Socio Economic Roles of Dragon Blood in Participative Rehabilitation of Degraded Forest and Land

S Lestari*, B T Premono, A Kunarso
Environment and Forestry Research Development Institute of Palembang
Ministry of Environment and Forestry, Jl. Kol. H. Burlian Km 6.5 Puntikayu, Palembang, South Sumatra, Indonesia

*Corresponding Email : lestari@iuj.ac.jp, btejoprem80@gmail.com, adikunarso@yahoo.com

Abstract. Overexploitation, both by the public and other parties that interact directly or indirectly with natural resources is one of the causes of forest and land degradation. Dragon’s blood development as one of the non-timber forest products is expected to be a solution to reduce the level of forests and land damage. This study aims to describe the community's efforts in the utilization and development of dragon’s blood, as well as their impact on the rehabilitation of forest areas that have been degraded due to over-exploitation. The study was conducted in Semendo Darat Ulu, Muara Enim Regency, South Sumatra Province. Field observations and interviews were used to collect information on respondents’ characteristics and their behavior in relation to the utilization and development of dragon’s blood. Data were analyzed descriptively and qualitatively to answer the research objectives. The findings show that the communities around forest areas have more eagerness to harvest dragon’s blood sustainably. People who previously have only perform dragon’s blood collection from the natural forest, began to make efforts for the development of dragon’s blood on their private land. The higher economic value of dragon’s blood raises public awareness to protect and preserve it. The successful development of dragon’s blood is expected to be a solution for forest and land rehabilitation in Muara Enim. Communities sources of income from dragon’s blood can reduce the dependence on the forest, so that public access to forests decreases. At last, the preservation of forests and land will be maintained and sustained.

1. Introduction
Degraded forest occurred in many parts of Indonesia since people who live nearby still have a high dependence on the forest to fulfill their needs. Previous research of [1] revealed that communities around the forest have a high level of dependence on forest resources in the form of timber and non-timber. The increasing number of population which is not accompanied by an increase in the number of jobs, both inside and outside the agricultural sector, will increase public pressure on the forests. This proves that forests have a significant role for the community welfare. The contribution of forest resources to the community per capita income will help the people to remain above the poverty line [2]. However, [3] revealed that there is no significant correlation between poverty and forest degradation. Forest became important sources of cash income for the people nearby [4]. Moreover, a forest has a socioeconomic and ecological contribution to improve livelihood and conservation income [5].
The involvement of local communities in the management of forest areas will increase their awareness of the importance of preserving forests, because forests can provide various functions that are needed by society. These functions are economic, ecological and social functions. The relationship between economic functions and ecological functions is often contradictory because when people prioritize economic functions, the ecological function must be sacrificed, or vice versa. In fact, if public awareness of the importance of forest values is high, between economic functions and ecological functions can be harmonized in tandem.

The collection of non-timber forest products from the forest by the community is often less concerned with the sustainability aspects of the harvest. In some cases, communities collect forest products that cause damage to these non-timber forest products in the long run. In Semendo Darat Ulu Sub-district, People awareness of dragon's blood sustainability as one of non-timber forest product increase since the availability of this product was getting scarce. This study aims to describe the community's efforts in the utilization and development of dragon’s blood, as well as their impact on the rehabilitation of forest areas that have been degraded due to over-exploitation.

2. Research Method

2.1. Time and study sites of the research
The study was conducted in Semendo Darat Ulu, Muara Enim Regency, South Sumatra Province in 2017. Semende Darat Ulu is located in Muara Enim Regency with an area about 426.64 square kilometers. The Semendo Darat Ulu sub-district is laid on the highland area which is part of the Bukit Barisan mountains. In this area, there are many hills and rivers in which Semendo Darat Ulu is a river upstream, namely the Enim river.

2.2. Data collection and analysis
Field observations and interviews were used to collect information on respondents’ characteristics and their behavior in relation to the utilization and development of dragon’s blood. Focus group discussion was employed to confirm some information gathered and to collect more facts from the community regarding the existence of dragon blood’s, the importance of dragons bloods, and also about people's expectations for the existence and management of dragon’s blood in the future.

Secondary data is carried out by collecting various materials from many sources, including reports, data from the Central Statistics Agency, and also from previous publications. Data were analyzed descriptively and qualitatively to answer the research objectives.

3. Results and Discussion

3.1. Descriptive analysis of the research area and the community
Semendo Darat Ulu consists of 10 villages, namely Segamit, Siring Agung, Aremantai, Pajar Bulan, Tanjung Agung, Datar Lebar, Cahaya Alam, Tanjung Tiga, Pelakat, and Danau Gerak. The number of residents in Semendo Daru Ulu Sub-district in 2016 was 16,622 people, with an area of 316.5 km². From this total area, 1,828 ha are rice fields, state forests covering 29,098 ha, land in the form of community forests covering 5,807 ha and land that is temporarily not cultivated covering 1,065 ha [6].

