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COMPOSITION AND CARBON STOCKS IN TALAGA KULON FOREST, MAJALENGKA DISTRICT, WEST JAVA PROVINCE, INDONESIA

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A B S T R A C T

The community forest in addition to the role for supplying wood and non-wood forest products industry, also play a role for carbon sinks, wich is stores into tree biomass. The species, diameter, and height are the most important properties of tress that are affecting the availability of tree biomass and carbon stock. The role of forests in carbon sinks have been gives a lot of benefits in reducing greenhouse effect which is caused global warming and climate change that also give affect to economy and environmental consequences. As the result, government of Indonesia has committed to reducing greenhouse gas emissions that clauses contained in Regulations of President of The Republic of Indonesia Number 71/2011 on the Implementation of National GHG Inventory. This research took a place at the civilian forest of Talaga Kulon, Majalengka District. Describe the aims of research The methods that are used in this research to find the dominance and the Important Value Index (IVI) value is analysis of vegetation. Mean while for finding biomass calculate I used allometric equations. The result of this research showed that the species of Mahogany, Sengon, Teak, Tisuk and any African/Mences type are the one that have the highest dominance and IVI value. While the amount of Carbon stocks of Civilian Forest of Talaga Kulon Village is 43,55 tons C/ha which composed for pole-stage tree is 9,33 tons/ha and 34,22 tons/ha for sawtimber stage tree.

Key words: **Community Forest, Carbon Stock, Dominance, Allometric equations**

1. Introduction

Forests have benefits that can be felt directly in the form of timber products, non-timber products and animals, and benefits that are not directly in the form of regulators, aesthetic functions, as oxygen producers and carbon sinks (Masripatin et al., 2010). The current forest degradation in the form of degradation and deforestation results in environmental damage.

Environmental damage that occurs has an impact on the imbalance of carrying capacity of the environment, climate change and global warming is a problem that arises from increasing greenhouse gas emissions as a result of environmental damage. This can also directly affect social and economic life (Cahyono, 2007).

The increase in greenhouse gas emissions is one of the issues of concern to the government, so that the Government of Indonesia has a commitment to reduce emissions contained in the Indonesian Republican Presidential Regulation No. 71 of 2011 concerning the Implementation of Greenhouse Gas Inventory, so that in line with this there is a need for research that aims to find out how much forest capacity is in carbon absorption and how much carbon is stored in a forest area.

Forest development in order to increase CO2 absorption can be carried out maximally, if community forests become one of the considerations for carbon sink potential not only as wood input. The research will be conducted in Talaga Kulon, Majalengka District.

2. Method

2.1. Study Sites

This study was carried out at Talaga Kulon Forest, Majalengka District. The material needed in this study is a community forest area with the object of research in the form of plants at the pole and tree level.

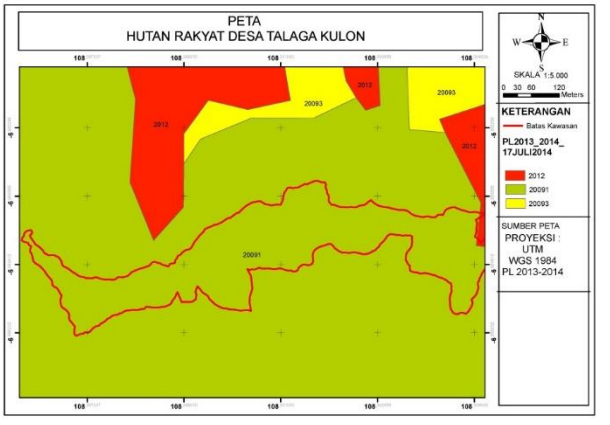

Figure 1. Site Map Research

2.2. Data Collection

Data collection is done by sampling (sampling), that is by taking a number of samples from the entire population of the research area. The method applied is purposive where the determination of plot locations is adjusted to existing accessibility, whether roads, rivers or canals (Manuri et al., 2011). Sampling intensity taken at 5%, based on the Ministry

of Forestry (2013) the intensity of sampling used is 1%, then the use of sampling intensity of 5% can be accepted, sampling intensity can be determined based on the level of accuracy, cost and inventory ability (Umroni, 2012 in Ristiara, et al., 2017).

