The Role of Plant Diversity In Local Community Of Gili Iyang Island, Sumenep, East Java, Indonesia

S Susiarti*, VBL Sihotang and Rugayah

Botany Division, Research Center for Biology, Indonesian Institute of Science (LIPI) Jl. Raya Jakarta-Bogor Km 46, Cibinong, Indonesia

*Corresponding Email : susi.etno@yahoo.com

Abstract. Indonesia is known as an archipelago with more than 17,000 islands, one of which is Gili Iyang Island. The island is located in the eastern part of Madura island, including in the region of Sumenep regency, East Java Province, Indonesia. Gili Iyang Island is reported as one of the highest oxygen sites in the world with tourism potency such as various caves with its natural beauty. The research was aimed to discover the plant diversity and local wisdom of the community. Data was collected through direct observation, open ended interview with 20 informants in two villages. The results showed that no less than 94 species utilized as food, medicines and other purposes. The plant species used for food such as taal (Borassus flabellifer L.), bukkol (Zizyphus jujuba Mill.), bille (Aegle marmelos (L.) Correa.) and bintaos (Wrightia pubescens R.Br.). The latter species is still rare to consume as food, while medicinal materials are landhek (Barleria prontitis L), membhe (Azadirachta indica A. Juss.) and tanggeri (Sida rhombifolia L.).

1. Introduction

Sumenep Regency is one of the regencies on Madura Island, East Java Province, Indonesia. Sumenep Regency has 126 islands. There are 48 islands which have inhabitants and one of them is Gili Iyang Island. Giliyang Island has an area of 9.15 km², located to the east of Sumenep regency and included in Dungkek district (63.35 km²).

This island has its own uniqueness. The oxygen content of the island is above the normal limits, which is 20.9% with LEL (Level Explosive Limit) 0.5%. According to the National Aeronautics and Space Agency (LAPAN) survey results, it was reported that the island's oxygen content was around 21.9%. Also, based on the LAPAN measurements in 2006, it is necessary to follow up on the factors causing the high oxygen concentration, by knowing the role of plant diversity in local people on the island.

We know that the oxygen level of an island / place is very dependent on various environmental factors around it, one of which is a component of the island's inhabitants. The disclosure of the island's biota has never been reported, therefore the research of the role of plant diversity for local people of GiliIyang Island needs to be carried out.

The Research Center for Biology, LIPI in collaboration with Sumenep Regional Development Planning Agency, conducted an inventory of the Gili Iyang island's biota in order to find out what factors caused the high levels of oxygen on the island, through the research of the role of plant diversity on the island. As we know that plants are the main oxygen contributors to this earth, although the levels are lower (20%) compared to plankton which reaches 80% [1]. Local people have mapped...
high oxygenated areas in the villages of Bancamara and Banraas. The first location is in the yard, around the house, while the second location is a bit far from the community's residence.

2. Method
The study was conducted on Gililyang Island, Dungkek district, Sumenep Regency (Figure 1)[2]. The island has two villages with a population of 8,321 people in 2014. The study was conducted through two approaches, namely field research to obtain primary data and then enriched through secondary data. Primary data collection was carried out by involving the community through interviews with local community groups and individual community members who have expertise and social status such as village heads (2 people), indigenous elders (4 people), and community members (20 people), both male and female [3,4]. In collecting data, the interview technique used was "open ended". This data collection technique is also used to explore the local knowledge system regarding the plant diversity and their use as food, medicinal ingredients and others. In addition, direct observation in the field was also carried out to document the local name of plants used and plants diversity. We also collect sample specimen (voucher specimen) for identification purposes at the Herbarium Bogoriense, Research Center for Biology - LIPI. Secondary data collected through the literature study by reviewing and analyzing books, articles and other forms of writing that support this research. Likewise with the use of local sources and writings from foreign authors related to research problems.

![Figure 1. Gililyang Island located to the East of Madura Island, one of the districts on Sumenep regency, East Java Province, Indonesia](image)

3. Results and Discussion
3.1. Brief Description of Gililyang Island
Sumenep Regency is located between 113°32’ E - 116 °16’ Eand 4° 55’ S – 7°24’ S with the following regional boundaries: North: Java Sea; East: Java Sea / Flores Sea; South: Madura Strait; and West: Pamekasan Regency.

