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Research Report: Structure Of Vegetation, Biomass, And Carbon Stock Of Langge Mangrove Forest, Gorontalo Utara Regency, Province of Gorontalo. Aust. J. Basic & Appl. Sci., 11(14): 48- 57, 2017 Research Report: Structure Of Vegetation, Biomass, And Carbon Stock Of Langge Mangrove Forest, Gorontalo Utara Regency, Gorontalo Province 1Dewi Wahyuni K. Baderan, 2Sukirman Rahim, 1Syam S. Kumaji 1Lecture, Department of Biology, Universitas Negeri Gorontalo, Gorontalo, Indonesia.

2Lecture, Department of Primary School Teacher Education, Universitas Negeri Gorontalo, Gorontalo, Indonesia. 1Lecture, Department of Biology, Universitas Negeri Gorontalo, Gorontalo, Indonesia. Address For Correspondence: Dewi Wahyuni K. Baderan, Universitas Negeri Gorontalo, Department of Biology, Mathematics and Natural Science Faculty,91628.Gorontalo. Indonesia. E-mail: dewibaderan14@gmail.com A R T I C L E I N F O A B S T R A C T Article history: Received 12 October 2017 Accepted 22 November 2017 Available online 6 December 2017 Keywords: IVi, Biomass, Carbon, Mangrove Background: Mangrove forest plays a vital role in mitigation of climate change as an impact of global warming since mangrove is able to reduce CO2 by sequestration mechanism, in which the carbon is absorbed from theatmosphere and stored in bio compartments, e.g.,

plant, organic waste, and organic materials of soil. (Hairiah and Rahayu, 2007). There is plenty of mangrove area in Gorontalo; one of them is in Langge village in Anggrek District, Gorontalo Utara Regency. The mangrove forest area in Langge is considered significant in carbon absorption potential towards its surrounding ecosystem due to the mangrove area is still in good condition and has no significant damage. The high absorption of carbon contributes to decrease CO2 contain in the air.

Rooted from the previous background, in-depth information of the mangrove is needed as areference and initial data in carbon trading, along with the improvement in thepreservation of mangrove forest within Anggrek District or in other sites. One needs to preserve mangrove forest to prevent carbon release to the air and further, helps to decrease the effect of climate change and global warming.

Objective: To identify the structure of vegetation, biomass, and carbon stock in Langge mangrove forest, Atinggola District, Gorontalo Utara Regency. Results: There are 12 species of mangrove, includingAvicennia Alba, Avicennia marina, Sonneratia Alba, Sonneratia ovata, Ceriops decandra , Ceriops tagal, Rhizophora apiculata , Rhizophora mucronata , Rhizophora stylosa, Bruguiera gymnorrhiza, Bruguiera parvifloraand Xylocarpus granatum.

The highest IVi value is found in Rhizophora mucronata, with IVi value of 57, 2 percent. Two other notable species are Avicennia marinaSonneratia Albawith IVi value of 44,935 percent and 40, 44 percent respectively. The total value of biomass is 1.085.676, and the carbon contained in Langge mangrove forest is 542.838,3138 kg with carbon dioxide absorption of 1.992.216, 611.

Conclusion: There are 12 species of mangrove in Langge forest at thetree, stake, and seeding level, includingAvicennia Alba, Avicennia marina, Sonneratia Alba, Sonneratia ovata, Ceriops decandra , Ceriops tagal, Rhizophora apiculata , Rhizophora mucronata, Rhizophora stylosa, Bruguiera gymnorrhiza, Bruguiera parviflora and Xylocarpus granatum. The total amount of carbon biomass in stem of all species of mangrove in Langgevillage is 1.085.676 kg.Meanwhile, the total carbon content of all species is

542.838,3138kg, and the total absorption ability of all species reaches 1.992.216,611kg/ha. 49 Dewi Wahyuni K.

Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 INTRODUCTION Mangrove forest plays a vital role in mitigation of climate change as an impact of global warming since mangrove is able to reduce CO2 by sequestration mechanism, in which the carbon is absorbed from theatmosphere and stored in bio compartments, e.g., plant, organic waste, and organic materials of soil. (Hairiah and Rahayu, 2007).

