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Revitalization of Traditional Knowledge in Natural Resource Management: An Ethnobotanical Study in the Dayak Kenyah Indigenous Community

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Abstract

This study aims to document the ethnobotanical knowledge of the Dayak Kenyah community in East Kalimantan as an effort to preserve culture and the environment. Using a qualitative-descriptive approach with data collection techniques through semi-structured interviews, walking transects, and visual documentation, this study identified 47 plant species utilized by the Dayak Kenyah community. The results showed that the plants were categorized based on their main functions, namely as medicine (38%), food (30%), building materials (19%), and ritual purposes (13%). Several types of key plants such as Tengkawang (Shorea spp.), Sungkai (Peronema canescens), Ulin (Eusideroxylon zwageri), and Katimpun (Uncaria gambir) have important values in the cultural and ecological structure of the community. Custom-based conservation practices such as Tana' Ulen are concrete evidence of the implementation of Traditional Ecological Knowledge (TEK) that supports the sustainability of forest ecosystems. However, there are indications of a decline in the interest of the younger generation in this local knowledge, with only 27.8% of young informants being able to identify more than 10 types of local plants. This study recommends the integration of TEK with modern conservation strategies and the revitalization of traditional knowledge through local culture-based education to ensure the sustainability of valuable traditional ecological knowledge.

Keywords: Ethnobotany, Dayak Kenyah, Traditional Ecological Knowledge, Tana' Ulen, Community-based conservation

1. Introduction

Sustainable management of natural resources (SDA) is a pressing global challenge, especially in countries with high biodiversity wealth such as Indonesia. According to a report by the Food and Agriculture Organization (FAO), Indonesia experienced a decrease in the rate of deforestation of 8.4% in 2021-2022, which is the lowest record since the 1990s (APIK Indonesia Network, 2024). On the other hand, indigenous communities have long managed their forests and environment wisely while maintaining ecological balance.

Traditional ecological knowledge or Traditional Ecological Knowledge (TEK) is a form of collective knowledge that is passed down from generation to generation in indigenous communities. This knowledge includes plant classification systems, conservation techniques, and philosophies of life that respect nature. According to research by Mardero et al. (2023), TEK plays an important role in adaptation to climate change and biodiversity conservation, because it is based on long-term observations and real practices in the field.

One of the indigenous communities rich in ecological knowledge is the Dayak Kenyah tribe spread across the interior of East Kalimantan and North Kalimantan (Suswandari et al., 2022). Based on various ethnographic records and local government reports, the Dayak Kenyah people inhabit areas such as Mahakam Ulu, West Kutai, and Malinau (Espree-Conaway, 2022). Although there is no official statistical data that specifically records the population of the Dayak Kenyah tribe at the provincial level, their presence as the main indigenous community in the area is reflected in the dominance of local culture, village social structures, and the use of regional languages that are still actively used.

Their presence is not only demographically significant, but also plays an important role in the management and preservation of the tropical rainforest ecosystem that surrounds these areas. Recent ethnobotanical research shows that the Dayak people have in-depth knowledge regarding the use of forest plants. As in the study conducted by Lovadi et al. (2021) in West Kalimantan documented 53 species of medicinal plants used by the Dayak Kanayatn community, covering various plant parts such as roots, stems, leaves, and flowers, to treat 31 types of disease symptoms. Similarly, research by Hafizi et al. (2021) in the Dayak Meratus community in South Kalimantan identified around 20 types of

plants that are often used as medicine, with the most widely used plant parts being roots (40%), leaves (30%), and stems (20%).

These findings confirm that the Dayak community has extensive and detailed knowledge of local flora and its use in traditional medicine. The Dayak Kenyah community has a plant classification system based on morphology, use, and natural habitat. For example, the "Tengkawang" plant (Shorea spp.) is not only known as a producer of vegetable oil, but is also protected by custom because it has high economic value and a long growing time (John et al., 2025). In the context of conservation, practices such as "Tana' Ulen" or forbidden forests are concrete evidence of the implementation of culture-based conservation, which is now beginning to receive legal recognition through Law Number 32 of 2009 concerning Environmental Protection and Management (Zahroh and Najicha, 2022).

