Composition of Trees Grown Surrounding Water Springs at Two Areas in Purwosari Pasuruan, East Java

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ABSTRACT

The aim of the research was to find out the composition of trees grown surrounding water springs at two areas in Purwosari, Pasuruan, East Java. Eleven plots for each area were observed. The data were analyzed using Mueller-Dombois's method to calculate their importance value indexes, while Shannon-Wiener's formula was used for determining the diversity index. The coordinate and altitude of every water spring or its group's site was determined using Geographical Position System (GPS) to know their positions on the map. The result indicated that there were at least 30 families, 49 genera which consisted of 68 species of trees grown surrounding water springs at the first area with 5.49 of diversity index, while the second area, consisted of 34 families, 63 genera and 79 species of trees with 5.24 diversity index. The diversity of trees species from Moraceae was the highest among other families, both at the first and the second area, whereas, trees species having a significant important value index included Bambusa blumeana, Dendrocalamus asper, Ficus racemosa, Horsfieldia irya and Ficus virens. The position of the springs in the two areas within the sub-districts of Purwosari is in the range of 7°44'448" south latitude; 112°44'353" east longitude up to 7°46'339" south latitude; 112°41'190" east longitude at an altitude between 251 and 522 m above sea level. We hope that the information can be used as an alternative guidance to restore or to conserve such areas in order to save and sustain trees diversity and their habitat.

Keywords: composition, trees, water springs, Purwosari, Pasuruan.

BACKGROUND

Plants play a fundamental role in maintaining the basic ecosystem functions and the quality of life on earth. Not only do they produce breathable oxygen, but they also take up carbon dioxide as they photosynthesize. All life depends on the ability of plants to capture the energy in sunlight and to convert it into the chemical energy. They provide the essential things for humans well-being: the varied food, the medicines, the materials with which we build our homes, fashion of our clothing, and the fuel that powers our energy. Plants are also an integral part of the processes that distribute and purify the water. They help to hold soil in place and to renew its fertility, provide natural food control, detoxify and decompose waste, and to purify the water and stabilize the climate.

In general, different plant species have different requirements in term of climate, soil type aspects and their essential biological relationships. For these reasons, the different plants communities are found in different habitats [1]. However, some plant species have a wide tolerance ranging their requirements; often, we find communities that vary in the same habitat, or the vice versa. Viewed from the conservation aspect, because of habitat destruction that has been reported elsewhere, a study on trees composition grown surrounding water springs is necessary. Based on the results of trees composition study, various follow-up activities can be done, for example the selection species, phenological studies, propagation and development of seedlings for reforestation or restoration. Thus, the expected quality of greening can be increased based on the advance and actual data, so that the multifunctional role of greening not only serves as a conservation area but also serves as a conservation of local species diversity, conservation of springs, improvement in the uptake of carbon dioxide and sustainable habitat restoration. The aim of the research was to find out the composition of
trees grown surrounding water springs at two areas in Purwosari, Pasuruan, East Java.

**MATERIALS AND METHODS**

The two areas observed are administratively located in Purwosari, Pasuruan. The first area is located in the village of Sekarmojo-Cendono and the second is located in the village of Pucangsari-Pager-Kucur. Eleven plots for each area were observed. The data were analyzed using Mueller-Dombois’s method to calculate the importance value index, while Shannon-Wiener’s formula was used for determining the diversity index [2]. The coordinate and altitude of every water springs or its group’s site was determined using Geographical Position System (GPS) to know the elevation of water spring places and their positions on the map.

**RESULT AND DISCUSSION**

The results of the study indicated that at least 30 families, 49 genera which consisted of 68 species of trees grown surrounding water springs at the first area with 5.49 of diversity index, while the second area consisted of 34 families, 63 genera and 79 species of trees with 5.24 diversity index. The composition of families and trees species are presented in Table 1 and 2.

