Jurnal Pendidikan Sains Indonesia
(Indonesian Journal of Science Education)
https://jurnal.usk.ac.id/jpsi

13(3), pp.793-810, (2025)
e-ISSN: 2615-840X p-ISSN: 2338-4379
https://doi.org/10.24815/jpsi.v13i3.45269

Utilization of Wetland Vegetation as Ethnobotany by the Community of Burai Village: Identification Study and Local Wisdom

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Article History:
Received date: March 22 2025
Received in revised from: July 10 2025
Accepted date: July 14 2025
Available online: July 23 2025

Citation:
Hastiana, Y., Anjelia, B., Sumah, A.S.W., & Putra, D.J. 2025. Utilization of wetland vegetation as ethnobotany by the community of burai village: identification study and local wisdom. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, 13(3):793-810

Abstract. The utilization of wetland vegetation as ethnobotany by the people of Burai Village reflects the strong relationship between local communities and their surrounding environment. This research aims to identify wetland plants used by the community and document their ethnobotanical values. The identification results will serve as a reference for the development of science learning resources and support the creation of contextual teaching materials for junior high school students in Burai Village The study applied a descriptive qualitative method with field surveys, observations, and in-depth interviews with traditional leaders and local residents. Data were analyzed through identification of species, uses, and cultural significance. The results identified 16 species of wetland plants utilized for food, traditional medicine, handicrafts, construction materials, and cultural ceremonies. Species such as *Hymenachine amplexicaulis, Melaleuca leucadendron, Nelumbo nucifera, Eleocharis dulci,* and *Nypa fruticans* are essential in daily life. The findings indicate that wetland vegetation plays a crucial role in supporting local livelihoods, preserving traditional knowledge, and maintaining cultural identity. This study emphasizes the importance of integrating local wisdom into sustainable wetland management to ensure ecological and cultural preservation in Burai Village.
Keywords: Wetland vegetation, ethnobotany, local wisdom

Introduction

Burai Village is one of the villages located in Tanjung Batu Subdistrict, Ogan Ilir Regency, South Sumatra, known as a wetland village. Most of the area is dominated by wetland ecosystems, forming a distinctive landscape of wetlands, small rivers, and seasonal water bodies. This geographical condition greatly influences the lifestyle of its residents. The people of Burai, who are mostly fishermen, wetland farmers, and craftsmen, have long adapted to the wetland environment and rely on it as their main source of livelihood.

As a community living in a wetland area, the people of Burai have a high dependence on the surrounding wetland vegetation. Various types of wetland plants have been traditionally used for generations serving as food sources, traditional medicines, building materials, and even ritual equipment for cultural ceremonies. Knowledge about selecting, processing, and utilizing these plants is passed down orally from generation to generation, shaping a unique local wisdom that reflects a harmonious relationship between humans and nature. Traditional ecological knowledge, passed orally through generations, encapsulates practical, cultural, and ethical insights into human-ecosystem interactions—such as those observed in indigenous communities in Veracruz, Mexico fostering resilience and stewardship (Molnár et al., 2023; Trinidad et al., 2021)

The people of Burai Village are closely connected to the recognition and understanding of the natural resources within their area. The wetlands, which are an integral part of the local ecosystem, hold a wide variety of plants with significant benefits for daily life. Understanding ethnobotany, which refers to the interaction between people and the plants around them, plays a crucial role in fostering food security and economic independence for the village community (Ramadhan, et al., 2023; Syamsiah, et al., 2021). Along with the growing awareness of the importance of sustainable use of natural resources, research is needed to explore the local wisdom and traditional practices related to the utilization of wetland vegetation in Burai Village.