Moreover, mangrove forest is potential to absorb more CO2 than other plants since it is a wetland forest, with less emission release than forests on drylands. The mechanism is due to the decomposition process of aquatic plants do not release carbon to the air. By that, the total carbon emission release can be suppressed (Purnobasuki, 2012).

There is plenty of mangrove area in Gorontalo; one of them is in Langge village in Anggrek District, Gorontalo Utara Regency. The mangrove forest area in Langge is considered significant in carbon absorption potential towards its surrounding ecosystem due to the mangrove area is still in good condition and has no significant damage. The high absorption of carbon contributes to decrease CO2 contain in the air.

Rooted from the previous background, in-depth informati ootmagrve rstruroven,bdsy, and carbon value is needed as are ference and initial data in carbon trading, along with the improvement in the preservation of mangrove forest within Anggrek District or in other sites. One needs to preserve mangrove forest to prevent carbon release to the air and further, helps to decrease the effect of climate change and global warming.

Methodology: Research Site: The research was carried out in mangrove forest area of Langge village, Anggrek district, Gorontalo Utara regency. Geographically, the research site is located within 000 .48 80″ and12 0 .5′.2,86E he research site shares its border with Sulawesi Sea at north, Tutuwoto village in the east, Tolongio village in thesouth, and Ilodulunga village in the west.

The detail of geographical location of research site is displayed as a map by fig.1. Fig. 1:

Study Location The research employed line plot method (combination of plot and transect) and exploration method to calculate vegetation structure, biomass content, and carbon stock at the site. The sampling process engaged vegetation structure sampling, by creating a square transect marked.

Every line of the transect is perpendicular towards land from the beach, cutting from front line formation mangrove community at the shore to the rearmost formation (bordering with land). The transect line was placed purposively based on area utilization. Inventory of tree growth strata is recorded at every line, dividing into the plot of 20x20m.

In the meantime, stake stratification was applied on the smallersubplot of 10x10m while seeding stratification was applied on subplot 5x5 m (Dombois and Ellenberg, 1974). Species sampling of mangrove was obtained and recorded by 50 Dewi Wahyuni K. Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 direct species identification process at every transect.

To calculation of biomass value on the surface (stem) was utilized by measuring the sample tree parallel to the diameter at breast height (DBH), i.e., 1,3 m on the soil surface from flood limit. The data obtained were further treated to compute biomass on the surface (stem) by allometric formula (Komiyana, 2008). Data analysis employed structure analysis of mangrove vegetation at tree, stake, and seeding.

Afterwards, the data were analyzed to identify the dominance, relative dominance, density, relative density, frequency, relative frequency, and Important Value Index (IVi) by the formula of Dombois and Ellenberg (1974), as follows: The allometric formula by Komiyama et al. (2008) was applied to calculate stem biomass, as follows: DW= ,1x x 2,46 Details: ? dy f o g m -3) DW = dry weight D = Tree diameter (1,3m from sea level or soil surface) Carbon Value and CO2 Absorption: Carbon value calculation applies formula as follows: Carbon content = Biomass x 50% (Brown, 1997) The CO2 absorption applies following equation CO2 = carbondioxide absorption Ra = Relative atom Rm = Relative molecule RESULTS AND DISCUSSION Structure of Mangrove Vegetation: The identification result shows that there are 12 species of mangrove found on atree, stake, and seeding, including Avicennia Alba, Avicennia marina, Sonneratia Alba, Sonneratia ovata, Ceriops decandra, Ceriops tagal, Rhizophora apiculata, Rhizophora mucronata, Rhizophora stylosa, Bruguiera gymnorrhiza, Bruguiera parviflora and Xylocarpus granatum.

The species found are included into Division of magnoliophyta, Class of magnoliopsida, spread into four Ordos, i.e., Scrophulariales, Myrtales, Rhizophorales, and Sapindales. Moreover, the species are spread into four Families, i.e., Acanthaceae, Rhizophoraceae, Sonneratiaceae, Meliaceae, and six Genes, i.e., Avicennia, Sonneratia, Ceriops, Rhizophora, Bruguiera, and Xylocarpus.