From Figure 1 and 2, it can be seen that the composition of tree species of Moraceae is higher than the other families which reach 14 and 11 species respectively, followed by Mimosaceae, Poaceae, Myrtaceae, Euphorbiaceae in the first area and Euphorbiaceae, Myrtaceae, Anacardiaceae, Sterculiaceae in the second area. Moraceae is one of the family of flowering plants, the tribe of Rosales. This tribe also includes the genus of *Ficus*. Most of the Moraceae family grows in the lowland tropics and even the genus of *Ficus* distribution centers on Indo-Malesia regions including Indonesia, Malaysia, the Philippines, Brunei, and Papua New Guinea. Some *Ficus* species can be classified as a key species (keystone species) because of its fruit. It is preferred to eat by animals, so it is potential if it is planted as a material for improving the environment quality [3,4,5,6].

In accordance to the restoration and maintenance of water resources, some species of the genus of *Ficus* have specific characteristics, such as deep and broad rooting, many branches in low position, and broad canopy potential to reduce the speed of rainfall grains. Thus the destructive force on the surface layer of soil is low, and the infiltration of water into the ground is better. As the result, water is retained relatively longer in the soil and is released slowly, allowing the continuity of spring and reducing erosion or landslides [7].

![Figure 1](image1.png)

**Figure 1.** Families composition and Tree species number in the First Area (Sekarmojo-Cendono)
Figure 2. Families composition and Tree species number in the second Area (Pucangsari-Pager-Kucur)

Figure 3. The positions of Springs or Spring groups in Two Areas in the Sub-District of Purwosari (Yellow dot); first area (a); and the second area (b); Map quoted from: Pasuruan SIMTARU.

From Figure 2, there are two families that were quite interesting to inform, namely the Rhizophoraceae and Dipterocarpaceae. Among the better known members of Rhizophoraceae family are mangrove trees, the genus of *Rhizophora*[8]. *Rhizophora* species generally live in intertidal zones which are inundated daily by the ocean. They exhibit a number of adaptations to this environment, including stilt-roots that elevate the plants above the water and allow them to respire oxygen even while their lower roots are submerged[9]. Some other genus can be grown on land [8] and the only one species found in this study is *Carallia brachiata* (Lour.) Merr. Its habitat generally is in evergreen forest, especially along rivers, below 400 m [10;11].

In this study, *C. brachiata* was found on the riverbank at an altitude of 256 m above sea level. The difference between the mangrove species and other species that typically grow in the land can be seen from the character of the seeds. Mangrove species are usually viviparous while those living on land are not[8]. Another family is Dipterocarpaceae. It has 17 genera and
approximately 500 species of mainly tropical lowland rainforest trees. Many are large forest emergent species, typically reaching heights of 40–70 m tall, some even over 80 m and one of them is genus Hopea. Their distribution is pantropical and the greatest diversity of Dipterocarpaceae occurs in Borneo. Some species are now endangered [12]. In Java there are two species Hopea, H. celebica and H. sangal [13]. Both species are now rarely found in Java[13]. In more detail, according to [14] and [15], the population of H. celebica is endangered A1cd+2cd, B1+2c ver 2.3 while H. sangal is critically endangered A1cd, B1+2c, C1, D ver 2.3. H. Sangal generally spreads on clay-rich soil on river banks or hillsides up to 500 m [16]. The only species and the only specimen of the family Dipterocarpaceae found in this study is H. sangal. It was found on the edge of the water source at an altitude of 522 m above sea level. Some seeds have been collected and been successfully germinated in the nursery of the Purwodadi Botanical Gardens.

Other species that have also been collected and been successfully germinated in the nursery are Horsfieldia irya (Myristicaceae) and Baringtonia insignis (Lecythidaceae). The later three species, Hopea sangal, Horsfieldia irya and Baringtonia insignis were collected by the Botanical Gardens. Therefore, those plants are expected to be added as new collection at the Purwodadi Botanical Gardens. I think this work provides sufficient information valuable for the conservation interests, either in national or international standards, especially when viewed from the standpoint of the basic tasks and functions of botanical gardens as well as international conservation targets such as conservation targets that are packed in the Global Strategy for Plant Conservation [17].

