TREE CARBON BIOMASS IN THE FOREST AREA OF LAMPAGEU UJONGPANCU VILLAGE, ACEH BESAR DISTRICT

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ABSTRACT

Forest biomass plays an important role in biogeochemical cycles, especially in the carbon cycle. Of all forest carbon, around 50% is stored in forest vegetation. Biomass is a material that can be obtained either directly or indirectly and used as energy. This research aims to determine the biomass and carbon of trees in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency using the direct survey method. There are three observation plots, each plot measuring 10 m × 10 m in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency. The research results show that the biomass stored in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency is 1,688, including the estimated biomass at station 1, 0.527, station 2, 0.785, station 3, 0.376. Meanwhile, the highest biomass and carbon stock estimates were at station 1 with species Silver nervosa total biomass 0.089 and total carbon 0.004. Station 2 with species Cleistantus myriantus total biomass 0.221 and total carbon 0.010. Station 3 with species Eurycoma longiefra total biomass 0.054 and total carbon 0.002. The total tree carbon in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency is 0.077.

Keywords: Carbon Biomass, Trees, Lampageu Village Ujong Pancu Aceh Besar District

A. INTRODUCTION

Lampageu Village, Peukan Bada District, Aceh Besar Regency, Aceh-Indonesia. This is a coastal area located ± 10 km west of Banda Aceh City. According to its topography, this village faces Kuala Pancu (Pancu estuary), an estuary that is in front of the Melaka Strait and the Bay of Bengal. There is a tropical rainforest area in Lampageu Village. Forest areas have the main function of protecting life support systems to regulate water management, prevent flooding, control erosion and maintain soil fertility.

A forest is a collection of plants and plants, especially trees or other woody plants, which occupy a fairly large area. As an ecosystem function, forests play an important role in various things, such as providing water sources, producing oxygen, living places for various flora and fauna, and playing a role in balancing the environment, as well as preventing global warming. Trees are quite tall plants with a lifespan of many years, and tall trees as the basic component of forests play an important role in maintaining soil fertility by producing litter as an important source of nutrients for forest vegetation. The tree is also different because it clearly has an upright, woody trunk that is quite long and a clear crown (crown of leaves) (Darussalam, 2011).

One important environmental issue that is currently of concern to various parties is global warming. Global warming is caused by emission gases such as carbon dioxide, methane, carbon monoxide in the atmosphere which causes air temperatures in the mountains to rise. If this continues to be allowed, this phenomenon will threaten the lives of all living creatures on earth. In connection with this phenomenon, efforts are needed to reduce greenhouse gas emissions. One of these efforts is to preserve forests or conserve vegetation on this earth because vegetation is able to control greenhouse gases by absorbing CO2 through photosynthesis. If managed well, forests are able to overcome excessive amounts of carbon in the atmosphere by storing carbon in the form of biomass. Forests are a place to store and emit carbon. Approximately 90% of the biomass on the earth's surface is found in forests in the form of wood, branches, leaves, roots and forest waste (litter), animals and microorganism.

Biomass is a term for live weight, usually expressed as dry weight, for all or part of the body of an organism, population or community. Plant biomass is the total dry weight of all living plant parts. Plant biomass increases because plants absorb carbon dioxide (CO2) from the air and convert this substance into organic material through the process of photosynthesis (Andy Gustiani Salim, 2014).

Trees as the main elements that form forests require sunlight, carbon dioxide gas (CO2) absorbed from the air and nutrients and water absorbed from the soil for their survival. (Lukito and Rohmatiah, 2013). Plants or trees in forests are

considered to function as a place to store or deposition carbon (carbon sink) (CIFOR, 2003 in Windusari, 2012).

Plant biomass experiences growth and development because plants absorb carbon dioxide (CO2) from the air and convert this substance into organic material through the process of photosynthesis. Different from animals, plants make their own food, which is called primary productivity which is divided into net primary productivity and productivity.

The important role of biomass in the biogeochemical cycle greatly influences the process of carbon cycle activity. Based on the total amount of forest carbon, around 50% of it is stored in forest vegetation. As a consequence, forest destruction, logging, fires, etc. will change the amount of carbon in the atmosphere (Elias, 2009).

