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## Ethnobotanical And Bioeconomy Study Of Kedung Pedut Vegetation By Javanese Community In Kulon Progo Yogyakarta

Nur Ahmad Rudin<sup>\*1</sup>, Rini Rahmawati<sup>1</sup>, Mohammad Bayu Hidayat<sup>1</sup>, Muhamad Ujang Sawajir<sup>2</sup>, Bondan Agung Pramono<sup>1</sup>

<sup>1</sup>Department of Tropical Biology, Faculty of Biology Universitas Gadjah Mada

<sup>2</sup>Department of Forest Management, Faculty of Forestry Institut Pertanian INTAN Yogyakarta

\*Corresponding author

Email: [nur.ahmad.rudin@mail.ugm.ac.id](mailto:nur.ahmad.rudin@mail.ugm.ac.id)

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### Abstract

Kedung Pedut is a natural waterfall located in Menoreh Highland, Kulon Progo, Special Region of Yogyakarta, Indonesia at altitude of 529 masl. Kedung Pedut has special natural vegetation characteristics, but since 2015 tourism developments was changing the composition of vegetation in this area. This makes the ethnobotany and biobased economy study are important. Therefore, this study aims to determine the abundance and utilization of vegetation in Kedung Pedut area by Javanese community in Kulon Progo and potential utilization of various vegetation in the future. The study was carried out by grid lines method and interview. Location of vegetation sampling was along the banks of river. Identification of vegetation was carried out on tree growthform. Data analysis was done by literature studies. The results of study identified 25 species of standing vegetation in Kedung Pedut. Tree vegetation with the greatest abundance are *Swietenia mahagoni* (4048.05 ind/ha), *Paraserianthes falcataria* (1700.18 ind/ha), *Cocos nucifera* (1484.29 ind/ha), *Bambusa blumeana* (782.62 ind/ha), and *Tectona grandis* (701.66 ind/ha). Potential utilization of vegetation in Kedung Pedut area by Javanese community in Kulon Progo based on the development of technology and science are for medicines, agroforestry, food and beverage industry, natural dyes, furniture industry, germplasm conservation, and conservation of environment.

### 1. INTRODUCTION

Kedung Pedut is a tourist destination of natural waterfall in Menoreh Highlands, Kulon

Progo Regency, Special Region of Yogyakarta. The area is located at altitude of 529 masl. Kedung Pedut has complex and natural

ecosystem structure because still far from urban crowds and less human intervention. This causes less damage to vegetation and disturbances to living things in environment so that the balance of ecosystem is very well maintained. The vegetation composition in Kedung Pedut area is quite complex to support creation of heterogeneous ecosystem. The vegetation composition is very diverse, from seedlings, shrubs, trees and herbaceous plants. This area offers an attractive panorama accompanied by comfortable temperature as tourist spot. Since opening in 2015, Kedung Pedut has been visited by tourists. The opening of tourist attractions was certainly accompanying by construction of supporting facilities for tourist access and infrastructure around waterfall location. This is support access to the waterfall point which has quite steep conditions filled with trees and shrubs (Fattah et al., 2017).

The community around Kedung Pedut are Javanese people who are still thick with culture. Initially, the community around Kedung Pedut only used enough forest products to fulfill their daily needs. People live traditionally by utilizing forest products such as cutting down trees to build houses, looking for food and medicine. Utilization of these forest products has been carried out for generations by Javanese people around Kedung Pedut. Javanese tribal people have received a lot of knowledge through generations about various types of plants and how to use them according to their life needs. This study can be studied through an ethnobotany. The study of relationship between humans and plants in their traditional utilization activities (Sukarman & Riswan, 1992). Meanwhile, the community around Kedung Pedut have also used forest products by making handicrafts such as various kitchen utensils made of bamboo. These handicrafts have higher selling value than the forest products were not processed and immediately sold. This can be studied through bioeconomics.

The opening of Kedung Pedut area as tourist destination has led to changes in vegetation arrangement in this area. Vegetation that was originally there was lost due to logging for build roads and construction of various tourist facilities that support increased tourist visits. The different of vegetation composition caused changes in the use of forest products by community. Changes in the use of forest products by Javanese tribe in Kedung Pedut can be studied with ethnobotany and bioeconomy considering that the Javanese people in Kedung Pedut area have also been touched by technology. This makes the ethnobotany and biobased economy study is important. Therefore, this study was conducted to determine the abundance and utilization of vegetation in Kedung Pedut area by Javanese people in Kulon Progo and potential utilization of various vegetation in the future.

