The utilization of Pandan Coconut (*Pandanaceae*) at the interior tribes Papua, Indonesia

L I Zebua, I M Budi, E Wanimbo, and Suharno

Department of Biology, Faculty of Mathematics and Sciences, Cenderawasih University, Jayapura-Papua, Indonesia Jl. Kamp Wolker, Waena, Jayapura 99351, Papua, Indonesia

Email: lispandanus@gmail.com

**Abstract.** Pandan is one of the unique plants, especially for Austronesia and Melanesia society in tropical areas, including Papua. The one of *Pandanus* which often exploited by local people in the middle mountain of Papua called coconut pandan (*Pandanus julianettii* Martelli). The aim of this study is to determine the utilization of coconut pandan by Lanny Jaya tribes in the middle mountain of Papua by using qualitative approaches (observation and interview). Purposive and snowball sampling has been used for informant selection. The results showed that all the plant organs (leaves, stem, roots, and fruits) could be utilized. For instance, the stem organs are used as materials for house building such floor and walls, and it also can be used as firewood. The people of this tribe also utilized the leaves as traditional mats and umbrella, and the leaves from Woromo cultivars can be used as cigarette rolls. The root fiber is used as material for making a traditional bag (noken) and to make the arrow. People of this tribe also consumed the fruits of coconut pandan because it tastes like coconut fruits.

1. **Introduction**

Pandan is a very unique plant, particularly for the tropics area. Widely use of Pandan is the specificity of Austronesian and Melanesian. Traditionally, pandan was used by Austronesian and Melanesian for many purposes, such as flavoring, medicines, and important items for religious ceremonies [1],[2].

Kogoya [3] reveals that many species of Pandanus has been used by local people living in the highland area of Papua and Papua New Guinea. One of those species is Pandan coconut (pandan Kelapa hutan), which has many cultivars. Pandan coconut is not familiar to many people. However, Lanny tribes who live in Jayawijaya upland consumed pandan coconut daily for since long time ago.

In general, the Lanny tribes consumed the fruits of pandan coconut. The fruits itself are very savory, and because it smells like coconut, they named it pandan coconut. For Lanny people, pandan coconut became a very important product due to its economic value. When the fruit season has come, the prices become very expensive. Therefore, lanny people often use pandan coconut as an exchange item on several ceremonies such as wedding and their other customs [4]. In addition to fruits, Lanny people also utilized the other organs of Pandan coconut. Therefore the aims of this study are to understand the utilization of Pandan coconut by lanny Jaya tribes.
2. Material and methodology

2.1. Study area
Lanny Jaya regency is located in the middle mountain of Papua, and it is one of the expansion areas of the Wamena Regency. Data collection was held from May to August 2014 in Pirime village (figure 1). The total area of Pirime village is 1,688 ha, which separated into 27 hillbilies with a total population of 94,852 peoples.

![Study location, Pirime Village Lanny Jaya Regency.](image)

2.2. Data collection
The data was collected by using in depth interviews with key informants (Tribal chief), and complementary informants (local people who utilized pandan coconut). In addition, observation, documentation, and participatory rural appraisal (PRA) also conducted as methodologies [5]. The Snowball sampling method was used to select the complimentary informants [6].

3. Results and discussion

3.1. Traditional knowledge of Lanny people about the diversity of Pandan coconut
The Lanny people can recognize the species of pandan coconut by seeing the morphology of the drupe. Therefore they give the named of each species based on the morphological traits of the drupe (figure 2). The interview with key informants shown that for Lanny people, there are three different species of Pandan coconut based on the size of cephalium and the drupe. The local name of these three species are Woromo, Gawing, and Lim, and the scientific name for each is Pandanus iwen Stone., Pandanus brosimus Merr & Perry., Pandanus jiulanettii Martelli [7]. P. Iwen Stone (Woromo) has 6
local cultivars. They are *Kopena*, *Lirungga*, *Loggaweng*, *Lokop*, *Ilakul*, and *Kaliruke*. *P. Brosimus* Merr. & Perry (Gawing) has 7 local cultivars. They are *Lirungga*, *Kopena*, *Kurir anogom*, *Peakore*, *Owanduk*, *Kubo*, and *Jelekme*. For *P. julianettii* Martelli (Lim), there is only 1 local cultivar named *Kaliye*.

![Figure 2. Habitus of Pandan coconut. (a) the tree; (b) cephalium; (c) drupe.](image)

Lanny people can recognize the difference of each cultivar based on the size, flesh of fruits texture, and also the skin’s texture of the drupe.

