other bamboos (*G. hasskarliana* and *S. lima*) are used as the substitute material.

Bamboos are often used as the only material for making patterned crafts since they can be painted using natural as well as synthetic dyes (Christensen, 2013). The bamboo craft made by the Dayak Iban-Désa, *S. brachycladum* with green culms have long lasting colour when it is painted. Therefore, *D. asper* and *S. brachycladum* with green culms have high ICS value in the plaited crafts production.

Pandans

Pandans (*Pandanus,* Pandanaceae) are well-known as a plant with various utilization, such as for food, spices, medicine, ritual and handicrafts (Sadsoeitoeboen, 1999; Wardah & Setyowati, 2009; Purwanto & Munawaroh, 2010). There are ± 700 species of *Pandanus* spread throughout the Old World Tropics, and ≥ 60 species occuring in Borneo (Purwanto & Munawaroh, 2010). The utilization of pandans as handicraft material have been known for a long time, especially by the communities in Jawa. There are a lot of small home-based industries in Indonesia that produce many tools made of pandan, such as mats, slippers, tissue boxes, shopping bags, wallets, and other items. Many of these home-based industries, such as in Kalirejo and Grenggeng, Kabupaten Kebumen, Central Java have exported their products. The raw materials of exported product are processed to increase their quality and durability (Wardah & Setyowati, 2009). However, the Dayak Iban-Désa in the Desa Ensaid Panjang did not use any special process for the raw pandan leaves since they made the crafts for themselves and rarely for sale. The Dayak Iban-Désa usually harvest the fresh leaves of pandan and bring it to the *betang panjang*. The spines on the margin of the leaves are removed, then the leaves are split into parts before being plaited. They recognised three types of pandans found around the Ensaid Panjang village for specific purposes based on differences in morphology features. *Ndas* (*Pandanus* sp. 1) have narrow (± 2.8 cm wide), long leaves (± 164 cm long) and it is claimed that it has leaves with smooth and stronger fiber than other pandans. This species is usually used to make sleeping mats and farming tools such as *takin, capan, tudung, cupai* and *bakul. Tandoh* (*Pandanus* sp. 2) have wider (± 4.2 cm wide) and longer leaves (± 216 cm long) than *Pandanus* sp. 1. The *tandoh* fiber is claimed to be stronger and rougher than that of *Pandanus* sp. 1 and *Pandanus* sp. 3. This species is often used to make sitting mats, farming tools and household furnishings. *Perupuk* (*Pandanus* sp. 3) has the widest (± 7.5 cm wide) and longest leaves (± 292 cm long). However, its fiber is claimed to be not as strong as *Pandanus* sp. 2, even though it is smoother. This species is commonly used to make sitting mats, but rarely used to make other crafts. The *Pandanus* sp. 1 has the highest ICS value because it is preferred over others pandans species. The species of *Pandanus* reported as commonly used for plaited material by the Dayak are *P. kamii*, *P. kinabaluensis* (Christensen, 2013), *P. amaryllifolius* and *Pandanus* cf. *kaida* (Uluk *et al.,* 2001). Since

the identity of the above three pandans has not be resolved, it is possible that these may prove to be among those commonly used species.

Palms

Licuala sp. is a fan palm used by the Dayak Iban-Désa as plaited material. There are few records about the utilization of fan palm for plaited material. *Licuala borneensis, L. spicata,* and *L. flabellum* are among the fan palm used to make small baskets and sun-hats (Christensen, 2002; Hajar, 2009). In the Dayak Iban-Désa, the *Licuala* are only use as a raw material for making sun-hats. The broad sheet of *Licuala* leaves are not plaited like other raw materials.The leaves are cut into big parts, and then sewn together for the outer layer of sun-hat. The Dayak Iban-Désa used the sheath of wild ginger (*Hornstedtia reticulata*) for the sun-hat inner layer. The outer and inner layer of the sun-hats are tighten and bound together with the frame.

Licuala sp. is a plaited plant with a low ICS value, being less important in the plaited crafts production by the Dayak Iban-Désa. The low ICS value is a consequence of the limited population of *Licuala* sp. and its harvesting location is far away from the village. There are only one young clump of the *Licuala* sp. left in their habitat. The distance between the habitat and the village is approximately ± 2.5 km, located inside of indigenous forest (compared to other plaited plants habitat in range 1 – 1.5 km). Therefore, the people rarely harvested the *Licuala* sp., and they usually substituted the material for making sun-hats with the leaves of *Pandanus* that was grown around their village.