## 2. MATERIALS AND METHODS

### Study area

This research was conducted in area of Kedung Pedut waterfall, Jatimulyo Village, Kulon Progo Regency, Special Region of Yogyakarta on 14 - 15 April 2018 (Figure 1). This location is famous for ecotourism waterfall which has beautiful water color and preserved vegetation in the surrounding area (Figure 2).

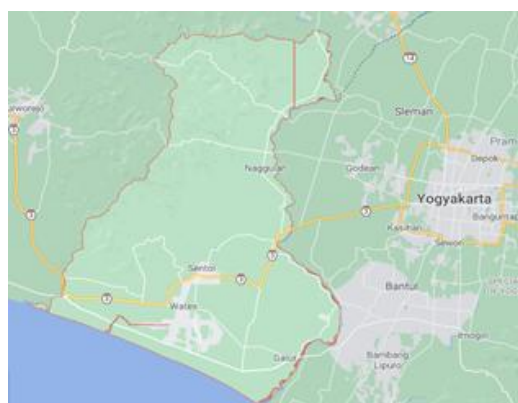


Figure 1. Maps of Kulon Progo Regency



Figure 2. Sampling location at Kedung Pedut Waterfall

### Procedures

Data collection was carried out by using the cat and mouse method (Martin, 1995). Field data were collected simultaneously and then interviews with local community as informants. The first stage, field observations with the roaming method to identify riparian vegetation species. Identification of species was carried out for stand growthform types (with more than 20 cm of diameter) and in areas along the banks of Kedung Pedut river, including river banks (pankful width) to upland which were affected by water runoff at the highest volume. The next stage is interviews and discussions with the surrounding community as informants. In this case, information related to the use of riparian vegetation species by local community has

been explored, then discussed the potential for bioeconomic and future utilization from literature studies.

### Data analysis

The data analysis is quantitative for density of the most abundance vegetation which presented with histogram and descriptive qualitative for vegetation utilization by community. The study is based on ethnobotany and bioeconomic which include identification of riparian vegetation types and utilization techniques to describe more deeply the potential use of riparian vegetation by surrounding community based on technological and scientific developments with the support of scientific literature.

## 3. RESULTS and DISCUSSION

### Utilization and Potential of Vegetation

The results showed that there were 25 species from 15 families of standing vegetation in Kedung Pedut Kulon Progo (Table 1). The largest number of species come from family of Fabaceae. This indicates that this family has an important role in the ecosystem. The selection of the most important plant families is subjective. Nonetheless, two are of unequivocal importance Poaceae and Fabaceae.

Table 1. Vegetation used by the javanese community and potential utilization at Kedung Pedut