The wetland vegetation in Burai Village not only serves as a source of food but also provides traditional medicines and other essential materials. Wetland vegetation in Burai plays a diverse role not only as an ecological element but also as an important source of food and livelihood for the community (Amalia, 2019; Liyanage, 2019), traditional medicines (Chen & Zhang, 2022; Feng, et al., 2023; Pan, et al., 2020), also serves as an economic resource (Osland et al., 2022; Pan et al., 2020), as well as materials for traditional ceremonies and cultural rituals (Amalia, 2019; Feng, et al., 2023), while simultaneously contributing to ecological stability through soil protection, carbon storage, and water quality improvement (Shan, et al, 2021; Shen, et al., 2022). The role of this vegetation is crucial in supporting biodiversity and enhancing resilience to climate change, as shifting rainfall patterns and temperature fluctuations can affect species composition and ecosystem functions (Xing, et al, 2023; Yang, et al., 2020). The integration of traditional ecological knowledge and cultural practices into sustainable management strategies can help preserve local heritage while maintaining ecosystem health, demonstrating the close connection between local conservation efforts and global environmental challenges (Elshehawi, et al., 2019; Radeva, et al., 2019; Zou, et al., 2021).

Most community members still rely on knowledge passed down through generations regarding the use of plants found in their surroundings, including their applications in medicine, food, and raw materials for handicrafts. Research conducted in various regions of Indonesia highlights that utilizing local resources is a vital step in preserving the environment while promoting local culture (Sujarwo, 2023; Supriani, et al., 2023).

This research focuses on identifying plant species utilized by the local community and exploring the traditional methods they have developed for using wetland vegetation. This study is important as it provides deeper insights into how the community adapts to and utilizes their environment to achieve well-being. Furthermore, incorporating local wisdom into natural resource conservation becomes highly relevant in the context of globalization, which poses risks to cultural sustainability and biodiversity(Ardiansah & Oktapani, 2020; Putra, et al., 2021)

Local wisdom, particularly traditional ecological knowledge (TEK), plays a vital role in natural resource conservation, especially amidst the threats of globalization that erode both cultural heritage and biodiversity (Huang, et al., 2024). TEK, passed down through generations, teaches sustainable resource management practices, as evidenced by the fact that indigenous territories covering only 22% of the earth's land harbor 80% of global biodiversity (Strickland, et al., 2024). In Japan, integrating indigenous communities and their TEK into biodiversity policies has proven effective (Ogawa et al., 2021).

However, cultural erosion and the declining transmission of traditional knowledge threaten the sustainability of TEK and biodiversity, as seen in the Mentawai Islands (Lee, et al., 2021). Integrating TEK into conservation policies is not merely about respecting

Indigenous rights but also serves as an effective strategy for strengthening ecological resilience (Robinson, et al., 2021). Local wisdom has proven capable of providing adaptive solutions to environmental degradation, such as those practiced by the Tengger community through culturally based ecological education and advocacy (Sunarno & Supriatna, 2023). Therefore, preserving TEK and recognizing local wisdom as a key component of sustainable natural resource management are essential for maintaining biodiversity and cultural heritage including the wetland vegetation of Burai Village in this era of globalization. This research also aims to document the increasingly endangered traditional knowledge due to modernization and rapid lifestyle changes

The research activities include identification pf wetland plant species used by the community, and tracing the uses and processing methods of these plants for daily needs, developing a sustainability model that harmonizes local economic development with environmental conservation. Through a participatory approach, it is hoped that the community will actively engage in all stages of the research process, from data collection to result reporting (Ferina, et al., 2024). In this context, traditional wisdom highly valued by the local population must serve as the foundation for conservation efforts, while also acting as a basis for developing innovative local products.

The problem solving strategy in this research involves several concrete steps. First, systematic documentation of plant species and their uses, both for economic and health-related purposes. Second, training for the local community to enhance their skills in processing and marketing non-timber forest products, particularly through innovative processing techniques. The last, dissemination of research findings to stakeholders and local government to provide input for policies that support wetland ecosystem sustainability and empower village communities (Nurchayati, 2022; Sujarwo, 2023; Wibowo, 2021).

By promoting the wise use of wetland vegetation, the people of Burai Village are expected to preserve their local wisdom while improving their quality of life. Therefore, this research not only contributes to scientific knowledge but also serves as a bridge between traditional knowledge and modern technology, which can be applied to natural resource management. This is crucial to fostering positive interactions between culture, ecosystems, and socio-economic development, creating long-term synergies for plant and ecosystem conservation (Firdawati, , et al., 2021; Rupidara, et al., 2020; Sujarwo, 2023). However, with modernization and the increasing availability of modern products, the community's dependence on wetland vegetation has begun to decline. This trend threatens the preservation of traditional knowledge, which has long been an integral part of Burai's cultural identity. If this knowledge is not properly documented, it risks disappearing, along with the reduced utilization and conservation of wetland vegetation itself.