Carbon is a natural element with the symbol C. Carbon is also one of the main elements that form organic materials, including living things. Nearly half of living organisms are carbon. Therefore, naturally more carbon is stored on earth (land and sea) than in the atmosphere. Carbon savings (carbon stock) is the amount of carbon stored in the ecosystem at a certain time, either in the form of plant biomass, dead plants, or carbon in the soil (Agus, et al., 2011).

The formulation of the problem in this research is how much tree carbon biomass is in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency. This research aims to find out how much tree carbon biomass is in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency.

The purpose of this research is to provide information about the contribution of trees in sequestering carbon to reduce greenhouse gases. The important role of biomass in the biogeochemical cycle greatly influences the process of carbon cycle activity. Based on the total amount of forest carbon, around 50% of it is stored in forest vegetation. As a consequence, forest destruction, logging, fires, etc. will change the amount of carbon in the atmosphere (Elias, 2009).

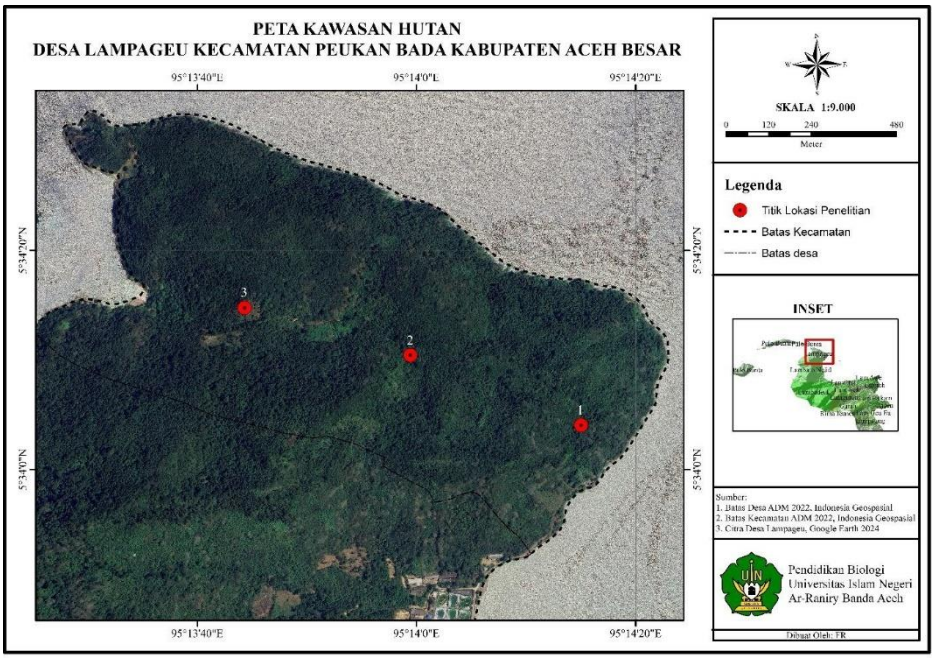
Based on the condition of the forest in this area, it is still very natural and there is also a lot of plant biodiversity, therefore research needs to be carried out to

determine the relationship between changes in vegetation and environmental changes in the forest and to find out the types of vegetation.

B. RESEARCH METHOD

Place and time

This research was conducted on June 18 2023, precisely in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency.



Gambar 1. Peta Lokasi Penelitian

Research Procedure

The steps for this research were carried out, namely determining the location in the field anddetermining the sampling intensity, making an area line 10 M long and 10 M wide. A transect arealine was made which was pulled by a neat rope. At each station, leaves will be taken or cut from different trees, from these 3 plots 42 leaves from different plants can be obtained. The leaves were taken and then weighed until they reached 100 grams for each tree taken. Then put it in the oven for 1 x 48 hours, at a temperature of 800C. After drying in the oven, weigh them again and note the weight of the leaves on each plant.

Tools and materials

The tools and materials used in this research activity were GPS, rope, measuring tape, stationery, cutter/scissors, plastic bags, scales, and sample objects in the form of leaves.

Research Instrument

The instrument used in this research was an observation sheet.

Data Collection Techniques

Data collection was carried out in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency, consisting of 3 stations. Leaf samples are taken using the same method and method,then processed to produce raw data which is then collected and processed into complete and perfectdata.