Based on Table 1 and 2, it can be seen that the composition of tree species with the highest importance value index, both in the first and the second area, was Bambusa blumeana from Poaceae. This is understandable because bamboo typically grows in clumps; thus affecting the number of individuals in each plot observation. Consequently, this would influence the significance of the important value index. Bambusa blumeana is commonly known growing in tropical Asia[18]. Unless Bambusa blumeana, there are also some species that are co-dominant such as, Dendrocalamus asper, Ficus racemosa, Horsfieldia irya, and Ficus virens. Dendrocalamus asper which also grow in clumps, while the significance of Ficus racemosa, Horsfieldia irya, and Ficus virens is more influenced by their stem diameter, which on average is quite large.

**The Spring Position on the Map**

The positions of the springs in the two areas within the sub-districts of Purwosari are in the range of 7°44'448" south latitude; 112°44'353" longitude up to 7°46'339" south latitude; 112°41'190" longitude at an altitude between 251 and 522 m above sea level. The position of the spring and the spring groups are listed in Figure 3ab.

**CONCLUSION**

At least 30 families, 49 genera which consisted of 68 species of trees grown at surrounding water springs at the first area with 5.49 of diversity index, while the second area consisted of 34 families, 63 genera and 79 species of trees with 5.24 diversity index. The composition of trees species from Moraceae was the highest among other families, both at the first and the second area, whereas trees species having a significant important value index include Bambusa blumeana, Dendrocalamus asper, Ficus racemosa, Horsfieldia irya and Ficus virens. The positions of the springs in the two areas within the sub-districts of Purwosari are in the range of 7°44'448" south latitude; 112°44'353" east longitude up to 7°46'339" south latitude; 112°41'190" east longitude at an altitude between 251 and 522 m above sea level. From this study it was recorded that at least three species, Hopea sangal, Horsfieldia irya and Baringtonia insignis are expected to be added as new collections at Purwodadi Botanical Garden.

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**Supplementary Data**

Table 1. Tree Species composition and Importance Value Index at the First area (Sekarmo)-Cendono)