Geographically, Sumenep Regency is divided into two parts, namely: the land area with an area of 1,146.93 km² (54.79%) and the islands with an area of 946.53 km² (45.21%). Administratively, Sumenep Regency is divided into 27 sub-districts, 328 villages and 4 sub-districts. Sumenep Regency has 126 islands that are inhabited or not. Dungkek district has 1 island, Gili Iyang Island, which is located on the east of Madura Island.
The area of Dungkek sub-district is 63.35 km², with a male population: 16,842 and women: 19,476 people[2]. The area of Gili Iyang Island is 5.5 hectares and consists of two villages namely Banraas
and Bancamara, each with an area of 4 km² and 5.15 km². The population in Banraas village (male: 1,609 and female: 1,972 inhabitants) and Bancamara village (male: 2,133 and female: 2,551). The livelihoods of community are farmers, fishermen, and household handicraft industry workers. Based on the Kalianget Meteorological Station, the maximum average temperature in October 2011 was 33.3°C and the average minimum temperature in June 2011 was 24.5°C.

3.2. History of Gili Iyang Island
It is said that the island is inhabited by local people who moved from Sumenep (Madura Island), during the time of Sultan Abdurrachmanand also people from Makassar. In 1818, there was a man from Makassar named Daeng Masalle, moving to this island, through Leguna beach which is currently called Banraas village. Then he came through Bancamara, where until now there is still the remains of the old stone fence from the Daeng Masalle family’s house. At that time, he looked for a place to live in the north-south of the island. Until now the descendants of Daeng Masalle are the eighth generation.

3.3. Local Knowledge of Plant Utilization in Gili Iyang Island
There are several trees which planted surrounded the area such as Borassus flabellifer, Azadirachta indica. Based on the local wisdom of the community, there are several plants can be utilized such as 94 species of 83 genera, 49 plant family including medicinal ingredients (28 species), vegetables (18 species), fruits (17 species), plants ornamental (16 species), carbohydrate sources (8 species), feed (7 species), spices (6 species), and others (5 species) (Table 1 and Figure 2). There is one species with dual function, marongghi (Moringa oleifera) is utilized as food ingredient as well as medicinal ingredients.

Local people utilize bukkol (Ziziphus jujuba), bille (Aegle marmelos) and bintaos (Wrightia pubescens R.Br.) as foodstuffs. This latter species (bintaos) has never been reported in book of ‘Tumbuhan Berguna Indonesia’ [4]. This species seldom consumes as food but is used for medicinal plants for malaria in West Timor Island [5].

Bille (Aegle marmelos) is one of the fruits found in Gili Iyang Island, this fruit has begun to scarce. According to Baliga[6], in India, beside as foodstuff, bille is also utilized for the treatment of chronic diarrhea, dysentery and gastric ulcers. In addition to antidiarrhoeal, according to Rahman & Parvin [7], it also contains antimicrobial and anticancer.

From the below table (table 1), beside as food ingredients, kacangkaju (Cajanus cajan) is utilized for medicine. The seeds are used as vegetables. According to Pal[8] and Primiani & Fujiati [9], kacang kajuis important local Leguminosae plant in dry land of tropical regions. This species contains high protein and isoflavonines which is similar to estrogen compounds, so that it looks like estrogen which can be used in the health sector. According to Widiyastuti et al. [10], the leaves and stems contain flavonoids and saponins. In addition, the leaves utilize to overcome scabies, relieve cough and use in dialysis. In Gili Iyang Island, the leaves are used as medicinal ingredients. The bioactive content (phytochemical) of the Cajanus cajan leaves is higher than the content of the seeds , [11].

In Gili Iyang Island, medicinal plants use for healing toothache, head, stomach, wounds, babies and children disease, recovery after child birth, increase appetite and the endurance. Medicinal ingredients are taken from around the settlement as well as from markets such as garlic (Allium sativum), jeringo (Acorus calamus), and majakane (Quercus lusitanica). Medicinal plants used on Gili Iyang Island are also included in the Top 100 Indonesian Medicinal plants including Acorus calamus, Piper nigrum, and Pluchea indica [12].

The other medicinal plant is landhek (Barleria prionitis) which is used for healing toothache. This plant contains toxicity [13]. According to Talukdar et al. [14]; [10], Barleria prionitis’s leaves also contains saponins, flavonoids, and tannins. Membhe (Azadirachta indica) contains antibacterial[15].