Based on this background, the research aims to identify wetland vegetation species used by the people of Burai Village and document the associated traditional knowledge and local wisdom. This documentation is expected to serve not only as a cultural preservation effort but also to support wetland biodiversity conservation and enhance community food security and health in a sustainable manner. Furthermore, the identification results will serve as a reference for the development of science learning resources and support the creation of contextual teaching materials for junior high school students in Burai Village. Thus, this study not only contributes to cultural and biodiversity preservation but also strengthens the integration of local knowledge into formal education.

Methods

This research employs a qualitative descriptive approach, using survey methods and ethnobotanical studies in Burai Village, Ogan Ilir. The research was conducted in the wetland areas, with a focus on vegetation utilized by the community. The steps in this research methodology can be seen in the following Figure 1.

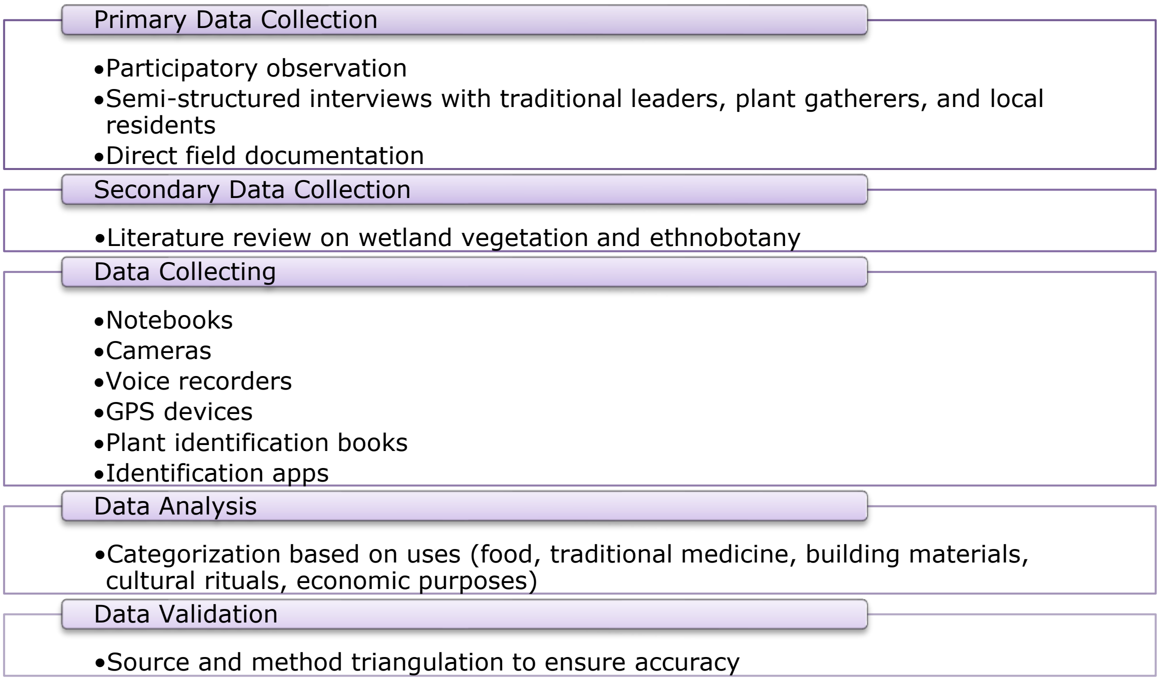

Figure 1. Research metodology (Bernard, 2018; Creswell, 2012)

Primary data were collected through participatory observation, semi-structured interviews with traditional leaders, plant gatherers, and local residents, as well as direct field documentation. These methods followed the qualitative research approach outlined by Bernard (2018), who emphasizes the importance of immersive fieldwork and flexible interviewing techniques in ethnographic studies. Secondary data were obtained through a literature review related to wetland vegetation and ethnobotany. The tools used included notebooks, cameras, voice recorders, GPS devices, plant identification books, and identification apps. Collected data were analyzed qualitatively by categorizing vegetation based on its uses, such as food, traditional medicine, building materials, cultural rituals, and economic purposes. Data validation was carried out through source and method triangulation to ensure the accuracy of findings.