**Table 1.** The morphology of cephalium and drupe for 3 species of Pandan Coconut.

| Local & Scientific name       | Length of cephalium (cm) | Size of a drupe (mm) | The texture of skin and flesh of fruits                          |
|-------------------------------|--------------------------|----------------------|------------------------------------------------------------------|
| Woromo (*Pandanus iwen* Stone.) | 45 - 50                  | 40-55 x 8-10         | The skin is smooth and easy to peel. The flesh is soft           |
| Gawing (*Pandanus brosimus* Merr & Perry.) | 28 - 40                  | 40-80 x 10-17        | The skin is rough and hard. The flesh is hard                    |
| Lim (*Pandanus julianettii* Martelli.) | 15 - 20                  | 50-90 x 18-20        | The skin is smooth and easy to peel. The flesh is soft           |

3.2. The utilization of Pandan coconut based on local knowledge

Based on the result from interviews and observation on the field, we found that Pandan coconut can be used for many purposes, such an income source, as tools for social interactions, food ingredients, handicrafts, and manufacture (to build the house, etc.). Kogoya [3] revealed that all the organs from all cultivars of Pandan coconut could be utilized. The utilization of each organ was shown in table 2.

**Table 2.** The utilization of each organ from Pandan Coconut.

| Organs         | Usability                                                                                     |
|----------------|-----------------------------------------------------------------------------------------------|
| Roots          | Materials for making traditional bag called *noken* and making arrows                        |
| Steam          | Materials for house making floor and wall                                                    |
| Leaf           | Use as an umbrella, materials for the traditional mat and as an alternative for rolling papers of cigarettes ) (craft material for the manufacture of the traditional umbrella, mats, and wrapping of cigarette/tobacco) |
| Fruits/drupe   | Foods and has high economic and social value (material food and has a high social and economic value in the community) |

Puwanto and Munawaroh [7] said that in Indonesia, other than *Pandanus brosimus* Merr & Perry., *Pandanus conoides* Lam., and *Pandanus julianettii* Martelli which traditionally cultivated by New
Guinea people, plant cultivation of *Pandanaceae* family that used as food ingredients has not been developed well (figure 2).

Figure 3. Cultivation of Pandan coconut around the house of Lanny people.

3.3. *Noken making process*

1. Cut the roots (the length of roots depend on the needs) then soak it into the mud during 1-2 weeks. Lanny people said the aims of soaking are to softening the roots; therefore, it would be easy to separate the skin from its fiber.
2. After 1-2 weeks, wash the soaking roots with clean water then dried under the sun. After well dried, take the torn out then separate the skin from root fiber.
3. Separated skin will be slightly cut in endways (Figure 3a), then dried under the sun. After the skin of the roots dry enough, cut it softly to make yarn (Figure 3b). Lanny’s women usually use their hands to roll up the cuted roots skin make it become yarn. To prevent their hands from blister when they roll up the roots, Lanny’s women put charcoal ashes on their hands. The yarn from roots skin will be using for webbing the noken (Figure 3c).

Figure 4. The stages of Noken making. (a) roots skin cuted softly in endways, (b) dried roots skin, and (c) noken.
3.4. Arrows making process
Choose and cut the hard roots of pandan coconut, side the roots into two parts, then cut the ends of the roots sharply to shape an arrow. Dry the arrows under the sun (The quality of arrows depends on the drying process). Lanny’s people said that the quality of pandan coconut’s arrow is better than other arrows from other plants.

3.5. Floor and wall making process
Usually, the bar/stem of Pandan coconut is used for floor and walls making. Lanny’s people use the old bars from Pandan coconut, which is unable to produce fruits as materials to make floor and walls for the house. The process is started with cutting the bars into two parts in endways then take out the bars’ skin. Press the cuted bars skin using heavy timber to make it flat and dry. If the bars’ skin is dry and flat enough, it is ready to use as materials for floor and walls making.

3.6. Umbrella, traditional mats, and cigarette’s papermaking process
The leaf organ from Pandan coconut is used to make an umbrella, mats, and paper for cigarettes. The leaf which is used to make these items are the leaf with a soft texture. The process was started by cutting down the leaf on its trunk, end of the leaf, and on its bone leaves (later will be the frame for umbrella). After cutting the leaf, put and dry it under the sun to make it well dry and soft. The next step is well dry leaf will be waving into the bone leaf by using the people (Figure 5).

![Figure 5. Traditional umbrella.](image)

The process of making a mat is quite similar to the umbrella. The difference is for the mat, and they didn’t use waving technique, Lanny people will only connect one leaf to another leaf by using a rope from rattan. The process of making a mat by Lanny people is actually the same with other tribes in the coastal area of Papua (Biak Numfor [8], Yapen [9], and east Fakfak [10]). The difference is only on the stages and species of Pandanus. This similarity can occur because, regarding Kiem [11], Pandanus is very important and widely used by Austronesian and Melanesian.

Only Pandanus from species *Pandanus brosimus* Merr & Perry can be used to make a rolling paper for a cigarette. Generally, Lanny people will choose the leaf with a soft texture, cut it into small pieces then dry it. If the leaf is already dry enough, people will use it as a rolling paper for cigarettes.

3.7. The utilization of drupe
Lanny’s people use Pandan coconut as a source of food. The organ which used as food is the fruits, and it tastes like coconut (*Cocos nucifera*) (Figure 6).
Figure 6. Drupe fruit, (a) flash of fruits, and (b) skin of the fruit.