Data analysis technique

Data analysis techniques for estimating biomass (carbon stock) in trees are analyzed quantitatively using the following formula:

Keterangan:

Biomassa (g/ha)
$$W = 0{,}11.\ BJ.\ D^{2,62}$$

W= Biomass (g/ha)

BJ= Tree Specific Gravity

D= Trunk Diameter at Chest Height (Didi, 2005)

Stok Karbon (g/ha)
$$C = 0{,}46 \times W$$

Keterangan:

C= Plant Carbon Stock (g/ha)

W= Tree Specific Gravity (Sofyan, 2013)

C. RESULT AND DISCUSSION

Observation result

Research data can be seen in the table below:

Table 1. Carbon found in each type of tree

No.	IndonesianName	Scientific Name	W=O,11.B J.D$^{2.62}$	Carbon Stock (CS=W×0, 46) Gram	Kilogram	Carbon Area (Ton/Ha)
1.	Melinjo	*Gnetum gnemon*	0,038	0,017	1,74901E-05	0,002
2.	Tanaman Teh	*Camellia sinensis*	0,044	0,020	2,027E-05	0,002
3.	Cengal	*Hopea nervosa*	0,089	0,041	4,09579E-05	0,004
4.	Biduri	*Calontropis gigntae*	0,018	0,008	8,06336E-06	0,001
5.	Persea	*Persea caesia*	0,030	0,014	1,37335E-05	0,001
6.	Meranti	*Shorea sp*	0,0305	0,009	8,86595E-06	0,0015
7.	Bayur	*Pterospemum javanicum*	0,026	0,012	1,21419E-05	0,001
8.	Kayu Raja	*Endosperum diadenum*	0,030	0,014	1,37633E-05	0,001
9.	Ara Tandan	*Ficus racemosa*	0,040	0,018	1,83766E-05	0,002
10.	Kedondong Hutan	*Spondias pinnata*	0,035	0,016	1,61178E-05	0,002
11.	Merawan	*Hopea ponga*	0,016	0,007	7,46547E-06	0,001
12.	Beringin cina	*Ficus microcarpa*	0,070	0,032	3,21134E-05	0,003
13.	Kesemek	*Diospyros lotus*	0,015	0,007	6,77669E-06	0,001
14.	Beringin	*Ficus benjamina*	0,017	0,009	8,67497E-06	0,001

15.	Kayu Manis	*Cinnamomum burmannii*	0,020	0,009	9,18296E-06	0,001
16.	Daun Jilat	*Villebrunea rubescen*	0,019	0,009	8,62515E-06	0,001
17.	Asam Gunung	*Cleistantus myriantus*	0,211	0,097	9,71843E-05	0,010
18.	Balik Angin	*Malotus floribundus*	0,068	0,031	3,13334E-05	0,003
19.	Gaharu	*Aquilaria malaccensis*	0,089	0,041	4,09957E-05	0,004
20.	Jamblang	*Syzygium cumimi*	0,035	0,021	2,14454E-05	0,0015
21.	Awar-awar	*Ficus septika*	0,069	0,032	3,18771E-05	0,003
22.	Mentaos	*Wringtia pubescens*	0,062	0,029	2,87325E-05	0,003
23.	Asam Gunung	*Cleistanthus myrianthus*	0,055	0,025	2,53865E-05	0,003
24.	Pasak Bumi	*Eurycoma longifolia*	0,0395	0,012	1,16088E-05	0,0015
25.	Magnolia Selatan	*Magnolia grandiflora*	0,032	0,015	1,46162E-05	0,001
26.	Kapuk Randu	*Ceiba pentandra*	0,022	0,010	1,00718E-05	0,001
27.	GlodokanTiang	*Polyalthia longifolia*	0,062	0,029	2,87413E-05	0,003
28.	Mahang	*Macaranga peltata*	0,025	0,012	1,15286E-05	0,001
29.	Dafnah	*Laurus nobilis*	0,037	0,017	1,67937E-05	0,002
30.	Kerukup	*Flacourtia jangomas*	0,018	0,008	8,30276E-06	0,001
31.	Mahoni	*Swietania mahagoni*	0,025	0,012	1,17022E-05	0,001
32.	Nobis Hijau	*Pareskia aculeata*	0,031	0,014	1,41157E-05	0,001
33.	Johar	*Senna siamea*	0,017	0,008	7,9837E-06	0,001