Results and Discussion

The research findings indicate that the people of Burai Village utilize a wide range of wetland vegetation to support their daily lives, covering food, traditional medicine, building materials, cultural needs, and economic activities.

Identification of Wetland Vegetation

Field identification recorded at least 16 species of wetland plants commonly used by the local community. The most dominant species include *Nelumbo nucifera* (telipuk/lotus), *Eleocharis dulcis* (purun/water chestnut), *Typha angustifolia* (cattail), *Nypa fruticans* (nipah/nipa palm), *Pandanus amaryllifolius* (screwpine), *Hymenachine amplexicaulis* (kumpai grass), and *Pistia stratiotes* L. (kiambang/water lettuce). The identification results regarding wetland vegetation and its benefits are listed in Table 1.

The study highlights the diverse utilization of wetland vegetation by the people of Burai Village, reflecting their deep dependence on natural resources for various aspects of daily life. The identification process recorded 16 species of wetland plants, each contributing to multiple functions, including food sources, traditional medicine, construction materials, handicrafts, cultural rituals, and economic activities. These findings emphasize the integral role of wetland plants in sustaining the livelihood of the local community.

Table 1.Identification of wetland vegetation utilized by the community of Burai Village.

No	Local Name	Scientific Name	Utilization
1	Lotus (*Telipuk*)	*Nelumbo nucifera*	Food, traditional medicine
2	Water chestnut (*Purun Tikus*)	*Eleocharis dulcis*	Mat and handicraft weaving
3	Cattail (*Ilalang Rawa*)	*Typha angustifolia*	Roofing material
4	Nipa palm (*Nipah)*	*Nypa fruticans*	Food, construction material
5	Pandan	*Pandanus amaryllifolius*	Food fragrance, traditional rituals
6	Kumpai grass	*Hymenachine amplexicaulis*	Livestock feed
7	Hydrilla	*Hydrilla verticillata*	Fever remedy
8	Gelam wood	*Melaleuca leucadendron*	Foundation for stilt houses
9	Water spinach	*Ipomoea aquatica*	Food ingredient, livestock feed
10	Water rose	*Ludwigia peploides*	Itch remedy, ornamental plant
11	Water Hyacinth	*Eichhornia crassipes*	Handicrafts, livestock feed
12	Water lettuce (*Apu-apu*)	*Salvinia molesta*	Remedy for fever and cough
13	Giant water lettuce (*Kiambang*)	*Pistia stratiotes L*	Livestock feed
14	Tembesu	*Fragreae fragrans* Roxb.	Construction material, casket (*pedapuran*), traditional rituals
15	Nutgrass	*Cyperus pulcherrimus*	Livestock feed
16	Water algae (*Riamun*)	*Myriophyllum spicatum*	Ornamental plant

Based on tabel 1, one of the most commonly used species is *Nelumbo nucifera* (lotus), which serves as both a food source and a component of traditional medicine. Similarly, *Nypa fruticans* (nipa palm) provides edible products and is also widely used in construction, showcasing the multifunctional nature of wetland vegetation. Additionally, *Pandanus amaryllifolius* (pandan) is utilized for food fragrance and in traditional rituals, indicating its cultural significance. Several plants play a crucial role in economic activities, particularly in handicraft production. For example, *Eleocharis dulcis* (water chestnut) is commonly used for mat and handicraft weaving, contributing to local craftsmanship and trade. Likewise, *Eichhornia crassipes* (water hyacinth) is utilized for making handicrafts and as livestock feed, demonstrating its dual-purpose benefits. These economic uses not only support the community's financial stability but also promote sustainable resource utilization.