Based on our interview with the elder people, there was a species also used as medicine, it is called bidara gunung. Unfortunately, we couldn’t find the specimen. It is possible that bidaragunung is the same species with bidara paek. Bidara paek (Strychnos sp.) was collected from Sepanjang island (included in Sumenep regency)[16]. Also, in Sepanjang Island, Talinum triangulare is utilized as
medicinal plants and it has economic value. On the contrary, there is no information that the species is used for medicinal plants in Gili Iyang Island.

In Gili Iyang Island, there are many elder people (about 100 years old) who still have activities, such as making mats. Generally, the elderly are not easy to remember food they had used in the past, especially that time was the colonial period such as the Japanese colonial period. In general, they remembered common foodstuffs such as corn (*Zea mays*), savurkomak (*Lablab purpureus*), sayur kratok (*Phaseolus lunatus*), banana midrib (*Musa acuminata*), bioka leaves (*Manihot glaziovii*), bintaos (*Wrightia pubescens*), and rambote (*?). These species are also known in the village of Karangbudi, another district in Sumenep. According to Kuswandi et al. [17], papaya stems or midrib also used as alternative food for making chips.

One of local people also know about *lorkong* which can be used as a substitute for wheat flour. It is made for snacks such as serpot cookies. *Lorkong* is also known in Sumenep. In the past, it is known as 'to'oo' in Kangean Island, but there are people in Saronggi District, Sumenep, who use it to this day which is known as 'oto'o' [18]. The scientific name of the plant is *Tacca leontopetaloides*. Unfortunately, we couldn’t find this plant because it was the dormant/sleep period. This plant experienced a normal sleep period in the dry season.

From the opinion of one of the elderly, not only health must be maintained but also the consumed food. Young people feel sick because they do not pay attention to their health. According to Anna [19], as Nir Barzilai (director of the Institute for Aging Research at Yehiva University Albert Einstein College of Medicine), said that someone who can reach 100 years of age may have longevity genes that help them to fight the ill effects of an unhealthy lifestyle. Amy Anderson,a lead researcher of the University of Maryland, said that parents who consume lots of fruits, vegetables, fish, poultry, and low-fat products have a lower risk of death [20].