The mangrove classification is displayed in Table 1. Density (D) Total individu of species Area of observation transect = Relative Density (Rd) = Density of species Density of all species Dominance (D) = Total of basal area of spec ies Area of observation transect Relative Dominan ce (Rd) = Dominance ofa spec ies Domina nce of all spec ies Frequency (F) = Amount of Transect in which species are found Total amount of all transects Relative Frequency (Fr) = Total frequency of all species Frequency of aspec ies (CO 2) = 51 Dewi Wahyuni K.

Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 Table 1: Classification of Mangrove Species in Research Site Regnum Division Class Ordo Family Genus Species Plantae Magnoliophy ta Magnoliopsid a Scrophulariales Acanthaceae Avicennia Avicennia alba Avicennia marina Myrtales Sonneratiaceae Sonneratia Sonneratia alba Sonneratia ovata Rhizophorales Rhizophoraceae Ceriops Ceriops decandra Ceriops tagal Rhizophora Rhizophora apiculata Rhizophora mucronata Rhizophora stylosa Bruguiera Bruguiera gymnorrhiza Bruguiera parviflora Sapindales Meliaceae Xylocarpus Xylocarpus granatum Structure of Mangrove Vegetation and Important Value Index of Tree Level: The computation result of Important Value Index is obtained by three criteria, i.e.,

relative density, relative dominance, and relative frequency. The IVi value can describe dominance, density, and frequency of each species. The detail of the structure of mangrove vegetation is displayed as follows: Table 2: Structur eof Mangrove Vegetation and Important Value Index of three level at Station I No Species Dens Rdens F Rf Dom Rdom IVI (%) (m2) (%) (%) (%) (cm2) (%) 1 Sonneratia ovata 0,055 15,45 1 8,333 0,37

16,66 40,44 2 Rhizophora apiculata 0,042 11,8 1 8,333 0,26 11,56 31,69 3 Rhizophora stylosa 0,041 11,52 1 8,333 0,25 11,11 30,96 4 Rhizophora mucronata 0,037 10,39 1 8,333 0,24 10,75 29,48 5 Avicennia alba 0,03 8,427 1 8,333 0,19 8,528 25,29 6 Bruguiera gymnorrhiza 0,029 8,146 1 8,333 0,17 7,836 24,32 7 Bruguiera parviflora 0,027 7,584 1 8,333 0,18 8,083 24 8 Avicennia marina 0,024 6,742 1 8,333 0,14 6,057 21,13 9 Ceriops decandra 0,022 6,18 1 8,333 0,13 5,971 20,48 10 Ceriops tagal 0,021 5,899 1 8,333 0,13 5,75 19,98 11 Sonneratia alba 0,015 4,213 1 8,333 0,09 4,247 16,79 12 Xylocarpus granatum 0,013 3,652 1 8,333 0,08 3,442 15,43 Table 2 displays particular species with high vegetation parameter value, in which it is used to specify the dominant species in a particular community. Sonneratia ovata is the most dominant species (13%) among all.

It has 40, 44% Important Value Index, dominance of 0, 37 cm2, frequency of 1%, and density of 0,055 m2. Concurrentl, Xylocarpus granatum has uneven distribution, only on particular points, since the species has the lowest Important Value of 5%, dominance of 0, 06 cm2, the frequency of 1%, and density of 0, 01cm2.

Furthermore, the detailed structure of mangrove vegetation and Important Value of tree level in Station II is shown in Table 3 below. Table 3: Structure of Mangrove vegetation and Important Value at tree levelon Station II No Species Dens R dens F Rf Dom R dom IVI (%) (m2) (%) (%) (%) (cm2) (%) 1 Rhizophora apiculata 0.08 23.67 1 9.09 0.52 24.42 57.2 9 Rhizophora stylosa 0.046 13.61 1 9.09 0.31 14.63 37.3 2 Bruguiera parviflora 0.045 13.31 1 9.09 0.28 12.93 35.3 3 Bruguiera gymnorrhiza 0.036 10.65 1 9.09 0.22 10.06 29.8 4 Sonneratia ovata 0.025 7.396 1 9.09 0.16 7.595 24.1 5 Rhizophora mucronata 0.025 7.396 1 9.09 0.16 7.431 23.9 6 Ceriops decandra 0.022 6.509 1 9.09 0.13 6.029 21.6 7 Ceriops tagal 0.018 5.325 1 9.09 0.12 5.456 19.9 8 Avicennia alba 0.019 5.621 1 9.09 0.11 4.999 19.7 11 Sonneratia alba 0.012 3.55 1 9.09 0.08 3.518 16.2 52 Dewi Wahyuni K.

Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 10 Xylocarpus granatum 0.01 2.959 1 9.09 0.06 2.92 15 Furthermore, the structure of vegetation and Important Value at tree level of Station III is elaborated in Table 4 as follows. Table 4: Structure of Mangrove vegetation and Important Valueat tree level on Station III No Species Dens Rdens F Rf Dom Rdom IVI (%) (m2) (%) (%) (%) (cm 2) (%) 1 Avicennia marina 0.072 17.48 1 10 0.442 17.46 44.935 2 Rhizophora stylosa 0.068 16.5 1 10 0.437 17.27 43.772 3 Rhizophora apiculata 0.05 12.14 1 10 0.309 12.2

34.34 4 Rhizophora mucronata 0.045 10.92 1 10 0.265 10.48 31.403 5 Xylocarpus granatum 0.04 9.709 1 10 0.26 10.26 29.97 6 Ceriops tagal 0.039 9.466 1 10 0.227 8.978 28.444 7 Sonneratia ovate 0.035 8.495 1 10 0.208 8.23 26.725 8 Bruguiera parviflora 0.028 6.796 1 10 0.175 6.925 23.721 9 Avicennia alba 0.019 4.612 1 10 0.123 4.84 19.451 10 Ceriops decandra 0.016 3.883 1 10 0.085 3.355 17.239 Fig. 2: The comparison of Important Value Index of tree level at Station I, II, and III.

Structure of Mangrove Vegetation and Important Value of Sapling Level: The vegetation analysis shows that there are particular species containing ahigh value of vegetation parameter and thus considered as the most dominant. Being the most dominant species by 13 percent, Rhizophora mucronatapossesses 47,58% of Important Value, dominance of 0,64 cm2, frequency of 1%, and density of 0,167 m2, on the other hand, Bruguiera gymnorrhiza possesses34,36% Important Value, dominance of 0,43 cm2, frequency of 1 %, and 0,11m2 density.

The analysis suggests that the spread of Rhizophora mucronata is more even than other species, thus having wider canopy. Furthermore, the display of structure of mangrove vegetation and dominant species distribution of stake level in station I is shown in Table 5. Table 5: Structure of Mangrove vegetation and Important Value of sapling level at Station I No Species Dens Rdens F Rf Dom Rdom IVI (%) (m2) (%) (%) (%) (cm 2) (%) 1 Rhizophora mucronata 0.167 19.49 1 8.333 0.64 19.76 47.58 2 Bruguiera gymnorrhiza 0.11 12.84 1 8.333 0.43 13.19 34.36 3 Rhizophora apiculata 0.11 12.84 1 8.333 0.43 13.18 34.35 4 Sonneratia ovata 0.077 8.985 1 8.333 0.3 9.247 26.57 5 Ceriops tagal 0.068 7.935 1 8.333 0.26 7.974 24.24 6 Rhizophora stylosa 0.085 9.918 1 8.333 0.19 5.933 24.18 7 Ceriops decandra 0.066 7.701 1 8.333 0.26 7.937 23.97 8 Avicennia marina 0.05 5.834 1 8.333 0.26 8.083 22.25 9 Bruguiera parviflora 0.047 5.484 1 8.333 0.18 5.622 19.44 10 Avicennia alba 0.031 3.617 1 8.333 0.11 3.507 15.46 11 Xylocarpus granatum 0.024 2.8 1 8.333 0.09 2.88 14.01 12 Sonneratia alba 0.022 2.567 1 8.333 0.09 2.677 13.58 Structure of vegetation and Important Value at mangrove stake level is elaborated in detail in Table 6.

Table 6: Structure of Mangrove vegetation and Important Value of Sapling level at Station II No Species Dens Rdens F Rf Dom Rdom IVI (%) (m2) (%) (%) (%) (cm2) (%) 1

Rhizophora apiculata 0.105 16.01 1 9.09 0.41 16.3 41.4 2 Bruguiera gymnorrhiza 0.096 14.63 1 9.09 0.37 14.8 38.5 0 10 20 30 40 50 60 70 SO RA RS RM AA BG BP AM CD CT SA XG Indeks Nilai Penting Spesies Mangrove Stasiun 1 Stasiun 2 Stasiun 3 53 Dewi Wahyuni K.

Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 3 Rhizophora mucronata 0.078 11.89 1 9.09 0.3 12.02 33 4 Bruguiera parviflora 0.066 10.06 1 9.09 0.25 9.928 29.1 5 Rhizophora stylosa 0.067 10.21 1 9.09 0.25 9.783 29.1 6 Ceriops decandra 0.064 9.756 1 9.09 0.25 9.95 28.8 7 Sonneratia ovata 0.056 8.537 1 9.09 0.22 8.829 26.5 8 Ceriops tagal 0.055 8.384 1 9.09 0.21 8.244 25.7 9 Xylocarpus granatum 0.031 4.726 1 9.09 0.11 4.312 18.1 10 Avicennia alba 0.023 3.506 1 9.09 0.09 3.538 16.1 11 Sonneratia alba 0.015 2.287 1 9.09 0.06 2.305 13.7

Table 6 illustrates that each species contains different Important Value, either from density, and dominance. Rhizophora apiculata is the most dominant species of all, by IV index of 41,4%, relative density of 16,01%, relative frequency of 9,09%, and relative dominance of 16,03%. Conversely, Sonneratia alba is the least dominant, with only 13,7% IV index, 2,28% relative density, 9,09% relative frequency, and 2,3% relative dominance.

From the data, it suggests that Rhizophora apiculatahas the highest adaptability towards the environment. Furthermore, the structure of mangrove vegetation and IV of stake level in Station III is detailed in Table 7. Table 7: Structure of Mangrove vegetation and Important Value of sapling level at Station III No Species Dens Rdens F Rf Dom Rdom IVI (%) (m2) (%) (%) (%) (cm2) (%) 1 Sonneratia ovata 0.181 14.73 1 10 0.708 14.78 39.51 2 Ceriops tagal 0.175 14.24 1 10 0.682 14.23 38.47 3 Rhizophora apiculata 0.164 13.34 1 10 0.64 13.35 36.698 4 Rhizophora mucronata 0.159 12.94 1 10 0.622 12.98 35.913 5 Ceriops decandra 0.132 10.74 1 10 0.517 10.8 31.538 6 Avicennia marina 0.124 10.09 1 10 0.479 9.998 30.087 7 Rhizophora stylosa 0.115 9.357 1 10 0.443 9.246 28.604 8 Avicennia alba 0.102 8.299 1 10 0.402 8.382 26.681 9 Bruguiera parviflora 0.055 4.475 1 10 0.216 4.511 18.986 10 Xylocarpus granatum 0.022 1.79 1 10 0.083 1.723 13.513 Furthermore, the comparison of mangrove vegetation structure and IV at stake level in the three stations is illustrated in the graph as follows: Fig.

3: Graph of comparison of IVi at sapling level in three stations Structure of Mangrove Vegetation and Important Value of Seedling Level: The calculation result of IV of mangrove at seeding level elaborates that there are two dominant species with 16% dominance, i.e.,Rhizophora mucronata and Rhizophora apiculata, by IV of 25,2% and 12%, density of 0,09 m2 and 0,07 m2, and frequency of 1% respectively.

Taxonomically, the two dominant species are in genus Rhizophora, thus, from thee co-physiological aspect, both species shares similar traits in adaptation towards the environment. This is to say thatboth species have optimal grow and even distribution over the research site, making them the primary vegetation of mangrove forest structure.

In detail, the structure of mangrove vegetation and dominant species distribution at seeding level in Station I is presented in Table 8. 0 5 10 15 20 25 30 35 40 45 50 RM BG RA SO CT RS CD AM BP AA XG SA Jndeks Nilai Penting Spesies Mangrove i Stasiun I Stasiun II Stasiun III 54 Dewi Wahyuni K. Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 Table 8: Structure of Mangrove vegetation and Important Value of seedling level at Station I No Species Dens Rdens F Rf IVI (%) (m2) (%) (%) (%) 1 Rhizophora apiculata 0.19 16.75 1 8.333 25.1 2 Rhizophora mucronata 0.171 15.08 1 8.333 23.4 3 Sonneratia ovata 0.123 10.85 1 8.333 19.2 4 Ceriops tagal 0.1 8.818 1 8.333 17.2 5 Rhizophora stylosa 0.101 8.907 1 8.333 17.2

