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The Role of Educational Forests in Community Empowerment and Climate Change Mitigation: A Case Study at Tadulako University

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Abstract: Educational Forests are greatly needed by higher education institutions, especially those studying forestry. Various activities can be carried out by students, lecturers, and related parties to be involved in research in order to develop science and knowledge so that they can make real contributions, and empower communities around forest areas to be competitive so that they do not have a high enough value for forest resources, especially wood forest products. In addition, the existence of educational forests is considered capable of mitigating climate change at a micro level. The research was conducted in the Tadulako University Educational Forest as shown in the picture above. The stages of this research consist of two, namely a ground check by taking random samples of trees. Then the second is to identify local community wisdom using qualitative methods with the Rapid Rural Appraisal approach. This research was conducted in the Tadulako University Educational Forest with a direct observation approach. The results of this study found that the land in the forest is still maintained by implementing a forestry system in the form of, where the community utilizes the forest by taking non-timber forest products, rattan, and air ecosystem services.

Keywords: Biodiversity; Educational forest; Environment

Introduction

The agricultural sector in Indonesia plays a crucial part in the country's economy, contributing to the development of Gross Domestic Product (GDP), generating foreign currency, supplying food and raw materials for industry, creating job opportunities, and enhancing the income of the population (Mukhlis et al., 2022). Agricultural development in Indonesia is crucial for the nation's economy. During the onset of the New Order administration, the policies related to agricultural growth significantly shaped the agricultural strategies in Indonesia (Sutanto, 2002; Mukhlis et al, 2024; Rauf et al, 2024).

In Indonesia itself, forests are divided based on three criteria are used to define the function: 1) conservation Forest because of the presence of particular qualities in the region; 2) protected forests serve as a system for controlling the spread of disease; 3) while production forests are places where forest products are designed to be produced. (Nandini, 2013; Nugroho et al., 2017; Safe'i et al., 2020).

Right now, protected forests don't always fulfill their mandates as set forth by the government. Deforestation has occasionally occurred in protected forest areas (Irawan et al., 2016). Deforestation is due to opening due to the increase in the population (Shrestha et al., 2018; Widodo & Sidik, 2020). But according to Tritsch et al. (2016), forest loss is not necessarily

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correlated with population. This transformation is necessary because the interaction of nearby populations and resource extraction by communities outside the area cannot be isolated from the existence of forests (Golar et al., 2022; Riggs et al., 2016). This was made worse by the Covid-19 outbreak, which increased strain on the area as a result of people losing their jobs (Golar et al., 2020).

Forests have a variety of benefits that can be used for the improvement and development of science so as to create awareness for the community (Achmad et al., 2013; Muncharaz et al., 2015; Rodríguez-Piñeros et al., 2020). Thus, forests with all the potential contained in them must be preserved and optimally useful for the welfare of the community without destroying the ecosystem (Erwin et al., 2020; Rizal, 2012).

The Education Forest is a forum for the development of science. Educational forests also serve as a medium of communication between academics, the government and the community to develop, utilize and preserve the area. As a faculty that focuses on the forestry sector, Tadulako University through the Faculty of Forestry has an important role in developing science and technology in order to produce competent graduates.

In order to achieve this role, universities need to be supported by educational forests as a means of providing adequate education, research and development of forestry innovations. With the inclusion of universities in Special Purpose Forest Areas (KHDTK) it will affect the dynamics of management. In this regard, this study discusses the effectiveness of Educational Forest in mitigating climate change that integrates collaborative management with approaches to ecological, social, economic and cultural aspects of local communities.

Method

Research data collection must use the right method in order to get optimal results (Herdiansyah, 2010; Mulyana, 2013). The research was conducted from August to November 2024 in the Tadulako University Educational Forest as shown in the picture above. The stages of this research consist of two, namely ground checks by taking random samples of trees. Then the second is to identify local community wisdom using qualitative methods with the Rapid Rural Appraisal approach.