| No. | Species                                      | Family | FR  | KR  | DR  | IV   | Hi   |
|-----|---------------------------------------------|--------|-----|-----|-----|------|------|
| 1   | *Bambusa blumeana* Schult.f.                | Poac.  | 4.88| 30.22| 5.27| 40.370| 1.220|
| 2   | *Dendrocalamus asper* (Roem. & Schult.f.) Backer ex Heyne | Poac.  | 4.07| 27.75| 5.77| 37.582| 1.142|
| 3   | *Ficus racemosa* L.                         | Morac. | 3.25| 0.96 | 25.59| 29.802| 0.089|
| 4   | *Syzygium javanicum* Miq.                   | Myrt.  | 2.44| 1.79 | 8.24 | 12.463| 0.121|
| 5   | *Syzygium picnicatum* Merr. & L.M. Perry    | Morac. | 4.88| 4.26 | 3.12 | 12.261| 0.288|
| 6   | *Ceiba pentandra* (L.) Gaertn.              | Bombac.| 4.07| 3.71 | 4.10 | 11.874| 0.257|
| 7   | *Alstonia scholaris* (L.) R. Br.            | Apoc.  | 2.44| 1.10 | 6.32 | 9.859 | 0.083|
| 8   | *Saraca indica* L.                          | Caesal.| 1.63| 3.85 | 3.87 | 9.338 | 0.200|
| 9   | *Dysoxylum geandichidianum* (A. Juss.) Miq. | Meliac.| 3.25| 1.24 | 4.53 | 9.022 | 0.107|
| 10  | *Arruga pinnata* (Wurmb) Merr.              | Arec.  | 4.88| 1.79 | 2.29 | 8.952 | 0.147|
| 11  | *Ficus benjamina* L.                        | Morac. | 1.63| 0.41 | 6.19 | 8.227 | 0.036|
| 12  | *Artocarpus elasticus* Reinw. Ex Blume      | Morac..| 2.44| 0.69 | 1.71 | 4.834 | 0.060|
| 13  | *Ficus kurzii* King                         | Morac. | 1.63| 0.69 | 2.34 | 4.650 | 0.056|
| 14  | *Tectona grandis* L.f.                      | Verb.  | 2.44| 1.10 | 0.27 | 3.807 | 0.089|
| 15  | *Pinus merkusii* Jungh & de Vriese          | Pinac. | 0.81| 2.06 | 0.92 | 3.791 | 0.115|
| 16  | *Ficus variegata* Bl.                       | Morac. | 2.44| 0.41 | 0.74 | 3.587 | 0.039|
| 17  | *Dendrocnide simulans* (L.f.) Chew          | Urt.   | 1.63| 0.55 | 1.18 | 3.352 | 0.046|
| 18  | *Syzygium polyanthum* (Wight) Walp          | Myrt.  | 1.63| 0.96 | 0.62 | 3.203 | 0.073|
| 19  | *Sapindus tarax DC.*                        | Sapind.| 2.44| 0.41 | 0.22 | 3.075 | 0.039|
| 20  | *Persea americana* Mill.                    | Laur.  | 1.63| 0.96 | 0.18 | 2.763 | 0.074|
| 21  | *Albizia chinensis* (Osb.) Merr.            | Fab.   | 1.63| 0.55 | 0.54 | 2.713 | 0.046|
| 22  | *Biscia javanica* Blume                     | Euph.  | 0.81| 0.41 | 1.46 | 2.690 | 0.033|
| 23  | *Ficus* sp. 1                              | Morac. | 0.81| 0.69 | 1.14 | 2.636 | 0.049|
| 24  | *Artocarpus altilis* (Park. Ex Zoll.) Forsberg | Morac. | 1.63| 0.55 | 0.44 | 2.616 | 0.047|
| 25  | *Ficus tinei* W. Aiton                      | Morac. | 1.63| 0.27 | 0.66 | 2.560 | 0.026|
| 26  | *Ficus superba* (Miq.) Miq.                 | Morac. | 0.81| 0.14 | 1.55 | 2.505 | 0.013|
| 27  | *Swietenia macrophylla* King                | Meliac.| 0.81| 1.51 | 0.17 | 2.498 | 0.091|
| 28  | *Gigantochloa atter* (Hassk.) kurz ex Munro | Poac.  | 0.81| 1.37 | 0.21 | 2.393 | 0.085|
| 29  | *Terminalia microcarpa* Deene               | Combret.| 0.81| 0.14 | 1.43 | 2.383 | 0.013|
| 30  | *Salix tetraspina* Roxb.                    | Salic. | 1.63| 0.41 | 0.34 | 2.376 | 0.036|
| 31  | *Spatheodea campanulata* Beauv.             | Bign.  | 1.63| 0.41 | 0.33 | 2.371 | 0.036|
| 32  | *Sterculia occineae* Jack                   | Sterc. | 0.81| 0.27 | 1.12 | 2.207 | 0.023|
| 33  | *Sterculia macrophylla* Vent.               | Sterc. | 0.81| 0.69 | 0.70 | 2.204 | 0.049|
| 34  | *Bombax ceiba* L.                           | Bombac.| 0.81| 0.14 | 1.20 | 2.154 | 0.013|
| 35  | *Moringa pterygosperma* Gaertn.             | Moring.| 1.63| 0.41 | 0.07 | 2.110 | 0.036|