However, unbalanced modernization has a negative impact on the sustainability of local knowledge. Along with economic and technological developments, many young generations of indigenous peoples are starting to abandon their traditional practices. This is due to various factors, including the influence of formal education which focuses more on scientific and technological knowledge, as well as the dominance of the market economy which is increasingly shifting local values. A study by Yang et al. (2022) noted that the younger generation in several indigenous communities tend to prefer working in the modern industrial sector rather than continuing the traditional traditions inherited from their ancestors. In some areas, for example, only a small proportion of the younger generation is able to identify local plants or master traditional rituals that are an important part of their community's life. This phenomenon shows the urgency of revitalizing traditional knowledge which is currently on the verge of extinction. Revitalization does not only mean preservation, but also reactualization in the current context, so that the knowledge remains relevant and accepted by the younger generation. One effective way is to document ethnobotanical practices and integrate them into local education systems and community-based forest management (Palaschuk et al., 2024).

In various policies related to climate change, indigenous peoples are often recognized as important actors in land-based mitigation efforts. However, this recognition is often not reflected in real implementation in the field, either in the form of effective programs or in regulations that support their protection and empowerment. A study by Ens et al. (2021) shows that although indigenous peoples have deep ecological knowledge and sustainable natural resource management practices, their access to policies and programs that support environmental sustainability is often limited.

Through this study, the author seeks to scientifically document the ethnobotanical knowledge of the Dayak Kenyah community in East Kalimantan as part of efforts to preserve culture and the environment. A qualitative-descriptive approach is used to explore traditional practices related to plant classification, utilization of forest species, and customary-based natural resource management. This study also examines the potential for integration between local knowledge and modern science, especially in inclusive and sustainable community-based conservation efforts.

2. Literature Review

2.1. Basic concepts of ethnobotany and its role in science

Ethnobotany is a branch of science that studies the relationship between humans and plants in the context of local culture and traditions. In general, ethnobotany focuses on how indigenous peoples use plants in their daily lives, whether for food, medicine, building materials, or for ritual purposes. Ethnobotanical knowledge is not only limited to plant identification, but also to sustainable natural resource management techniques and biodiversity maintenance (Kumar et al., 2021).

In the development of modern science, ethnobotany plays an important role in biodiversity conservation and adaptation to climate change. Local knowledge held by indigenous peoples is often deeper and more integrated with the ecosystem, so it has the potential to be combined with modern scientific approaches in maintaining ecological balance. For example, ethnobotanical studies provide insight into traditional ways of introducing sustainable agricultural systems, as well as the use of medicinal plants that can support treatment research (Dean, 2024).

The role of ethnobotany in science is increasingly recognized, especially in the context of climate change mitigation and maintenance of tropical forest ecosystems. Ethnobotany not only enriches the scientific database on flora and fauna but also helps in formulating policies that involve local communities in natural resource management (Alemu et al., 2024).

2.2. Previous studies on Dayak indigenous peoples and nature management

Research on Dayak indigenous peoples, especially in terms of nature management, has been widely conducted, considering their very important role in maintaining the sustainability of tropical forests in Indonesia. Dayak people, including Dayak Kenyah, have in-depth knowledge of forest ecosystems and sustainable ways of utilizing natural resources. According to a study by John et al. (2025), the Dayak Kenyah people are known for their forest management system based on local wisdom, such as the practice of "Tana' Ulen" or forbidden forests that function as natural conservation areas.

Another study by Lovadi et al. (2021) in West Kalimantan noted how the Dayak Kanayatn people use more than 50 plant species for traditional medicine, including a plant classification system based on their morphology and function.

In addition, research by Hafizi et al. (2021) in Dayak Meratus also showed the use of around 20 types of plants that are often used for traditional medicines, as well as in-depth ecosystem-based management.

