

Species richness, conservation status, and potential uses of plants in Segara Anakan Area of Sempu Island, East Java, Indonesia

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Abstract. Nurfadilah S, Hapsari L, Abywijaya IK. 2017. Species richness, conservation status, and potential uses of plants in Segara Anakan Area of Sempu Island, East Java, Indonesia. *Biodiversitas* 18: 1568-1588. Sempu Island is a small Island in Indonesia that has an important functional role as a nature reserve to protect unique landscapes and high plant species richness. Within the Island, one of the most frequently visited areas, Segara Anakan, needs careful attention in order to conserve its plant diversity. The objectives of the present study were to investigate the species richness, conservation status, and potential uses of plants in Segara Anakan, Sempu Island. The aim was to support management of the area and to reveal plants that have potential to be developed for useful products. A total of 77 plant species belonging to 43 families were recorded within the study area. These consisted of trees (55.84 %), shrubs (33.77%), herbs (9.09%) and epiphytes (1.3%). Two species were listed in the IUCN Red List as endangered (*Cycas circinalis* L. and *Myristica teijsmannii* Miq.). Plant species in Segara Anakan have many potential uses; namely for staple food, fruits, vegetables, flavouring, beverages, herbal medicines, timbers, ornamental plants, natural dyes, and other uses. The study has implications for biodiversity conservation and management of Sempu Island. Plant species on the IUCN Red List should receive priority in conservation efforts. Data concerning the potential uses of plants can serve as a basis for biodiversity conservation on Sempu Island.

Keywords: Biodiversity, conservation status, species richness, potential uses of plants, Sempu Island

INTRODUCTION

Understanding diversity, conservation status, and potential uses of plants is important for conservation planning (Kreft et al. 2004; Pearce and Moran 1994; IUCN 2013). Compilation of an inventory of plant diversity can be used to assess the richness of flora and the rarity of species within an area. It is considered as a basis for prioritisation in the conservation of biodiversity in an area, focussing efforts on the most species-rich ecosystems and on species threatened by environmental pressures (Gordon and Newton 2006; Torres-Miranda et al. 2011). Recording the conservation status of plants based on assessment by the IUCN, leads to identification in the IUCN Red List of those species that require high priority in conservation efforts.

Plants play important roles fulfilling human needs, including staple foods, medicines, sources of timber, fruits, beverages, and so on. Many plant species have been recorded and documented to have several uses based on the empirical experience and local knowledge of indigenous people (Trimanto et al. 2016, Frei et al. 1998). The ethnobotany and local knowledge of indigenous peoples has been widely studied across the world in an endeavour to identify the value and uses of plants in context. Such ethnobotanical studies have been conducted in places like Brazil (de Oliveira et al. 2007; Peroni et al. 2008), Central America (Audet et al. 2013), South Africa (Dahlberg and Trygger 2009), West Africa (Etongo et al. 2016), Albanian Alps (Pieroni, 2008), Nepal (Upreti et al. 2011), South

Korea (Ong et al. 2016), Indian Himalayas and the Slovenian Alps (Kala and Ratajč 2012), Solomon Islands (Furusawa et al. 2014), Patagonia, South America (Ladio and Lozada 2004), Australia (Edwards and Heinrich 2006), Cyprus (Ciftcioglu 2015), Bolivian Amazon (Thomas 2012), the Pacific Islands (da Silva et al. 2004), and in Italy (Motti et al. 2009).

Information on plant utilization derived from local knowledge and ethnobotanical data provides a basis to support biochemical, pharmacological, and pharmaceutical research for the development of plant products with prospective use in food, medicine, and in the industrial sector. For example, the industrial development of certain medicines has quite often been based on the knowledge and empirical experience of local and indigenous peoples that has stimulated laboratory identification of biologically active compounds suitable for formulation as new drugs (Jaric et al. 2014; Razak et al. 2014; Dahlberg and Trygger 2009; Balick and O' Brien 2004; Sabandar et al. 2016; Frei et al. 1998).

Indonesia is one of the world's biodiversity hotspots, comprising a wide diversity of plant life with multiple potential uses (Myers et al. 2000; Heyne 1987). Many ethnic groups in Indonesia, including the Javanese, Sundanese, Madurese, Dayakese and others, have various traditional uses for plants growing in their regions and have their own local names for each particular plant (Abdillah et al. 2014, Setyowati et al. 2005, Trimanto et al. 2016, Hapsari et al. 2017). Ethnobotanical research has been carried out to increase our understanding of the plant

species in terms of their uses and interaction with human life, and for further development of natural products. Botanical research on plant biodiversity needs to be coupled with research in the human sciences, in order to learn the traditional cultural knowledge of uses, conservation and preservation of plant life accomplished over countless generations by indigenous peoples in Indonesia.

One of many important conservation areas in Indonesia is Sempu Island Nature Reserve. It possesses a high richness and diversity of plants, with many potential uses that warrant exploration for bioprospecting purposes. Despite the fact that this very small island ecosystem is still relatively protected and is in quite good condition (Suhardjono 2012; Risna 2009), the study area is currently facing various ecological threats from uncontrolled tourism (Purnomo 2013) and invasion by alien species (Abywijaya et al. 2014). The aims of the present study were to investigate the species richness, conservation status, and potential uses of plants in Sempu Island, to support biodiversity conservation management, and to bioprospect for plant resources that can be developed into potential new products.

MATERIALS AND METHODS

Study area

Sempu Island is a very small island off the south coast of East Java province (Indonesia) with a total area of 877 ha. It is administratively located in Malang Regency, East Java. The coastline is mainly composed of limestone cliffs in the southern part of East Java. The present study focussed on the Segara Anakan area within Sempu Island (Figure 1). Its ecosystem is lowland tropical forest.

The topography of Sempu Island is mainly undulating, with rocky hills. The altitude is between 0 and 102 m asl. Based on Ministry of Forestry Regulation No. 837/Kpts/II/1980, the slope of the flat area in the island ranges between 0 and 8%, while the slopes of the hilly area can reach > 45%.

Wet season in Sempu Island occurs from October to April with an annual precipitation of 2,132 mm with 90.3 rainy days. The dry season occurs between July and September. The temperature in the island ranges from 22°C to 30 °C and relative humidity from 53% to 92% (between 08.00 am and 14.00 pm). The soil pH ranges from 6.0 to 7.0 (Risna 2009).

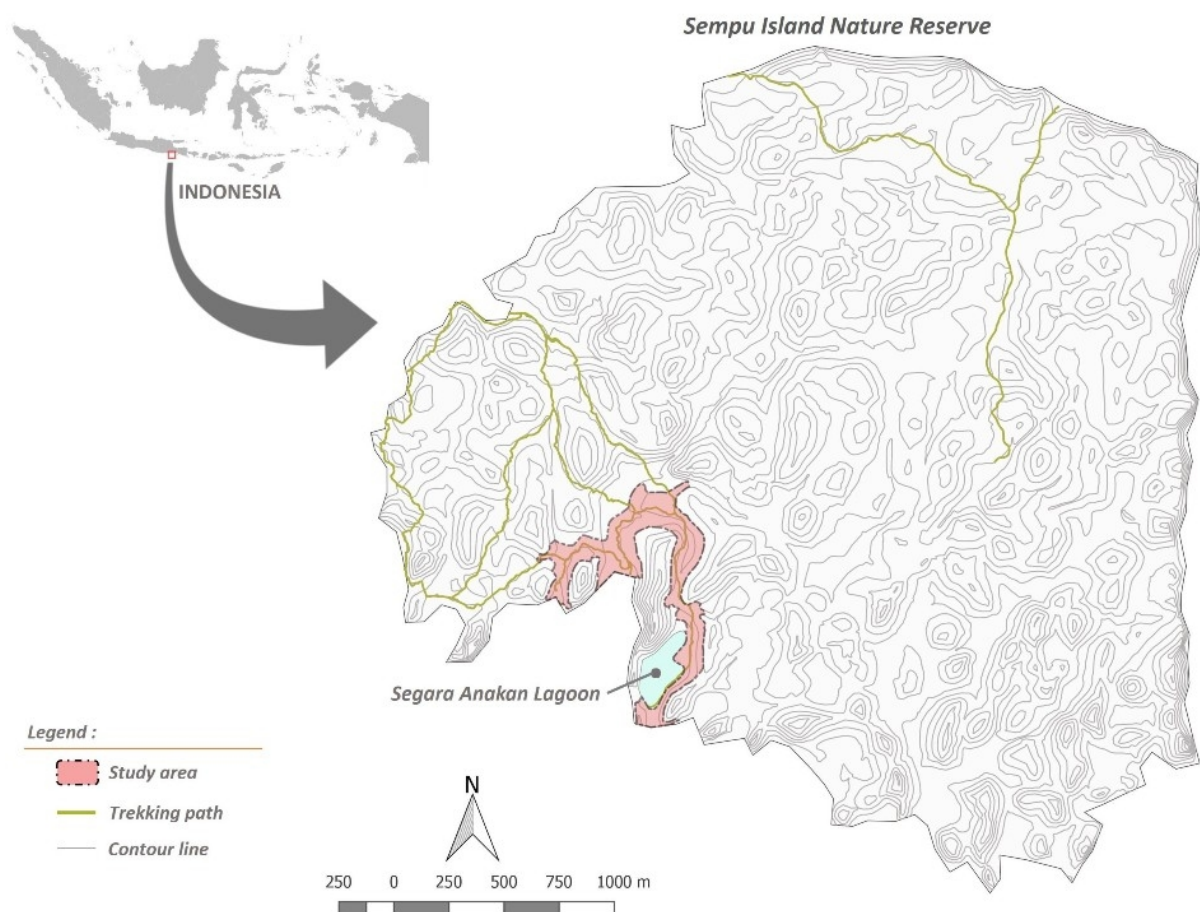


Figure 1. Study area in Segara Anakan area within Sempu Island, East Java, Indonesia

Procedures

To investigate the plant species richness in the Segara Anakan area, we explored along tracks. Within each 100 m of the exploration tracks we observed, identified and documented each plant in the area. The conservation status of the plants was evaluated based on the IUCN Red List (<http://www.iucnredlist.org/>). Potential uses and vernacular names for the plant species were verified by local informants and through scientific literature (Jaric et al. 2014).