No.	Family	Species	Utilization	Potential
1	Anacardiaceae	<i>Spondias dulcis</i>	Fruit	Fruit, Leaf, Stem
2	Anacardiaceae	<i>Mangifera indica</i>	Fruit, Leaf	Stem, Seed, Fruit, Leaf, Root, Flower
3	Arecaceae	<i>Cocos nucifera</i>	Fruit, Leaf, Stem	Fruit, Leaf, Stem, Root
4	Arecaceae	<i>Arenga pinnata</i>	Flower, Fruit, Leaf, Stem, Root	Flower, Fruit, Leaf, Stem, Root
5	Caricaceae	<i>Carica papaya</i>	Fruit, Leaf, Flower	Stem, Seed, Fruit, Leaf, Root, Flower
6	Combretaceae	<i>Terminalia catappa</i>	Stem	Stem, Seed, Fruit, Leaf, Root
7	Fabaceae	<i>Paraserianthes falcataria</i>	Stem	Stem, Leaf
8	Fabaceae	<i>Acacia cuneuliformis</i>	Stem	Stem, Root
9	Fabaceae	<i>Dalbergia latifolia</i>	Stem, Leaf	Stem, Leaf
10	Fabaceae	<i>Leucaena leucocephala</i>	Seed, Leaf	Seed, Leaf, Flower, Stem, Root
11	Gnetaceae	<i>Gnetum gnemon</i>	Seed, Leaf, Flower	Seed, Leaf, Flower, Stem
12	Lamiaceae	<i>Tectona grandis</i>	Stem, Leaf	Stem, Leaf, Root, Flower, Seed
13	Málvaceae	<i>Hibiscus tiliaceus</i>	Leaf, Flower	Fruit, Seed, Leaf, Stem
14	Málvaceae	<i>Theobroma cacao</i>	Fruit, Seed	Fruit, Seed, Leaf, Stem
15	Méliaceae	<i>Swietenia mahagoni</i>	Stem, Leaf	Stem, Leaf, Seed
16	Moraceae	<i>Anacarpus heterophyllus</i>	Fruit, Leaf, Stem, Seed	Fruit, Leaf, Seed, Stem, Flower, Root
17	Moraceae	<i>Anacarpus altilis</i>	Fruit, Seed	Fruit, Leaf, Seed, Stem, Flower, Root
18	Misaceae	<i>Musa spp.</i>	Fruit, Leaf, Flower, Root	Fruit, Leaf, Flower, Root, Stem
19	Nyctaceae	<i>Syzygium aqueum</i>	Stem, Fruit	Stem, Fruit, Leaf
20	Nyctaceae	<i>Syzygium aromaticum</i>	Flower	Flower, Leaf
21	Poaceae	<i>Gigantochloa apus</i>	Stem, Leaf	Stem, Leaf
22	Poaceae	<i>Bambusa blumana</i>	Stem, Leaf, Shoot	Stem, Leaf, Shoot
23	Sapindaceae	<i>Schleichera oleosa</i>	Stem, Leaf	Stem, Leaf, Fruit, Seed
24	Sapindaceae	<i>Nephelium lappaceum</i>	Fruit, Leaf	Fruit, Leaf, Seed, Stem
25	Sterculiaceae	<i>Guazuma ulmifolia</i>	Stem	Stem, Seed, Fruit, Leaf



Fabaceae are herbs, shrubs, trees, lianas or vines usually bearing alternate, pinnately compound, pulvinate, stipulate leaves. N-fixing bacteria are common in two subfamilies: Mimosoideae and Papilionoideae. The androperianth is 5-merous with 10 to numerous stamens (Mimosoideae). The gynoecium consists of a single carpel with 2 to many ovules. Fruits are usually legumes, splitting along two sutures but sometimes indehiscent. The cosmopolitan family contains an estimated 18,000 species in 630 genera. Twenty genera account for nearly half of the species in the family and 16 contain more than 200 species. Fabaceae rank second to Poaceae with respect to human importance. Members of the subfamily Papilionoideae are significant non-animal protein sources. Fabaceae family has great importance as economic source. It is a source of high protein food, vegetable oil, dyes, and forage. Fabaceae are also used as ornamental plants. Many plants of the Fabaceae family provide timber of building, furniture, and fuel. In medicine sector, many plants of this family are used in medicines (Bennett, 2011; Molares & Ladio, 2012; Rahman & Parvin, 2014). The community around Kedung Pedut still limited use of vegetation in certain parts so that there are still many potential utilization.

#### Vegetation Utilization Percentage and Ethnobotany

The percentage of vegetation parts that most widely used by the community are leaves, stems, fruit, flowers, seeds, roots, and shoots (Figure 3). Leaves are most widely used in relation to people majority who work as farmers. Vegetation are part of biodiversity that always exist in surrounding environment, whether grow wild or cultivated. Traditional communities have long used of the natural resources surround them. Because traditional community life is very close to environment, one of interactions that appears is related to the use of vegetation (Al Liina, Fauziah, & Nurmiyati, 2017).