6 Bruguiera parviflora 0.099 8.73 1 8.333 17.1 7 Bruguiera gymnorrhiza 0.091 8.025 1 8.333 16.4 8 Ceriops decandra 0.086 7.584 1 8.333 15.9 9 Avicennia marina 0.067 5.908 1 8.333 14.2 10 Avicennia alba 0.065 5.732 1 8.333 14.1 11 Xylocarpus granatum 0.036 3.175 1 8.333 11.5 12 Sonneratia alba 0.005 0.441 1 8.333 8.77 Each species possesses different adaptability to maintain its existence and thus be the most dominant species, shall it succeeds.

Table 8 displays that the most dominant species is Rhizophora apiculatawith IVI of 25,1%, relative density of 16,75%, and relative frequency of 8,33%. Concurrently, Sonneratia Alba is the least dominant of all, by only having IV of 8,77%, relative density of 0,44%, and relative frequency of 8,33%. Furthermore, the following table 9 illustrates the structure of mangrove vegetation and Important Value at seeding level in Station II.

Table 9: Structure of Mangrove vegetation and Important Value of seedling level at Station II No Species Dens Rdens F Rf IVI (%) (m2) (%) (%) (%) 1 Bruguiera parviflora 0.196 14.07 1 9.09 23.2 2 Rhizophora apiculata 0.183 13.14 1 9.09 22.2 3 Rhizophora stylosa 0.177 12.71 1 9.09 21.8 4 Bruguiera gymnorrhiza 0.175 12.56 1 9.09 21.7 5 Sonneratia ovata 0.155 11.13 1 9.09 20.2 6 Ceriops tagal 0.137 9.835 1 9.09 18.9 7 Ceriops decandra 0.122 8.758 1 9.09 17.8 8 Rhizophora mucronata 0.12 8.615 1 9.09 17.7 9 Avicennia alba 0.072 5.169 1 9.09 14.3 10 Xylocarpus granatum 0.049 3.518 1 9.09 12.6 11 Sonneratia alba 0.007 0.503 1 9.09 9.59 Furthermore, Table 10 displays the structure of mangrove vegetation and IV index at seeding level in Station III.

Table 10: Structure of Mangrove vegetation and Important Value of seedling level at Station III No Species Dens Rdens F Rf IVI (%) (m2) (%) (%) (%) 1 Sonneratia ovata 0.243 15.2 1 10 25.2 2 Rhizophora apiculata 0.231 14.5 1 10 24.5 3 Ceriops tagal 0.195 12.2 1 10 22.2 4 Rhizophora stylosa 0.188 11.8 1 10 21.8 5 Avicennia alba 0.148 9.26 1 10 19.3 6 Rhizophora mucronata 0.142 8.89 1 10 18.9 7 Avicennia marina 0.135 8.45 1 10 18.4 8 Bruguiera parviflora 0.12 7.51 1 10 17.5

9 Ceriops decandra 0.113 7.07 1 10 17.1 10 Xylocarpus granatum 0.083 5.19 1 10 15.2 The comparison of IV index of mangrove at seeding level in three stations is illustrated in the graph as follows: 55 Dewi Wahyuni K. Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 Fig.

4: Graph of comparison of IVi at stake level in three stations The analysis result of mangrove vegetation structure in Langge village suggests that mangrove categorized in Rhizophora genus is the most dominant at the site. As observable in Figure 2 and 3, the comparison of IV index in the tree stations shows that Rhizophora apiculataand Rhizophora mucronata are the most dominant species.

The situation is down to the supportive environmental condition and substrates at the site, as well as muddy soil; thus aiding Rhizopora genus mangrove in growing and adapting optimally. The notion is in line with Noor et al. (2012), arguing that Indonesian muddy substrate is highly compatible to Rhizophora apiculataand Rhizophora mucronata stands.

This is in accordance with the soil surface at the side, i.e., sandy mud. Being the most dominant species, Rhizophora mucronatahas physical features, i.e.,significantsize, broad canopy, and widespread. Moreover, Rhizophora apiculatais categorized in Rhizophoraceae family and inhabits on muddy soil. The species tends to spread evenly and adapt well to mangrove community in Tutuwoto village.