Data analysis

The relative abundance (percentage) of trees, shrubs, herbs, and epiphytes on Sempu Island was calculated using a MS Excel spreadsheet.

RESULTS AND DISCUSSION

Plant species richness

There were 77 plant species recorded in the present study belonging to 68 genera and 43 plant families (Table 1). The plant classification system used in this study was that of the Angiosperm Phylogeny Group (Stevens 2001). The four plant families in Segara Anakan Area with the highest number of species (4-5) were Anacardiaceae, Euphorbiaceae, Leguminosae, and Rutaceae.

The 77 plant recorded species comprised trees, shrubs, herbs, and epiphytes. The highest percentage was trees (55.84%), followed by shrubs (33.77%), and herbs (9.09%), while the lowest percentage was epiphytes (1.3%) (Fig.2).

Conservation status of plants on Sempu Island

Of all 77 plant species recorded in Segara Anakan area, Sempu Island, two species (i.e. *Cycas circinalis* and *Myristica teijsmannii*) were listed on the IUCN Red List as endangered plant species (Table 2).

Potential uses of plants

Each plant species has several potential uses such as for staple food, fruits, vegetables, timber, and for other uses. The species with these potential uses are categorized and described below:

Staple food

There is one species that has potential use as a staple food i.e. *Cycas circinalis* (Table 3). The trunk and seeds of *Cycas circinalis* can be prepared as a food source. The inner part of the trunk (pith) of *C. circinalis* contains starchy substances that can be processed into a kind of sago. Various food and culinary items can be made from this sago flour. The seeds of *C. circinalis* can also be processed into flour. The seeds need to be leached by boiling in water more than three times to remove the poisonous substances contained in the seeds. After leaching, the seeds are dried and pounded, and then processed into flour. The flour is a source for making a variety of foods, such as noodles (Saneesh 2009). The

potential uses of *C. circinalis* is important to support food security and food diversification. Research is required into suitable technology for processing *C. circinalis* into various culinary items. The uses of *C. circinalis* need to take into account conservation status, because it is listed as an endangered species on the IUCN Red List. Species recovery is required for *C. circinalis* before the development of its potential uses.

Fruits

There are 12 plant species that have potential to be used for fruits, either fresh or processed (as jam, jelly, candy, juices, pickles, chutneys, and dried slices) (Table 4). *Antidesma bunius*, *Antidesma montanum*, *Ardisia crispa*, *Hernandia nymphaeifolia*, *Mangifera indica*, *Phaleria capitata*, *Sandoricum koetjape*, *Streblus asper*, *Syzygium polyanthum*, *Vitex glabrata*, and *Spondias pinnata* can be eaten as fresh fruits. Furthermore, some of these fruits can be processed into jams (such as *A. bunius*, *S. koetjape*, *S. pinnata*), jelly (*A. bunius*, *S. koetjape*), chutneys (*M. indica* and *S. pinnata*), candy (*S. koetjape*), pickles (*Fagraea ceilanica*, *M. indica*, *S. pinnata*), and dried slices (*M. indica*).

These edible fruits have high potential to be developed as popular local fruits. Research on the development and domestication of these edible fruit plants is required. This will promote the conservation and cultivation of local fruits to counter competition from imported fruits from other countries. We have a lot of plant resources that can be used to meet the requirement for fruit in Indonesia. We have to encourage the development and popularisation of local fruits. The conservation of plants species with potential for such local fruit production is an important priority in Indonesia.

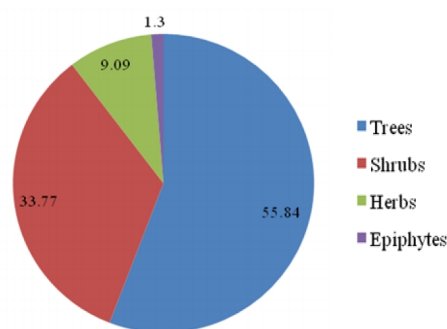


Figure 2. Relative abundance (percentage) of tree, shrub, herb, and epiphyte species in Segara Anakan area, Sempu Island, East Java, Indonesia

Table 2. Conservation status of plants in Segara Anakan, Sempu Island (IUCN Red List)

Species	Family	Habit	Conservation status
<i>Cycas circinalis</i> L.	Cycadaceae	Tree	Endangered
<i>Myristica teijsmannii</i> Miq.	Myristicaceae	Tree	Endangered

Table 1. Plant species recorded in Segara Anakan area, Sempu Island, East Java, Indonesia

Family	Number of species	Plant species
Anacardiaceae	5	<i>Buchanania arborescens</i> (Blume) Blume; <i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe; <i>Mangifera indica</i> L.; <i>Semecarpus heterophylla</i> Blume**; <i>Spondias pinnata</i> (L. f.) Kurz
Annonaceae	2	<i>Mitrephora polypyrena</i> (Bl.) Miq.*; <i>Polyalthia lateriflora</i> (Blume) Kurz
Apocynaceae	1	<i>Rauvolfia sumatrana</i> Jack
Araliaceae	1	<i>Schefflera elliptica</i> (Blume) Harms
Aspleniaceae	1	<i>Asplenium nidus</i> L.
Burseraceae	2	<i>Canarium hirsutum</i> Willd.; <i>Canarium indicum</i> L.
Calophyllaceae	1	<i>Mammea odorata</i> Kosterm.
Celastraceae	2	<i>Euonymus indicus</i> B.Heyne ex Wall.; <i>Lophopetalum javanicum</i> (Zoll.) Turcz.**
Clusiaceae	1	<i>Garcinia celebica</i> L.
Combretaceae	2	<i>Terminalia bellirica</i> (Gaertn.) Roxb.; <i>Terminalia catappa</i> L.
Compositae	3	<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob.; <i>Cyanthillium cinereum</i> (L.) H.Rob.; <i>Synedrella nodiflora</i> (L.) Gaertn.
Convolvulaceae	1	<i>Ipomoea pes-caprae</i> (L.) R. Br.
Cycadaceae	1	<i>Cycas circinalis</i> L.
Cyperaceae	1	<i>Cyperus elatus</i> L.
Dioscoreaceae	1	<i>Dioscorea hispida</i> Dennst.
Ebenaceae	1	<i>Diospyros maritima</i> Blume
Euphorbiaceae	4	<i>Baccaurea dulcis</i> (Jack) Müll.Arg.; <i>Baccaurea javanica</i> (Blume) Müll.Arg.; <i>Croton tiglium</i> L.; <i>Macaranga tanarius</i> (L.) Müll.Arg.
Gentianaceae	1	<i>Fagraea ceilanica</i> Thunb.
Goodeniaceae	1	<i>Scaevola taccada</i> (Gaertn.) Roxb.
Hernandiaceae	1	<i>Hernandia nymphaeifolia</i> (J.Presl) Kubitzki
Lamiaceae	1	<i>Anisomeles indica</i> (L.) Kuntze
Lamiaceae	2	<i>Premna serratifolia</i> L.; <i>Vitex glabrata</i> R. Br.
Lauraceae	2	<i>Cinnamomum iners</i> Reinw. ex Blume; <i>Dehaasia caesia</i> Blume
Lecythidaceae	2	<i>Barringtonia racemosa</i> (L.) Spreng.; <i>Chydenanthus excelsus</i> (Blume) Miers
Leguminosae	4	<i>Cynometra ramiflora</i> L.; <i>Dendrolobium umbellatum</i> (L.) Benth.; <i>Derris elliptica</i> (Wall.) Benth.; <i>Pongamia pinnata</i> (L.) Pierre.
Magnoliaceae	1	<i>Magnolia liliifera</i> (L.) Baill
Malvaceae	2	<i>Hibiscus tilliaceous</i> L.; <i>Pterospermum diversifolium</i> Blume*
Meliaceae	2	<i>Aglaia lawii</i> (Wight) C.J.Saldanha; <i>Sandoricum koetjape</i> (Burm.f.) Merr
Moraceae	3	<i>Artocarpus elasticum</i> Reinw. ex Blume; <i>Ficus microcarpa</i> L.f.; <i>Streblus asper</i> Lour.
Myristicaceae	1	<i>Myristica teijsmannii</i> Miq.****
Myrtaceae	3	<i>Syzygium polyanthum</i> (Wight) Walp.; <i>Syzygium racemosum</i> (Blume) DC.; <i>Syzygium syzygoides</i> (Miq.) Merr. & L.M.Perry
Pandanaceae	2	<i>Pandanus furcatus</i> Roxb.; <i>Pandanus tectorius</i> Parkinson ex Du Roi
Phyllanthaceae	3	<i>Antidesma bunius</i> (L.) Spreng.; <i>Antidesma montanum</i> Blume; <i>Glochidion obscurum</i> (Roxb. ex Willd.) Blume
Primulaceae	3	<i>Ardisia crispa</i> (Thunb.) A.DC. ; <i>Ardisia fuliginosa</i> Blume; <i>Ardisia humilis</i> Vahl
Putranjivaceae	1	<i>Drypetes longifolia</i> (Blume) Pax & K.Hoffm
Rhizophoraceae	1	<i>Carallia brachiata</i> (Lour.) Merr.
Rubiaceae	2	<i>Guettarda speciosa</i> L.; <i>Ixora nigricans</i> R.Br. ex Wight & Arn.
Rutaceae	4	<i>Acronychia pedunculata</i> (L.) Miq.; <i>Glycosmis pentaphylla</i> (Retz.) DC.; <i>Harrisonia perforata</i> (Blanco) Merr.; <i>Zanthoxylum rhetsa</i> (Roxb.) DC.** and ***
Smilacaceae	1	<i>Smilax zeylanica</i> L.
Stemonaceae	1	<i>Stemona tuberosa</i> Lour.
Sterculiaceae	1	<i>Sterculia cordata</i> Blume*
Thymelaceae	1	<i>Phaleria capitata</i> Jack
Vitaceae	1	<i>Cissus javana</i> DC.