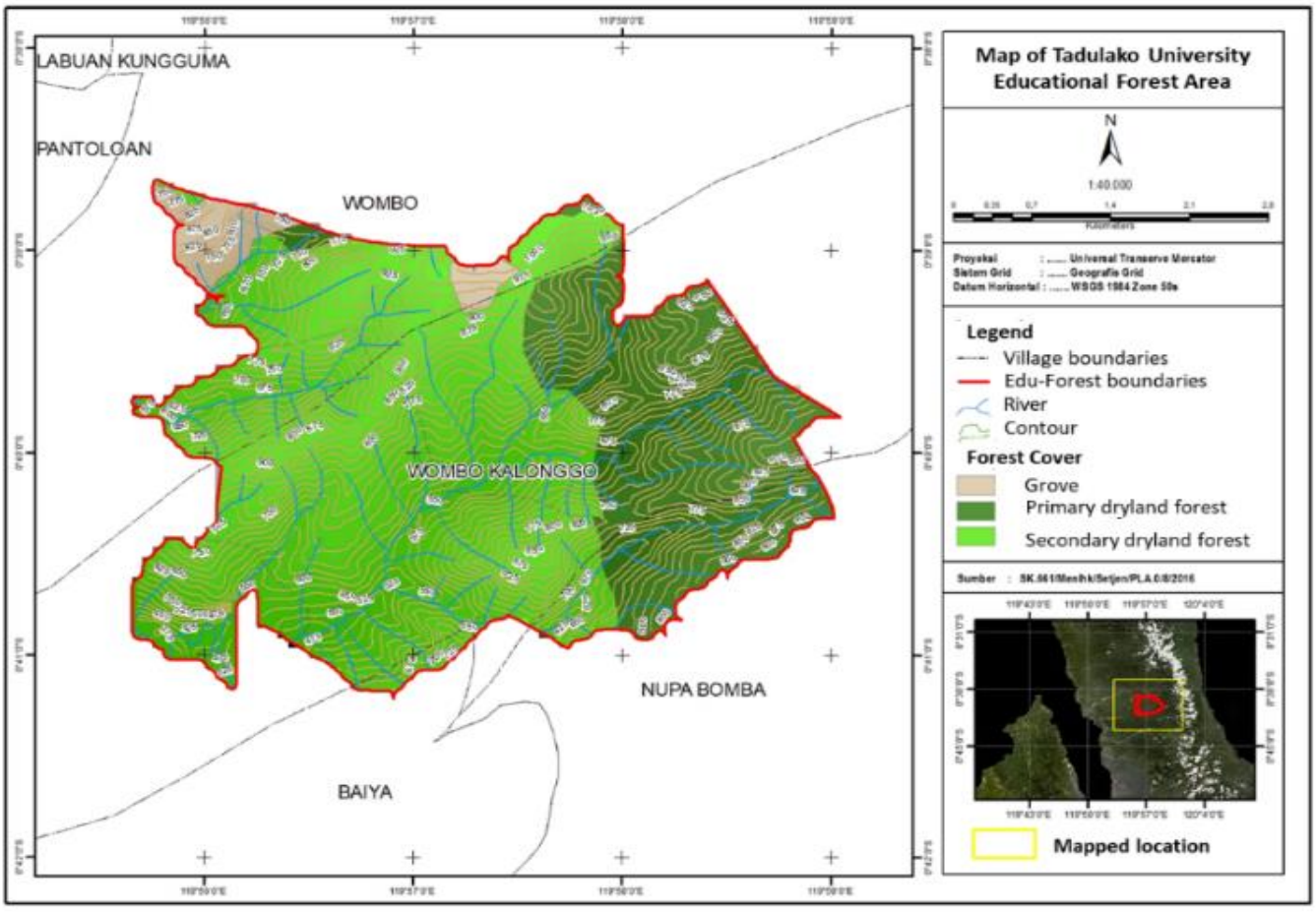

Figure 1. Mapping the location of educational forest

Result and Discussion

Variations of Educational Forest Stands

To find out and obtain data and information about the potential, characteristics, landscapes, socioeconomic conditions and other information in an Educational Forest area, forest inventory activities are carried out. This activity is carried out through a survey conducted by sampling.

The distribution of diameter classes at the tree level for all types of groups is very even. By the total number of trees found is 146 trees with the total volume being 325.24 m^3. The dominant species are Kaili (Dracontomelon dao Merr) with 26 trees, Amara with 20 trees, and Kume (Palaquium sp) and Surem (Toona sureni) with 16 trees each. The largest volumes are the Surem (Toona sureni) type with 52.521 m^3, Tea (Artocarpus teysmanii) 42.63 m^3 and Amara 41.03 m^3.