| 36  | *Cananga odorata* (Lam.) Hook.f. & Thomson | Annon. | 1.63| 0.27 | 0.18 | 2.085 | 0.026|
| 37  | *Artocarpus heterophyllus* Lam.             | Morac. | 1.63| 0.27 | 0.13 | 2.030 | 0.013|
| 38  | *Garuga floribunda* Deene                  | Burs.  | 0.81| 0.27 | 0.83 | 1.916 | 0.023|
| 39  | *Durio zibethinus* Merr.                    | Bombac.| 0.81| 0.27 | 0.45 | 1.338 | 0.023|
| 40  | *Gloucidion mel Blume*                      | Euph.  | 0.81| 0.55 | 0.09 | 1.453 | 0.041|
| 41  | *Ficus rumphii* Blume                       | Morac..| 0.81| 0.41 | 0.21 | 1.439 | 0.033|
| 42  | *Horsfieldia irya* (Gaertn) Warb.           | Myrist.| 0.81| 0.27 | 0.29 | 1.376 | 0.023|
| No. | Species                                      | Family     | KR  | DR  | FR  | IV  | Hi  |
|-----|---------------------------------------------|------------|-----|-----|-----|-----|-----|
| 43  | Leucaena leucocephala (Lam.) de Wit          | Mim.       | 0.81 | 0.41 | 0.13 | 1.357 | 0.033 |
| 44  | Lannea coromandelica (Houtt.) Merr.          | Anac.      | 0.81 | 0.14 | 0.36 | 1.308 | 0.013 |
| 45  | Ficus retusa Auct. Non L.                    | Morac.     | 0.81 | 0.14 | 0.36 | 1.308 | 0.013 |
| 46  | Lansium domesticum Corr.                     | Meliac.    | 0.81 | 0.14 | 0.25 | 1.199 | 0.013 |
| 47  | Ficus callosa Willd.                         | Morac.     | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 48  | Parkia speciosa Hassk.                       | Mim.       | 0.81 | 0.27 | 0.10 | 1.190 | 0.023 |
| 49  | Syzygium cumini (L.) Skeels                  | Myrt.      | 0.81 | 0.27 | 0.06 | 1.150 | 0.023 |
| 50  | Areca cathecu L.                             | Arec.      | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 51  | Milicia champaca L.                          | Magnol.    | 0.81 | 0.27 | 0.05 | 1.142 | 0.023 |
| 52  | Parkia timorriana (DC.) Merr.                | Mim.       | 0.81 | 0.27 | 0.05 | 1.136 | 0.023 |
| 53  | Hibiscus tiliaceus L.                         | Malv.      | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 54  | Pterocarpus indicus Willd.                   | Papil.     | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 55  | Alnus neglecta North. Ex Miq.                | Lecac.     | 0.81 | 0.27 | 0.05 | 1.142 | 0.023 |
| 56  | Ficus callosa Willd.                         | Morac.     | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 57  | Hibiscus tiliaceus L.                         | Morac.     | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 58  | Ficus elástica Nats. Ex Bl.                  | Morac.     | 0.81 | 0.14 | 0.12 | 1.072 | 0.013 |
| 59  | Pterocarpus indicus Willd.                   | Papil.     | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 60  | Syzygium cumini (L.) Skeels                  | Myrt.      | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 61  | Trema orientalis (L.) Bl.                    | Ulm.       | 0.81 | 0.14 | 0.09 | 1.040 | 0.013 |
| 62  | Litsea noronhae Bl.                          | Laur.      | 0.81 | 0.14 | 0.06 | 1.013 | 0.013 |
| 63  | Morinda citrifolia L.                        | Rub.       | 0.81 | 0.14 | 0.06 | 1.013 | 0.013 |
| 64  | Alnus neglecta North. Ex Miq.                | Lecac.     | 0.81 | 0.27 | 0.05 | 1.142 | 0.023 |
| 65  | Areca cathecu L.                             | Arec.      | 0.81 | 0.14 | 0.16 | 1.110 | 0.013 |
| 66  | Sterculia cordata Blume                      | Sterec.    | 0.81 | 0.14 | 0.04 | 0.990 | 0.013 |
| 67  | Tabernaemontana sphaerocarpa Blume           | Poac.      | 0.81 | 0.14 | 0.02 | 0.973 | 0.013 |