Senggang (wild ginger)

Information about the plaited raw material from Zingiberaceae are still limited. The species of this family are commonly used as spices and medicine (Setyawan, 2001; Tanto & Setyawati, 2009), with some species that have beautiful flowers are planted as ornamental plants and cut flowers (Handayani & Ariyanti, 2015). *Etlingera coccinea* is used as plaited material (Christensen, 2013). The *senggang* (*Hornstedtia reticulata*; Fig. 3) used by the Dayak Iban-Désa are also known and used as the plaited material by other related groups of Dayak Iban (Christensen, 2013; Bléhaut, 2013; Ball, 2013).

The leaf sheath of *Hornstedtia reticulata* is peeled layer by layer for preparing plaited material. The peeled sheaths then are rolled and dried under the sun for at least three days or up to a week, depending on the weather. The colour of dry leaf sheaths of the *senggang* are yellowish brown and its surface is shiny. The Dayak Iban-Désa use *senggang* to make various products. The main farming tools made of *senggang* is *kelayak,* a mats for drying rice grains under the sun. *Senggang* are also specially used as the inner

Fig. 3. The habit (a) and flower (b) of senggang (*Hornstedtia reticulata*) grow in open area in a farmer field.

layer of the patterned crafts made of bamboos. The aims of making double layers of the patterned crafts is to make the crafts stronger and more durable (Christensen, 2013). The patterned crafts are usually used in ritual ceremony. Therefore, those crafts need to be made neat, beautiful and durable. The Dayak Iban-Désa also use the *senggang* as subtitute materials of burden baskets such as *empajang* which is commonly made of rattans. High usability of the *senggang* result in this plant being important (high ICS value) in the plaited crafts production of the Dayak Iban-Désa. S*enggang* is cultivated by the Dayak Iban-Désa around their own yard and field.

Assessment of plaited plants to determine the conservation strategy

Plaited craft production by the Dayak Iban-Désa still depends on natural raw material. Although the plaited craft products are rarely sold in the market, being only used for daily usage, the availability of plaited plants in their natural habitats are not always sufficient to supply the required amount of raw material. Continuous harvesting of plants without concern for their long-term availability may cause the population of plaited plants to decrease. Therefore, we need to observe the relation between utilization and availability of the plant material, in order to determine appropriate conservation strategy. There are four conservation strategies for plaited plants that are here suggested based on ICS and IVI values (modified from Sofiah, 2013)

Plants used for plaiting with:

- high ICS and IVI: protecting and maintaining the habitat;
- high ICS and low IVI: cultivating the plaited plants;
- low ICS and high IVI: exploring and increasing other potential value of the plants;
- low ICS and IVI: cultivate, explore and developing other potential of the plants.

The important plants used in plaited craft production are frequently harvested throughout the year by the Dayak Iban-Désa (Table 3). Therefore, high availability of plants in the habitat is required to satisfy the demand. There are nine species of rattans, two species of bamboos, one species of pandans, and the *senggang* that are claimed as important plants in plaited craft production by the Dayak Iban-Désa. However, only six taxa of rattans (*Plectocomiopsis wrayi*, *Calamus blumei, C. javensis* var. *peninsularis, C. javensis* var. *peninsularis* subvar. *polyphyllus*, *C. speciosissimus, Ceratolobus concolor*), one species of pandan (*Pandanus* sp. 1), and *senggang* (*Hornstedtia reticulata*) that are highly abundant in their habitat. The appropriate conservation strategy for those species is to protect and maintain the natural habitat of these plants.

Three species of rattans (*K. echinometra, K. flagellaris, Calamus* sp.) and two species of bamboos (*D. asper* and *S. brachycladum* with green culms) also used as important plaited crafts (high ICS value) and harvested throughout the year (Table 3), are suggested to be cultivated. Minor availability of individuals or clumps of these three species (Table 4 and Table 6) are needed to be increased by cultivating plants due to their importance for the plaited craft production. Although the period of rattans and bamboos cultivation require a long period (± 15 years and 4 years respectively) (Sutarno *et al.,* 1994; Sukawi, 2009), long-term cultivation ensure the regeneration of plants.