Most of the people in Semendo Darat Ulu depend on coffee plantation crops (Figure 4) in which the current coffee plant area is 2,941 hectares [6]. Some people have opened state forests which were production forests and planted them with coffee crops. Initially, this was an illegal activity, through a social forestry program, community access to the forest would become legal. However, the community is burdened with a number of obligations so that even though the community opened these forests land, the function and the sustainability of this area is expected to be maintained.

The community who became dragon's blood seekers in Semende Darat Ulu Subdistrict are widely found in Tanjung Agung, Tanjung Tiga, Danau Gerak, and Muara Danau Villages. However, the largest number of market participants was in Tanjung Agung and Tanjung Tiga Village. Therefore,
people who know more about dragon's blood, both types, quality, and processing, are also found in Tanjung Agung and Tanjung Tiga Village. On the other hand, the socialization of dragon's blood plants in Muara Danau and Danau Gerak village has not been widely carried out by market participants. Therefore, people in Muara Danau and Danau Gerak Village did not really understand about dragon's blood.

Figure 1. Discussion with people who have been looking for dragon’s blood in the forest

Figure 2. Survey of dragon’s blood plants that grow among coffee crops

Of the household survey, as much as 62 respondents were interviewed to gather information about their characteristics and their knowledge about dragon’s blood. All of the respondents had the main job as a farmer and the average age of them was 37 years old. As a farmer, 37 years old people are still very productive to cultivate the land. Most of them had an education level up to elementary school (56.5%), 29% of them went to junior high school, and only 14.5% got an education level up to high school (Figure 1). The average land holding by the community was 2.1 hectares and most of them grow coffee on their land. Therefore, their main source of income was coming from coffee. The respondents average income per month was 1,3 million rupiah. In addition they also try to get additional income, especially in the famine season, by looking for dragon's blood in the forest.

Figure 3. Education level of the respondents

Based on the interview during the research, as many as 90.3% of the respondents know clearly about dragon’s blood, even 66.1% of them had been looking for dragon's blood in the forest and sold them to the traders who came to their village. All respondents stated that they often access the forest
that is close to their village, and they get many benefits from the existence of the forest including clean air, clean water, firewood, and other non-timber forest products.

3.2. Degraded forest and land rehabilitation in Semendo Darat Ulu

Forest area in South Sumatra is currently estimated about 3.4 million hectares. However, some have changed to non-forest cover such as settlements, plantations, rice fields and ponds (KLHK, 2017). Thus, the most important challenge in the management of remaining forests in South Sumatra is how to create a balance between conservation efforts and human needs, which in this case is a major factor in land cover changes. Communities that living around the forest areas are closely related to the efforts of flora and fauna conservation. Since ancient times, people living in and around forests area tend to use forest products, both to meet their daily needs and commercial interest. Without clear enforcement of laws and regulations, communities around the forest tend to engage in activities that have an impact on reducing forest cover. On the other hand, some efforts to maintain forests without any attention to the community welfare will be difficult to apply because of the high dependence of the communities on forest products.

One of non-timber forest products that have economic value in South Sumatra is dragon’s blood. Dragon’s blood has existed and been utilized by local people since ancient times. However, along with the reduced number of forest cover and unwise means of collection, the population of dragon’s blood in the natural forests of South Sumatra is also decreasing. In contrast to manau rattan which must be harvested by the trunk, dragon’s blood rattan can actually be maintained in nature, because the fruit is harvested without having to cut down the trunk. So in terms of species conservation, it is very profitable. However, for practical reasons, people often harvest fruit by cutting the trunk. At present, cultivation has been carried out by several parties, one of them is the tribal child community in South Sumatra and Jambi with the assistance of NGOs, the private sector and the government. The ecological benefit of dragon’s blood cultivation is that this plant needs another tree as a propagator, so by cultivating dragon’s blood means that it also maintains the existing trees. From the aspect of conservation, cultivation both inside and outside its natural habitat certainly helps maintain the existence of its species which are increasingly threatened.

[5] Classified that the relationship between tree species richness (ecology function) and forest-based subsistence livelihoods (economic function) will have three possibilities. The first one is that between species richness (ecology function) and livelihoods contributions (economy function) are both above average. In this case we can get sustainable forest systems. The second relationship is that between species richness (ecology) and livelihoods (economy function) are both below average. When this fact happens, we will encounter an unsustainable forest system condition. The last one was the condition in which either species richness (ecology function) is above average relative to other forests and livelihoods are below average, or species richness is below average but livelihoods are above average. In this condition, there will be trade-off between ecology function and economy function (trade-off forest systems).

In tropical developing countries like Indonesia, the management of forest as the protected areas is a great challenge as many contain resources on which local communities rely. Non timber forest products collection and trading have been carried out by the community as forest-based livelihood strategy [7]. Furthermore, non timber forest product is expected to be a potential means to improve the success of conservation efforts and at the same time play an important role in improving rural livelihoods [7,8]. In addition, productivity improvements in the agricultural sector could help to reduce agricultural encroachment of forests and forest- dependency so that it can reduce poverty and increase community welfare [9].