Description: KR: Relative Density; DR: Relative dominance; FR: Relative Frequency; IV: Importance value Index; Hi: Diversity Index.
Table 2. Tree Species composition and Importance Value Index at the Second area (Pucangsari-Pager-Kueur)

| No. | Species                        | Family       | FR   | KR   | DR   | IV   | Hi   |
|-----|--------------------------------|--------------|------|------|------|------|------|
| 1   | Bambusa blumeana Schult.f.     | Poac.        | 2.14 | 39.67| 3.01 | 44.819 | 1.029|
| 2   | Horsfieldia irya (Gaertn.) Warb.| Myrist.      | 2.86 | 4.86 | 10.91| 18.635 | 0.278|
| 3   | Vicus virini W. Aron           | Morac.       | 2.14 | 0.91 | 15.24| 18.298 | 0.075|
| 4   | Ceiba pentandra (L.) Gaertn.   | Bombac.      | 1.43 | 3.95 | 7.26 | 12.642 | 0.200|
| 5   | Barringtonia insignis (Bl.) Miq.| Lecyth.      | 1.43 | 5.47 | 1.86 | 8.757  | 0.268|
| 6   | Vicus benjamina L.             | Morac.       | 2.14 | 0.46 | 6.02 | 8.618  | 0.043|
| 7   | Artocarpus elasticus Reinw. Ex Blume | Morac.      | 2.86 | 1.82 | 3.58 | 8.258  | 0.138|
| 8   | Alstonia scholaris (L.) R. Br. | Apoc.        | 2.86 | 0.61 | 4.41 | 7.876  | 0.057|
| 9   | Syzygium syzygioides (Miq.) Amshoff | Myrt.       | 0.71 | 0.30 | 5.29 | 6.309  | 0.025|
| 10  | Diospyros bactiti Zoll.         | Eben.        | 2.14 | 2.74 | 1.51 | 6.193  | 0.176|
| 11  | Dracontomelon dao (Blanco) Merrl & Rolfe | Anac.      | 1.43 | 1.67 | 2.85 | 5.948  | 0.115|
| 12  | Glirichidia mole Blume         | Euph.        | 2.86 | 1.98 | 0.90 | 5.734  | 0.134|
| 13  | Syzygium picanatum Merr. & L.M. Perry | Myrt.      | 2.86 | 2.13 | 0.72 | 5.709  | 0.159|
| 14  | Buchanania arborescens (Blume) Blume | Anac.       | 2.86 | 1.37 | 1.39 | 5.613  | 0.111|
| 15  | Areca catechum L.              | Arec.        | 2.14 | 3.19 | 0.26 | 5.590  | 0.202|
| 16  | Syzygium littorale (Blume) Amshoff | Myrt.       | 2.86 | 1.22 | 1.15 | 5.220  | 0.099|
| 17  | Dendrocalamus asper (Schult.f.) Backer ex Heyne | Poac.      | 0.71 | 3.80 | 0.54 | 5.058  | 0.179|
| 18  | Dyssoxylum guiboureetianum (A.Juss.) Miq. | Meliac.   | 2.86 | 0.76 | 1.43 | 5.047  | 0.068|
| 19  | Sterculia foetida L.           | Stere.       | 1.43 | 1.22 | 2.34 | 4.986  | 0.084|
| 20  | Parkia timoriana (DC.) Meer.   | Mim.         | 1.43 | 0.46 | 2.79 | 4.674  | 0.040|
| 21  | Antocephalus chinensis (Lam.) Rich. Ex Walp | Ru.        | 2.14 | 1.06 | 1.39 | 4.592  | 0.082|
| 22  | Terminalia microcarpa Deene    | Combret.     | 2.14 | 0.46 | 1.61 | 4.211  | 0.043|
| 23  | Bischofia javanica Bl.         | Euph.        | 1.43 | 0.91 | 1.81 | 4.154  | 0.071|
| 24  | Syzygium polyanthum (Wight) Walp | Myrt.       | 2.86 | 0.76 | 0.22 | 3.837  | 0.068|
| 25  | Vicus raomosa L.               | Morac.       | 0.71 | 0.46 | 2.65 | 3.817  | 0.035|
| 26  | Vicus variegata Blume          | Morac.       | 2.14 | 0.61 | 0.62 | 3.370  | 0.054|