34.	Tingkeum	*Bischofia javanica*	0,016	0,007	7,20058E-06	0,001
35.	Cendana	*Santalum album*	0,034	0,016	1,58589E-05	0,002
36.	Mangga	*Mangifera indica*	0,011	0,005	5,0546E-06	0,001
37.	Kalak Asu	*Anomianthus dulcis*	0,031	0,014	1,43707E-05	0,001
38.	Mete Liar	*Anacardium excelsum*	0,012	0,005	5,3727E-06	0,001
39.	Gaharu	*Aquilaria malaccensis*	0,027	0,013	1,25592E-05	0,001

Table 2. Total Biomass and Carbon

No.	Station	Total Biomass	Total Carbon
1.	Station 1	0,527	0,024
2.	Station 2	0,785	0,036
3.	Station 3	0,376	0,017
	Total Carbon	**1,688**	**0,077**

Table 3. Results of Biomass Estimation Research (Carbon Stock Estimation) on Trees at Station 1

No.	Indonesian Name	Scientific Name	W=O,11.B J.D$^{2.62}$	Carbon Stock (CS=W×0, 46) Gram	Kilogram	Carbon Area (Ton/Ha)
1.	Melinjo	*Gnetum gnemon*	0,038	0,017	1,74901E-05	0,002
2.	Tanaman Teh	*Camellia sinensis*	0,044	0,020	2,027E-05	0,002
3.	Cengal	*Hopea nervosa*	0,089	0,041	4,09579E-05	0,004
4.	Biduri	*Calontropis gigntae*	0,018	0,008	8,06336E-06	0,001
5.	Persea	*Persea caesia*	0,030	0,014	1,37335E-05	0,001

6.	Meranti	*Shorea sp*	0,019	0,009	8,86595E-06	0,001
7.	Bayur	*Pterospemum javanicum*	0,026	0,012	1,21419E-05	0,001
8.	Kayu Raja	*Endosperum diadenum*	0,030	0,014	1,37633E-05	0,001
9.	Ara Tandan	*Ficus racemosa*	0,040	0,018	1,83766E-05	0,002
10.	Kedondong Hutan	*Spondias pinnata*	0,035	0,016	1,61178E-05	0,002
11.	Merawan	*Hopea ponga*	0,016	0,007	7,46547E-06	0,001
12.	Beringin cina	*Ficus microcarpa*	0,070	0,032	3,21134E-05	0,003
13.	Kesemek	*Diospyros lotus*	0,015	0,007	6,77669E-06	0,001
14.	Beringin	*Ficus benjamina*	0,019	0,009	8,67497E-06	0,001
15.	Kayu Manis	*Cinnamomum burmannii*	0,020	0,009	9,18296E-06	0,001
16.	Daun Jilat	*Villebrunea rubescen*	0,019	0,009	8,62515E-06	0,001
	Total Carbon Station 1		**0,527**			**0,024**

Table 4. Results of Biomass Estimation Research (Carbon Stock Estimation) on Trees at Station 2

No.	Indonesian Name	Scientific Name	W=O,11.BJ.D$^{2.62}$	Carbon Stock (CS=W×0,46) Gram	Kilogram	Carbon Area (Ton/Ha)
1.	Asam Gunung	*Cleistantus myriantus*	0,211	0,097	9,71843E-05	0,010
2.	Balik Angin	*Malotus floribundus*	0,068	0,031	3,13334E-05	0,003
3.	Gaharu	*Aquilaria malaccensis*	0,089	0,041	4,09957E-05	0,004
4.	Jamblang	*Syzygium cumimi*	0,047	0,021	2,14454E-05	0,002
5.	Meranti	*Shorea sp*	0,042	0,019	1,92473E-05	0,002
6.	Awar-awar	*Ficus septika*	0,069	0,032	3,18771E-05	0,003
7.	Mentaos	*Wringtia pubescens*	0,062	0,029	2,87325E-05	0,003
8.	Asam Gunung	*Cleistanthus myrianthus*	0,055	0,025	2,53865E-05	0,003
9.	Pasak Bumi	*Eurycoma longifolia*	0,025	0,012	1,16088E-05	0,001
10.	Magnolia Selatan	*Magnolia grandiflora*	0,032	0,015	1,46162E-05	0,001
11.	Kapuk Randu	*Ceiba pentandra*	0,022	0,010	1,00718E-05	0,001
12.	Glodokan Tiang	*Polyalthia longifolia*	0,062	0,029	2,87413E-05	0,003
	Total Carbon Station 2		**0,785**			**0,036**