The Tea wood type (Artocarpus teysmanii) has greater potential even though the amount (N) is smaller than the Kaili type (Dracontomelon dao Merr). This is due to the difference in numbers in the diameter class of the Kaili type (Dracontomelon dao Merr), the largest number (N) in the diameter class of 30-39.9 cm, namely 10 trees with a volume of 9.279 m^3. Tea type (Artocarpus teysmanii) is the largest in the diameter class 60 up by 4 trees with a volume of 35.868 m^3. Information about the number of trees and the volume of each diameter class and type group can be seen in Table 1.

Based on the results of trees measurement (Figure 2), that has been carried out at Educational Forest of Tadulako University, 20 types of plants were obtained, namely Amara, Cempaka (Magnolia champaca), Kayu Batu (Maranthes corymbose), Bayur Pterospermum. Sp), Dara-dara (Casuarina junghuniana), Finjalu, Jambu hutan (Psidium guajava), Kaili (Dracontomelon dao Merr) Karoho, Leda (Eucalyptus deglupta), Malapoga (Toona ciliate), Pangi (Pangium edule), Poli (Lithocarpus celebicus), Saponi, Tea (Artocarpus teysmanii), Kume (Palaquium sp), Surem (Toona sureni), Eboni (Diospyros celebica), Pala hutan (Myristica fragrans) and Lotu (Aglaia sp) which are scattered on the tiers of seedlings, stakes, poles and trees.

Sampling of trees carried out by inventory, is a type of tree that is scattered along the educational forest area. The living vegetation conditions are still relatively good, because according to the conditions of the educational forest, it is dominated by marbles above 40^0, and the amount of steep land physiography. Vegetation that is classified as good, can provide benefits in terms of ecosystem services for the surrounding environment (Cao et al., 2020; Tesfay et al., 2022). Ecosystem services in the form of maintained water can be used by communities around forest areas to meet their daily needs (Miyamoto, 2020; Santika et al., 2020). With the existing conditions that occur, tree vegetation in the educational forest with an area of ±1.813 ha can contribute to the decrease in temperature due to micro climate change.

Figure 2. Trees diameter measurement

Dynamics of Management by Communities around the Educational Forest

The complexity of the meaning of land owned or controlled tends to encourage a person or community group to continue to strive to defend their rights (Golar et al., 2022; Helmi et al., 2021). Especially against land controlled (Falah, 2013). Land clearing activities still often occur around protected areas held by Forest Management Unit (FMU) of Dolago Tanggunung. However, encroachment activities by the community did not reach the location of the educational forest. In general, people in Wombo Village, which is a buffer village for the Educational Forest, are gardening around the protected forest utilization block.

Figure 3. Rattan is utilized by the community

However, to increase the economic coffers of the local community, many people take forest products in the form of rattan (Figure 3). The potential of rattan in the area is still abundant in stock. This is what makes the community extract these forest resources. Extraction of non-timber forest products in protected forest areas is

allowed, as long as it does not damage the surrounding vegetation (Cahyanto et al., 2014; Mamuko et al., 2016; Syaprillah, 2015).

The community near the Education Forest area searches for rattan in groups. The rattan will then be left close to the river. After that, the rattan will be combined and weighed for sale. To mitigate the effects of global warming on a smaller scale. Furthermore, due to the region's extremely steep physiographic features, where illicit land clearance activities are less common since they could devastate nearby settlements, people are unwilling to engage in them. However, the neighborhood's residents still consume rattan as a non-timber forest product close to the forest.

Conclusion

The community near the Education Forest area searches for rattan in groups. The rattan will then be left close to the river. After that, the rattan will be combined and weighed for sale. To mitigate the effects of global warming on a smaller scale, the vegetation surrounding the Tadulako University Educational Forest area is still kept in good condition. Furthermore, due to the region's extremely steep physiographic features, where illicit land clearance activities are less common since they could devastate nearby settlements, people are unwilling to engage in them. However, the neighborhood's residents still consume rattan as a non-timber forest product close to the forest.

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Author Contributions

Conceptualization, A.R; methodology, A.R., G.G; validation, A.R., G.G; formal analysis, A.R., G.G., B.S; investigation, A.R., G.G., B.S., R.F.B., H.H; resources, A.R., G.G; data curation, A.R: writing—original draft preparation, A.R., G.G; writing—review and editing, A.R., B.S., R.F.B., H.H; visualization, A.R. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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