Sar: Kanume tribal culture in environmental conservation to reduce global warming effects

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Abstract. Global warming is an event that occurs due to the trapping of some gas on earth that makes the earth's temperature increases. One way that can be used to reduce the effects of global warming is by forest conservation or tree planting. In Merauke, one of the Kanume culture, the sar culture, is a culture that forbids human beings to extract natural products from a region that is applied to sar. This study is a descriptive study with the aim of explaining the role of sar culture as one way to reduce the greenhouse effect through the process of absorption of CO_2. The data is taken by interview and also literature study. The results show that sar culture can serve as an alternative to absorb CO_2. This is because, at the time sar apply, plants or trees that exist in the area can grow and do photosynthesis effectively. The growth and process of photosynthesis are what acts as a CO_2 absorber.

1. Introduction

Merauke is the easternmost district of Indonesia with an area of 45,071 km^2 and has great natural resources in fishery and marine fields, food crop agriculture, plantation, livestock, forestry, industry and tourism and culture [1]. Most of the area in Merauke is swamp and forest. The area of the swamp is ± 1,425,000 ha, and the forest area is ± 4,677,832 ha [1]. The forest area, there are various types of trees, such as gambier (*Uncaria gambier*), rattan (*Calamus rotang*), Ironwood (*Eusideroxylon zwageri*) nutmeg (*Myristica fragrans*), *Melaleuca leucadendra*, *Melaleuca cajuputi,* and many other trees, as well as some species of orchids. In addition to being a place to grow trees, the forest is also home to some of the typical fauna of Merauke, including deer, pigs, kangaroos, bird of paradise, cockatoos, pigeon, and many other species of bird.

Merauke has several indigenous tribes scattered throughout the Merauke region. One of them is the Kanume tribe who lives in Sota and Naukenjerai districts. The area of Naukenjerai district is ± 90,876 Ha whose area is still a forest [2]. One of the Kanume tribal villages in the Naukenjerai district is Tomer village. The tribe of Kanume who live in Tomer village still rely on nature. They cultivate their land, which is still mostly forest, by planting vegetables and tubers. Also, they also hunt and catch fish in the swamps.

The tribal diversity in Merauke also makes the Merauke rich in culture. Each tribe has its own culture that is applied in their lives and so is the Kanume tribe. One of the cultures of the Kanume tribe is *Sar*, a culture where there is a prohibition of taking natural resources over a long period [3]. This culture is held as a tribute to the deceased person [3].

This culture is held by prohibiting the community from taking natural resources from a region applied by the *sar* culture. If *sar* is applied for 1 year, it means that the community is prohibited from

taking the natural resources for 1 year. This is indirectly affecting the conservation of nature in that region.

The current conservation of nature is something that is being encouraged all over the world. This is related to global warming. The effects of global warming are the rising earth temperatures, ice melting in the north and south poles, the occurrence of natural disasters, rising of surface water levels on earth and many other effects. One method to reduce the effects of global warming is the conservation of nature. Indirectly, this *sar* culture can be one of the methods to reduce the effects of global warming.

This paper describes the role of *sar* culture to reduce the global warming effect through the absorption of carbon dioxide by the trees.

2. Literature Review

2.1. Sar Culture

Environmental conservation or nature conservation in this era is one of the main topics that is discussed all over the world. Any method is used so that the environment or nature sustainability can be maintained. The methods can be performed using a modern method or using technology; there are also methods that use the culture or local wisdom of a region. Local wisdom or commonly referred to as traditional wisdom is one of the cultural heritages that exist in the community and is hereditarily implemented by the community [4].

In Indonesia, some regions use local wisdom to preserve their nature. The term for local wisdom is also different, depends on the region. In Sumatra, this local wisdom is called *ngalau agung*, which is nature conservation for fish [5] [6]. In Kendal, it is called *Tuk Serco* that is nature conservation for springs [7]. In Sulawesi, Maluku and also some region of Papua, the local wisdom is called *sasi* [8].

The Kanume tribe, one of the tribes in Merauke, has local wisdom for nature conservation and that culture is called *sar*. According to the interviews with the tribal elders of the Kanume tribe, the culture of *sar* is prohibiting people from taking natural resources for a long period. This culture is held if there are people who passed away with the aim to honor the deceased person.

