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**Indigenous knowledge in harvesting and extracting essential oil from the  
bark of Mangasa (*Cinnamomum cullilawang* BL.) employed by Irarutu  
ethnic at Manggera Village, Kaimana, West Papua**

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**ABSTRACT**

Indigenous knowledge is numerous ways of life of local community to adapt and survive to their surrounding environment. The ways to harvest and extract forest resources to supply the daily needs of the forest people are ranging from one ethnic to another, and naturally being transferred from the old to young generation. These practices are also implied to the forest people at Manggera village, Kaimana, West Papua. Mangasa is local name for one of Non-Timber Forest Products (NTFP), which produces an essential oil, well known as Cullilawang or Kulit lawang (*Cinnamomum cullilawang* BL.).

Due to limitation of geographical access, and numbers of the forest people who have distilled devices, a short field trip was conducted to survey the natural standing stock of Lawang (*C. cullilawang*), and Manggera village was selected for this purpose. This field trip was also to closely examine how bark of Mangasa was selected, harvested, prepared, and transported by the local ethnic using their traditional knowledge and ways before the distillation processes are taking place. One forest people, an expert and has distilled devices, was selected for demonstrating a traditional distillation method representing the Manggera indigenous knowledge. Also, interview was conducted to investigate deeply and enlarge this knowledge for fully understanding the related issues of this NTFP commodity.

The results indicated that cullilawang essential oil is traditionally used to cure, and treat a daily symptoms or illness, such as skin care, protection from insect and mosquitoes, massages, and so on. It was found that using their own experiences, the cullilawang trees were selected based on a minimum DBH of 30 cm, and season of March-April, when the young leaves are grown, a stage or physiological conditions that a bark is less sticky to the trunk. The selected cullilawang trees were felled, debarked using traditional ways and tools, as well as drying the debarked bark to reduce moisture contents and costs of transportation. The reduced moisture of barks was chopped prior to distillation. All chopped barks from whole trunk were poured into the wooden tank distillator for single distillation time. Local scale and simple construction of distillation kiln made from local material were used to extract the essential oil of cullilawang. The essential oil collected, then filtered using compacted white cotton with funnel into dark recycled bottles and then sealed. This essential oil is marketed into local market or barter with other daily-consumed products. Harvesting and extracting cullilawang essential oil are ways to earn extra incomes and alternative works for some forest people in Manggera village, particularly when they cannot go for planting, fishing, and hunting. Probably, these practices are rational method to manage and utilize their own forest resources for fulfilling

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their needs, and probably could be highlighted as indigenous wisdoms leading to what we call as sustainable ways.

**Keywords:** Indigenous knowledge, Mangesa, Irian Jaya, and cullilawang essential oil

## 1. INTRODUCTION

### 1.1 Background

Papua land consisting of Papua and West Papua has been acknowledged world widely for its richness in terms of biodiversity, ethnics, social and culture customs, as well as indigenous knowledge practices. With respect to its biodiversity, Papua tropical rain forests are produced enormous quantity and high grades of timbers, and provided various commodities of non-timber forest products (NTFPs). These NTFPs commodities play a key role on supplying the daily needs and necessity of the local community with un-measurable ways and values. They can provide food, vegetables, supplementary nutrients, shelters, daily incomes, and non-formal jobs. For local people, forest is also never ending sources of medicinal plant used for maintaining their health, cure symptoms of their daily diseases, and provide chemists with invaluable compounds of starting points for development of new drugs (Pieroni *et al.* 2002; Ghisarbetti, 2008).

Indigenous knowledge is the ways of knowing, seeing, and thinking that are passed down orally from generation to generation, which reflects thousands of years of experimentation and innovation in agriculture, animal husbandry, child raising practices, education system, medicine, natural resources management and utilization (ICIK, 2012). Similarly, traditional knowledge refers to any knowledge, innovations, and practices of the indigenous groups related to agriculture, foods and environmental managements, medicine and health cares, arts, languages and other aspects of livelihoods (Wahyudi, 2012). Therefore, indigenous knowledge sometimes is referred as traditional knowledge.