| 29  | Swietenia macrophylla King     | Meliac.      | 0.71 | 1.82 | 0.77 | 3.311  | 0.105|
| 30  | Antar toxicaria (Pers.) Lesch   | Morac.       | 1.43 | 0.61 | 1.07 | 3.102  | 0.050|
| 31  | Inocarpus fagiferus (Park.) Fosh.| Papil.      | 1.43 | 0.46 | 1.04 | 2.922  | 0.040|
| 32  | Tabernaemontana sapotifolia Blume | Apoc.      | 1.43 | 1.06 | 0.57 | 2.862  | 0.076|
| 33  | Pangium edule Reinw.           | Flac.        | 1.43 | 0.46 | 0.85 | 2.737  | 0.040|
| 34  | Pometia pinnata J.R. & G. Forst var javanica K. & V. | Sapind.     | 1.43 | 0.30 | 0.99 | 2.721  | 0.028|
| 35  | Garuga floribunda Deene        | Burs.        | 1.43 | 0.46 | 0.77 | 2.655  | 0.040|
| 36  | Artocarpus altlis (Park. Ex Zoll.) Forsberg (sukun) | Morac.    | 1.43 | 0.76 | 0.42 | 2.608  | 0.061|
| 37  | Syzygium cumini (L.) Skeels    | Myrt.        | 1.43 | 0.46 | 0.28 | 2.167  | 0.040|
| 38  | Antidesma bunius (L.) Spreng.  | Euph.        | 1.43 | 0.46 | 0.25 | 2.132  | 0.040|
| 39  | Arenga pinnata (Wurmb) Meer.   | Arec.        | 0.71 | 0.76 | 0.64 | 2.110  | 0.054|
| 40  | Sterculia macrophylla Vent.    | Stere.       | 0.71 | 0.61 | 0.76 | 2.081  | 0.045|
| 41  | Palaquium ambizwena Burck.     | Sapot.       | 1.43 | 0.46 | 0.19 | 2.072  | 0.040|
| 42  | Cananga odorata (lam.) Hook.f.& Thomson | Annon.    | 1.43 | 0.46 | 0.15 | 2.036  | 0.040|
| 43  | Vicus sp.                      | Morac.       | 0.71 | 0.15 | 1.15 | 2.018  | 0.014|
| 45  | Perea americana Mill.          | Laur.        | 1.43 | 0.46 | 0.07 | 1.954  | 0.040|
| 46  | Aphanamixia grandifolia (Blume) Walp. | Meliac. | 1.43 | 0.30 | 0.20 | 1.930  | 0.028|
| No. | Species Name                                                   | Family  | KR  | DR  | FR  | IV    | Hi    |
|-----|---------------------------------------------------------------|---------|-----|-----|-----|-------|-------|
| 47  | Flacourtia rakam Zoll. & Moritzi                             | Flac.   | 1.43| 0.30| 0.08| 1.809 | 0.028 |
| 48  | Artocarpus heterophyllus Lam.                                | Morac.  | 1.43| 0.30| 0.07| 1.802 | 0.028 |
| 49  | Siphonodon celastriinus Griff.                               | Celast. | 0.71| 0.61| 0.46| 1.782 | 0.045 |
| 50  | Hopea sangal Korth.                                          | Dipt.   | 0.71| 0.15| 0.82| 1.691 | 0.028 |
| 51  | Spathodea campanulata Beauv.                                 | Bign.   | 0.71| 0.15| 0.82| 1.691 | 0.044 |
| 52  | Sterculia cocinea Jack                                       | Sterc.  | 0.71| 0.15| 0.82| 1.691 | 0.028 |
| 53  | Pinus elliottii Bl.                                          | Nyct.   | 0.71| 0.61| 0.32| 1.637 | 0.045 |
| 54  | Gluta rehmi L.                                               | Anac.   | 0.71| 0.46| 0.31| 1.476 | 0.035 |