Dragon's blood conservation activities in natural forests will be difficult if the community continues to exploit these species. Therefore, it is necessary to do the cultivation and domestication of dragons blood on community-owned lands. If the dragons blood on the community's land has already yielded results, it is expected that the community will no longer carry out harvesting in the natural forest. So that the regeneration process of dragon's blood in natural forests can occur without human
interference. The existence of dragons blood as a potential non-timber forest product is quite beneficial for the farmers, it is also useful as an effort to conserve forest resources. With the existence of dragon’s blood, people can get additional income. Moreover, the community will no longer cut down timber because the community is sufficient to utilize NTFPs. Therefore, some efforts to rehabilitate forest land can be done more easily.

The efforts of domestication of dragon's blood on private land are also expected to be one of the efforts to diversify income for the community. So far, the people in Tanjung Agung and Tanjung Tiga village depend a lot on coffee as their main source of income. Besides coffee, people also grow cinnamon, jackfruit, cloves and vegetables. The existence of dragon's blood on their land that can be harvested several times a year, is expected to be an additional source of income when the coffee harvest season is over.

3.3. The importance of dragon’s blood in Semendo Darat Ulu

Forest and the natural resources inside can be used to support the livelihoods of people living around. Rural dwellers in tropical forest use forest products for subsistence or for sales in markets [10], forest also can play a role as safety net and seasonal income gap fillers [11], and diversified sources of income [12]. Both timber and non-timber forest products can provide economic value that can be used by the community to sustain their life. Since forest products experience severe degradation, non-timber forest products have an important role for the livelihoods of the communities around the forest. Environmental services produced by forests can also be used to improve community welfare. Dragon blood as one of non-timber forest product also has high impact for the people in Semendo Darat Ulu.

Crop land area had a significant negative relationship with forest related income. People with wider land will spend their resources on crop production rather than on forestry activities, and this also applies the other way around. The community in Semendo Darat Ulu is still largely dependent on the surrounding forest area. In the past, the community only took timber products in the forest. When there is only a small remaining population of timber left, people begin to utilize non-timber forest products. Over time, non-timber forest products that were initially very abundant, have now begun to be very limited. This happens because of excessive exploitation.

In a certain place, forest becomes the most important sources of income of the households rather than income from livestock production [2]. Natural resources will also provide some sort of insurance for households when they experience negative agricultural shocks. In fact, agriculture has an important role in economic growth, enhancing food security, poverty reduction and rural development [13]. When there is agricultural shocks, the impact can be minimized in the presence of natural resources. Collection and trading activity of non-timber forest products (NTFPs) is a well-established forest-based livelihood strategy, which has been promoted as a potential means for enhanced conservation and improved rural livelihoods [7]. Non timber forest products have high contribution in sustaining forest-based rural livelihood [14], through their consumption and marketing [15].

In Semendo Darat Ulu, the community realized that the presence of dragon’s blood was getting shrinking, dragon’s blood fruit (Figure 6) will be increasingly difficult to obtain in large quantities, so they began to find dragon’s blood seeds in the forest and plant them on their land. Even some people have started trying to make seedlings from dragon’s blood seeds (Figure 5). The higher the level of demand for dragon’s blood has encouraged traders to make dragon’s blood processing equipment (Figure 7), so that the quality of the resin produced was better. Furthermore, it can increase the price of dragon’s blood resin. According to [16], dragon’s blood (both fresh fruit and resin) can contribute 20.20% to the total income of farmers in Semendo Darat Ulu.

The eagerness of the community to plant dragon’s blood increase because some reasons: 1) the community believes that dragons blood will increase their income, 2) the yield of dragons blood can be sold easily, 3) the price of dragons blood will be more stable and increase, 4) planting dragons blood will not disturb the main crop, that is coffee, 5) dragon’s blood is suitable to be planted with soil conditions in Semendo Darat Ulu area, 6) planting dragon’s blood is easy and does not require special
maintenance, and 7) planting dragon’s blood can provide a variety of yields, both types and times of harvest.

![Figure 4. Coffee as the main source of people income in Semendo Darat Ulu](image1)

![Figure 5. Dragon’s blood seeds that are being developed by the community independently](image2)

![Figure 6. Dragon's blood fruit that has been collected by the community from the forest](image3)

![Figure 7. Dragon's blood processing machine owned by one of the traders in Tanjung Tiga Village](image4)

4. Conclusion
The findings show that the communities around forest areas get some benefits from the forest, specifically come from non-timber forest products (NTFPs). Dragon’s blood was one of non-timber forest product that has long been known and utilized by the community in Semendo Darat Ulu South district. Nowadays, people have more eagerness to harvest dragon’s blood in sustainable way. People who previously have only perform dragon’s blood collection from the natural forest, began to make efforts for the development of dragon’s blood on their private land. The higher economic value of dragon’s blood raises public awareness to protect and preserve it. The efforts of domestication of dragon's blood on private land are expected to be one of the efforts to diversify income for the community. The successful development of dragon’s blood is expected to be a solution for forest and land rehabilitation in Muara Enim Regency.

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