Recently, there is an increasing awareness of the significance of ethnic and traditional knowledge in the development of new methods, strategies, and approaches to give clear clues to solve the complexity of the recent problems in health system, natural resources management and utilization, food shortage, and climate pattern. With respect to the local knowledge to select, harvest, and utilize the NTFPs for medicinal and economical purposes, the indigenous people of Kaimana, mainly at Manggera village, Arguni district, have been practicing distillation essential oils taken from the bark of kayu Lawang (*Cinnamomum cullilawang* Bl.) from generation to generation. Using their knowledge and tools, kayu Lawang is selected and harvested. Local-design and devices are used to extract the essential oil from the bark of this tree. Chemical compounds of *C. cullilawang* extracted with traditional method collected from Merauke has been reported by Trianto and Susanti (2007). However, these traditional practices from Manggera village, Kaimana, have not been studied, recorded and documented yet intensively for education, and scientific purposes (Womsiwor, 2013).

## 1.2 Goals

This paper was designed for three main goals as follows:

- To investigate the traditional method in selecting, and preparing the bark of kayu Lawang (*C. cullilawang*) prior for distillation;
- To examine tools, devices, equipment and all related complementary material used for these extracting method;
- To estimate the volume of essential oils collected from these practices.

## 2. METHODS

### 2.1 Research Location

This research was conducted at Manggera village, Arguni district for collecting the bark of kayu Lawang (*C. cullilawang*), and Kaimana town for distillation processes. Both locations are under administration of regional government of Kaimana, West Papua. These field researches started in April and finished in June 2013.

### 2.2 Methodology

Description method is mainly used in these research activities. Field observation and semi-structural interview were used to collect the data and information from the key persons and other stakeholders involved. Data and information gathered were tabulated, summarized, and expressed in Figures and Tables.

### 2.3 Variables

Variables investigated on this research are method of distillation, distillation tools and equipment, complementary tools and material needed. Local knowledge in identifying, selecting, felling, debarking, chopping, and preparing the bark of kayu Lawang (*C. cullilawang*) prior for extraction were also investigated. Furthermore, the geographical, ecological, and socio-economical status of Manggera village were collected for supplementary information.

## 3. RESULTS AND DISCUSSION

### 3.1 Geography

Using long boat with 25-horse power (hp) engine, Manggera village can be reached in two hours from Kaimana Town, and it costs approximately Rp. 350.000 (*three hundred and fifty thousand rupiah*) per person. Manggera village is bordered with Warmemu village in the North, Kufuryai in the South, Mandiwa village in the East, and Bintuni bay territory in the West.

### 3.2 Socio-economic Status

Manggera village is inhabited by 241 people, 120 men and 121 women, and mostly or 46.9% belongs to productive age (15-49 years old). Ethnic Iraputu is the dominant family, like Sinafuna, Tanggarofa, Surune, Sirini, Nyai, Tafre, and Jawi. Farming is their main job to get income, followed by fishing and hunting.

### 3.3 Natural Standing Stock of Kayu Lawang (*C. cullilawang*)

Manggera people collected bark of kayu Lawang from their surrounding forest, but in this research the selected kayu Lawang was found 5 km away from the village, or 1 hour by

walking. This kayu Lawang grows naturally at the wild or primary forest mixing with other forest vegetation. According to the villagers, today, kayu Lawang is getting difficult to be found at appropriated diameter for collecting its essential oils.

### 3.4 History of Distillation Method Used in Manggera Village

Mangasa is the local name for kayu Lawang (*C. cullilawang*) for Iraputu ethnic at Kaimana, while Koirwai ethnic mentions it as Wuipuri and Mesoi Kakie. History of Kayu Lawang distillation was started in 1942 when Chinese traders came to Kaimana introduced the distillation method to Iraputu ethnic. The local people followed the method until now.

Initially, the local people used dried and chopped Kayu Lawang barks, with 10 cm x 5 cm size as folk medicine. When they are traveling they keep it in their traditional bag (*noken*). When they suffer from pain, insect bitten, fatigue, and so on, the barks were chewing into small size and they apply gentle to the suffering skins or body (Womsiwor, 2012).

### 3.5 Distillation and Bark Preparations

The bark of kayu Lawang is collected manually from kayu Lawang grown at their clan community forests. There are several steps being employed to collect the bark, and prepare for distillation purposes used by Manggera villagers. These steps accordingly can be summarized as follows: a) Selecting; b) felling; c) debarking; d) drying; and e) chopping the barks.