Furthermore, Irwanto (2007) states that a mangrove community is said to be diverse in species if it consists of different and almost alike species, and vice versa. Biomass, Carbon Content, and CO_2 Absorption: The quantification result of stem biomass, carbon content, and CO_2 absorption is shownin Figure 5. Fig. 5: Graph of total biomass, carbon content, and CO_2 absorption The density of a mangrove is highly related to the biomass of its standing, in which the total amount of biomass in an area is obtained from the biomass production and density by measuring the diameter, height, weight, and density of a tree.

Biomass is a certain amount of organic materials produced by plants during photosynthesis process, in which CO_2 and water is converted into simple carbohydrate molecule during 0 5 10 15 20 25 30 RA RM SO CT RS BP BG CD AM AA XG SA Value index Spesies Mangrove Stasiun I Stasiun II Stasiun III 0 200000 400000 600000 800000 1000000 1200000 1400000 1600000 1800000 2000000 Biomassa Karbon Batang Serapan CO_2 Pohon 532930.0239 266465.012 977926.5939 Pancang 552746.6035 276373.3018 1014290.017 Total 1085676.627 542838.3138 1992216.611 Total of Biomass, Carbon Content, dan Carbondioxide Absorption of Mangrove Forest 56 Dewi Wahyuni K.

Baderan et al, 2017 Australian Journal of Basic and Applied Sciences, 11(14) December 2017, Pages: 48-57 metabolism. The molecules are further converted into lipid, nucleic acid, protein, and organic molecules, such as CO_2. These molecules undergo sequestration process, in which they are stored in biomass of leaves, stem, roots, tuber, fruit, and substrate.

CO_2 content absorbed by plants from the air is described from theamount of carbon stored in biomass of a land (Hairiah and Rahayu, 2007). Moreover, Ilmiliyana (2012) mentions that the higher the biomass potential in a tree is determined by how old the standing is. This is due to the growth in a tree diameter by continuous cambium cell division and regeneration, or simply said as secondary growth.

Henceforth, the diameter of a tree can determine the amount of the biomass inside. The texture of stem of Rhizophora mucronata is hard and rough and contains cellulose, hemi cellulose, and lignin. The tree diameter determines the amount of cellulose in a stem.

Moreover, tree stem contains the most amount of carbon among others, in theaccount of its forming substances which are stronger than the other parts. The cell cavity inside a stem is formed mostly of component substances than of water, making the biomass amount bigger than other tree parts. (Purnobasuki, 2012). The result indicates that the stem of dominant species, Rhizophora apiculata and Rhizophora mucronata, can absorb carbon in the largest biomass of other species, having 47.422,5051 kg and 76.616,8952 kg respectively.This signifies the correlation that the bigger the diameter, the higher the biomass amount is.

Moreover, the total of biomass amount in the stem of all mangrove species in Langge village reaches 1.085.676 kg, absorbing total carbon of 542.838,3138kg. By that, the research concludes that the CO2 absorption ability of all species reaches 1.992.216,611kg/ha in total. This shows that mangrove is essential to decrease carbon emission in the air. Conclusion: There are two conclusions in this study: 1.

There are 12 species of mangrove in Langge forest at thetree, stake, and seeding level, includingAvicennia Alba, Avicennia marina, Sonneratia Alba, Sonneratia ovata, Ceriops decandra, Ceriops tagal, Rhizophora apiculata, Rhizophora mucronata, Rhizophora stylosa, Bruguiera gymnorrhiza, Bruguiera parvifloraand Xylocarpus granatum. 2. The total amount of carbon biomass in stem of all species of mangrove in Langgevillage is 1.085.676 kg.Meanwhile, the total carbon content of all species is 542.838,3138kg, and the total absorption ability of all species reaches 1.992.216,611kg/ha
ACKNOWLEDGEMENT The researchers would like to express their gratitude to the Government of Anggrek District, Gorontalo Utara Regency; to Students of Graduate Department of Biology and KLH Postgraduate Department for helping the researchers to collect data.Special gratitude also goes to the Head of Institute of Research and

Community Service of Universitas Negeri Gorontalo for granting funds for the research by Research Grant in Basic Scientific Scheme.

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