Beyond economic contributions, many wetland plants provide essential construction materials. *Typha angustifolia* (cattail) is widely used for roofing material, while *Melaleuca leucadendron* (gelam wood) is a key resource for building stilt house foundations, ensuring structural stability in wetland environments. The use of *Fragreae fragrans* Roxb. (tembesu) in traditional rituals and for constructing caskets further illustrates the cultural importance of these plants.

Furthermore, medicinal properties are a significant aspect of wetland vegetation usage. *Hydrilla verticillata* (Hydrilla) and *Salvinia molesta* (water lettuce) are traditionally known for their effectiveness in treating fever and cough. Similarly*, Ludwigia peploides* (water rose) is utilized as an itch remedy, showing how local knowledge contributes to natural healing practices. These findings demonstrate the community's reliance on plant-based medicine, which may serve as a foundation for further ethnobotanical studies. Another vital aspect of wetland vegetation utilization is livestock feeding. Several species, including *Hymenachine amplexicaulis* (kumpai grass), *Cyperus pulcherrimus* (nutgrass), *Ipomoea aquatica* (water spinach), and *Pistia stratiotes* L. (giant water lettuce), are essential as animal feed. This highlights the significant role of wetland plants in supporting the agricultural and livestock sector in Burai Village.

In summary, the research findings underscore the multifunctionality of wetland plants in Burai Village, demonstrating their importance in food security, construction, traditional medicine, cultural rituals, and economic activities. The sustainable management of these natural resources is crucial for preserving biodiversity while maintaining the cultural and economic well-being of the local community. Future studies could further explore conservation strategies to ensure the continued availability of these valuable plant species for future generations.

Adaptation of Wetland Vegetation

Wetland vegetation has evolved various adaptations to thrive in waterlogged and oxygen-deficient environments. *Nelumbo nucifera* has large, broad leaves that float on the water's surface, optimizing sunlight absorption for photosynthesis. Its long, flexible stem contains air spaces, which provide buoyancy and facilitate oxygen transport to submerged roots. These adaptations, including the floating leaves and aerenchyma in the stem, are crucial for its survival in aquatic environments. Additionally, its antioxidant properties help the lotus cope with environmental stress, enhancing its ecological resilience (Sranujit et al., 2021). Similarly, *Pistia stratiotes* possesses thick, spongy leaves and dangling roots that enable it to float while absorbing nutrients directly from the water.

Melaleuca leucadendron has developed a strong, expansive root system that provides stability in waterlogged soils and helps prevent erosion. This root network also enhances nutrient uptake under saturated conditions (Dang et al., 2023). In addition, the tree's peeling bark reduces water loss and shields it from environmental stressors (Lourenço et al., 2022). These adaptations make *Melaleuca leucadendron* an ecologically important species in wetland ecosystems (Adame et al., 2019; Teoh et al., 2022).

Hymenachine amplexicaulis and *Ludwigia peploides* exhibit rapid growth and creeping stems, allowing them to spread across wetland areas, stabilizing soil and preventing erosion. These plants help enhance habitat complexity and improve wetland ecosystems (Song, 2021; Sun et al., 2023). However, invasive species like *Hymenachne amplexicaulis* can disrupt native biodiversity, underscoring the need for balanced wetland management (Lahiri & Davidson, 2020; Mazurczyk & Brooks, 2021). These wetland plants demonstrate remarkable adaptations that ensure survival in dynamic ecosystems, highlighting their crucial role in maintaining wetland biodiversity, water filtration, and soil stabilization. Wetland vegetation can be seen in Figure 2.

