Sumatra Journal of Disaster, Geography and Geography Education June, 2023. Vol.7. No. 1. Special Issue. pp. 124-127
West Pasaman Geography Issues, Socio-Economy Commonity on the West Slope of Marapi, and Action Learning
ISSN : 2580 - 4030 (Print) 2580 - 1775 (Online), Indonesia http://sjdgge.ppj.unp.ac.id/index.php/Sjdgge

ANALYSIS OF CARBON STOCK ESTIMATION IN NAGARI RABI JONGGOR FOREST AREA, WEST PASAMAN REGENCY

*Nur Ifa Lisa

SMAN 4 Bengkalis - Indonesia
[2]Master Program of Geography Education, Universitas Negeri Padang - Indonesia
Email: ifalisa@gmail.com

*Corresponding Author, Received: April 12, 2023. Revised: May 10, 2023. Accepted: June 06, 2023

ABSTRACT: The potential of forest areas in Nagari Rabbi Jonggor to store carbon has not been studied, so there is no data on carbon stock storage and the estimated potential of oxygen produced. In order to quantify the potential of forest resources, specifically carbon and oxygen reserves produced, the author conducted a study on estimating carbon stocks and oxygen potential in the Nagari Rabbi Jonggor forest area. And this study aims to determine the forest use value of Nagari Rabi Jonggor Area, Gunung Tuleh District, West Pasaman Regency. This research was conducted in Nagari Rabi Jonggor Nagari Rabi Jonggor is one of the 19 main nagari in West Pasaman Regency, West Sumatra Province. Nagari Robi Jonggor is located in Gunung Tuleh District, West Pasaman Regency with an area of 289.98 km3 or 63.88% of the area of Gunung Tuleh District. The time of the study will be in May 2023. The method used is allometric using a plot system. The tools and materials used in this study are phi bands (measuring tapes), plastic ropes measuring 100 meters and 20 meters, plant scissors, analytical scales, pilox (to mark trees that have been measured) haga hypsometer, calculators, cameras, herbal equipment, tally sheets, GPS, compasses, clinometers, measuring instruments. The results showed that it can be seen that the total amount of biomass (Y) produced from the measurement is 7550.14. Where the tree that produces the largest biomass is a tree with a local name of rubber tree in sample 1 with a total biomass of 5294.23 and a tree that produces the lowest biomass is a tree species with a local name of rubber in sample II with a total biomass of 209.45. and it can be seen that the total amount of biomass (Y) produced from the dilangan measurement is 7550.14. Where the tree that produces the largest biomass is a tree with a local name of rubber tree (Hevea brasiliensis) in sample 1 with a total biomass of 5294.23 and a tree that produces the lowest biomass is a tree species with a local name of rubber tree (Hevea brasiliensis) in sample II with a total biomass of 209.45.
Keywords : *Forest, Carbon Stock*

1. INTRODUCTION

In forest ecosystems also learn about the influence of various ecological factors on population conditions, both plant and animal populations in it. However, in principle, in forest ecology, the study of both aspects (autecology and synecology) is very important because forest knowledge as a whole includes knowledge of all components that make up forests. Forest is seen as an ecosystem is very appropriate, considering that forests are formed or arranged by many components that each component cannot stand alone, cannot be separated and even influence each other and depend on each other [1].

Forests are the largest carbon stocks on earth. Carbon is stored in trees, both in roots, stems, branches, leaves, and in sarasah. Forest loss due to land conversion to non-forest lands, will result in the removal of carbon deposits into CO2 so that it will increase the concentration of greenhouse gases (GHG) in the atmosphere. Efforts to save forests continue to be carried out, both on a global (international), regional (regional) and local (country) scale [2].

The total forest area in the world is recorded at around 3.9 billion ha, of which 95% is natural forest and 5% is plantation. It is estimated that there is deforestation of 16.5 million ha / year, mostly in the tropics. Forest destruction is generally caused by a wrong perspective on forests, this is caused by governments, entrepreneurs, and communities assessing forests from the side of wood only, even though the greatest benefit lies precisely in the wealth of flora and fauna and ecosystems [3].