The tribal elders led the implementation of sar and coupled with some traditional events. This cultural implementation procession begins with a customary event and an installation of a sign on the area that is applied by *sar*. The region applied by *sar* is the area or territory of the deceased person. As long as *sar* is applied, the area shall not be managed, or its natural resources can be taken. This traditional ceremony is followed by the entire family of the deceased person and also the community of the village. It aims to let everyone know if the area is applied by *sar* so that no one takes the natural resources from the area. If there is a violation, then the person will be subject to the customary sanctions.

In the area that is applied by *sar*, *sar* sign is given, that is the special wood called *misar*. The length of implementation of *sar* is at least 3 years. After 3 years or completion time of *sar*, it is opened through a traditional ceremony. At this traditional ceremony, the whole family and also the community are included in the ceremony. If *sar* has been opened, it means that the family or the local community is allowed to manage or take the natural resource from that area.

2.2 Global Warming

Global warming is one of natural phenomenon that is currently faced by the world. This phenomenon occurs because of the rising of earth surface temperature and also the environmental temperature due to the greenhouse effect [9]. The greenhouse effect is defined as a phenomenon when certain gases are trapped and can not escape from the earth causing an increase in the temperature of the earth [10]. The gases in question are carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxide (NO_2), chlorofluorocarbons (CFC), suphuric fluoride, methane, hydrocarbons and other gases [9], [10]. These gases are produced from human activities. Therefore, 97% of the scientists working in the world of climate agree that humans are the main cause of global warming [10].

The results of human activities that led to the emergence of greenhouse gases are called emissions [11]. These human activities have been started since the 18^{th} century, i.e., since the industrial

revolution begins [11]. The things that can increase the gas emissions are factory wastes in the form of smoke, power plants, transportation, fuel burning, and waste disposal.

The consequences of this global warming effect are the rising of earth surface temperatures and causing the earth to heat up. Over the past 100 years, the average increase in surface temperature has reached 1^{o}C or 1,3^{o}F [12]. According to the US National Oceanic and Atmospheric Administration, in recent years, the temperatures around the Arctic continent have reached 5^{o}C or 9^{o}F, which is the temperature above normal [12]. Due to the rise in the temperature of the earth, the ice in the Arctic continent and the Antarctic continent melts and causes an increase in sea level. Global warming also leads to uncertain climate change and also causes natural disasters such as floods, landslides, hurricanes, and tornadoes.

3. Methods

This research was descriptive research. Data collection was done by interview and also literature study. Interviews were conducted with the tribal elders of the Kanume tribe to obtain information about *sar* culture. A literature study was conducted to obtain information on global warming as well as the methods to reduce the effects of global warming.

4. Results and Discussion

4.1. The amount of CO_2 absorbed by a tree

A tree requires CO_2 to survive through the photosynthesis process. In the process of photosynthesis, the tree releases the oxygen gas (O_2) needed by living things to breathe. It is estimated that A tree can absorb CO_2 as much as 1 ton during its life [12]. It is estimated that 1 ha of trees can absorb 13,2 tons of CO_2 per year [11].

Research to calculate the amount of CO_2 that can be absorbed by trees has been done. According to Rane *et al.* study [13], teak trees (*Tectona gandis*), Polyalthia longifolia trees, Indian trumpet flower tree (*Oroxylum Indicum*), golden rain tree (*Cassia fistula*) and some other species of tree can be useful as a good CO_2 absorber as well producing better air quality [13]. From the research that was conducted, teak trees absorbed the most CO_2 of 9.47 μ mol/m^2/sec in winter and of 3.87 μ mol/m^2/sec in spring.

Research conducted by Rivai *et al.* [14] counted the number of CO_2 absorption in some parks in Medan. The results showed that the majority of the absorption occurred in Taman Merdeka Medan, which was 383.56 tons/year. This was influenced by the types of plants located in that park; those were rained tree (*Samanea saman*) and some trees from the Fabaceae family.

Suwanmontri et al. also conducted research and performed calculations using chamber analysis. From the result of the research, it was found that copper pod tree (*Peltophorum pterocarpum*) reached the absorption of CO_2 of 24.5 μ mol/m^2/sec and rain tree (*Samanea saman*) reached the maximum absorption of CO_2 of ± 20.9 μ mol/m^2/sec [15].

