Conservation of Tropical Wild Orchids Through Empowering Local Community in Yogyakarta

Latifa Nuraini[1*], *Aninda Retno Utami* Wibowo[2], and *Istiana* Prhatini[1]

[1]Research Center for Plant Conservation, Botanic Garden and Forestry, National Research and Innovation Agency
[2]Research Center for Biosystematics and Evolution, National Research and Innovation Agency

Abstract. Yogyakarta has many tropical wild orchids spread in the karst mountains. After the COVID-19 pandemic, ecotourism has started to develop again, especially in this area, which offers many beautiful tourist spots. The increasing number of tourists visiting the area will increase the demand for wild tropical orchids. The method used in this study was exploration, observation, and interviews with the local farmers were carried out to obtain the primary data. The secondary data was obtained from a qualitative approach through a literature study. Data analysis uses interpretation, and the data obtained in the field will be interpreted from the aspect of the orchid's conservation process to the ecotourism development. Based on the results of studies and research that have been conducted, this local community-based ecotourism occurred when there is awareness of the local community to maintain and preserve a sustainable environment by utilizing the existing land to be more valuable. This community-based ecotourism also showed a positive impact on the conservation of tropical wild orchids and the protection of the environment.

1 Introduction

Yogyakarta has natural wealth in the form of biodiversity, which is very diverse and attractive to tourists [1]. One of the natural potentials related to plants, which is a special attraction, is the existence of various wild orchids. Wild orchids are one of the favourites of tourists because they are unique due to the various variations in colour, flower shape, type and how they grow. Orchids are also charismatic plants that are popular among ornamental plant lovers. The increasing growth of the ecotourism sector could have an impact on market demand for wild orchids, which will, of course, affect their existence. In recent years, various studies related to orchid conservation have seen the existence of wild orchids threatened and their numbers decline. It was linked to global warming and deforestation. Orchids are still considered wild plants like grass, so in practice, they are cut for animal feed, land degradation, and randomly crossing wild orchids without proper procedures, which causes the original loss of biodiversity [2].

Tropical wild orchids are distributed in the Sleman, Gunung Kidul, Bantul, and Kulonprogo Regency because these areas are relatively more suitable for the conditions for

* Corresponding author: lati008@brin.go.id

growing wild orchids, namely hills and mountains. The habitat of wild orchids is mostly epiphytic, that is, they stick to trees as hosts but do not cause any harm in terms of absorbing nutrients from the host trees they occupy. Natural orchids can adapt and survive by adapting to the surrounding natural conditions. They are widespread because of their small seed forms and influence wide distribution with the help of animals, wind, water and humans. Wild orchids that are able to adapt to environmental stress will modify their way of life, shape, flowers, roots, leaves, and other organs, thus forming variations in the morphology of the plant [3-6].

Natural wild orchid conservation efforts can be carried out using two propagation techniques: conventional and modern propagation techniques. Wild orchid propagation techniques can be done naturally using seeds planted in pots or raised beds. Apart from that, conventional techniques include separating clumps, cutting roots, and cutting off seedling shoots [7]. Conventional techniques for propagating wild orchids to support conservation efforts are widely used because they are relatively easier and cheaper, even though they have relatively longer time constraints. Modern techniques for propagating wild orchids are often mentioned in research on the *Vanda tricolor* Lind [8], and the research done for the conservation of 19 species orchid species using seed explants and VW medium [9].

Even though the cultivation of wild orchids has been explained in many studies as having conservation value for plants threatened with extinction and endemic plants as well as supporting a green economy, the latest facts about the condition of wild orchids in the field which are under threat, both species population numbers and diversity, should receive serious attention regarding conservation strategies. New concepts and methods related to conservation are explained in full, namely placing the community as the subject, respect for human rights, cooperation between government institutions, respect for cultural and traditional values, multilevel leadership, science-based decision making, ecotourism-based management, appreciation and mentoring, and learning organizations [10]. In relation to orchids, communities around forest areas where wild orchids live can be positioned as the main actors as forest managers, development and ecotourism actors, sustainable use of orchids as non-timber forest products, area forest guards, restoration, fire control, orchid cultivation actors with prioritizing conservation principles, as well as preventing massive poaching of wild orchids. The concept of society as the main actor in orchid conservation can encourage cooperation to support environmental sustainability with democratic principles at the local community level [11].