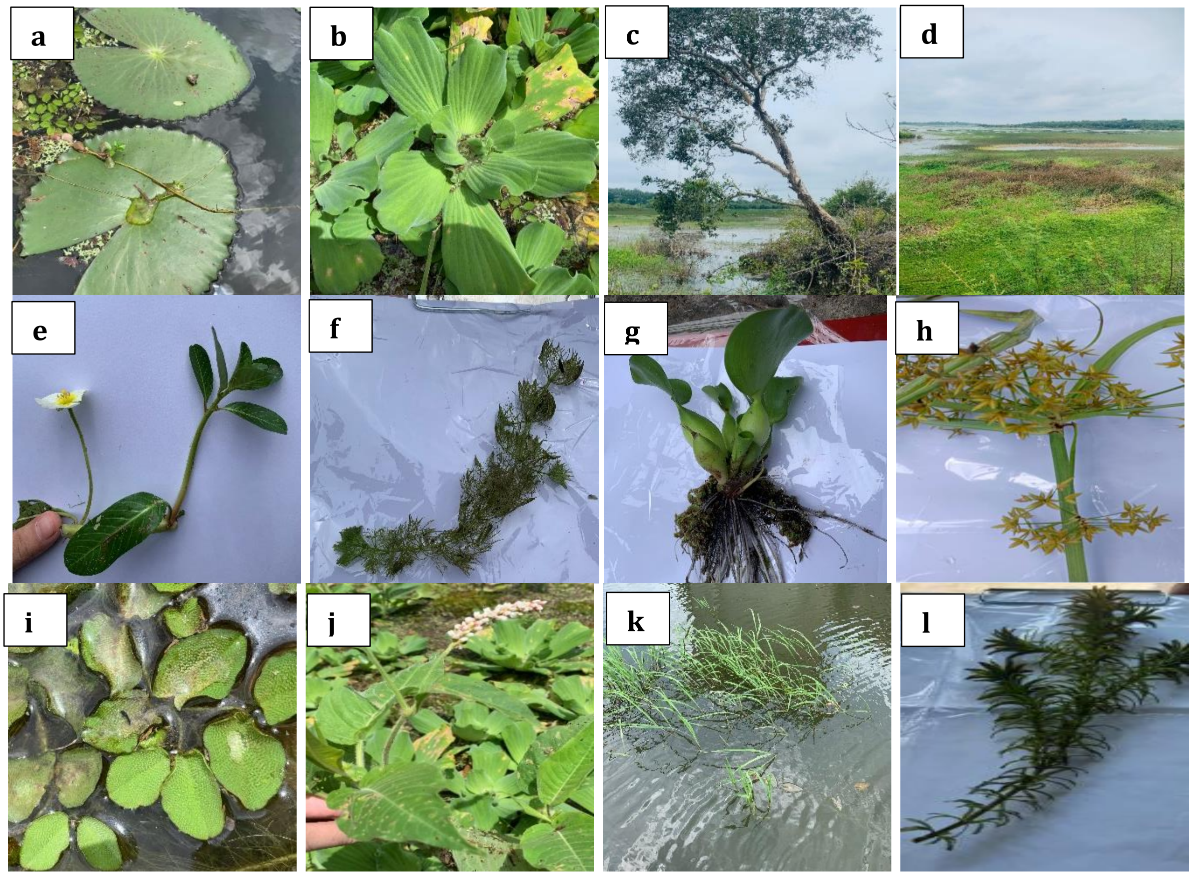

Figure 2. Adaptation of wetland vegetation: a) *Nelumbo nucifera*, b) *Pistia stratiotes*, c) *Melaleuca leucadendron*, d) *Hymenachine amplexicaulis*, e) *Ludwigia peploides*, f) *Hydrilla verticillata*, g) *Eleocharis dulcis*, h) *Cyperus pulcherrimus,* i) *Salvinia molesta*, j) *Ipomoea aquatica*, k) *Typha angustifolia,* l) *Myriophyllum spicatum*).

Hydrilla verticillata and *Myriophyllum spicatum* are submerged aquatic plants that absorb dissolved nutrients and oxygen directly from the water. They have flexible stems and finely divided leaves that maximize surface area for photosynthesis and nutrient uptake. As aquatic plants that play a crucial role in absorbing dissolved nutrients and oxygen from water, thereby supporting overall aquatic ecosystems (Maroti & Hutchinson, 2024). These species enabling movement with water currents for optimal sunlight exposure (Tippery, 2023). Through their nutrient absorption and oxygen production mechanisms, both species contribute greatly to the health and stability of aquatic ecosystems (Detülger al., 2017).