Note: * Backer CA and van den Brink jr RCB (1963); ** Backer CA and van den Brink jr RCB (1965); *** Backer CA and van den Brink jr RCB (1968); **** de Wilde (2000)

Vegetables

There are 12 plant species that can be used for vegetables (especially the young leaves of some plants). The leaves can be eaten as fresh vegetables or cooked vegetables. Other parts of the plants can in some cases be used for vegetables such as the young shoots of

Cyanthillium cinereum, flowers of *Dracontomelon dao*, and the fruit of *Spondias pinnata* (Table 5).

These plant species from the present study have potential to be developed and popularised as alternative vegetables and to support diversification of vegetables sources. These would make an addition to common

vegetables daily consumed, such as spinach, water spinach (kangkung), long beans, green beans, cabbage, carrot, and lettuce.

Flavouring

There are five plant species that have potential use for flavouring foods (fish or meat stew) and confectionary (Table 6). The leaves of *A. pedunculata*, *D. dao*, *S. pinnata*, and *S. polyanthum* can be used as spices for flavouring various type of food. The leaves of *Antidesma bunius* can be used to flavour fish or meat stew; both immature fruits and young leaves can substitute for vinegar, and the fruits in sour fish sauce. In addition to flavouring foods, there is one species that also has been recorded as providing a flavouring in sweets, candies and confectionary, i.e. the oil from *Cinnamomum iners*. Cinnamon can be added as a flavouring in the making of some cakes and fudges.

Beverages

There are two plant species that have potential use in beverages i.e. *Antidesma bunius* and *Mangifera indica* (Table 7). A refreshing drink can be made from fully ripened fruits of *A. bunius*. Juices and syrup can be made from fruits of *M. indica*.

Herbal medicines

A total of 49 plant species were recorded that have potential uses for herbal medicines to treat a wide range of ailments and diseases; such as malaria, headache, stomach ache, dysentery, chickenpox, fever, and itch. (Table 8). *Fagraea ceilanica* (roots, bark, twigs, leaves, and flowers), *Rauvolfia sumatrana* (bark), *Scaevola taccada* (leaves), and *Antidesma montanum* (roots) have potential uses for treating malaria. Liver complaints can be cured using *Glycosmis pentaphylla* and *Ficus microcarpa*.

Plants that have potential use in treating stomach ache are *Canarium hirsutum* (roots), *Cyanthilium cinereum* (roots), *Cissus javana* (leaves), *Glochidion obscurum* (roots), *Glycosmis pentaphylla* (leaves), *Ipomoea pes-caprae* (seeds), *Premna serratifolia* (leaves and roots), and *Sandoricum koetjape* (roots). Some plants can also be used to treat diarrhoea, such as *Barringtonia racemosa* (peeled seeds), *Cyanthilium cinereum* (root decoction), *Glycosmis pentaphylla*, *Harrisionia perforata* (young shoots, root bark, dried roots, and stems), *Hibiscus tiliaceus* (leaves), *Pandanus furcatus* (leaf sap), *Sandoricum koetjape* (roots), *Streblus asper* (stem bark), *Synedrella nodiflora* (roots and leaves), *Syzygium polyanthum* (bark) and *Terminalia bellirica* (fruits).

To treat coughs, some plants can be used such as *Barringtonia racemosa* (fruits and scraped nuts), *Glycosmis pentaphylla*, *Hibiscus tiliaceus* (leaves), *Pandanus furcatus* (young top leaves), *Premna serratifolia* (leaves), *Scaevola taccada* (young leaves), *Stemona tuberosa* (tuberous roots), and *Synedrella nodiflora* (roots). Some plants can also be used for treating wounds, such as *Cyanthilium cinereum* (ground or poultice of the leaves), *Ficus microcarpa* (roots, bark, and leaf latex), *Guettarda speciosa* (bark), *Harrisionia perforata* (dried roots), *Ipomoea pes-caprae* (crushed leaves), *Pterospermum*

diversifolium (leaves and bark), *Scaevola taccada* (stem sap), and *Streblus asper* (bark).

Itch can be treated by plants such as *Acronichya pedunculata* (bark extract), *Barringtonia racemosa*, *Carallia brachiata* (bark), *Derris elliptica*, *Harrisionia perforata* (crushed leaves), *Pterospermum diversifolium* (leaves and bark) and *Syzygium polyanthum* (bark, roots, and leaves). Plant species that can be used to treat rheumatism include *Acronichya pedunculata* (root extracts), *Dioscorea hispida*, *Glycosmis pentaphylla*, *Ipomoea pes-caprae*, *Pongamia pinnata* (extracts of the leaves, bark, and seeds), *Premna serratifolia*, *Smilax zeylanica* (roots), *Synedrella nodiflora* (leaves), and *Terminalia catappa* (leaves).

Tuberculosis can be treated by *Hibiscus tiliaceus* (leaves) and *Scaevola taccada* (young leaves; chewed or extracts from the leaves). Asthma can be treated by *Barringtonia racemosa* (fruits), *Cyanthilium cinereum* (leaves) and *Scaevola taccada* (leaves extracts). Some species can also be used to treat fever, such as *Asplenium nidus* (decoction or infusion), *Ficus microcarpa* (young leaves), *Glycosmis pentaphylla* (juice of the leaves), *Premna serratifolia* (extracts of leaves), and *Sandoricum koetjape* (fresh leaves).

Timber

There are 42 plant species that have potential use for timber as important sources of material for housings, buildings, furniture, cooking utensils, canoes, and handicrafts (Table 9). Some plant species that have potential use for housing/buildings are *Acronichya pedunculata*, *Baccaurea dulcis*, *B. javanica*, *Cinnamomum iners*, *Cynometra ramiflora*, *Dehaasia caesia*, *Drypetes longifolia*, *Euonymus indicus*, *Fagraea ceilanica*, *Glochidion obscurum*, *Guettarda speciosa*, *Macaranga tanarius*, *Mammea odorata*, *Polyalthia lateriflora*, *Terminalia bellirica*, *T. catappa*, and *Vitex glabrata*.

Some species have potential use for furniture, such as *Acronichya pedunculata*, *Baccaurea dulcis*, *B. javanica*, *Buchanania arborescens*, *Drypetes longifolia*, *Euonymus indicus*, *Fagraea ceilanica*, *Glochidion obscurum*, *Guettarda speciosa*, *Hernandia nymphaeifolia*, *Magnolia liliifera*, *Polyalthia lateriflora*, *Pterospermum diversifolium*, *Terminalia bellirica*, *T. catappa*, and *Vitex glabrata*. Timbers of some other plant species also have potential uses for making canoes and boats, such as timbers of *Baccaurea dulcis*, *B. javanica*, *Dehaasia caesia*, *Fagraea ceilanica*, *Hernandia nymphaeifolia*, *Macaranga tanarius*, *Magnolia liliifera*, *Mammea odorata*, *Spondias pinnata*, and *Terminalia catappa*.

Ornamental plants

Fifteen species can be used as ornamental plants because of their beautiful flowers, leaves, and/or plant shapes (Table 10). Some of the plants have attractive flowers e.g. *Fagraea ceilanica* and *Pongamia pinnata*. *Cissus javana* has beautiful leaves. Some of the plants have unique plant shapes of ornamental value e.g. *Cycas circinalis* and *Pandanus tectorius*.