As a step to prevent the extinction of tropical wild orchids, it is urgent to carry out conservation efforts for various reasons, including the five reasons put forward by Wahjudi Warjono, namely the spiritual sense of reason that humans have, tradition, economics, ecology, and food, energy, and water scarcities crisis [12]. Therefore, research related to plant conservation is important. Collaborative research related to tropical wild orchid conservation must be structured and involve various parties in an integrative and coordinated manner, including central and regional governments, academics, researchers, the private sector, non-governmental organizations, as well as local communities as the main actors (Wiratno, 2023 personal discussion) [13]. In the context of this research collaboration, the principles of mutual respect, mutual trust and mutual benefit must be applied [14].

The results of research conducted in the Sleman area, DI Yogyakarta regarding the community-based model of conservation ecotourism and orchid floriculture show that this model can be applied to the community with independent initiative and at the same time implementing a system of solidarity together which is carried out by building active participation from the community to be aware of tourism and care about the environment [15]. The Yogyakarta area with its hilly and karst mountain areas and the possession of various types of wild orchids will have a lot of potential for ecotourism development, especially orchids which are expected to be able to become an alternative source of income

and support people's lives [16]. Hopefully, this research can be developed for various in-depth studies regarding the potential of wild orchid species or bioprospecting in the Yogyakarta area to support efforts to conserve Indonesia's biodiversity, especially Yogyakarta.

2 Materials and methods

2.1 Research geographical site

This research was carried out from July to August 2023. The first exploration was in Purwosari village, Kulon Progo, Yogyakarta. Located in the geographical position 07°43.706'; 110°07.900'. The Purwosari area has an altitude of 700-900 meters above sea level. This area is hilly with mountainous parts, namely Mount Bathok, Mount Nongko, Sungan Langit and Mount Gendhol.

The second exploration was conducted in Nglanggeran, Patuk, Gunung Kidul, Yogyakarta, with the geographical position 07°50.536'; 110°33.213'. This area is an ancient volcanic area that was developed as an area with ecotourism potential, including the peak of Mount Pillow, Gendhong Klotok, and the Kampung Pitu area. The relative height of the area is between 500-700 meters above sea level (Fig. 1).

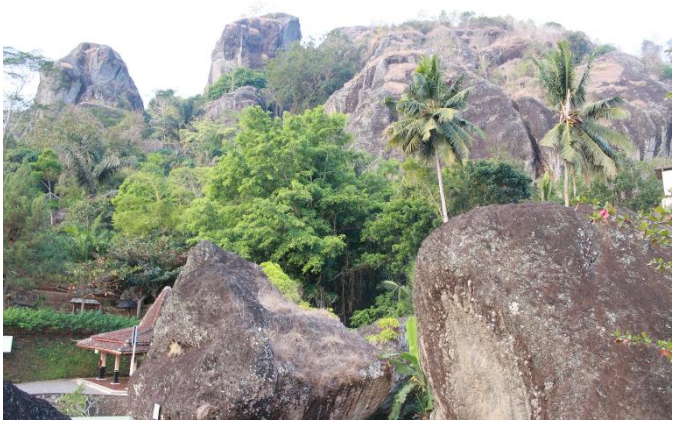

Fig. 1. Topographical conditions of Nglanggeran Village, Gunung Kidul, Yogyakarta. Source: author documentation, 2023

2.2 Research material

Various tools used in exploratory research include personal equipment such as digital cameras. Various tools to support the propagation of wild orchids include wire, coconut fibre, raffia, scissors, and label paper.

2.3 Data collecting

The research was done on the two sites, first in Purwosari and the second in Nglanggeran village. Data about the wild-type orchid was then collected. We got around 22 in Purwosari and about 23 wild-type orchids from Nglanggeran.