In Pekanbaru, Pane et al. conducted a study on three shade trees for CO_2 absorption. The trees were an angsana tree (*Pterocarpus indicus*), mahogany tree (*Swietenia macrophylla*) and *Melaleuca leucadendron* tree. From the results of research and calculation, it was found that Angsana trees absorbed the most CO_2 of 81.83 x 10^{-3} g/leaf/hour and had a potency as the best shade plant [16].

Research on the amount of CO2 absorbed by a tree calculated several factors. These factors were the size of trees both the height and diameter of the stem, the number and size of leaves and the area planted by the trees. The results of several studies showed that large trees such as teak trees, rain trees and angsana trees were the trees that absorbed the most CO_2. Since the trees were large, it made the trees had left in large quantities. The more leaves the tree has, the more effective the process of photosynthesis become. Therefore, the absorption of the CO_2 occurred fastly and expedited the process of photosynthesis.

4.2. Sar Culture as an Alternative of CO_2 Absorption

The forest which is the place where the tree lives must be preserved. This is one of the methods to reduce the effects of global warming. Merauke which has a large area, where most of the area is still covered by forests, has the potential to become a CO_2 absorber in a large amount. Therefore, the community and also the government must preserve the forest.

One method that can be used is through local wisdom or *sar* culture. The principle of the implementation of this sar culture is to prohibit people from managing or taking natural resources from a region that is applied by *sar*. The validity time of this *sar* is at least 3 years.

If a region is applied by *sar*, indirectly it allowed everything in the area to live and breed, both plants or animals. Because the Merauke area, especially where the Kanume tribe live, is still covered by forests, *sar* culture has indirectly preserved the sustainability of the plants in that area.

The duration *sar* that is at least 3 years makes the plants or trees that exist in the area can grow without any disturbance. The dominant types of plants are ironwood, melaleuca leucadendra, and melaleuca cajuputi trees which can grow and multiply freely.

The type of plants that exist in the area of the Kanume tribe is a type of plant with a large size and also a large number of leaves. Ironwood tree has a height of 15-25 m with oval-shaped leaves of 8-16 x 5.2-12 cm [17]. *Melaleuca leucadendra* trees can also reach a height of 30 m to 40 m, with oval-shaped leaves of 9-22.5 x 3.5 – 9.5 cm [17] while the *Melaleuca cajuputi* tree can reach up to 40 m tall with elliptical leaves of 3-12.5 x 1.1x3.75 cm [17].

Those three types of trees, namely ironwood trees, *Melaleuca leucadendra* trees and also *Melaleuca cajuputi* trees were a potential tree to absorb CO_2 in large quantities. This was because the tree was big. By the research of Pane *et al*., *Melaleuca cajuputi* trees could absorb CO_2 by 59.34 x 10^{-3} g/leaf/hour [16]. Also, the large size and a large number of leaves also caused the trees to photosynthesize effectively.

As long as the *sar* culture is applied, the plants in the area, can grow and photosynthesize without any disruption. During the growth period, plants continue to photosynthesize without stopping. The process of photosynthesis that takes place continuously indicates that the trees continue to absorb the CO_2 around them. This continuous absorption indirectly reduces the amount of CO_2 in the earth's surface. Besides absorbing CO_2, this process of photosynthesis removes O_2 which is beneficial for the living things to breath, including the tree itself.

Besides photosynthesis, as long as the *sar* culture is applied, the plants will still grow and produce fruit or something that can later be used by humans. During the period of growth and producing fruit, it does not rule out the possibility that new plants from the types of plants that exist in the area will grow. This is because the process of plant multiplication can occur naturally or with the help of wind. Trees that have fruit, if the fruit fell then it will produce a new plant. So is with the wind, which can bring seed from the tree to another place and from the seeds, the new plants can grow. The existence of the new plants is also useful to absorb the CO_2.

5. Conclusions

Merauke, which the territory is still mostly covered by forests, can potentially become a good area of CO_2 absorption. But this happens if the forest can be preserved by the community and government. One of the methods that can be used was through *sar* culture, Kanume's culture that forbid someone to manage or take something from an area that was applied by *sar*. This prohibition has indirectly ensured the survival of the existing plants in the area. Those plants could grow and photosynthesize effectively. From the process of photosynthesis, plants could absorb CO_2 in large quantities. It could be an alternative to reduce the effects of global warming that occured on this day.

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