Biomass calculations are carried out at the pole level and Manuri et al. (2011) stated that the poles had DBH ≤ 10 - <20 cm and DBH trees ≤ 20 -> 35 cm. The number of sample plots taken is based on the Simon formula (1996).

2.3. Analysis

Vegetation analysis is used to find out which plant species are most dominant in areas with mixed stands in community forests. Indriyanto (2006) says that important value index (IVI) is used to measure the dominance of species in a plant community.

Data analyzed in the form of density (D), relative density (RD), frequency (F), relative frequency (RF), dominance (D), relative dominance (RM) and IVI value, tree biomass and carbon estimation.

3. Results and Discussion

3.1. Composition Talaga Kulon Forest

Found 28 species of plants included in 19 families with a total plant at the level of the pole as many as 598 individuals and the tree level was 360 individuals. There is one type that is not identified, namely Kipasung, the following types of families are found, namely, Anacardiaceae, Apocynaceae, Bombaceae, Caesalpiniaceae, Combretaceae, Euphorbiaceae, Fabaceae, Gnetaceae, Lamiaceae, Lauraceae, Malvaceae, Meliaceae, Moraceae, Myrtaceae, Papilionaceae, Rutaceae, Rhamnaceae, Rhamnaceae, Sapindaceaedan Verbenaceae.

Table 1. Recapitulation of species at the research location

No	Nama Family	Botanical Name	Local Name
1	Anacardiaceae	*Mangifera foetida*	Limus
		Mangifera indica	Mangga
2	Apocynaceae	*Alstonia scholaris*	Lame
3	Bombaceae	*Durio zibethinus*	Duren
4	Caesalpiniaceae	*Tamarindus indica*	Asem
5	Combretaceae	*Terminalia catappa*	Ketapang
6	Euphorbiaceae	*Baccaurca racemosa*	Kapundung
7	Fabaceae	*Pithecelobium jiringa*	Jengkol
		Parkia speciosa	Petai
		Parasserianthes falcataria	Sengon
8	Gnetaceae	*Gnetum gnemon*	Melinjo
9	Lamiaceae/Verbenaceeae	*Tectona grandis*	Jati
10	Lauraceae	*Persea americana*	Alpukat
11	Malvaceae	*Ceiba petandra*	Randu/Kapuk
		Hibiscus macrophyllus	Tisuk
12	Meliaceae	*Swietenia sp.*	Mahoni
		Melia azedarach	Mindi
		Toona sureni	Suren
13	Moraceae	*Artocarpus heterophyllus*	Nangka
		Artocarpus communis	Sukun
14	Myrtaceae	*Eugenia aromatica*	Cengkeh
		Syzygium polyanthum	Salam
15	Papilionaceae	*Pterocarpus indica*	Angsana
16	Rutaceae	*Evodia samentoda*	Sampang
17	Rhamnaceae	*Maesopsis emini*	Afrika/Mences
18	Sapindaceae	*Nephelium lappaceum*	Rambutan
19	Verbenaceae	*Gmelina arborea*	Gmelina/JatiPutih
20	Unidentification	Unidentification	Kipasung

The results of vegetation analysis that have the highest IVI and dominate the location are Swietenia macrophyllus, Parasserianthes falcataria, Maesopsis emini and Tectona grandis . IVI value is an indicator that becomes a reference for the importance of a species found in a habitat determined by density, frequency and dominance in a plot (Wisnu et al, 2013).

According to Aminudin (2008), an important value index is an appropriate indicator to see changes number of types after certain treatment so that

Resulting in shifting the value of IVI. The type that dominates a habitat shows its ability to adapt to the environment so that it can develop and master the environment in part or in whole (Fajri and Saridan, 2012 in Ristiara et.al, 2017). The following types of plants are found in the community forests of Talaga Kulon, Majalengka District.