Table 3. Plant species with potential use of plants from Segara Anakan area, Sempu Island, East Java, Indonesia

Latin name	Vernacular names (Indonesian) *	Family	Uses	References
Staple food				
<i>Cycas circinalis</i> L.	Pakis Haji, Pakis Raja ¹	Cycadaceae	A kind of sago from the trunk and flour from the seeds	Anon. (1992)
Edible fruit				
<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	Fresh fruits, or made into jam or jelly	Lemmens (2003)
<i>Antidesma montanum</i> Blume	Ande-ande ¹ , Kenyan Pasir, Wunen ³ ,	Phyllanthaceae	Fresh fruits	Lemmens (2003)
<i>Ardisia crispa</i> (Thunb.) A.DC.	Mata Ayam ⁴	Myrsinaceae	Fresh fruits	Heyne (1987)
<i>Fagraea ceilanica</i> Thunb.	Tamosu ⁸ , Kolaki, Nosu ¹⁰	Gentianaceae	Fruits are sometimes pickled and eaten	Hildebrand et al. (1995)
<i>Hernandia nymphaeifolia</i> (J.Presl) Kubitzki	Kampak, Kampis ² .	Hernandiaceae	Fresh fruits	Irwanto (1998)
<i>Mangifera indica</i> L.	Mangga, Mempelam ¹	Anacardiaceae	Fresh fruits when ripe, or processed fruits (in pickles, chutneys, dried slices) when unripe	Boer et al. (1995)
<i>Phaleria capitata</i> Jack	Kakapasan ² , Lawe ³	Thymelaceae	Fresh fruits (sweet fruit), the seed cotyledon contains a biting poison	Anon. (2003)
<i>Sandoricum koetjape</i> (Burm.f.) Merr	Kecapi, Kentuat, Sentul ¹	Meliaceae	Fresh fruits, or processed into candy, chutney, jam, jelly, marmalade or preserve, or used in flavouring native dishes	Sotto (1992)
<i>Streblus asper</i> Lour.	Serut ² , Peleh ¹²	Moraceae	Fresh fruits	Kalima (2002); Ba (1998)
<i>Syzygium polyanthum</i> (Wight) Walp.	Salam, Manting ³ , Ubar Serai ⁸	Myrtaceae	Fresh fruits	Haron et al. (1995)
<i>Vitex glabrata</i> R. Br.	Ketileng, Bigbul, Gentileng ³	Lamiaceae	Fresh fruits	Sunarno et al. (1995)
<i>Spondias pinnata</i> (L. f.) Kurz	Kedongdong ¹ , Kedongdong Leuweung ² , Kacemcem ⁹	Anacardiaceae	Fresh fruit when ripe, or processed in chutneys, stews, pickles, and jams	Anon. (1999)
Vegetables				
<i>Acronychia pedunculata</i> (L.) Miq.	Jejerukan ² , Kayu Semidra, Sarirah ³ ,	Rutaceae	Young vegetables as condiments	Tue and Sosef (1998)
<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	Young leaves for salads and cooked with rice	Lemmens (2003)
<i>Asplenium nidus</i> L.	Paku Sarang Burung ¹	Aspleniaceae	Young curled leaves as a vegetable	Rusea (2003)
<i>Barringtonia racemosa</i> (L.) Spreng.	Penggung ^{2,3} , Putat Sungai ⁴ , Butun Darat ⁵ .	Lecythidaceae	The fresh or cooked leaves as a vegetable	Yaplito (2002)
<i>Cyanthillium cinereum</i> (L.)	Sasawi Langit ² , Maryuna ³	Compositae	The young shoots as a cooked vegetable	Utomo and van Valkenburg (1999)
<i>Cycas circinalis</i> L.	Pakis Haji, Pakis Raja ¹	Cycadaceae	The youngest leaves as a vegetable	Anon. (1992)

<i>Cissus javana</i>	Beubeureumen ² , Mirah ³ , Rabet Dara ¹²	Vitaceae	The sour leaves and young shoots mixed with other vegetables.	Anon. (1994)
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	Dahu ¹ , Sengkuang ⁶ , Basuong ¹³	Anacardiaceae	Cooked flowers and leaves as a vegetable	Louman et al. (1995)
<i>Mangifera indica</i> L.	Mangga, Mempelam ¹	Anacardiaceae	Young leaves as a vegetable	Boer et al. (1995)
<i>Premna serratifolia</i> L.	Ki Pahan ² , Singkil Alas ³ ,	Lamiaceae	Cooked leaves are as a vegetable	Cardenas (1999)
<i>Synedrella nodiflora</i> (L.) Gaertn.	Jotang Kuda ² , Bruwan ³ , Gofu Makeang ²⁰	Compositae	Tender leaves in salads	Hidayat (2002)
<i>Spondias pinnata</i> (L. f.) Kurz	Kedongdong ¹ , Kedongdong Leuweung ² , Kacemcem ⁹	Anacardiaceae	Unripe fruit as a vegetable	Anon. (1999)

Flavouring

<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	Fruit in sour fish sauce Young leaves to flavour fish or meat stew, and both immature fruit and young leaves serve as substitutes for vinegar	Lemmens (2003)
<i>Cinnamomum iners</i> Reinw. ex Blume	Ki Kacengal ¹² , Medang Kalong ²¹	Lauraceae	The oil from the leaves for flavouring sweets and confectionary	Wiselius et al. (1995)
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	Dahu ¹ , Sengkuang ⁶	Anacardiaceae	Flowers and leaves for food flavouring	Louman et al. (1995)
<i>Spondias pinnata</i> (L. f.) Kurz	Kedongdong ¹ , Kedongdong Leuweung ² , Kacemcem ⁹	Anacardiaceae	The leaves for flavouring	Anon. (1999)
<i>Syzygium polyanthum</i> (Wight) Walp.	Salam, Manting ³ , Ubar Serai ⁸	Myrtaceae	The aromatic leaves for spice in food	Haron et al. (1995)

Beverages

<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	Juice of fully ripened fruit as a refreshing drink	Lemmens (2003)
<i>Mangifera indica</i> L.	Mangga, Mempelam ¹	Anacardiaceae	Fruits are processed into syrup, juice	Boer et al. (1995)

Herbal medicines

<i>Acronychia pedunculata</i> (L.) Miq.	Jejerukan ² , Kayu Semidra, Sarirah ³ ,	Rutaceae	Root extract applied to the skin for rheumatism Bark extract for itch.	Tue and Sosef (1998)
<i>Aglaiia lawii</i> (Wight) C.J. Saldanha	Langsat Lutung ³ , Lasih ⁸ , Kayu Jangan ¹⁰ , Aisnepapir ^{13, 16}	Meliaceae	The leaves for aroma therapy The leaves for headache	Ba et al. (1995)
<i>Anisomeles indica</i> (L.) Kuntze	Ki Hileud, Patuk Bangkok ² , Celangking ³	Lamiaceae	The whole plants, especially leaves and roots are used as a powerful astringent, carminative (to reduce flatulence), febrifuge (to reduce fever), and tonic (to promote general health)	Ng and Ling (2002)
<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	The leaves as a stimulant and to treat syphilis	Lemmens (2003)
<i>Antidesma montanum</i> Blume	Ande-ande ¹ , Kenyan Pasir, Wunen ³	Phyllanthaceae	Roots for measles, chickenpox, and malaria The leaves externally applied for headache and thrush in children Roots and stems as a diuretic (to promote diuresis)	Lemmens (2003)

<i>Ardisia fuliginosa</i> Blume	Getah Adjag ¹	Myrsinaceae	Dried sap from the stem for scabies	Lemmens (2002 a) Quattrocchi (2012) Lemmens (2002 b)
<i>Ardisia humilis</i> Vahl	Lampeni ² , Lempeni ³ , Jambulan Pante ⁴	Myrsinaceae	The leaves for scabies The fruits as anthelmintic (to expel parasitic worms) and cardiotoxic (having a tonic effect on the heart)	
<i>Asplenium nidus</i> L.	Paku Sarang Burung ¹	Aspleniaceae	Decoction or infusion of the plant to ease labour pain and against fever	Rusea (2003)
<i>Barringtonia racemosa</i> (L.) Spreng.	Penggung ^{2,3} , Putat Sungai ⁴ , Butun Darat ⁵	Lecythidaceae	Leaves, roots or bark are externally applied to chickenpox A poultice for itch The roots as a febrifuge; an infusion for measles A decoction of the scraped nut for cough, sinusitis, or bronchitis The fruit for coughs and asthma and the peeled seed mixed with flour and oil for diarrhoea The seed is internally applied for colic and externally for ophthalmia The fruit for poulticing sore throat and skin eruptions The leaves for high blood pressure and as purgative (to stimulate evacuation of the bowels)	Yaplito (2002)
<i>Buchanania arborescens</i> (Blume) Blume	Getasan ³ , Rawa-rawa Pipit ⁶	Anacardiaceae	Pounded leaves as a poultice for headache	Sulistiarini (1998)
<i>Canarium hirsutum</i> Willd.	Ki Bonteng ² , Mede-mede ⁵ , Kanari Jaki ¹⁰	Burseraceae	A decoction of the roots for stomach ache	Kochummen et al. (1995)
<i>Carallia brachiata</i> (Lour.) Merr.	Kitamiyang ² , Sepat ³ , Ringgit Dareh ⁸	Rhizophoraceae	The bark for itch	Hou (1998 b) Wardani (2003)
<i>Cyanthillium cinereum</i> (L.)	Sasawi Langit ² , Maryuna ³	Compositae	Ground or poultice of leaves for headache and wounds The ground or decoction of leaves for skin diseases Root decoction for diarrhoea and stomach ache An infusion of the plant for coughs The leaves for asthma and bronchitis	Utomo and van Valkenburg (1999)
<i>Cycas circinalis</i> L.	Pakis Haji, Pakis Raja ¹	Cycadaceae	A poultice of the seeds and bark for sores and skin complaints	Anon. (1992)
<i>Cissus javana</i>	Beubeureumen ² , Mirah ³ , Rabet Dara ¹²	Vitaceae	The leaves for stomach ache	Anon. (1994)
<i>Dendrolobium umbellatum</i> (L.) Benth	kanyere laut ² , blanakan ³ , gowou ²⁰ .	Leguminosae	A decoction of the leaves as a general tonic. The young leaves are an ingredient of medicine for women after child delivery	Aguilar (2002)
<i>Derris elliptica</i> (Wall.) Benth.	Tuwa Leteng ² , Tuba, Oyod Tungkul ³ ,		For antisepsis and applied to abscesses and against leprosy and itch. The roots as an emmenagogue (to increase menstrual flow) and the stems as a blood tonic	Hamid (1999)
<i>Dioscorea hispida</i> Dennst.	Gadung ¹ , Sikapa ^{9,10} , Ondo ¹¹	Dioscoreaceae	The pounded tubers, used externally as an antiseptic, and a decoction for chronic rheumatism	Onwueme (1996)
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	Dahu ¹ , Sengkuang ⁶ , Basuong ¹³	Anacardiaceae	The bark for dysentery	Louman et al. (1995)
<i>Fagraea ceilanica</i> Thunb.	Tamosu ⁸ , Kolaki, Nosu ¹⁰	Gentianaceae	Decoctions of roots, bark, twigs, leaves, and flower for malaria and dysentery	Hildebrand et al. (1995)
<i>Ficus microcarpa</i> L. F	Preh ¹	Moraceae	The root, bark, and leaf latex for wounds, headache and toothache The bark and leaf latex for colic and liver trouble Perspire in the steam of boiling young leaves for fever and headache	Rojo et al. (1999)