2.4 Data analysis

The data was collected and selected from the physiological and morphological detail information to be used for conventional propagation by splitting and for the next project research to reveal the molecular genetic information.

3 Results and discussion

The results showed that wild orchid conservation with the empowerment of local communities can be interpreted as the embodiment of a research integration model that combines community collaboration as the main component, researchers as government institutions, universities represented by students, and non-governmental organizations (Fig. 2).

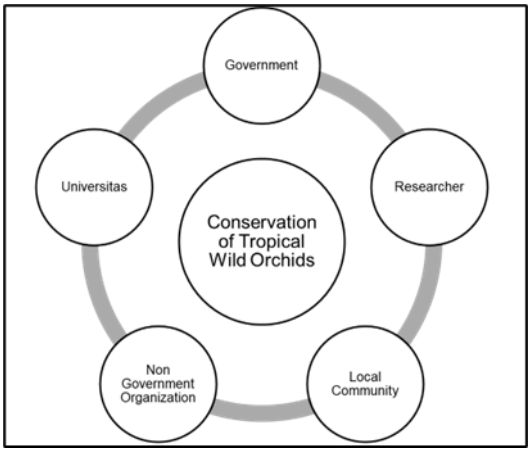

Fig. 2. Collaboration Research. Source: researcher's personal documents, 2023

Collaborative research in the form of wild orchid exploration is the first initiative to confirm the number of different wild orchids in the Yogyakarta area. Apart from that, the process of identifying wild orchid types. In the future, developments related to the propagation of wild orchids will be carried out, which will support conservation efforts to avoid extinction.

Several types of wild orchids are found in the Purwosari area, Kulon Progo, such as *Acriopsis liliifolia, Zeuxine gracilis, Bryobium retusum*, and *Dendrobium crumenatum.*Various studies on orchid propagation efforts have been carried out to support conservation efforts, including stem separation. Several methods used are [13]: first, the type of epiphytic orchid is selected based on its morphological appearance. The orchids are selected and separated from the others. The analysis is carried out based on the types of flower variations that are unique and interesting to develop. The shape of the leaves and roots are easy to separate, and the ability to live is high and able to adapt. The second step is to prepare a growing medium that resembles the habitat of clay orchids. Coconut fibre was chosen because this type is a natural medium that is easy, cheap and appropriate for orchid root growth. Next, the wild orchids are glued and tied with the help of raffia rope for a certain period of time to strengthen the process of uniting the roots. Moss is added to the bottom and front of the roots to maintain moisture during the splitting process. Next, the orchid is hung and aired in the shade (Fig. 3).

Fig. 3. Wild orchid splitting process involving local residents as a conservation effort. Source: researcher's personal documents, 2023

Based on the results of the research conducted, the process of transferring knowledge to local residents will form research collaborations. In this case, the principles of mutual respect, mutual trust, and mutual benefit [15] are effective and will continue to be implemented. Residents in ecotourism areas are very dependent on the surrounding nature as a source of life support, but most of them still have little understanding of protecting biological resources and their sustainability. The role of the government, researchers and university intellectuals will help local residents learn about wild orchid cultivation techniques that are easy, cheap and applicable in the field. Of course, efforts to cultivate wild orchids using modern methods such as in-vitro culture are more practical and faster, but some residents in the ecotourism environment, both in Purwosari and Nglanggeran villages, are still very constrained by capital, so conventional initial steps such as the method of propagating wild orchids by splitting are expected to help. as a more applicable first step. Apart from that, this conventional method will maintain the authenticity of wild orchid species which are an asset of the Indonesian nation and which of course, must be preserved.