The plants that dominate the land are Swietenia macrophyllus and Parasserianthes falcataria, where both types of plants have a high selling value, because both of them are used as materials for making furniture and building materials. Sselai's uses of mahogany plants have health benefits, namely seeds, as drugs to reduce blood glucose levels for people with diabetes mellitus (Soerianegara and Lemmens, 1993; in Krisnawati et al, 2011). The type of sengon has benefits as wind and fire retaining plants (Krisnawati, et al, 2011), according to Orwa et al, (2009) litter derived from sengon twigs and leaves has benefits to increase nitrogen content, organic matter and soil minerals.

Table 2. Important Value Index (IVI)

No	Species	Pole				Tree			
		RD (%)	RF (%)	RM (%)	IVI (%)	RD (%)	RF (%)	RM (%)	IVI (%)
1	*Swietenia macrophyllus*	*34*	*21*	*36*	*91*	*46*	*24*	*52*	*122*
2	*Parasserianthes falcataria*	*29*	*17*	*29*	*75*	*17*	*17*	*14*	*48*
3	*Maesopsis emini*	*8*	*9*	*9*	*26*	*12*	*13*	*11*	*35*
4	*Tectona grandis*	*7*	*8*	*6*	*21*	*5*	*5*	*6*	*16*
5	*Hibiscus macrophyllus*	*6*	*12*	*6*	*25*	*5*	*8*	*3*	*16*

3.2. Carbon Stocks

The value of stored carbon reserves is 43.55 tons / ha of community forest area of 2.1 ha which is divided at pole level of 9.33 tons / ha and tree level of 34.22 tons / ha. The amount of carbon stored above the surface of the community forest land in Talaga Kulon of 43.63 tons / ha is relatively smaller than the Manglid community forest in Tasikmalaya of 44 tons / ha (Siarudin & Yongky, 2014), as well as the Jamblang community forest in Gunung Kidul Regency is 81 tons / ha (Indrajaya & Sudomo, 2016) or with Kelungu Pekon community forests that have a saved carbon amount of 99.92 tons / ha (Ristiara et., Al. 2017). This can occur due to differences of the stand density at the research location which is relatively lower compared to the three research sites. According to Suwardi et al., (2013) states that differences in the number, type and size of trees that make up a forest cause a difference in the value of tree biomass.

Public forest carbon stocks in Kelungu Pekon at the pole level of 10.97 tons / ha (Ristiara et. Al., 2017), have greater value than community forests in Talaga Kulon village, which is 9.41 tons / ha which has a difference in value. relatively small, and for the tree level has a value of 34, 22 tons / ha is also smaller in value than the tree level carbon value in the community forest Kelungu Pekon which has a value of 85.68 tons / ha (Ristiara et. al, 2017).

The diameter that has the greatest value is found in the size of> 30 cm, which is equal to 18.118.91 kg while the smallest value is found in the diameter size of 25 - 29 cm which is equal to 2809.03 kg. If it is assumed that 50% of the amount of biomass is carbon, then the value of carbon reserves at sizes> 30 cm is 9019.53 tons C / ha while for sizes 25 - 29 cm in diameter is 1401.76 tons C / ha.