The destruction or degradation of forest lands as a repository of carbon stocks on earth is generally caused by rapid development activities that have caused changes in land cover, where developed land increasingly dominates and urges natural lands (forests) to change function. The occurrence of land conversion in rural areas and protected areas is an environmental phenomenon that is permissible if it is based on environmental sustainability. However, over time, the conversion of land in rural areas from forest land to agricultural land, and agricultural land to developed land, is seen as a phenomenon of community interaction that has prioritized economic attraction without paying attention to environmental sustainability [4].

In addition, the development of land resources that are not oriented towards the three pillars of sustainable life, makes rural areas no longer able to maintain the ability of land to support crop productivity. The opening of new land becomes very interesting to improve the economy of the community, without paying attention to the allocation of space, so that rural areas that are directly bordered by protected areas, inadvertently continue to intervene into protected areas. Thus, there will be rural development activities that have an impact on human safety and the environment itself [5-9].

Nagari Rabi Jonggor forest area is a conservation area that has a purpose for the collection of natural or non-natural plants and / or animals, native species and / or non-native species, which are not invasive and are used for the purposes of research, science, education, supporting cultivation, culture, tourism, and recreation. The potential of forest areas in Nagari Rabbi Jonggor to store carbon has not been studied, so there is no data on carbon stock storage and the estimated potential of oxygen produced. In order to quantify the potential of forest resources, specifically carbon and oxygen reserves produced, the author conducted a study on estimating carbon stocks and oxygen potential in the Nagari Rabbi Jonggor forest area. And this study aims to determine the forest use value of Nagari Rabi Jonggor Area, Gunung Tuleh District, West Pasaman Regency.

2. METHODS

This research was conducted in Nagari Rabi Jonggor Nagari Rabi Jonggor is one of the 19 main nagari in West Pasaman Regency, West Sumatra Province. Nagari Robi Jonggor is located in Gunung Tuleh District, West Pasaman Regency with an area of 289.98 km^2 or 63.88% of the area of Gunung Tuleh District. The research will be conducted in May 2023. The method used is allometric using a plot system. The tools and materials used in this study are *phi bands (measuring* tapes), plastic ropes measuring 100 meters and 20 meters, plant scissors, analytical scales, pilox (to mark trees that have been measured) haga hypsometer, calculators, cameras, herbal equipment, tally sheets, GPS, compasses, clinometers, measuring instruments.

The type in the study consists of primary and secondary data. Primary data is data obtained through field observations and laboratories, namely in the form of tree names, tree biomass and carbon stocks from biomass. Secondary data is data obtained from literature sources that support the research.

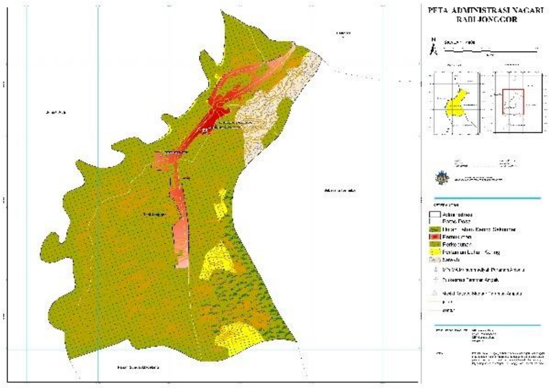


Fig 1. Map of Nagari Rabi Jonggor Forest Area

Data collection is carried out by taking data directly at the research site. The location of the study is in the Rabi Jonggor nagari forest area has a total area of 289.98 km2, or 63.88 percent of the area of Gunung Tuleh District. The data taken is data about the volume of trees of each type at the research location. The measurement method was carried out using a square-shaped sampling plot that was determined randomly in each cluster of vegetation cover at the study site. The plot form used is shown in the following figure:

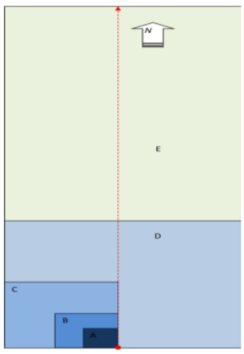


Fig 2. Form of carbon survey measuring plot from IHMB and Hi nrichs et al, 1998)

The data collection procedure in this study is as follows:

1. Tree naming to find the specific gravity (BJ) value of trees on the BJ list of existing tree timber.
2. Tree volume measurement
3. Determination of tree biomass

4. Determination of carbon stocks
5. Conversion of carbon stocks to vast areas of forest.

Tree biomass measurement is carried out by estimating the volume of trees without damage (*non-destructive*). The volume of a tree is estimated by the size of its trunk diameter, which is measured *at breast height* (DBH or 1.3 m from ground level) as can be seen in Figure 3. Tree height is measured to enhance the accuracy of tree volume estimation.