#### 3.5.1 Selecting trees

According to the villagers, there are three criteria in selecting cullilawang tree for felling namely, minimum diameter, barks stickiness, and leaf buds, respectively. The trees must have diameter more than 30 cm, at diameter breast height (DBH). The stickiness of cullilawang barks are related to the physiological activities on the trees, particularly when the mature leaves are replaced by the young leaf (leaf buds). On this condition, the barks will be easily peeled or separated. Selection will be cancelled if suitable cullilawang tree are not found according to their un-written guidance. Stickiness of the bark to the trunk is also evaluated by punching long knife (*parang*), as illustrated by Figure 1.



Figure 1. Testing the stickiness of bark kayu Lawang using long knife (*parang*)

Diameter of tree, probably related to the capacity of tank distillator. With that diameter, whole barks could be extracted in single running time. With limitation using traditional ways and tools, debarking process is time consuming. Therefore, stickiness of cullilawang bark must be considered carefully mainly related to the process of debarking, times, and location from the

villages. It is interesting to examine and understand carefully the knowledge underlying leaf buds examination. It could be highly related to the physiological activity of the trees.

### *3.5.2 Felling the selected trees*

When cullilawang tree has been selected and determined, the next step is felling the tree. However, approximately 100 cm above the ground or forest floor, the barks have to be debarked using parang, a 100 cm longitudinally to top and covering the trunk diameter. An illustration of debarking and felling cullilawang tree is illustrated in Figure 2.

The main purposes of debarking 1 m long of standing tree prior felling are not well understood. Presumably, it is related to the probability of barks for being a dirty or damage because improper felling, a dirty and damage barks will reduce quality of bark and result low quality of essential oil (Gunter, 1948; Ketaren, 1985).



Figure 2: Debarking barks prior felling the trees

### *3.5.3. Debarking the felt trees*

When trees have been felt down, the next step is debarking process. Debarking is undertaken along a clear bole of the trunk, and finished at the first branch. Debarking process for kayu Lawang with diameter of 35 cm and 15 m long was finished in an hour by employing 5 people, replacing one to another. The barks then were converted into reasonable size 100 cm long and 7 cm wide, or stripped size, for accelerating water to evaporate from the barks. Debarking process of felt tree and stripped sizes of cullilawang barks are shown in Figure 3.



Figure 3: Debarking process of kayu Lawang barks

Figure 3 illustrate that debarking process was done manually, as no standard tools were used. Conversion into stripped size could be related to the effectiveness for packing, handling, and transportation.

#### *3.5.4 Drying the barks*

To reduce the water content of the barks, drying process is necessary. The stripped size barks were dried by arranging, and lying on the debarked trunk and exposed to the direct sunlight as illustrated by Figure 4. On sunny day, the drying process will take 6-7 hours continuously. Besides reducing water content, this drying process is also intending to reduce the total weight and bark dimension. These treatments will support the bark effectiveness and efficiency for transportation and distillation process.



Figure 4. Air drying processes of bark kayu Lawang

Drying bark into the direct sunlight for long time are not recommended. The bioactive compounds of plant material will react directly with the sunlight, and could lead to the changing the originality of these chemical compounds of these plants (Jone, 1998). Therefore, shading drying is highly recommended. The people of Manggera are drying their bark only for 6-7 hours probably due to the reason mention previously.

#### *3.5.5 Chopping the air dried barks*

After bark moisture contents are reduced, the dried barks were chopped into small size, 7 cm in long and 1 cm in wide, prior for distillation process. Knives or parangs were used to converted into small size. The chopped cullilawang barks are presented in Figure 5.



Figure 5. Chopped barks into small sizes

Chopping barks into small size have several purposes, like the small size of barks could fulfill the tank distillator more effectively and efficiently; to enhance the penetration of water steam into bark more shortly; and accelerate the essential oil out from the bark (Ketaren, 1985; Sunardi, 2008). Pre-treatment of air-drying and chopping will influence the volume of essential oils produced from leaves of Nilam (*Pogostemon cablin*) and Kayu Putih (*Melaleuca leucadendron*), Rahayoe *et al.* (2007).

### 3.6 Tools, equipment and raw material needed for constructing and running distillation kiln

Tools and equipment used by Manggera villagers to construct their distillation kiln can be summarized in Table 1, while the distillation construction is illustrated in Figure 6.