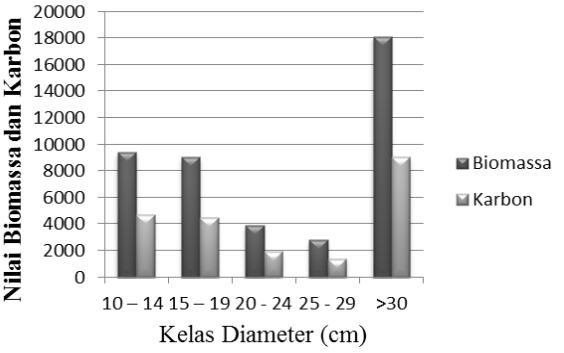

Figure 2. Biomass and Carbon Stock in metric per ha

Research by Hendrayana et al (2018) also shows differences in the value of biomass and carbon at each height in the type of Ficus sp, the total amount of biomass is 606.75 tons ha-1 with details at an altitude of 500 m 51.69 tons / ha, height of 600 m 143.46 tons / ha, height of 700 m 133.10 tons / ha, height of 800 m 147.95 tons / ha, height of 900 m 109.30 tons / ha and altitude of 1000 m 12.15 tons / ha. While the total carbon content is, 303.38 tons ha-1 with technicians at an altitude of 500 m 25.85 tons C / ha, height 600 m 71.73 tons C / ha, height 700 m 66.55 tons C / ha, altitude 800 73.97 tons C / ha, height of 900 m 54.65 tons C / ha and a height of 1000 m 6.08 tons C / ha. Ficus sundaica Blume is the type with the highest carbon storage value, which is 77.16 tons C / ha, while the smallest value of Ficus ampelas Burn is 0.39 tons C / ha.

The amount of biomass and carbon stored is inversely proportional to the number of individuals in the diameter class, where the highest number of individuals is in the 10-14 cm diameter class with 382 individuals, the lowest in the 25-29 cm diameter class with 91 individuals, while the diameter class> 30 cm which has the highest amount of biomass and carbon has 109 individuals. So it can be concluded that the diameter size is a factor that affects the amount of biomass and carbon stock stored.

Based on the above data, it shows five types of plants with the highest values both on the amount of biomass and carbon

calculated based on the stratification of tree levels (poles and trees) and diameter classes, the types of plants are Africa, teak, mahogany, sengon and tisuk. Several factors that affect biomass and carbon stock deposits in addition to diameter are tree height, tree type and tree density. In harmony with Sugirahayu and Omo, (2011) which states that differences in carbon deposits occur because it is influenced by the number and density of trees, tree species, and environmental factors.

Tree density has a high value, so high biomass and carbon deposits, while what is meant by environmental factors is related to photosynthesis. Where environmental factors include solar radiation, water content, temperature and soil fertility that affect the rate of photosynthesis (Sugirahayu and Omo, 2011). Data from the research show that diameter is a factor that influences the amount of biomass and carbon stock deposits, according to Langi et al, (2007) that the larger the density the greater the density and the water content will decrease.

Based on this opinion, it can be taken a statement that specific gravity has correlation to biomass and carbon deposits. Suwardi et al, (2013) state that density has a correlation with biomass and carbon stock deposits, but the correlation contributes little to biomass and carbon stock deposits, in the study the stem diameter has a correlation of r = 0.853 or about 97.1% while the weight type has correlation equal to r = 0.139 or around 1.9%.

Field data shows that community forests in Talaga Kulon village are managed by agroforestry systems and mixed systems. Mixed systems are systems of land planted more than one forestry network, while agroforestry systems are land management that combines woody plants (forestry), agriculture and or livestock in rotation which will produce ecological and economic interactions (Lundgren & Raintree, 1982; in Hairiah et al, 2003).

Community forests, agroforestry and trees outside forest areas have the potential to reduce greenhouse gas emissions (Pendey, 2002; in Langi, 2007), community forests have a role in storing carbon stocks, which are dominated by wood having a biomass content of 45-50% dry matter containing carbon (Brown, 1997; in Langi 2007), which in commercial trees the biomass content generally consists of tree trunks (60-65%), canopy (5%), leaves and branches (10-15%) and root (5%) (Whitten & Plasket, 1981; in Rachman, 2009).

Community forests have the potential for carbon sequestration with the many management systems applied to manage community forests, the agroforestry system is a system recommended to be implemented in its management. This is because the agroforestry system can safeguard ecological values in addition to providing economic benefits. According to Langi (2007), the advantage of this system is the sustainability of soil fertility, soil conservation, increased yield, minimizing crop failure due to ease of management.

4. Conclusion

The dominance of Talaga Kulon forest Majalengka District is Swietenia macrophylla, Parasserianthes falcataria, Maesopsis emini, Tectona grandis and Hibiscus macrophyllus, with the discovery of 28 species of plants, 27 plants belonging to 19 families and 1 species not identified, Kipasung.

Carbon reserves in the community forests of Talaga Kulon forest have differences at the level of the level, carbon stocks with the smallest values are at pole level of 9.33 tons C / ha and for tree level 34.22 tons C / ha, the total carbon stock is 43, 55 tons C / ha

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