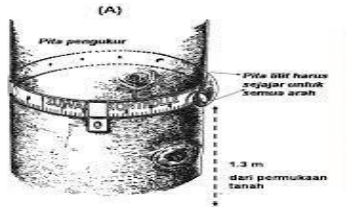
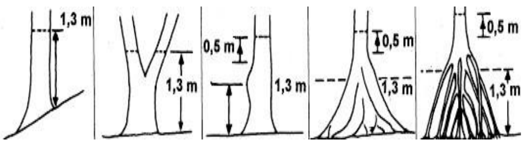
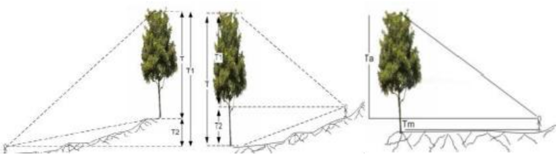


Fig 3. How to measure the girth of a tree trunk using a measuring tape (phi band) (Hairiah, *et. al.*, 2011)

Every measurement of tree diameter is not all tree positions in perfect upright condition, therefore the picture below shows how to determine the point DBH measurement of tree trunks with banir, wavy, low branching or on sloped land.





a) T = T1 – T2 b) T = T1 + T2 c) T = Ta + Tm

Information:

T = Tree height
T1 = Scale reading when shooting tree tops
T2 = Scale reading when shooting the base of the tree
T = Tree height, Ta = scale reading on measuring instruments
Tm = Height of measuring eye (*cruiser*)
a = Gauge position lower than the tree
b = Gauge position higher than the tree
c = Gauge position parallel to the tree

The stages of tree biomass measurement are carried out as follows:
1. Identify the name of the tree species
2. Measure diameter at chest level (DBH)
3. Measure tree height
4. Calculate tree biomass

Analyze the data to determine the specific gravity of the calculation using the formula:

$$BJ(g/cm^2) = \frac{BK(g)}{V\ (cm^2)}$$

Remarks : BJ = Specific gravity (g/cm^3)
BK = Dry weight
V = Volume (cm^3)

Meanwhile, to find out the volume is calculated using the formula:
Volume (m^3)=πR^2 T
Keterangan : p = 3.14
R = Radius of wood pieces
T = Length of wood (m)

The calculation of tree biomass is calculated using the formula:
$B_P = V_P$ x Bj_p
Remarks : BP = Tree biomass (Kg)
V_P = Tree Volume (m3)
BJ_P = specific gravity of tree (g/cm2)
The calculation of carbon stocks from biomass uses the formula:
C_b = B x % C $_{organic}$
Description: C_b = carbon stock from biomass
B = Total biomass (Kg)
% C $_{organic}$ = Percentage value of carbon stock 47%

3. RESULTS AND DISCUSSION

3.1 Findings and Measurements in the Field

Based on observations and field research, 6 individual trees were found from 3 types of tree species make up the rabi jonggor forest area (table 1). The results of field observation as presented to the derikut tabeb. Where rubber tree species dominate and further can be found durian and mahogany trees. Rubber dominates because this area is a mixed plantation area managed by the community in a customary system.

Tabel 1. Tree species findings

No	Nama Pohon		Jumlah
	Lokal	Latin	
1	Durian	*Durio zibethinus*	2
2	Mahoni	*Swietenia marchophylla*	1
3	Karet	*Hevea brasiliensis*	3

Data source : primary data

3.2 Estimate carbon stock

Tabel 2 Field Calculation Results

Nama lokal	Tinggi (m)	Diameter (Cm)	Jari jari (cm)	Volume kayu cm³	Volume (m)	Biomassa (Y)