The plaited plants with high abundance but are not as usable in plaited craft production need to be considered. The existence of less usable plants tend to become unknown and forgotten. Therefore, the usefulness of those plants need to be explored for other potential value, such as for food resources and medicine, to increase usability of these plants. The plaited plants with high abundance (high IVI value), but less usable (low ICS value) are three species of rattans (*C. rugosus, C. zonatus, D. oligophyllus*), one species of bamboo (*G. hasskarliana*), and one species of pandans (*Pandanus* sp. 3).

Low availability and utilization of plaited plants are found in *C. axillaris* (the rattan), *Licuala* sp. (the palm), *Pandanus* sp. 2 (the pandan), *S. lima* and *S. brachycladum* with yellow culms (the bamboos). The appropriate conservation strategy for these plants is to cultivate, explore and to increase other potential values of the plants. The plaited plants in those categories are easily threatened with extinction.

There are plaited plants that have become locally extinct because people did not control the plant harvesting in the last few years, such as *purun, mendong* and *kulan.* These plants are used to make mats. The population of several species of rattan such as *wi matahari, wi sega* and *wi jerenang* have also decreased. Therefore, conservation strategies must be quickly applied to prevent extinction on these and other highly exploited species.

The future of plaiting culture in the Dayak Iban -Désa

Due to modernization and technological invention, the skills in traditional plaiting techniques of the Dayak Iban-Désa inherited from the ancestors are threatened with extinction. The Dayak Iban-Désa community is currently facing a problem on preserving the culture of producing plaited crafts. They gradually leave the traditional farming systems which use a variety tools of plaited crafts. Most plaited household products

made of plant materials have been replaced by plastic or other synthetic products. Young generation does not want to learn plaiting and are not interested in preserving the culture of making the crafts. At the time of this research, we only found crafts technician over 40 years old who still actively produce the crafts. Efforts should be made to preserve the culture of plaiting. The Dayak Iban-Désa communities should collaborate with the government and Non Government Organizations (NGOs) to organize workshops and exhibition programs for reintroducing the culture of plaiting to the younger generations. Identification of plants used for the plaited material may help the people to cultivate and preserve the plants in order to maintain the availability of the craft materials instead of gathering the material from natural habitats. We need to innovate by creating and introducing a variety of plaited products for more varied usability and adjusted to current requirements. In addition, a trade management in the marketing of the craft productions should be applied. Community agency such as Dekranasda Sintang and Koperasi Kobus in the Sintang district has contributed on marketing the plaited crafts and other craft products. The plaited crafts could be exposed in an art galery that will be visited by domestic and international tourists. A great effort and support are needed to preserve the plaited crafts through next generation.

CONCLUSIONS

The diversity of plants used for plaited crafts by the Dayak Iban-Désa consisted of twenty-one species, one variety and one sub-variety. The plants are classified in four families (Arecaceae, Poaceae, Pandanaceae, and Zingiberaceae). The *Arecaceae* has more species used for the plaited material than the other families. The plaited materials were made from stem or culm (rattan and bamboo), leaf blade (pandan and palm) and leaf sheath (senggang) of those plants. The Dayak Iban-Désa produce about twenty-six types of plaited crafts used for tools or equipment in farming, animal husbandry, fishing, household furnishings, ritual ceremony and children toys.

The ICS values showed that eleven species, one variety and one sub-variety of plant have high ICS values, but the plants with high abundance were only six species, one variety and one sub variety, including *Plectocomia wrayi, Calamus blumei, Calamus javensis* var. *peninsularis*, *Calamus javensis* var. *peninsularis* subvar. *polyphyllus*, *Calamus speciosissimus, Calamus concolor, Pandanus* sp. 1 and *Hornstedtia reticulata*. The ICS and IVI value can be used to determine the proper conservation strategy in order to keep the continuity of plaited craft production.

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Scope. *Reinwardtia* is a scientific irregular journal on plant taxonomy, plant ecology and ethnobotany published in June and December. Manuscript intended for a publication should be written in English.

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