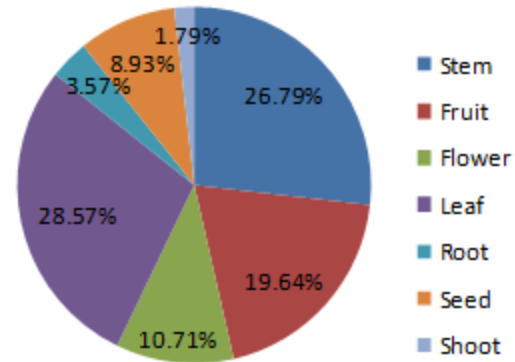


Figure 3. Percentage of vegetation parts utilization

Utilization of vegetation parts by the community around Kedung Pedut aims to fulfill their daily needs. The use of vegetation as food is based on the necessities of daily life. Almost all parts of the vegetation can be used as food. Vegetation as drink characterized by water content in one part of the vegetation. The use of aromatic vegetation is easily seen and observed in the food made by community, either for daily meals or thanksgiving events. Existing aromatic vegetation have 3 functions in people's lives, including air freshener, clothing fragrances, delicious food tastes and aromas (Amboupe, Hartana, & Purwanto, 2019). For cooking purposes, the whole community uses firewood. This is adjusted to cooking utensils who still use the stove. To get firewood, the community took dry wood branches and dead trees that made it impossible to use as building materials. The main sources of firewood come from gardens and forests. Some parts of community buildings made from vegetation, such as doors, window frames, and roofs. Common vegetation are used to make ropes, plaits and crafts from bamboo, rattan and wood. The use of woven vegetation and handicrafts by community only revolves around the needs of household or kitchen utensils, agricultural tools, and furniture (Hidayat, Hikmat, & Zuhud, 2010).

The community uses all parts of vegetation from roots to leaves as medicinal substances. Basically the use of medicinal vegetation by the community is simple, only sourced from

experience and information of previous parents. The medical practice is also not known for the exact dosage, but the most important thing is to process vegetation so that it can be used for treatment (Destryana & Ismawati, 2020). The treatment performed by the community is categorized into 2 types, treatment for external and internal diseases. External medicine is all treatment related to the outside of human body, such as skin diseases, toothaches, eyes, and wounds. Meanwhile, internal disease is treatment by eating and drinking medicinal plant preparations, such as digestive disorders, high blood pressure, and cleaning the uterus after childbirth. For the purposes of treating external diseases, the parts of vegetation are usually only crushed, grated and rubbed directly onto affected area, such as banana sap for wound medicine. For the treatment of inside body, usually more processing is needed, such as drying in the sun, boiling, brewing or eating directly. Boiled vegetation species are usually used as herbal medicine by the community (Santhyami, 2008).

In agriculture, vegetation are used as fertilizer. Organic fertilizers are produced from plant species. Meanwhile, vegetable pesticides and natural poisons are single or compound active ingredients to control crop pests. Its function can be as repellent, puller, sterile, and killer. Vegetable pesticides are plant-based pesticides that are relatively easy to made with limited skills and knowledge. Vegetation are also used as animal feed. Vegetation as animal feed are all types that given to domestic animals, either directly or mixed. Animal feed is low concentration plant and easy to digest which is edible by herbivores. Livestock feed grows wild in fields, gardens, rice fields and deliberately planted as animal feed reserves during the dry season. Vegetation species as animal feed have quite a variety of habitus compositions. It is not only grass that is used as feed but certain tree levels can be used as animal feed, usually in form of leaves (Hidayat et al., 2010).

Javanese tribal community commonly use leaves as complementary of various traditional and cultural rituals. Vegetation are used in various traditional rituals, such as birth ritual. Javanese tribal generally have a traditional birth ceremony which is divided into several stages including tingkeban/mitoni in the seventh month of womb, and after birth ritual are placenta care, remaining umbilical cord, sepasaran, selapanan, and weton salvation every day birth (35 day cycle) (Al Liina et al., 2017). The wedding ceremony is a ritual that mostly uses vegetation, its existence can be seen in flowers that adorn the walls of bridal house, wedding leaves, and attributes used by the bride and groom. Vegetation are also used in religious rituals on the Prophet's Birthday (Syafitri, Sitawati, & Setyobudi, 2014). The use of vegetation for aesthetic purposes is observed from vegetation around the community, both inside and outside the home. Identify by observing plants that attract attention and look beautiful. In addition, dye plants are vegetation species that can give color effects to objects, whether food, drink or other objects after being processed beforehand (Kuni, Hardiansyah, & Idham, 2015)

### Species Density and Bioeconomy

The most abundance of vegetation in Kedung Pedut were *Swietenia mahagoni*, *Paraserianthes falcataria*, *Cocos nucifera*, *Bambusa blumeana*, and *Tectona grandis*. The five species with the highest abundance were studied bioeconomically to determine the economic potential of each species (Figure 4).