Durian	25	38.85	19.43	2962580	2.96	1420.28
Karet l	2	70.38	35.19	9721537	9.72	5294.23
Karet ll	1.5	17.83	8.92	624203.8	0.62	209.45
Mahoni	6	19.11	9.55	716560.5	0.72	251.59
Karet lll	2.1	35.03	17.52	2408439	2.41	1118.50
Durian	8	22.29	11.15	975318.5	0.98	374.59
total	44.6	203.49	101.76	17408638.8	17.41	7550.14

Data source : primary data

Based on the table above, it can be seen that the total amount of biomass (Y) produced from the measurement is 7550.14. Where the tree that produces the largest biomass is a tree with a local name of rubber tree (Hevea brasiliensis) in sample 1 with a total biomass of 5294.23 and a tree that produces the lowest biomass is a tree species with a local name of rubber tree (Hevea brasiliensis) in sample II with a total biomass of 209.45.

Tabel 3. Estimation of carbon and oxygen stocks in Nagari Rabi Jonggor forest area

Tree biomass	Estimate the mount of carbon (Cn)	Carbon uptake	Oxygen	Carbon conversion to liters
4684,09	2154,68	7907,68	5772,61	7696788,92
5294,23	2435,35	8937,72	6524,54	8699359,20
209,45	96,35	353,59	258,12	344158,99
251,59	115,73	424,74	310,06	413408,55
1118,50	514,51	1888,26	1378,43	1837897,68
374,59	172,31	632,38	461,63	615510,88
11932,45	5488,93	20144,36	14705,38	19607124,22

Data source : primary data

The estimation of carbon stocks in the Nagari Rabi Jonggor forest area shown in table 3 shows that the total carbon sequestration was 20144.36 and the estimated oxygen produced was 14705.38.

4. CONCLUSION

Based on the study, it can be seen that the total amount of biomass (Y) produced from the measurement is 7550.14. Where the tree that produces the largest biomass is a tree with a local name of rubber tree (Hevea brasiliensis) in sample 1 with a total biomass of 5294.23 and a tree that produces the lowest biomass is a tree species with a local name of rubber tree (Hevea brasiliensis) in sample II with a total biomass of 209.45. Based on the research, it can be seen that the estimation of carbon stocks in the Nagari Rabi Jonggor forest area shown in table 3 shows that the total carbon sequestration is 20144.36 and the estimated oxygen produced is 14705.38.

5. REFERENCES

[1] Hairiah, K., A. Ekadinata, R.R. Sari dan S. Rahayu. (2011). Pengukuran Cadangan Karbon: Dari Tingkat Lahan ke Bentang Lahan. Petunjuk praktis. Edisi kedua. Bogor: World Agroforestry Center.

[2] ICRAF. (2017). Wood Density Database. db.worldagroforestry.org. Diakses Pada tanggal 5- 7- 2017.

[3] Malamasam, D. (2009). Modul Pembelajaran Inventarisasi Hutan. Makasar: Fakultas Kehutanan. Universitas Hasanudin.

[4] Manuhuwa, E. (2007). Kadar Air Dan Berat Jenis Pada Posisi Aksial Dan Radial Kayu Sukun (Arthocarpus communis, J.R dan G.Frest). Jurnal Agroforestry 2(1), 50.

[5] Peraturan Pemerintah Republik Indonesia Nomor 28 Tahun 2011 tentang Pengelolaan Kawasan Suaka Alam dan Kawasan Pelestarian Alam.

[6] Siwi, S. E. (2012). Kemampuan Ruang Hijau dalam Menyerap Gas Karbon Dioksida (Co2) di Kota Depok. (Tesis). Fakultas Matematika dan Ilmu Pengetahuan Alam Departemen Geografi. Universitas Indonesia. Depok.

[7] Sutaryo, D. (2009). Penghitungan Biomassa: Sebuah Pengantar Untuk Studi Karbon dan Perdagangan Karbon. Bogor: Wetlands International Programme.

[8] Tahura Inten Dewata. (2017). Laporan Rencana Pengelolaan Tahura Inten Dewata. Kementrian Lingkungan Hidup Dan Kehutanan Kabupaten Sumedang.

[9] Wahyu, G.T. (2015). Mengenal Ruang Terbuka Hijau, Medco Foundation. http://www.medcofoundation.org/mengenal-ruang-terbuka-hijau. Diakses pada tanggal 15-1-2017.