Table 5. Results of Biomass Estimation Research (Carbon Stock Estimation) on Trees at Station 3

No.	Indonesian Name	Scientific Name	W=O,11.BJ. $D^{2.62}$	Carbon Stock (CS=W×0,46) Gram	Kilogram	Carbon Area (Ton/Ha)
1.	Mahang	*Macaranga peltata*	0,025	0,012	1,15286E-05	0,001
2.	Jamblang	*Syzygium cumimi*	0,023	0,011	1,07575E-05	0,001
3.	Beringin	*Ficus benjamina*	0,015	0,007	6,88182E-06	0,001
4.	Dafnah	*Laurus nobilis*	0,037	0,017	1,67937E-05	0,002
5.	Kerukup	*Flacourtia jangomas*	0,018	0,008	8,30276E-06	0,001
6.	Mahoni	*Swietania mahagoni*	0,025	0,012	1,17022E-05	0,001
7.	Nobis Hijau	*Pareskia aculeata*	0,031	0,014	1,41157E-05	0,001
8.	Johar	*Senna siamea*	0,017	0,008	7,9837E-06	0,001
9.	Tingkeum	*Bischofia javanica*	0,016	0,007	7,20058E-06	0,001
10.	Cendana	*Santalum album*	0,034	0,016	1,58589E-05	0,002
11.	Pasak Bumi	*Eurycoma longiefra*	0,054	0,025	2,46354E-05	0,002
12.	Mangga	*Mangifera indica*	0,011	0,005	5,0546E-06	0,001
13.	Kalak Asu	*Anomianthus dulcis*	0,031	0,014	1,43707E-05	0,001
14.	Mete Liar	*Anacardium excelsum*	0,012	0,005	5,3727E-06	0,001

15.	Gaharu	*Aquilaria malaccensis*	0,027	0,013	1,25592E-05	0,001
	Total Carbon Station 3		**0,376**			**0,017**

Based on the results of research that has been carried out in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency, it is known that this area is a mountainous area where there is still primary forest, namely forest that is still dense with various types of plants in it, the condition of the forest is still beautiful with tree species. with different heights and various animals that inhabit the area. The research carried out also shows that biomass is biological material that comes from living organisms or creatures. Biomass can also be defined as the total number of organisms found in a habitat.

Biomass can be obtained from relatively young organic materials originating from plants or animals. Biomass energy is an alternative energy source to replace fossil fuels. Biomass is an energy source that will never run out, because the biological materials needed to make biomass energy will always be available. Energy produced from biomass can be used for various purposes.

Based on research results, carbon estimation in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency, was obtained by determining the area of the place or forest that will be used as a sampling location, the aim of which is to determine the accumulation of organic carbon in plants such as herbs, litter and trees. , as well as to determine the absolute carbon relationship in a biomass or plant at a certain time.

The results of research on the physical environment, soil moisture is 6.4% and soil pH is 6.69. The air temperature is 310C and the light intensity is 180. The research results show that the biomass stored in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency is 1.688, including the estimated biomass at station 1, 0.527, station 2, 0.785, station 3, 0.376. Meanwhile, the highest biomass and carbon stock estimates were at station 1 with species Silver nervosa total biomass 0.089 and total carbon 0.004. Station 2 with species Cleistantus myriantus

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Differences in the estimated values of biomass and carbon stocks in trees can be caused by several factors, both internal and external factors which have an important role in the values of both. Among these factors can be caused by the height or low of a tree and even the type of species of the tree. This is thought to be because the low density of individual tree stands causes the available nutrients to become greater, so that individual trees will absorb a lot of nutrients and will form a large biomass. Low density will provide optimal opportunities for growth trunk diameter, because competition between individuals is reduced, so the tree stand will increase its diameter (Latifah, 2004).