<i>Glochidion obscurum</i> (Roxb. ex Willd.) Bl.	Ki Pare Lalaki ² , Uris-urisan ³	Phyllanthaceae	The roots for stomach ache	Irwanto (1998)
<i>Glycosmis pentaphylla</i> (Retz.) DC.	Gongseng ² , Jerukan, Totoan ³	Rutaceae	A decoction of the roots for bilious attacks A decoction of roots and leaves for intestinal trouble The leaves to stimulate appetite, and for stomach ache. An infusion of roasted leaves for women after delivery as an appetite stimulant. To treat diarrhoea, coughs, rheumatism, anaemia, and jaundice. Juice of the leaves for fever, liver complaints and as a vermifuge (anthelminthic) A paste of the leaves mixed with ginger is applied for eczema and skin affections	Chua and van Valkenburg (2002)
<i>Guettarda speciosa</i> L.	Jati Pasir, Titi Laut ¹¹ , Kenjang-kenjang ¹²	Rubiaceae	The bark for chronic dysentery, wounds and abscesses	Ong (1998)
<i>Harrisonia perforata</i> (Blanco) Merr.	Garut ² , Ri Kengkeng ³ , Sese pang ¹⁴	Rutaceae	Young shoots for diarrhoea A decoction of the root bark for diarrhoea, dysentery, cholera Ashes of the roasted leaves mixed with oil or crushed leaves are applied to relieve itch The dried root as antipyretic and anti-inflammatory, for wound and diarrhoea	Kiew (2002)
<i>Hernandia nymphaeifolia</i> (J.Presl) Kubitzki	Kampak, Kampis ² .	Hernandiaceae	The stems for diarrhoea The blackish corewood at the base of the trunk for haemorrhaging The leaves and the fruit are purgatives An extract of the leaves for painless depilation.	Irwanto (1998)
<i>Hibiscus tilliaceous</i> L.	Waru, Waru Laut, Baru ¹	Malvaceae	The fresh macerated bark makes water mucilaginous, and for dysentery The leaves as a laxative, and the pulverized roots as a vomitive A decoction of the leaves is emetic (to cause vomiting) A decoction of the leaves for sore throat, pneumonia, coughs, tuberculosis and diarrhoea	Dasuki (2003)
<i>Ipomoea pes-caprae</i> (L.) R. Br.	Daun Katang ⁵ , Katang-katang ⁹ , Batata Pantai ¹⁵	Convolvulaceae	The leaves and roots are crushed in water and drunk to ease labour pain The plant as astringent, tonic, alterative (to restore normal health), diuretic, and laxative, useful in skin infections. A decoction of the root as emollient and diminishes the irritation caused by bladder infections A paste of the leaves for ulcers and boils The seed is chewed and swallowed as a remedy for cramp and stomach ache A decoction is anodynal (to soothe pain) in rheumatism Leaf sap for jellyfish stings The seeds for stomach ache The crushed leaves for boils, ulcers, piles, haemorrhoids, swellings and wounds The leaves as astringent, alterative, tonic, and diuretic, and as an external application for rheumatism, dropsy, and colic The seeds for stomach ache and cramp The juice from the stem for sting of jellyfish and toadfish	Dibiyantoro and Schmelzer (2002)

<i>Ixora nigricans</i> R.Br. ex Wight & Arn.	Soka ¹	Rubiaceae	The leaves as anti-dysenteric	Ysrael and Van Valkenbonurg (1999)
<i>Mangifera indica</i> L.	Mangga, Mempelam ¹	Anacardiaceae	Bark, kernels, and flowers as astringents Various parts of the tree have antibiotic properties	Boer et al. (1995)
<i>Pandanus furcatus</i> Roxb.	Harashas ² , Panan Kowang ³ ,	Pandanaceae	The young top leaves as an antidote, the leaf sap for diarrhoea and dysentery	Brink and Jansen (2003)
<i>Pandanus tectorius</i> Parkinson ex Du Roi	Pandan Pudak ¹	Pandanaceae	The bark is scraped into a wild ginger leaf, water is added and the solution to sedate mental patients	Brink and Jansen (2003)
<i>Phaleria capitata</i> Jack	Kakapasan ² , Lawe ³ ,	Thymelaceae	The seeds for scurf in children	Anon. (2003)
<i>Pongamia pinnata</i> (L.) Pierre	Ki Pahang Laut ² , Bangkok ³ , Kranji ¹² .	Leguminosae	Extracts from the leaves, bark, and seeds as antiseptic against skin diseases and rheumatism	van Valkenburg (2002)
<i>Premna serratifolia</i> L.	Ki Pahan ² , Singkil Alas ³ ,	Lamiaceae	The leaves and roots as a diuretic, stomachic and febrifuge The leaves as a galactagogue (to stimulate lactation), and for rheumatic arthritis, colic, and flatulence A decoction of roots and leaves as a febrifuge Extracts of the leaves for coughs, headache, and fever A tea from the boiled bark for neuralgia	Cardenas (1999)
<i>Pterospermum diversifolium</i> Blume	Bayur ¹ , Wadang ³ .	Malvaceae	Leaves and bark as a poultice for itch and wounds, and internally for dysentery	Boer and Lemmens (1998)
<i>Rauvolfia sumatrana</i> Jack	Lame Lalaki ² , Tampa Badak ⁸ , Polay Lakek ¹² ,	Apocynaceae	The bark for dysentery. The dried bark as an anti-malarial	Ly and Mai (1999)
<i>Sandoricum koetjape</i> (Burm.f.) Merr	Kecapi, Kentuat, Sentul ¹	Meliaceae	The fresh leaf: when applied to the skin is sudorific (causing sweat): and in decoction, for fever The powdered bark: effective treatment for ringworm The roots: anti-diarrhetic, anti-spasmodic, carminative, stomachic, and as a general tonic after childbirth	Sotto (1992)
<i>Scaevola taccada</i> (Gaertn.) Roxb.	Babakoan ² , Dudulan ³ , Subong-subong ¹⁷ .	Goodeniaceae	Diluted sap from the leaves or sap from the ripe berries to clear opacity of the eye and in the treatment of eye infections The bitter leaves for indigestion, and as a poultice for headache The root as an antidote after eating poisonous fish or crab The roots in decoction for beri-beri and in certain syphilitic affections, also in dysentery Roots and leaves for skin affections. The young leaves for coughs, colds, tuberculosis, and malaria. The sap directly applied to sores. An extract from the leaves as a form of long-term contraception by women and for earache, asthma, and tuberculosis The juice squeezed from young stems and ripe fruits applied directly to bites and stings The leaves for skin ailments. Swellings, elephantiasis, scrotal swellings, oedema, chill, and indigestion; the roots for cancer therapy; the bark for abscesses, menstrual complaints and bone fractures; the stem for abdominal complaints Stem sap to cleanse a sore eye and on wounds, and when hot on topical ulcers	Wardini (2002)