| 55  | Erythrina fusca Lour.                                        | Papil.  | 0.71| 0.30| 0.42| 1.434 | 0.025 |
| 56  | Acacia mearnsii (L.) Willd.                                  | Euph.   | 0.71| 0.15| 0.44| 1.303 | 0.014 |
| 57  | Ficus karzii King                                            | Morac.  | 0.71| 0.15| 0.44| 1.303 | 0.014 |
| 58  | Carallia brachiata (Lour.) Merr.                            | Rhizoph.| 0.71| 0.15| 0.38| 1.250 | 0.014 |
| 59  | Sterculia cordata Blume                                      | Stere.  | 0.71| 0.15| 0.38| 1.250 | 0.028 |
| 60  | Beilschmiedia roxburghiana Nees                              | Laur.   | 0.71| 0.30| 0.19| 1.211 | 0.025 |
| 61  | Cassia fistula L.                                            | Caesal. | 0.71| 0.15| 0.33| 1.200 | 0.028 |
| 62  | Ficus calophylla Bl.                                         | Morac.  | 0.71| 0.15| 0.33| 1.200 | 0.028 |
| 63  | Pisonia exelsa Bl.                                          | Euph.   | 0.71| 0.30| 0.17| 1.189 | 0.025 |
| 64  | Baccaurea dulcis (Jack) Muell. Arg.                          | Myrt.   | 0.71| 0.15| 0.25| 1.112 | 0.014 |
| 65  | Alchornea australisana (Blume) Meek. & L.M. Perry            | Mim.    | 0.71| 0.15| 0.25| 1.112 | 0.014 |
| 66  | Albizia procera (Roxb.) Benth.                               | Anac.   | 0.71| 0.30| 0.04| 1.061 | 0.025 |
| 67  | Lanina coromandelica (Houttt.) Merr.                         | Anac.   | 0.71| 0.15| 0.17| 1.037 | 0.028 |
| 68  | Hopea sangal Korth.                                          | Dipt.   | 0.71| 0.15| 0.11| 0.975 | 0.014 |
| 69  | Trema orientalis (L.) Bl.                                    | Ulm.    | 0.71| 0.15| 0.11| 0.975 | 0.028 |
| 70  | Durio zibethinus Murr.                                       | Bombac. | 0.71| 0.15| 0.08| 0.950 | 0.014 |
| 71  | Salix tetrasperma Roxb.                                      | Salic.  | 0.71| 0.15| 0.08| 0.950 | 0.025 |
| 72  | Diodyos macrophylla Blume                                    | Eben.   | 0.71| 0.15| 0.06| 0.928 | 0.014 |
| 73  | Vitex pubescens Vahl. = V. pinnata L.                         | Verb.   | 0.71| 0.15| 0.06| 0.928 | 0.014 |
| 74  | Macaranga tanarius Mull. Arg.                                | Euph.   | 0.71| 0.15| 0.04| 0.909 | 0.014 |
| 75  | Garcinia dulcis (Roxb.) Kurz                                | Clus.   | 0.71| 0.15| 0.03| 0.894 | 0.014 |
| 76  | Leucaena leucocephalla (Lam.) de Wit                         | Mim.    | 0.71| 0.15| 0.03| 0.894 | 0.014 |
| 77  | Melanolepis multiflora Reich. f.                             | Euph.   | 0.71| 0.15| 0.03| 0.894 | 0.014 |
| 78  | Leucaena aculeata Blume ex spreng.                           | Leac.   | 0.71| 0.15| 0.02| 0.882 | 0.014 |

Description: KR: Relative Density; DR: Relative dominance; FR: Relative Frequency; IV: Importance value Index; Hi: Diversity Index