| No | Species                        | Family               | Local Name | Potency         |
|----|--------------------------------|----------------------|------------|-----------------|
| 1  | *Acorus calamus*               | Acoraceae            | Jeringo    | Medicinal       |
| 2  | *Aegle marmelos* (L.) Correa   | Rutaceae             | Bille      | Fruit           |
| 3  | *Aleurites moluccana* Wild.    | Euphorbiaceae        | Kemiri     | Spices          |
| 4  | *Allium sativum*               | Liliaceae            | Bebung poti | Spices         |
| 5  | *Alpinia galanga*              | Zingiberaceae        | laos       | Spices          |
| 6  | *Amorphophalus campanulatus* Blume | Araceae       | Sobe     | Carbohydrate   |
| 7  | *Anisomeles indica* (L.) Kuntze | Lamiaceae         | Sepmana    | Medicinal       |
| 8  | *Annona muricata* L.           | Annonaceae           | Nangka belandhe | Fruit |
| 9  | *Annona squamosa* L.           | Annonaceae           | Srikaje    | Fruit           |
| 10 | *Anredera cordifolia* (Ten.) Steenis | Basellaceae   | Binahong  | Medicinal       |
| 11 | *Averrhoa bilimbi* L.          | Oxalidaceae          | Belimbhing buluh | Fruit |
| 12 | *Averrhoa carambola* L.        | Oxalidaceae          | Belimbhing | Fruit           |
| 13 | *Azadirachta indica* A. Juss.  | Meliaceae            | Mimbhe     | Medicinal, Feed |
| 14 | *Bambusa vulgaris* Schrad.     | Poaceae              | Ornamental |
| 15 | *Barleria prionitis* L.        | Acanthaceae          | Landek     | Medicinal       |
| 16 | *Benincasa pruriens* (Parkinson) W.J. de Wilde & Duyfjes (Thunb.) Cogn. | Cucurbitaceae | Kondur | Vegetable |
| 17 | *Boesenbergia rotunda* (L.) Mansfeld | Zingiberaceae    | Temo konce | Medicinal, Spices |
| 18 | *Borassus flabelifer* L.       | Arecaceae            | Tarebung   | Carbohydrate, Feed |
| 19 | *Bougainvillea spectabilis* Wild. | Nyctaginaceae    |            | Ornamental       |
| 20 | *Caesalpinia pulcherrima* (L.) Swartz | Caesalpinaceae | bunga merak | Ornamental       |
| 21 | *Cajanus cajan* (L.) Huth     | Papilionaceae        | Kacang kaju | Vegetable, Medicinal |
| 22 | *Carica papaya* L.             | Caricaceae           | Pepaya     | Fruit, medicinal |
| No | Species | Family | Local Name | Potency |
|----|---------|--------|------------|---------|
| 23 | Casuarina equisetifolia J.R. & G. Forst. | Casuarinaceae | Cemara odeng | Ornamental |
| 24 | Citrus × aurantium L. | Rutaceae | Jeruk madura | Fruit |
| 25 | Cocos nucifera | Arecales | Nyior | Ornamental |
| 26 | Codiaeum variegatum (L.) blume | Euphorbiaceae | Puring | Ornamental |
| 27 | Cordia dichotoma G. Forst. | Borraginaceae | Boat | Vegetable |
| 28 | Cucumis sativa L. | Cucurbitaceae | Temon | Vegetable |
| 29 | Cucurbita moschata (Duch.) Poir. | Cucurbitaceae | Labu kuning | Vegetable |
| 30 | Curcuma longa | Zingiberaceae | Konyek | Vegetable |
| 31 | Curcuma aeruginosa Roxb. | Zingiberaceae | Temo enreng | Vegetable |
| 32 | Digitaria longiflora (Retz.) Pers | Poaceae | Feed | Vegetable |
| 33 | Dioscorea alata L. | Dioscoreaceae | Obi | Carbohydrate |
| 34 | Dioscorea bulbifera L. | Dioscoreaceae | Obi | Carbohydrate |
| 35 | Dioscorea hispida Dennst. | Dioscoreaceae | Gedung | Carbohydrate |
| 36 | Dracaena fruticosa | Liliaceae | Feed | Vegetable |
| 37 | Eragrostis amabilis (L.) Wight & Arn | Poaceae | Feed | Vegetable |
| 38 | Euphorbia tirucalli L. | Euphorbiaceae | Tulang Tulang | Vegetable |
| 39 | Ficus superba Miq. | Moraceae | Medicinal | Vegetable |
| 40 | Ficus benjamina L. | Moraceae | Medicinal | Vegetable |
| 41 | Fimbristylis cymosa | Cyperaceae | Feed | Vegetable |
| 42 | Gliricidia sepium (Jacq.) Kunth ex Walp | Fabaceae | Feed | Vegetable |
| 43 | Charophyllum pictum Griff. | Euphorbiaceae | Ornamental | Vegetable |
| 44 | Hibiscus rosa-sinensis L. | Malvaceae | Kembang sepatu | Ornamental |
| 45 | Hoya diversifolia Blume | Asclepiadaceae | Tang katang tasek | Ornamental, Medicinal |
| 46 | Ipomoea batatas (L.) L. | Convolvulaceae | Tela | Vegetable, Carbohydrate |
| 47 | Jatropha curcas L. | Euphorbiaceae | Medicinal, ornamental | Vegetable |
| 48 | Jatropha gossypifolia var. elegans (Pohl) Müll.Arg. | Euphorbiaceae | Kaleke | Ornamental |
| 49 | Kaempferia galanga L. | Zingiberaceae | Kencor | Vegetable |
| 50 | Lablab purpureus (L.) Sweet. | Papilionaceae | Komak | Vegetable |