The Dayak community is also known for its sustainable agricultural systems, such as intercropping and crop rotation, which not only meet food needs but also maintain soil fertility and prevent ecosystem damage. In this case, their ethnobotanical knowledge plays a role in natural management that does not damage, but rather maintains the sustainability of natural resources naturally.

2.3. Theoretical framework: Traditional Ecological Knowledge (TEK)

Traditional Ecological Knowledge (TEK) is a system of knowledge that develops in indigenous communities along with their interactions with the surrounding environment. TEK includes knowledge about the life cycle of plants and animals, the use of various natural resources, and conservation principles that have been applied for centuries (Sinthumule, 2023). TEK plays a very important role in sustainable natural resource management because this knowledge comes from direct experience in facing ecological and environmental challenges.

According to Das et al. (2021), TEK is not only technical knowledge, but also includes an understanding of the spiritual relationship between humans and nature. This concept forms a mindset that respects the balance of the ecosystem and encourages nature conservation. TEK is also a tool for adaptation to environmental changes, such as climate change, by offering proven strategies in land, water, and forest management. Traditional ecological knowledge is often integrated with various aspects of indigenous people's lives, including social, economic, and cultural. For example, in the Dayak Kenyah community, local wisdom-based conservation practices such as "Tana' Ulen" and the use of forbidden forests are evidence of how TEK is implemented to maintain biodiversity and natural sustainability. Thus, TEK not only reflects the knowledge possessed by indigenous peoples, but also a lifestyle that supports long-term ecosystem sustainability (Rani et al., 2025).

In this study, TEK will be used as a theoretical framework to understand how the Dayak Kenyah community manages and conserves tropical forests through their knowledge of flora and fauna. This study aims to examine how TEK can be integrated into modern conservation efforts, as well as the challenges and opportunities that arise in the revitalization of traditional ecological knowledge in the modern era.

3. Methods

3.1. Research Approach

This research uses a qualitative-descriptive approach with a focus on ethnobotanical studies, namely exploring and documenting the knowledge of the Dayak Kenyah indigenous community related to the use and management of local plants. This approach was chosen because it allows researchers to understand the meaning behind traditional practices related to the environment and to capture the cultural, ecological, and spiritual dimensions of human-plant relations in the community. In addition, this method supports the preservation of traditional ecological knowledge (TEK) which is narrative and contextual.

3.2. Research Location

The research was conducted in one of the Dayak Kenyah community villages in East Kalimantan, which is administratively located in the Mahakam Ulu Regency. This area was chosen because it still maintains customary structures, local conservation practices such as Tana' Ulen, and the active use of local languages and knowledge systems. This location also has high and relatively well-maintained biodiversity, allowing for in-depth exploration of ethnobotanical potential.

3.3. Data Collection Techniques

Data collection in this study was carried out through three main complementary methods, namely semi-structured interviews, walking transects (walk-in-the-woods), and visual documentation. Semi-structured interviews were conducted by involving key informants, such as traditional figures, village elders, and residents who have in-depth knowledge of local plants. This form of interview was chosen so that researchers could flexibly and in-depthly explore information related to local plant names, their benefits, processing methods, and the cultural context behind them.

In addition, the walking transect technique was used to directly identify plant species in the field with informants. Through activities of walking through the forest directly, researchers can contextually record the location of the natural habitat of plants, the parts used, and how people recognize and use them. This activity also opens up space for the emergence of local narratives that usually do not appear in formal interviews. Visual documentation complements this process by recording images of plants and plant use practices directly. The resulting photos and videos are not

only useful as ethnobotanical archives, but also as validation materials for scientific identification and visual support in research reports.

3.4. Data Analysis Techniques

The data obtained were analyzed using a categorization and thematization approach. First, the types of plants were categorized based on a local classification system that includes regional names, morphological forms, and their natural habitats. If possible, the classification will be compared with scientific nomenclature to enrich the scientific dimension of field findings. Furthermore, each type of plant was analyzed for its function, whether it was used as medicine, food, building materials, ritual equipment, or other needs in the daily lives of the Dayak Kenyah community. This analysis also includes the frequency of use and community preferences for certain plants.