Table 1: Tools required to assembling distillator and their functions

No	Name	Functions
1	Large frying pan 1	Bottom cap of wooden drum
2	Large frying pan 2	Top cap of wooden drum for condenser or cooling
3	Solid-wooden drum with diameter 110 cm and 130 long made from Mahoni wood.	The main tank or funnel of distillation kiln to steam the bark
4	Small bamboo 40 cm long 3 cm in diameter	Tunnel for transfer the condensed and cooled water vapor to the bottle.
5	Rattan robe	Guiding the condensed water vapor into bottle
6	Curve aluminum	Collecting the cooled and dropped water vapor from condenser
7	Funnel	Transfer and guide the oil to the bottle
8	Cotton	Filtering oils from dust or unnecessary matter
9	Recycle bottle	Collecting the mixed oil-water
10	Large bucket	Container to collected water spilled from bottle
11	Hose	Transferring water for cooling kiln

Table 1 indicates that tools and equipments used to construct the distillation kiln are local made or scales. Even though, some tools are fabricated products. These products are available at the local market with reasonable price. Wooden tank and rattan are two sustainable and practicable material used in this construction.

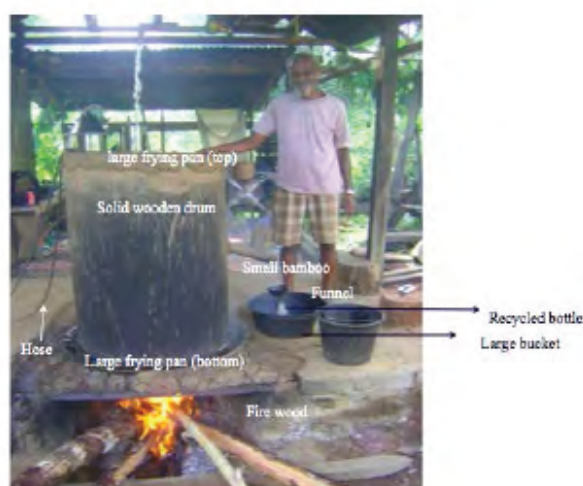


Figure 6. Distillation kiln employed by Manggera villagers in Kaimana, West Papua.

### 3.7 Distillation Processes

When distillation kiln has been constructed (see Figure 6), the distillation process can be started. Initially, chopped bark was poured into the wooden tank, tank distillator, and filled with water. Curve aluminum was installed just upper side the top level of water-chopped barks. The top wooden tank was capped with large frying pan 2. Rag or gunny was used to cover the slot gap between large frying pan and tank distillator. Clay was used to natural seal.

After firewood was initiated, 30 minutes later the steam are going trough into the distillation tank, penetrate to the bark to evacuate essential oils. Mixed oil-water is vaped and trap by oval plated, condensed and then dropped into curve aluminum and then transferred trough bamboo to reach the collecting bottle.

With respect to the basic method of essential oil extraction, the extraction method employed by the Manggera villagers belongs to water extraction method. Using this method, however, the quality of essential oils produced is very low. For local market, and common utilization the culillawang oils from Manggera village is still usable for local market and community.

### 3.8 Collecting Oils

Oils produced from this distillation kiln was collected into the re-cycled bottle, which is placed in the middle of the plastic buckets. Initially, only water vapors are entering to the bottle. Using specific gravity, culillawang oils will stand in the bottom, and water on the top. Water vapor will mount out into the plastic bucket.

### 3.9 Volume and Price

Volume of oil collected from this distillation kiln was estimated approximately 2640 ml, 2.6 L. Total price of this volume is Rp. 4.000.000 (*four million rupiah*). This oil is marketed into local market in the four volume sizes, as tabulated in Table 2.

Table 2: Packed bottle of *cullilawang* oils and their prices

No	Volume (ml)	Price (Rp)
1	150	100,000
2	330	150,000
3	350	200,000
4	620	400,000

#### 4. CONCLUSIONS

- Local community has their own knowledge, technology and view in managing, harvesting, and processing their natural forest resources;
- With their own wisdom, they could manage their income from the forest resources for next harvesting;
- Utilizing local material and construction can produce economical products to supply the demand for their own community, local market and maintain their health;
- NTFP's activity, like extracting essential oils, give alternative works, and extra income for the Manggera villagers, and other forest people as well;
- Principally, the distillation method employed by the Manggera villagers belongs to the water distillation.

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