<i>Schefflera elliptica</i> (Blume) Harms	Tangana ³ , Panakomo ¹⁸ , Putiana Ma Gitipi ¹⁹	Araliaceae	The bark as a bechic (cough-suppressant), the resin as a vulnerary (to heal wounds) A decoction of the leaves is an effective antiscorbutic (to prevent scurvy) and for aromatic baths The wood chewed to relieve toothache The roots mixed with rice are eaten to cure dropsy	Tap and Sosef (1999)
<i>Smilax zeylanica</i> L.	Kayu Cina Utan, Saihe Maruani, Asaihe Tuni ⁵	Smilacaceae	The roots against rheumatism, urinary complaints and venereal diseases	Teo (1999)
<i>Spondias pinnata</i> (L. f.) Kurz	Kedongdong ¹ , Kedongdong Leuweung ² , Kacemcem ⁹	Anacardiaceae	The fruit as an astringent, antiscorbutic (to prevent scurvy), and against bilious dyspepsia The juice is applied against earache	Anon. (1999)
<i>Stemona tuberosa</i> Lour.	Kanyalut ⁵ , Ngabalo ¹⁹ , Isoratu ²⁰	Stemonaceae	The tuberous roots as insecticides and therapeutical agents (especially for coughs). The ground fresh tuberous roots to repel lice from body and clothing The tuberous roots to treat scabies and kill head lice The tuberous roots used internally as an antitussive (cough-suppressant) and anthelmintic, and externally as an insecticide.	Thin (2002)
<i>Streblus asper</i> Lour.	Serut ² , Peleh ¹²	Moraceae	The leaves with a little salt are given after childbirth as depurative (detoxifier); in a mixture with other plants as a galactagogue (to stimulate lactation) The bark as a disinfectant for wounds, and as a depurative (detoxifier) in certain skin diseases A decoction of stem bark is anti-diarrhoeal, anti-dysenteric, and anti-pyretic (to reduce fever) The seed as tonic and carminative, as well as appetizer An infusion of the leaves as a purgative The smoke from the wood for nose polyps The root bark powdered or in decoction for toothache and periodontitis (gum disease) A decoction of the branchlets to relieve a swollen abdomen, and a decoction of the roots to treat diphtheria	Kalima (2002) Ba (1998)
<i>Synedrella nodiflora</i> (L.) Gaertn.	Jotang Kuda ² , Bruwan ³ , Gofu Makeang ²⁰	Compositae	The leaves as a poultice for sore legs and rheumatism, as an embrocation (liniment) for different oedemas. An infusion of young leaves as a laxative The juice of the leaves to treat earache, mouth affections such as infected gums The root is chewed against diarrhoea, together with some other herbs Dislocated bones are massaged daily with sap from the squeezed leaves A decoction of the leaves for haemorrhoids and diarrhea A decoction of the pounded and cooked roots as a cough mixture The entire plant as an emmenagogue (to increase menstrual flow)	Hidayat (2002)
<i>Sterculia cordata</i> Blume	Hantap Heulang ² , Kayu Binong ³ , Gelumpang Padang ⁴	Sterculiaceae	The seeds are used in traditional medicine	Lemmens et al. (1995)

<i>Syzygium polyanthum</i> (Wight) Walp.	Salam, Manting ³ , Ubar Serai ⁸	Myrtaceae	An extract of the bark for diarrhea Bark, roots, and leaves for poulticing against itch	Haron et al. (1995)
<i>Terminalia bellirica</i> (Gaertner) Roxb	Jaha Kebo, Jaha Sapi ³ , Ulu Belu ⁸ .	Combretaceae	The unripe fruit is purgative and the ripe fruit astringent The fruit for dropsy, haemorrhoids and diarrhea	Sosef et al. (1995)
<i>Terminalia catappa</i> L.	Ketapang ¹	Combretaceae	The leaves cause sudorific (sweating) action and are applied to rheumatic joints The tannin from leaves and bark is used as an astringent in dysentery and thrush, also as a diuretic and cardiotonic agent, and applied externally on skin eruptions A decoction of the leaves as a vermifuge (anthelmintic) Crushed flowers to induce sterility	Sosef et al. (1995)
Timber				
<i>Acronychia pedunculata</i> (L.) Miq.	Jejerukan ² , Kayu Semidra, Sarirah ³	Rutaceae	The wood for house building, utility furniture, flooring, lining, panelling, mouldings, turnery, carving, and tool handles	Tue and Sosef (1998)
<i>Aglaia lawii</i> (Wight) C.J. Saldanha	Langsat Kayu Jangan ¹⁰ , Aisnepapir ^{16, 13}	Meliaceae	The wood an important source of timber	Ba et al. (1995)
<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	The wood for timber	Lemmens (2003)
<i>Baccaurea dulcis</i> (Jack) Müll.Arg.	Kepundung, Menteng, Tampui ¹	Euphorbiaceae	The wood for poles, construction of houses, boats, and furniture	Uji (1992)
<i>Baccaurea javanica</i> (Blume) Müll.Arg.	Heucip ² , Jirek Emprit, Kapundung Lanang ³ ,	Euphorbiaceae	The wood for poles, construction of houses, boats, and furniture	Idris (1998)
<i>Buchanania arborescens</i> (Blume) Blume	Getasan ³ , Rawa-rawa Pipit ⁶ .	Anacardiaceae	For light construction, canoes, furniture, drawers, mouldings, light framing, interior finishes, household implements, cigar boxes, turnery articles, veneer and blockboard, and also for pulp and as firewood	Sulistiarini (1998)
<i>Canarium indicum</i> L.	Kenari Ambon ² , Kanari Bagea ⁵ , Kanari Ternate ¹⁰ ,	Burseraceae	For light construction, mouldings, interior finishes, and as firewood	Kochummen et al. (1995)
<i>Carallia brachiata</i> (Lour.) Merr.	Kitamiyang ² , Sepat ³ , Ringgit Dareh ⁸	Rhizophoraceae	Timber and fuelwood	Hou (1998 b); Wardani (2003)
<i>Cinnamomum iners</i> Reinw. ex Blume	Ki Teja ^{2, 3} , Kacengal ¹² , Medang Kalong ²¹ ,	Lauraceae	For house building, and cabinet work	Wiselius et al. (1995)
<i>Cynometra ramiflora</i> L.	Kateng, Kepel, Wunut ³	Leguminosae	The wood for house building, tool handles, woodcraft and ornamental purposes	Soerianagara et al. (1994)
<i>Artocarpus elasticus</i> Reinw. ex Blume	Teureup ² , Benda ³ , Mengko ⁸	Moraceae	The wood for light construction	Djarwaningsih et al. (1995)
<i>Dehaasia caesia</i> Blume	Huru Kacang ² , Madang Intalo ⁶ , Medang Batu ⁸ .	Lauraceae	For light construction under cover, house posts, house piling, interior finishes, panelling, partitioning and ceiling, picture framing, oars, boat building Musical instruments (pianos), tools, and knife sheaths	Wiselius (1998 a)
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	Dahu ¹ , Sengkuang ⁶ , Basuong ¹³	Anacardiaceae	For timber	Louman et al. (1995)

<i>Drypetes longifolia</i> (Blume) Pax & K.Hoffm	Buniyaga ² , Batung ³ , Kikir Daun Besar ⁶	Putranjivaceae	The exceptionally tough wood is used for general construction under cover (beams, joists, rafters, flooring), temporary construction, bridge, and wharf superstructure, industrial flooring, furniture and cabinet making, rice mortars, tool handles, posts, piles, poles and railway sleepers	Boer and Sosef (1998a)
<i>Euonymus indicus</i> B.Heyne ex Wall.	Ki Keuyeup ² , Jerukan ³ , Awa Kudang-kudang ⁸	Celastraceae	The wood for house building, temporary constructions, bridges, small furniture, carving and turnery and as a substitute for boxwood (<i>Buxus</i> spp) for making small articles such as spindles, pegs, spoons, and toothpicks	Kochummen (1998)
<i>Fagraea ceilanica</i> Thunb.	Tamosu ⁸ , Kolaki, Nosu ¹⁰	Gentianaceae	The strength and durability wood for heavy constructions, in exposed conditions and in contact with the ground. For house posts, bridges, boats, railway sleepers, piles, poles, fence posts, door and window sills, heavy-duty flooring, barrels, chopping blocks and coffins, and considered a first-class turnery timber for furniture cabinet making and carving, high-quality firewood and charcoal	Hildebrand et al. (1995)
<i>Garcinia celebica</i>	Manggu leuweung ² , Baros ³ , Kirasa ¹⁰	Clusiaceae	The wood to build houses	Noor (1998); Heyne (1987)
<i>Glochidion obscurum</i> (Roxb. ex Willd.) Blume	Ki Pare Lalaki ² , Uris-urisan ³	Phyllanthaceae	The wood to build native and temporary houses, mainly as poles and rafters, and for tool handles for light framing, flooring, moulding, interior trim, and utility furniture The trees yield a good hot fuelwood and the boles used in mushroom cultivation	Irwanto (1998)
<i>Glycosmis pentaphylla</i> (Retz.) DC.	Gongseng ² , Jerukan, Totoan ³ ,	Rutaceae	The pale wood for tool handles.	Chua and van Valkenburg (2002)
<i>Guettarda speciosa</i> L.	Jati Pasir, Titi Laut ¹¹ , Kenjang-kenjang ¹²	Rubiaceae	For house-blocks, very durable, and for heavy furniture	Ong (1998)
<i>Hernandia nymphaeifolia</i> (J.Presl) Kubitzki	Kampak, Kampis ²	Hernandiaceae	The wood for furniture and cabinet work, light interior construction, mouldings, canoe building, fishing net floats, wooden sandals, drawing boards, carving, model making, chopsticks, musical instruments and for core veneer	Irwanto (1998)
<i>Lophopetalum javanicum</i> *(Zdl.) Turcz.	Mandalaksa ³ , Madang-gambici ^{8,23} , Tatokwa ¹³ .	Celastraceae	The wood for timber	Kartasubrata et al. (1994)
<i>Macaranga tanarius</i> (L.) Müll.Arg.	Mara ² , Tutup Ancur ³ , Hanuwa ⁵	Euphorbiaceae	Peeled poles for temporary construction and especially for parts of native houses not in contact with the ground The wood for light framing, interior trim, moulding, shingles, packing cases, outriggers for canoes and, especially, match splints A high quality pulp and produces high quality particle board, cement-bonded board, and wood-wool board, and for the production of plywood. It provides good fuelwood, wooden shoes	Lim (1998)
<i>Magnolia liliifera</i> (L.) Baill	Kembang Tunjung ² , Cempaka Gonda ³	Magnoliaceae	The wood for general construction under cover, bridge building, interior finishes, panelling, partitioning, flooring, door and window frames, furniture, mouldings, sporting goods, musical instruments, handicrafts, canoe building, and pencil slats	Sambas and Sosef (1998)