No less important, this study also explored the cultural and ecological values inherent in the practice of utilizing plants. This was done to understand how local knowledge becomes an integral part of the community's social and spiritual systems. All of this information is then linked to the concept of Traditional Ecological Knowledge (TEK), as a theoretical framework that explains the relationship between humans and their environment in a sustainable manner. Through this analysis, it is hoped that the potential for integrating local knowledge into an inclusive and contextual community-based conservation strategy can be mapped.

4. Results and Discussion

4.1. Plant species inventory

Based on the results of walking transects and interviews with key informants, 47 plant species were obtained that are known and utilized by the Dayak Kenyah community. These plants are categorized based on their main function of use, namely medicine, food, building materials, and ritual purposes. Of the total species identified, the majority are used as medicines (38%), followed by food (30%), building materials (19%), and ritual purposes (13%).

Table 1: Classification of functions and number of plant species utilized

No	Category Function	Number of Species	Persentage (%)
1	Medicine	18	38%
2	Food	14	30%
3	Building materials	9	19%
4	Ritual & spiritual	6	13%
5	Total	47	100%

Table 1 shows the classification of forest plant species based on their primary uses by the Dayak Kenyah community. The data clearly illustrates that medicinal plants dominate local usage patterns, accounting for 38% of the total, followed by edible plants (30%), construction materials (19%), and ritual or spiritual plants (13%). This functional categorization reflects how local ecological knowledge is closely tied to everyday life and cultural practices.

The predominance of medicinal plants indicates the community's dependence on natural resources for traditional health practices, while the presence of plants for food and building materials demonstrates a holistic understanding of forest utility. Ritual plants, although fewer in number, also signify the spiritual bond between humans and nature in Dayak Kenyah cosmology. The following is Figure 1 Utilization of Plant Species by Function in Dayak Kenyah Community. This pie chart visually represents the data in Table 1, emphasizing the dominant role of medicinal plants in the ethnobotanical knowledge system of the Dayak Kenyah.

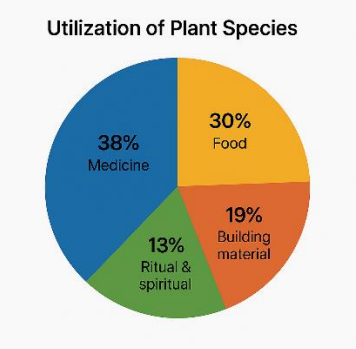

Figure 1: pie chart visualization

4.2. Examples of Key Species and Their Utilization

Several key species found in this study reflect the deep ecological knowledge of the Dayak Kenyah community. Some examples of plant species and their functions can be seen in table 2.

Table 2: Examples of plant species and their functions

Local Name	Scientific Name	Parts Used	Main Uses	Cultural Description
Tengkawang	Shorea spp.	Seeds	Vegetable oil, skin medicine	Regulated by customary law, it cannot be cut carelessly
Sungkai	Peronema canescens	Leaves, stems	Fever medicine, malaria	Often used in healing ceremonies
Ulin	Eusideroxylon zwageri	Wood	Main building material	Protected in the Tana' Ulen area
Katimpun	Uncaria gambir	Leaves, stems	Traditional herbal medicine	Used in body cleansing rituals

Table 2 shows several representative plant species that highlight the depth and specificity of the Dayak Kenyah community's ethnobotanical knowledge. Each species listed not only serves a practical function—such as for health, construction, or daily use but also carries cultural and spiritual significance that governs how the plant is harvested, processed, and protected.

For example, Tengkawang (Shorea spp.), a highly valued species, is regulated by customary law due to its ecological and economic importance, particularly for its oil-rich seeds. Similarly, Ulin (Eusideroxylon zwageri), known for its extremely durable wood, is protected within the sacred conservation zones known as Tana' Ulen, demonstrating how traditional ecological knowledge also plays a role in conservation practices.