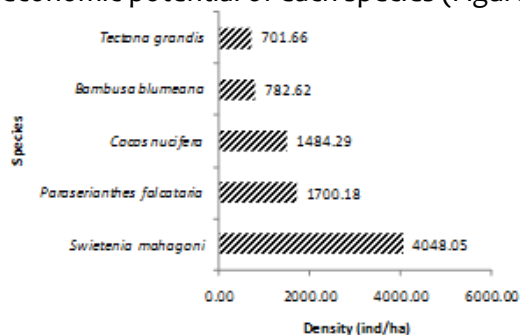


Figure 4. Density of vegetation with highest abundance

Potential utilization of vegetation in Kedung Pedut area by Javanese people in Kulon Progo based on the development of technology and science are for medicines, agroforestry, food and beverage industry, natural dyes, furniture industry, germplasm conservation, and conservation of environment. *S. mahagoni* has potential to be used in the parts of stem, seed, and fruit. Stem is used for antiseptic, astringent and febrifuge, decoction for diarrhea and dysentery, vitamins and iron, induce haemorrhage, clear the blood, increase appetite, restore strength in tuberculosis, inhibitory activity on HIV-1 protease, tannins and dyeing. The seeds are used for inhibited platelet aggregation, tetranotriterpenoids, and commercial value of oil. Fruit is used for potting medium (Moghadamtousi, Goh, Chan, Shabab, & Kadir, 2013; Sahgal et al., 2009). *P. falcataria* has potential to be used in the parts of stem and leaf. Stem is used for pulp and paper, light construction, furniture, packaging and pallets, wooden shoes, music instruments, veneers, plywood, particleboards, wood-wool boards, blockboards, hardboards, and fuelwood. Leaf is used for fodder of chickens and goats (Iskandar, Iskandar, & Partasmita, 2017; Paquit & Rojo, 2018; Wibowo, 2013).

*C. nucifera* has bioeconomic value in the parts of seed, fruit, leaf, stem, and root. Seeds is used as very versatile food on raw or cooked, flavoring in cakes, curries, coconut milk or cream, margarines, shortening, filled milk, ice cream, confectioneries, cytotoxic, emetic, emollient, hypotensive and purgative, stiff joints, treat rheumatism and back pains, maintain smooth and soft skin, treat sick new born infants, and peat-free composts. Fruit is used for delicious refreshing drink, diuretic, treat fish poisoning, difficult pregnancies, and treat kidney problems. Leaf is used for vegetable and alcoholic beverage. Stem is used for bread and added to soups or pickled. Root is used for coffee substitute, treating stomach-ache and blood in the urine (Pham, 2016; Siriphanich et al., 2011; Victor, 2013). *B. blumeana* has potential to be used in the parts

of stem, root and shoot. Stem can be used for construction, baskets, furniture, parquets, concrete reinforcements, kitchen utensils, chopsticks, hats and toys, paper, and firewood. Root is used for prevent soil erosion. Shoot is used for vegetables (Abdullah et al., 2019; Setiawati, Mutaqin, Irawan, An'amillah, & Iskandar, 2017; Sujarwo, 2018; Wróblewska, de Oliveira, Grombone-guaratini, & Moreno, 2018).

The parts of *T. grandis* that has potential are leaf, stem, root, flower and seed. Leaf is used for natural dye, host of microbe fermentation on tempeh, diuretic, depurative, purgative, stimulant, antidysenteric and vermifuge, treat anemia, asthenia, fever and malaria, amoebiasis, schistosomiasis and tuberculosis, antimicrobe, treat bleeding of larynx, trachea, bronchi, or lungs sore throat, and tender shoots is used against scabies in children. The stem is used for vermifuge, promotes digestion, relieving bilious headaches and tooth aches, reduces inflammation or eruptions of the skin, hair tonic, swelling of the eyelids, astringent and bronchitis. Root is used for eczema, ringworms and inflammation. Flowers are used for diuretics, treat biliousness, bronchitis and urinary disorders. Seed is used for diuretics (Devadiga, Shetty, & Saidutta, 2015; Vyas, Yadav, & Khandelwal, 2018).

#### 4. CONCLUSION

Tree vegetation with the greatest abundance are *Swietenia mahagoni* (4048.05 ind/ha), *Paraserianthes falcataria* (1700.18 ind/ha), *Cocos nucifera* (1484.29 ind/ha), *Bambusa blumeana* (782.62 ind/ha), and *Tectona grandis* (701.66 ind/ha). Potential utilization of vegetation in Kedung Pedut area by Javanese community in Kulon Progo based on the development of technology and science are for medicines, agroforestry, food and beverage industry, natural dyes, furniture industry, germplasm conservation.

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