| 51 | Lannea coromandelica (Houtt.) Merr. | Anacardiaceae | Palembheng | Vegetable, Medicinal, Feed |
| 52 | Lawsonia inermis | Lythraceae | Pacar | Medicinal |
| 53 | Luffa acutangula (L.) Roxb. | Cucurbitaceae | Vegetable | Vegetable |
| 54 | Luffa aegyptiaca Mill. | Cucurbitaceae | Vegetable | Vegetable |
| 55 | Mangifera indica L. | Anacardiaceae | Pao | Fruit |
| 56 | Manihot esculenta Crantz | Euphorbiaceae | Sabreng | Carbohydrate |
| 57 | Manihot glaziovii Mul. Arg. | Euphorbiaceae | Bioka | Vegetable |
| 58 | Manilkara zapota (L.) P.Royen | Apocynaceae | Sabu | Fruit |
| 59 | Morinda citrifolia L | Rubiaceae | Koduk | Vegetable, Medicinal |
| 60 | Moringa oleifera Lmk. | Moringaceae | Marongghi | Vegetable, Medicinal |
| 61 | Musa acuminata Colla | Musaceae | Gedheng | Vegetable |
| 62 | Orthosiphon aristatus (Blume) Miq. | Lamiaceae | Komis kocing | Medicinal, Ornamental |
| No | Species | Family       | Local Name   | Potency       |
|----|---------|--------------|--------------|---------------|
| 63 | *Paederia foetida* L. | Rubiaceae     | kasembuhgen  | Medicinal     |
| 64 | *Pandanus amaryllifolius* Roxb. | Pandanaceae   | Panden       | Spices, dye   |
| 65 | *Pandanus dubius* Spreng | Pandanaceae   | Panden       | Ornamental    |
| 66 | *Passiflora edulis* Sims. | Passifloraceae | sok dang dang | Fruit         |
| 67 | *Pemphis acidula* J.R.& G.Forst. | Lythraceae    | Cantigi      | Ornamental    |
| 68 | *Phaseolus lunatus* L. | Papilionaceae  | Kratok       | Vegetable     |
| 69 | *Piper betle* L. | Piperaceae     | Sereh        | Medicinal     |
| 70 | *Piper nigrum* L. | Piperaceae     | Saang        | Medicinal     |
| 71 | *Piper retrofractum* L. | Piperaceae     | Cabbhi Jemo  | Medicinal     |
| 72 | *Pluchea indica* (L.) Less. | Asteraceae    | Beluntas     | Medicinal     |
| 73 | *Polytrias indica* (Houtt.) Veldkamp | Poaceae       |              | Vegetable     |
| 74 | *Portulaca oleracea* L. | Portulacaceae  |              | Vegetable     |
| 75 | *Protium javanicum* Burm.f. | Burseraceae   | Tanggulun    | Medicinal     |
| 76 | *Psidium guajava* L. | Myrtaceae     | Jembhu       | Fruit, Medicinal |
| 77 | *Punica granatum* L. | Punicaceae    | Delima       | Fruit         |
| 78 | *Quercus lusitanica* Lam | Fagaceae      | Majakane     | Medicinal     |
| 79 | *Sauroups androgyynus* (L.) Merr | Phyllanthaceae | Katuk        | Vegetable     |
| 80 | *Schleicheria oleosa* (Lour.) Merr. | Sapindaceae   | Kosambi      | Fruit         |
| 81 | *Senna siamea* L. | Caesalpiniaeae |              | Ornamental    |
| 82 | *Sesbania grandiflora* (L.) Poiret | Papilionaceae | Toroy        | Vegetable     |
| 83 | *Sida acuta* Burm.f. | Malvaceae     | Tanggeri     | Medicinal     |
| 84 | *Solanum melongena* L. | Solanaceae    | Terong       | Vegetable     |
| 85 | *Spondias pinnata* (L.f.) Kurz | Anacardiaceae | Kadingdung   | Fruit         |
| 86 | *Syzygium samarangense* (Blume) Merr. & Perry | Myrtaceae     | Jembhuir     | Fruit         |
| 87 | *Tamarindus indica* L. | Leguminosae   | Accem        | Spices        |
| 88 | *Talinum triangulare* Vahl | Talinaceae    |              | Ornamental    |
| 89 | *Tectona grandis* L.f | Verbenaceae   | Jete         | Board         |
| 90 | *Wrightia pubescens* R.Br. | Apocynaceae   | Bintaos      | Vegetable     |
| 91 | *Zanthoxylum rhetza* (Roxb.) DC. | Rutaceae     | Krangean     | Carving, putty ship |
| 92 | *Zea mays* L. | Poaceae       | Jagung       | Carbohydrate  |
| 93 | *Zingiber officinale* Rosc. | Zingiberaceae | Jehi         | Spices, Medicinal |
| 94 | *Zicophus jujuba* Mill. | Rhamnaceae    | Bukkol       | Fruit         |
Figure 2. Graphic of Plants Utilization in Gili Iyang Island

4. Conclusion
The role of plant species diversity in local communities of Gili Iyang Island is described through their local knowledge of plant utilization. They utilize the plants in all aspects of life. The use 94 species of the 83 genera, 49 plant family including medicinal ingredients (28 species), vegetables (18 species), fruits (17 species), ornamental plants (16 species), carbohydrate sources (8 species), feed (7 species), spices (6 species), and others (5 species). Some plants have multiple functions, both utilized for food plants and medicinal ingredients.

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