Plants like Sungkai and Katimpun are integral to traditional medicine and ritual healing, reinforcing the interconnectedness of health, spirituality, and the environment within the Dayak Kenyah worldview.

These examples illustrate that plant use in the Dayak Kenyah community is not random, but guided by generations of knowledge that integrates environmental stewardship with cultural heritage.

4.3. Custom-based conservation practices

One of the important findings in this study is the existence of the Tana' Ulen practice, a customary forest area designated as a conservation zone by the community itself. Plants growing in this area may not be taken carelessly without permission from customary leaders. This forest not only has an important ecological function as a catchment area and wildlife habitat, but also acts as a "genetic bank" of local plants that are important for cultural sustainability.

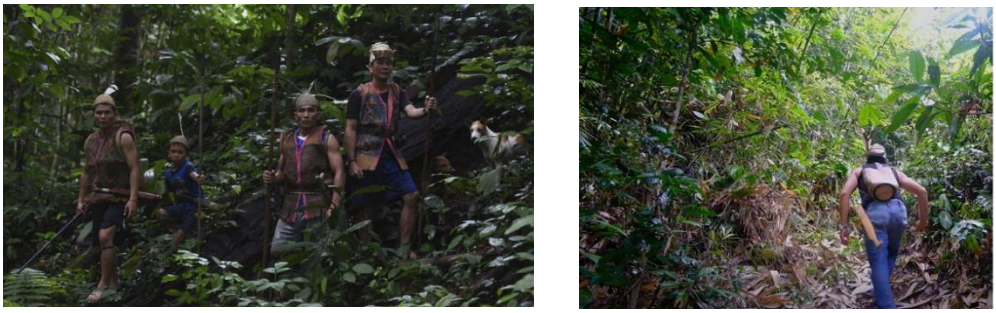

Figure 2: tana' ulen practices by the Dayak Kenyah community

4.4. Intergenerational knowledge transfer

Knowledge about plants is generally passed down orally through direct interaction between parents and children, especially in gardening, hunting, or gathering forest products. However, interviews showed a decline in interest in this knowledge among the younger generation. Only 5 out of 18 young informants were able to mention more than 10 local names of plants and their uses. This shows the urgency of revitalizing local knowledge, for example through the integration of local culture-based curriculum in village schools.

4.5. Integration of TEK with modern conservation

This study shows that the TEK possessed by the Dayak Kenyah community is very rich and applicable in the context of modern conservation. Many of their practices, such as land rotation, prohibition of illegal logging, and selective harvesting, are in line with the principles of sustainable ecology. The researcher recommends that

conservation institutions and local governments begin to adopt a community-based conservation model that prioritizes the position of indigenous peoples as the main actors.

5. Conclusion

This study reveals the rich ethnobotanical knowledge of the Dayak Kenyah community in East Kalimantan, which includes the identification and utilization of 47 plant species with various functions. The distribution of plant utilization shows a dominant use for medicine (38%), followed by food (30%), building materials (19%), and ritual purposes (13%). These findings confirm that the Dayak Kenyah community has a complex ecological knowledge system that is integrated into their daily lives and cultural practices.

Custom-based conservation practices such as Tana' Ulen are concrete evidence of the implementation of Traditional Ecological Knowledge (TEK) that has been carried out for generations. This system not only functions as a mechanism for protecting forest ecosystems, but also ensures the sustainability of plant genetic resources that have important value for the community. This shows that the traditional ecological knowledge of the Dayak Kenyah community has strong relevance to modern conservation efforts.

However, there are indications of a decline in interest among the younger generation in this local knowledge, where only 27.8% of young informants were able to identify more than 10 types of local plants and their functions. This phenomenon indicates a serious threat to the sustainability of traditional ecological knowledge and culture-based conservation practices.

Based on these findings, this study suggests the need for integration between TEK and modern conservation strategies within the framework of inclusive and sustainable natural resource management. Efforts to revitalize traditional knowledge through local culture-based education, systematic documentation, and legal recognition of indigenous conservation practices need to be prioritized to ensure the sustainability of this valuable ecological knowledge.

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