D. CONCLUSION

The research location for estimating tree carbon biomass was carried out in the forest area of Lampageu Ujong Pancu Village. The results of research on the physical environment, soil moisture is 6.4% and soil pH is 6.69. The air temperature is 310C and the light intensity is 180. The research results show that the biomass stored in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency is 1.688, including the estimated biomass at station 1, 0.527, station 2, 0.785, station 3, 0.376. Meanwhile, the highest biomass and carbon stock estimates were at station 1 with species Silver nervosa total biomass 0.089 and total carbon 0.004. Station 2 with species Cleistantus myriantus total biomass 0.221 and total carbon 0.010. Station 3 with species Eurycoma longiefra total biomass 0.054 and total carbon 0.002. The total tree carbon in the forest area of Lampageu Ujong Pancu Village, Aceh Besar Regency is 0.077.

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become greater, so that individual trees will absorb a lot of nutrients and will form a large biomass. Low density will provide optimal opportunities for increasing trunk diameter, because competition between individuals is reduced, so that standing trees will increase their diameter.

E. REFERENCES

Arief, A. 2005. *Hutan dan kehutanan*, Kanisius : Yogyakarta

Brown, Sandra, 1997. Estimating biomass and biomass change of tropical forests: a Primer. FAO Forestry Paper - 134. FAO, Rome.

Darussalam D. 2011. *Pendugaan Potensi Serapan Karbon Pada Tegakan Pinus Di KPH Cianjur Perum Perhutani Unit III Jawa Barat dan Banten*. Skripsi Institut Pertanian Bogor.

Elias, N.J. Wistara., 2009, Metode Estimasi Massa Karbon Pohon Jeunjing *(Paraserianthes falcataria* L Nielsen) di Hutan Rakyat, Artikel Ilmiah, Vol. XV, No. 2, Bogor: IPB.

Fahrudin, L., 2004, *Komposisi Jenis Vegetasi Pada Hutan Sekunder Di Sekitar Kawasan Taman Nasional Lore Lindu Desa Rompo Kecamatan Lore Tengah Kabupaten Poso Sulawesi Tengah*, Skripsi, Program Studi Manajemen Hutan Jurusan Budidaya Pertanian Fakultas Pertanian Universitas Tadulako, Palu.

Fischer, C., & Traub, B. 2019. *Swiss National Forest Inventory – Methods and Models of the Fourth Assessment.* Switzerland: Springer.

Hairiah K, S.M. Sitompul, 2001, Methods For Sampling Carbon Stocks Above and Belowground, Bogor: Local Action and Global Concerns, ICRAF.

Hilmi, E dan Kusmana, C. 2008, Model Pendugaan Potensi Karbon Flora Bakau, Bogor: Fahutan IPB.

Latifah, S., 2004. *Pertumbuhan Hasil Tegakan Eucalyptus grandis di Hutan Tanaman Industri*. ITI Jurusan Kehutanan Fakultas Pertanian. Medan: Universitas Sumatera Utara.

Lubis, Sofyan Hadi, dkk., 2013. Analisis Cadangan Karbon Pohon pada Lanskap Hutan Kota di Dki Jakarta. *Jurnal Penelitian dan Ekonomi Kehutanan*. Vol. 10. No. 1.

Lukito M. dan Rohmatiah A. 2013. Estimasi Biomassa dan Karbon Tanaman Jati Umur 5 Tahun. *Agri-tek.* Volume 14 Nomor 1 : 1-23.

Masripatin, dkk., 2010, Cadangan Karbon pada berbagai Tipe Hutan dan Jenis Tanaman di Indonesia. Pusat Penelitian dan Pengembangan Perubahan Iklim dan Kebijakan.

Sianturi, R., & Masiyah, S. 2018. Estimasi Stok Karbon Mangrove Di Muara Sungai Kumbe Distrik Malind Kabupaten Merauke. *Musamus Fisheries and Marine Journal*, 24-32.

Supriadi, 2011, Hukum Kehutanan dan Hukum Perkebunan, Jakarta: Sinar Grafika.

Sutaryo, D. 2009. *Penghitungan Biomassa: Sebuah Pengantar untuk Studi Karbon dan Perdagangan Karbon.* Bogor: Wetlands International Indonesia Programme.

Usmadi Didi dkk., 2015. Potensi Biomassa dan Cadangan Karbon Kebun Raya Balikpapan, Kalimantan Timur. *Jurnal Buletin Karbon Raya*. Vol. 18. No. 1.