<i>Mammea odorata</i> Kosterm.	Kembang Satu ^{1, 11} , Kapurancak ³ , Lolang Waran ¹¹ ,	Calophyllaceae	The wood for boat building (planks and pins), house posts, flooring and cabinet work	Wiselius (1998 b)
<i>Mangifera indica</i> L.	Mangga, Mempelam ¹	Anacardiaceae	The wood as machang, e.g. in door construction, it makes excellent charcoal, also used to culture mushrooms	Boer et al. (1995)
<i>Mitrephora polypyrena</i> (Bl.) Miq.	Janglot, Kalak Sapi ³ , Tapai Bunga ⁸	Annonaceae	The wood for interior joinery, poles, tool handles, matchboxes, splints, packing cases, and firewood	Boer and Sosef (1998b)
<i>Polyalthia lateriflora</i> (Blume) Kurz	Kalak ² , Kalak Ucet ³ , Janglot ¹²	Annonaceae	The generally tough and flexible wood for temporary construction, house building, furniture, interior trim, mouldings, light framing, decorative wall panelling, masts, oars, wooden shoes, tool handles, sporting goods, novelties, toys, match splints, packing cases and boxes	Ban (1998)
<i>Pongamia pinnata</i> (L.) Pierre	Ki Pahang Laut ² , Bangkong ³ , Kranji ¹²	Leguminosae	The wood provides timber for cabinet work and chartwheels and paper pulp	van Valkenburg (2002)
<i>Pterospermum diversifolium</i> Blume	Bayur ¹ , Wadang ³ .	Malvaceae	The wood for joinery, flooring furniture, cladding, striking tool handles, implements and plywood also used in ship and bridge building suitable for construction under cover; e.g. for boards, beams, joists and rafters	Boer and Lemmens (1998)
<i>Rauvolfia sumatrana</i> Jack	Lame Lalaki ² , Tampa Badak ⁸ , Polay Lakek ¹² ,	Apocynaceae	The lightweight wood is sometimes used for planks and small objects such as knife handles	Ly and Mai (1999)
<i>Sandoricum koetjape</i> (Burm.f.) Merr	Kecapi, Kentuat, Sentul ¹	Meliaceae	The wood for construction, carpentry, household utensils and implements	Sotto (1992)
<i>Semecarpus heterophylla</i> Blume	Rengas Gunung ² , Ingas ³ , Lungas Delok ⁸	Anacardiaceae	The wood for temporary construction, mouldings, interior finishes, boxes and crates	Hou (1998 a)
<i>Spondias pinnata</i> (L. f.) Kurz	Kedongdong ¹ , Kedongdong Leuweung ² , Kacemcem ⁹	Anacardiaceae	Timber for packing cases, floats, canoes, matches, and non-ornamental plywood	Anon. (1999)
<i>Sterculia cordata</i> Blume	Hantap Heulang ² , Kayu Binong ³ , Gelumpang Padang ⁴	Sterculiaceae	The wood for timber	Lemmens et al. (1995)
<i>Syzygium polyanthum</i> (Wight) Walp.	Salam, Manting ³ , Ubar Serai ⁸	Myrtaceae	The timber for house building	Haron et al. (1995)
<i>Syzygium racemosum</i> (Blume) DC	Kopo Mangud, Resep ³ , Klampok Bato ¹²	Myrtaceae	The timber for house building	Haron et al. (1995)
<i>Syzygium syzygoides</i> (Miq.) Merr. & L.M.Perry	Ki Sereum ² , Manting ³ , Mengkelingan ²¹	Myrtaceae	The timber for house building	Haron et al. (1995)
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Jaha Kebo, Jaha Sapi ³ , Ulu Belu ⁸	Combretaceae	The wood for boxes, furniture, and house construction after being steeped in water to make it more durable The tree also yields a good-quality firewood and charcoal	Sosef et al. (1995)
<i>Terminalia catappa</i> L.	Ketapang ¹	Combretaceae	The wood for house and boat construction, furniture, and cabinet-making	Sosef et al. (1995)
<i>Vitex glabrata</i> R. Br.	Ketileng, Bigbul, Gentileng ³	Lamiaceae	The timber for house construction and furniture	Sunarno et al. (1995)
<i>Zanthoxylum rhetsa</i> (Roxb.) DC	ki tanah ² , kayu lemah ³ , kaju tana ¹²	Rutaceae	The wood to build small houses, tools, and knife sheaths	Boer et al. (1998); Heyne (1987)

Ornamental plants

<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob.	Teklan ³	Compositae	As an ornamental plant but in some areas has become a troublesome weed	Anon. (1997)
<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	Ornamental tree with changing colour of fruits	Lemmens (2003)
<i>Asplenium nidus</i> L.	Paku Sarang Burung ¹	Aspleniaceae	Ornamental plants	Rusea (2003)
<i>Barringtonia racemosa</i> (L.) Spreng.	Penggung ^{2,3} , Putat Sungai ⁴ , Butun Darat ⁵ .	Lecythidaceae	Planted as a roadside tree	Yaplito (2002)
<i>Cycas circinalis</i> L.	Pakis Haji, Pakis Raja ¹	Cycadaceae	Ornamental plant	Anon. (1992)
<i>Cissus javana</i> DC.	Beubeureumen ² , Mirah ³ , Rabet Dara ¹²	Vitaceae	Ornamental plant	Anon. (1994)
<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	Dahu ¹ , Sengkuang ⁶ , Basuong ¹³	Anacardiaceae	The tree is planted as an ornamental in roadside plantings	Louman et al. (1995)
<i>Fagraea ceilanica</i> Thunb.	Tamosu ⁸ , Kolaki, Nosu ¹⁰	Gentianaceae	Planted as ornamental trees along roads and avenues, because of their handsome, slender appearance and their fragrant or large flowers.	Hildebrand et al. (1995)
<i>Guettarda speciosa</i> L.	Jati Pasir, Titi Laut ¹¹ , Kenjang-kenjang ¹²	Rubiaceae	The fragrant flowers are used as decoration (garlands)	Ong (1998)
<i>Mitrephora polypyrena</i> (Bl.) Miq.	Janglot, Kalak Sapi ³ , Tapai Bunga ⁸	Annonaceae	Cultivated as an ornamental and has been used as cover crop in forest plantations	Boer and Sosef (1998 b)
<i>Pandanus tectorius</i> Parkinson ex Du Roi	Pandan Puduk ¹	Pandanaceae	Grown worldwide as ornamentals for their attractive yellow and green striped leaves, indoors in temperate regions and outdoors in the tropics	Brink and Jansen (2003)
<i>Pongamia pinnata</i> (L.) Pierre	Ki Pahang Laut ² , Bangkong ³ , Kranji ¹²	Leguminosae	Ornamental plants because of its attractive flowers	van Valkenburg (2002)
<i>Sandoricum koetjape</i> (Burm.f.) Merr	Kecapi, Kentuat, Sentul ¹	Meliaceae	Excellent shade trees with ornamental values	Sotto (1992)
<i>Scaevola taccada</i> (Gaertn.) Roxb.	Babakoan ² , Dudulan ³ , Subong-subong ¹⁷	Goodeniaceae	Ornamental plant	Wardini (2002)
<i>Terminalia catappa</i> L.	Ketapang ¹	Combretaceae	The trees as shade trees in gardens and along roads.	Sosef et al. (1995)

Natural dyes

<i>Mangifera indica</i> L.	Mangga, Mempelam ¹	Anacardiaceae	The bark yields a yellowish-brown dye for silk	Boer et al. (1995)
<i>Mammea odorata</i> Kosterm.	Kembang Satu ^{1,11} , Kapurancak ³ , Lolang Waran ¹¹	Calophyllaceae	The heartwood yields a red dye	Wiselius (1998 b)
<i>Myristica teijsmannii</i> Miq.	Kosar, Sibungan ² , Durenan ³	Myristicaceae	The bark yields a red dye to colour paper	Heyne (1987) Risna (2009)
<i>Pterospermum diversifolium</i> Blume	Bayur ¹ , Wadang ³ .	Malvaceae	The bark yields a yellow dye	Boer and Lemmens (1998)
<i>Syzygium polyanthum</i> (Wight) Walp.	Salam, Manting ³ , Ubar Serai ⁸	Myrtaceae	The bark for tanning fishing-nets and for dyeing matting	Haron et al. (1995)
<i>Syzygium racemosum</i> (Blume) DC.	Kopo Mangud, Resep ³ , Klampok Batu ¹²	Myrtaceae	The bark yields a black dye	Haron et al. (1995)
<i>Syzygium syzygoides</i> (Miq.) Merr.& Perry	Ki Sereum ² , Manting ³ ,	Myrtaceae	The bark yields a brown or black dye and for tanning fishing-nets	Haron et al. (1995)