To get the flash of fruits, people used to biting or beating the fruits' skin. Regarding Kayser [12], pandan coconut becomes an alternative food for Lanny tribes when they failed to harvest other products such as sweet potato due to bad weather. When fruits season has come, Lanny’s people harvest the fruits from the forest, and sometimes this harvesting season led to conflict between some groups who claimed that they own the area of harvesting.

The fruits of pandan coconut not only become food sources for Lanny tribes and the tribes living in the middle mountain of Papua. It also becomes an important product for its income sources. People living in the upland area of Papua, get to sell the fruits of Pandan coconut at a traditional market in cooked (smoked or burned) or uncooked products [7]. Regarding Kogoya [3], smoked fruits of pandan coconut can be stored for more than 2 years, it means smoked could be the way of fruit preservation.

This study also found that Lanny tribes treat the Pandan coconut very carefully because this plant has an economic and social value for them. In the fruits season, the price of pandan coconut would be very high (300,000-600,00 rupiah) depends on the size of the fruit. Lanny tribes use the harvested fruits for some ceremonies such as the coronation of tribes chief, ecclesiastical activities, etc.

3.8. The cultivation of Pandan Coconut

From this study, we understand that Pandanus iwen Stone. (Woromo) which is planted around the house of lanny tribes becomes the most popular species for cultivation. The reason why these species become popular is because of its ability to produce fruits in a short time, and the height of the tree is not so high (>15 meters). The fruitful season of this species is around March to May every year. Other species which not cultivated by lanny tribes have the height >25 meters, and its fruitful season is around June to August every year. However, lanny tribes don’t only taking care of plants their cultivated, pandan coconut, which grows wildly in the forest, also treated very well by lanny tribes. Lanny tribes often cutting down the old leaves and use it as organic fertilizer for pandan coconut.

Regarding Kogoya [3], Pandanus can be found at the altitude 1750–3500 above sea level (asl), and Jayawijaya highland is the area that rich with this plant. Besides Jayawijaya, there are other areas in Papua island where we can find pandanus. They are Puncak Jaya, Puncak Trikora, Nduga, Wamena, Yahukimo (all are located in the middle mountain of Papua), and also PNG.
4. Conclusion
From this study, we can conclude that there are 3 species of pandan coconut which utilized by lanny tribes for their daily needs. They are Woromo (Pandanus iwen Stone), Gawing (Pandanus brosimus Merr & Perry), and Lim (Pandanus Julianettii Martelli). From these 3 species, only Woromo (Pandanus iwen Stone) was cultivated around the house of Lanny tribes.

All of the organs from Pandan coconut can be utilized such roots (for noken and arrow), bars (for floor and walls of the house), leaves (for umbrella and mats, and cigarette paper), and fruits/drupe (for foods). Pandan coconut has an important meaning for lanny tribes because it has economic and social values. Therefore they treat and conserve this plant very carefully.

Acknowledgment
We would like to thanks Minister of Research, Technology and Higher Education for supporting this study through Hibah Fundamental fund, 2012, and we also would like to thanks our students from Departement of Biology, Cenderawasih University, Isak Mandosir, Torlengka Aronggear, and Resmin Kogoya who helped us to collect the data on the field.

References
[1] Stone B C 1975 On the Biogeography of Pandanus (Pandanaceae) (University of Malaya).
[2] HEYWOOD V H 1993 The flowering plants of the world. BT Batsford Ltd London.
[3] Kogoya B 2012 Pandan Kelapa Hutan Papua.
[4] Kogoya B, Guritno B, Arifin and Suryanto A 2014 Bioactive Components of Pandan’s Fruits From Jayawijaya Mountains, Papua, Indonesia J. Environ. Sci. Texocology, Food Technol. 8 1–8.
[5] Martin G J 1995 Ethnobotany Chapman & Hall London (UK).
[6] Bernard H R 2002 Research Methods in Cultural Anthropology: Qualitative and Quantitative, 301-331.
[7] Purwanto Y and Munawaroh E 2010 Etnobotani jenis-jenis Pandanaceae sebagai bahan pangan di Indonesia Berk. Penelit. Hayati A 5 97–108.
[8] Woisiri S F 2013 Etnobotani Pandan Tikar Menurut Masyarakat Pulau Owi Distrik Biak Timur Kabupaten Biak Numfor (Universitas Cenderawasih).
[9] Aronggear T 2014 Keanekaragaman Pandanus dan Pemanfaatannya oleh Masyarakat Kampung Papuma Distrik Yapen Barat Kabupaten Kepulauan Yapen (Universitas Cenderawasih).
[10] Adelce P 2015 Pemanfaatan Pandanus oleh Masyarakat Kampung Wayati Distrik Fakfak Timur, Kabupaten Fakfak (Universitas Cenderawasih).
[11] Keim A P 2012 New variety, records & discoveries of some species of Pandanus (Pandanaceae) in Sumatra & Kalimantan, Indonesia Reinwardtia 13 255–62.
[12] Kayser A 2002 Nauru, One Hundred Years Ago. Pandanus. (trans: A. Blum).