In efforts to conserve biodiversity in the context of wild orchids, of course, success factors require indicators, including fulfilling the principles of maintaining landscape sustainability with a coherent ecological network and ensuring diverse and viable flora and fauna; able to provide benefits in the form of ecosystem services and optimum welfare for the surrounding community; able to play a role as a climate change mitigation and adaptation strategy [14]. These indicators are not yet fully visible in the context of wild orchid conservation in the Yogyakarta region. This is assumed to be due to various obstacles such as the need for leadership figures in terms of wild orchid conservation, international scale collaborative research, long-term research funding, the need for encouragement to policymakers at the central and regional government levels so that in the future wild orchid conservation becomes a priority scale; as well as openness of information data regarding various statuses of wild orchids referring to IUCN and CITES.

Tropical wild orchids are one of the rich assets of the Indonesian nation that must be preserved for present and future generations. Therefore, efforts to preserve it are our duty. In this case, research collaboration is expected to become a basis for understanding conservation from a scientific perspective that differs between one branch of science and another but should support efforts to conserve biodiversity sustainably.

4 Conclusion

Based on the research conducted, several important conclusions can be drawn to encourage and strengthen the tropical wild orchid conservation movement. Firstly, we need to increase the international scale research collaboration with long-term funding that supports efforts to transfer knowledge to local communities regarding the conservation of endangered wild orchid species as well as orchid species endemic to Yogyakarta. Secondly, collaborative research methods with multi-disciplinary backgrounds are necessary for wild orchid conservation to encourage research to become a national priority scale research. Thirdly, local community-based ecotourism occurs when there is awareness of the local community to maintain and preserve a sustainable environment by utilizing the existing land to be more valuable. This community-based ecotourism also positively impacted the conservation of tropical wild orchids and environmental protection.

The author would like to express gratitude and appreciation to all parties who have helped in the research process until completion. Special thanks to Mrs. Murniyati and Mr. Aan for their time in the interview process.

References

1. Yogyakarta Special Region Government (accessed on 25th September 2023). https://www.jogjaprov.go.id/berita/2025-diy-jadi-tujuan-wisata-terkemuka-asia-tenggara (2023)
2. M.F. Fay, Bot Stud **59**, 1-6 (2018)
3. J.B. Comber, Orchids of Java (The Royal Botanic Garden Kew, London, 1990)
4. R.L. Dresser, The orchids: natural history and classification (Harvard University Press, Cambridge, 1982)
5. A. Setiaji, A. Muna, F.P. Jati, F. Putri, E. Semiarti, Pros Sem Nas Masy Biodiv Indon. **4**, 63-68 (2018)
6. Biosc team, Yogyakarta Orchids (Canisius, Yogyakarta, 2020)
7. Zulkaidah, Asri P, Ariyanti, Sustri, Anditani: Journal of Community Service **3**, 84-86 (2020)
8. R. Dwiyani, A. Purwanto, E Semiarti, Jurnal Bumi Lestari **12**, 93-98 (2012)
9. S. Kartikaningrum, D. Pramanik, M. Dewanti, R. Soehendi, M. Prama Y, Nuftah Plasma Bulletin **23**, 109-118 (2020)
10. Wiratno, Ten new ways to manage Indonesian conservation areas: building a learning organization (Directorate General of Natural Resources and Ecosystem Conservation, Ministry of Environment and Forestry. PP 1-38, 2018)
11. Wiratno, Smart Investment as a utilization strategy in Indonesian Conservation Areas. Seminar on Biology and Management of Tropical Natural Resources, Faculty of Biology UGM (2017)
12. W. Warjono, Biodiversity conservation for the future of the world: opportunities and Indonesia's role (Speech on the Award of the Degree of Doctor Honoris Causa, Gadjah Mada University, 2023).
13. Wiratno, Interview with Dr. Wiratno with the research topic of becoming a future leader in the field of nature conservation and an intellectual travel book, travel notes 2005-2020. September 21 in South Jakarta, DKI Jakarta. (2023).

14. W. Wardojo, Inspiration from Mount Gede Pangrango (Directorate General of Conservation of Natural Resources and Ecosystems, Ministry of Environment and Forestry, 2020)
15. L. Nuraini, Hastangka, Research Results Journal **X**, 63-74 (2023)
16. FAO, Enhancing the Socio-Economic benefit from forest (State from World Forest) (FAO, Rome, Italy, 2015)