<i>Terminalia bellirica</i> Gaertner (Roxb)	Jaha Kebo, Jaha Sapi ³ , Ulu Belu ⁸	Combretaceae	Fruits containing tannin and a dye are used to tan leather and dye cloth and matting, and to prepare ink	Sosef et al. (1995)
<i>Terminalia catappa</i> L.	Ketapang ¹	Combretaceae	The bark and the leaves are used for tanning leather and for dyeing cloth, and making ink, Green fruits are used for the same purpose	Sosef et al. (1995)
Other purposes				
<i>Acronychia pedunculata</i> (L.) Miq.	Jejerukan ² , Kayu Semidra, Sarirah ³ , Teklan ³	Rutaceae	The bark for caulking boats and toughening fishing nets The wood for firewood	Tue and Sosef (1998)
<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob.		Compositae	As green material for composting, and as a cover crop to check erosion on slopes and terrace walls and the spread of <i>Imperata cylindrica</i> L. Raeuschel	Anon. (1997)
<i>Antidesma bunius</i> (L.) Spreng.	Buni ¹ , Huni ² , Wuni ³	Phyllanthaceae	Applied in reforestation projects, it has high adaptability to dry environment	Lemmens (2003) Rindyastuti and Hapsari (2017) Rusea (2003)
<i>Asplenium nidus</i> L.	Paku Sarang Burung ¹	Aspleniaceae	Young <i>A. nidus</i> leaves as a contraceptive To improve hair growth by frequent washing of the hair with a decoction of a mixture of ground leaves and coconut milk	
<i>Buchanania arborescens</i> (Blume) Blume	Getasan ³ , Rawa-rawa Pipit ⁶ .	Anacardiaceae	Tannin from the bark for toughening fishing nets As a shade tree for dry, sunny sites and poor soils	Sulistiarini (1998)
<i>Canarium hirsutum</i> Willd.	Ki Bonteng ² , Mede-mede ⁵ , Kanari Jaki ¹⁰	Burseraceae	The resin for torches and as a glue	Kochummen et al. (1995)
<i>Canarium indicum</i> L.	Kenari Ambon ² , Kanari Bagea ⁵ , Kanari Ternate ¹⁰ ,	Burseraceae	An oil extracted from the seeds serves as a substitute for coconut oil	Kochummen et al. (1995)
<i>Chydenanthus excelsus</i> (Blume) Miers	Besole, Blundeng, Brosol, Emprak, Leprak ³ .	Lecythidaceae	Fuelwood	Heyne (1987)
<i>Croton tiglium</i> L.	Kemalakian ⁷ , Ceraken ³ , Simalakian ⁷	Euphorbiaceae	For production of soap	van Welzen and Esser (2002)
<i>Cinnamomum iners</i> Reinw. ex Blume	Ki Teja ^{2,3} , Kacengal ¹² , Medang Kalong ²¹	Lauraceae	The mucilage has found technical applications; e.g in the manufacture of mosquito coils, fragrant joss-sticks, plastic products, formica, glue, inner layering of tyres, coating of high quality paper products, joints, and fibre glass The tree as a shade tree	Wiselius et al. (1995)
<i>Cyperus elatus</i> L.	Lilisungan ² , Wlingi ³ , Tintilohuangga ¹⁰	Cyperaceae	Weaving hats and mats Forage for cattle	Dasuki (2003)
<i>Artocarpus elasticus</i> Reinw. ex Blume	Teureup ² , Benda ³ , Mengko ⁸	Moraceae	The latex for birdlime and the bark is prepared for cloth and rope by aboriginal tribes.	Djarwaningsih et al. (1995)
<i>Derris elliptica</i> (Wall.) Benth.	Tuwa Leteng ² , Tuba, Oyod Tungkul ³	Leguminosae	The powdered root as an insecticide	Hamid (1999)
<i>Diospyros maritima</i> Blume	Kunyit ³ , Kayu Itam Lewo ¹⁰ , Belu Itam Perempuan ²²	Ebenaceae	The pale wood: used locally; e.g. for musical instruments, furniture, inlaying and novelties good quality charcoal	Soerianagara et al. (1995)

<i>Drypetes longifolia</i> (Blume) Pax & K.Hoffm	Buniyaga ² , Batung ³ , Kikir Daun Besar ⁶	Putranjivaceae	For manufacture of paper	Boer and Sosef (1998a)
<i>Fagraea ceilanica</i> Thunb.	Tamosu ⁸ , Kolaki, Nosu ¹⁰	Gentianaceae	The latex under the epidermis of the fruits as a glue used as a fly trap The leaves for feed stock	Hildebrand et al. (1995)
<i>Ficus microcarpa</i> L. f	Preh ³	Moraceae	Shade trees	Rojo et al. (1999)
<i>Pandanus furcatus</i> Roxb.	Harashas ² , Panan Kowang ³	Pandanaceae	The wood is used to make floats for fishing nets, covers for quivers For matting, woven, untrimmed leaves Pandanus leaves are usually reduced to strips for weaving a range of articles, from small hand bags and containers to large floor mats or light interior wall panels. Leaves potential sources of weaving material, and serve for thatching The leaves, stems or prop roots may be retted to obtain fibres which are used for twine and ropes	Brink and Jansen (2003)
<i>Pandanus tectorius</i> Parkinson ex Du Roi	Pandan Puduk ¹	Pandanaceae	The leaves are made into hats, mats, sacks, cordage, baskets, umbrellas, and other articles	Brink and Jansen (2003)
<i>Phaleria capitata</i> Jack	Kakapasan ² , Lawe ³	Thymelaceae	The tough fibre from the inner bark is used as tying material and for making cordage	Anon. (2003)
<i>Pongamia pinnata</i> (L.) Pierre	Ki Pahang Laut ² , Bangkong ³ , Kranji ¹²	Leguminosae	Dried leaves are stored with grain to repel insects The bark can be made into rope The oil is applied as a lubricant, as a leather dressing in the traditional Indian tanning industry, and in manufacturing soap, varnish, and paint For reforestation of marginal land, its extensive root system making it valuable for checking erosion	van Valkenburg (2002)
<i>Premna serratifolia</i> L.	Ki Pahan ² , Singkil Alas ³	Lamiaceae	The wood is used for implements and paddles, the bark as binding material. The plant is usually used as hedges.	Cardenas (1999)
<i>Pterospermum diversifolium</i> Blume	Bayur ¹ , Wadang ³	Malvaceae	The wood is suitable for matches and for the production of wood-wool boards The pulp is suitable for making paper	Boer and Lemmens (1998)
<i>Scaevola taccada</i> (Gaertn.) Roxb.	Babakoan ² , Dudulan ³ , Subong-subong ¹⁷	Goodeniaceae	The bark is locally used for toughening fishing nets The wood from the base of the mature stems is used as nails in traditional boat building. The plant is used for soil stabilization and wind and salt spray protection in coastal zones	Wardini (2002)
<i>Spondias pinnata</i> (L. f.) Kurz	Kedongdong ¹ Leuweung ² , Kacemcem ⁹	Anacardiaceae	For unbleached wood pulp	Anon. (1999)

*) Note: 1. Indonesia 2. Sunda 3. Java 4. Bangka 5. Moluccas 6. Kalimantan 7. Minangkabau 8. Sumatra 9. Bali 10. Sulawesi 11. Ambon, 12. Madura 13. Irian Jaya 14. Lampung 15. Manado 16. Biak 17. Bengkulu 18. Timor 19. Halmahera 20. Ternate 21. Belitung 22. Seram 23. Batak

Natural dyes

Nine plant species have been recorded to be used for natural dyes (Table 11): the bark of *Mangifera indica* provides a yellowish-brown dye, the heartwood of *Mammea odorata* provides a red dye, the bark of *Pterospermum diversifolium* provides a yellow dye, the bark of *Syzygium racemosum* provides a black dye, and *Syzygium syzygoides* provides a brown or black dye. These natural dyes have potential to be developed as natural colouring for fabrics such as batik, for food and for beverages. Further research is required into the efficacy and safety of their use in colouring food, beverages, fabrics, and for other purposes. Natural dyes are in high demand as environmental friendly products, as a result of concern over the adverse impacts of synthetic dyes on the environment and on health.

Other uses

There were 25 plant species that have other uses; such as for shampoo and hair improvement, shade trees, woven hats and mats, reforestation, wood pulp, forages, and other uses (Table 12). A decoction of a mixture of ground leaves of *Asplenium nidus* and coconut milk can be used for shampoo and hair growth improvement. Some plant species can also be used for shade trees, such as *Buchanania arborescens*, *Cinnamomum iners*, *Ficus microcarpa*, *Sandoricum koetjape*, and *Terminalia catappa*. Woven hats and mats can be made from leaves of *Cyperus elatus* and *Pandanus tectorius*. Some other plant species are useful for reforestation, such as *Pongamia pinnata*. The leaves of *Fagraea ceilanica* can be used as forage to feed livestock. Wood of *Spondias pinnata* is a good source for unbleached pulp.

Implications for conservation

Overall, the present study, based on the knowledge of local informants and on a review of ethnobotanical literature, provides empirical data on the plant species of Segara Anakan area, Sempu Island, East Java; on their conservation status; and on potential uses of the plants. Further research is required on the biochemical, pharmaceutical, and pharmacological value of the plants as well as on the possible development from them of prospective products for the industrial sector. Developing useful products from the local plant life has the potential to raise the socio-economic level of communities near the island.

The rich diversity of plant life in the Segara Anakan area needs to be conserved, with priority to be given to plant species on the IUCN Red List. Developing new potential uses of the plants for the local communities near Sempu Island can provide a strong incentive for conservation of the plant life. However, development of the potential uses of the plant species requires pro-active consideration of their conservation in order to avoid the kind of over-exploitation that would result in decline in biodiversity, or even threaten the survival of the plant species (Lopez-Pujol et al. 2006).

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