Eleocharis dulcis has a specialized underground tuber system that stores nutrients, allowing it to survive seasonal changes in water levels. This plant survives seasonal water level fluctuations through a specialized underground tuber system that stores essential nutrients, enabling regrowth during dry periods and enhancing resilience in diverse aquatic environments, including highly acidic soils; this adaptation supports its ecological role in nutrient cycling and habitat stability, allowing it to thrive and rapidly reestablish itself after environmental changes (Napisah & Annisa, 2020; Haryanti et al., 2022).

Cyperus pulcherrimus and *Salvinia molesta* are well-adapted to fluctuating water conditions. Nutgrass develops rhizomes that help it survive in both submerged and dry environments, while water lettuce has water-repellent, hairy leaves that prevent excessive moisture absorption and promote buoyancy. *Cyperus pulcherrimus* survives fluctuating moisture through rhizomes, though detailed studies are lacking, while *Salvinia molesta* uses trichome covered, superhydrophobic leaves for buoyancy and moisture control (Steigleder & Roldo, 2019; Konrad et al., 2021; Kim et al., 2022), supporting its role in phytoremediation (Arifin et al., 2023; Kitamura et al., 2023).

Ipomoea aquatica (water spinach) is an amphibious plant with hollow stems that enhance floating capability and allow it to thrive in both aquatic and terrestrial conditions. It has buoyant stems that enable it to thrive in both aquatic and terrestrial environments (Ibrahim et al., 2019), contributing to ecosystem health through nutrient absorption and water quality improvement (Ruan et al., 2024), while its adaptability across habitats from wetlands to farms supports its role in sustainable agriculture and nutrition (Fevria et al., 2021; Rahayu et al., 2021; Sambo et al., 2023)

Typha angustifolia (cattail) has a robust aerenchyma tissue system, enabling efficient oxygen transport from its leaves to the submerged roots, which is essential for survival in low oxygen environments. The thrives in low oxygen wetlands via aerenchyma tissue that enables oxygen transport from leaves to roots (Liu et al., 2019), supporting roles in water treatment (Hasan et al., 2022), long distance oxygen flow (Yamauchi et al., 2019), and ecological resilience (Liao et al., 2023).

Local Wisdom in Utilization

The local wisdom related to the utilization of wetland vegetation in Burai Village, as shown in Figure 2, includes species selection based on seasons: the community understands the seasonal availability of certain plants and knows the best time for harvesting. Sustainable harvesting methods, only specific parts of the plant are taken to allow the vegetation to regenerate naturally. Multi-purpose utilization, a single species is often used for multiple purposes. For example, purun is used to make mats, ropes, and even house roofs. Traditional beliefs, certain plants are believed to ward off misfortune or attract prosperity, making them essential in traditional ceremonies and rituals. In terms of food, wetland plants such as lotus (*Nelumbo nucifera*) are utilized for their seeds and tubers, which are rich in carbohydrates and fiber (Amalia, 2019). In addition, nipa palm (*Nypa fruticans*) produces sap that is processed into sugar or traditional beverages, while its leaves are used as food wrappers. This demonstrates that wetland vegetation not only serves as an ecological buffer but also contributes significantly to local food security (Liyanage, 2019).

For traditional medicine, the local community uses pandan leaves (*Pandanus amaryllifolius*) and lotus roots to relieve fever, coughs, and digestive issues. The belief in the effectiveness of these traditional remedies has been passed down through generations, reflecting the development of TEK within the community (Feng et al., 2023; Yan et al., 2021). From an economic perspective, wetland vegetation also supports household economies, particularly through handicrafts made from *Eleocharis dulcis*, which are marketed as distinctive local products (Liyanage, 2019; Osland et al., 2022).

Culturally, certain wetland plants play important roles in traditional ceremonies. Pandan and nipa leaves, for example, are used in ancestral grave rituals and as decorative elements in religious ceremonies and traditional weddings (Feng et al., 2023; Pan et al., 2020). This cultural use of wetland vegetation highlights the deep connection between the wetland ecosystem and the cultural identity of the Burai Village community. Beyond these direct benefits, wetland vegetation plays a crucial role in maintaining ecosystem stability. The root systems of wetland plants help prevent erosion, improve water quality, and absorb carbon, contributing to climate change mitigation (Shen et al., 2022; Yang et al., 2020).

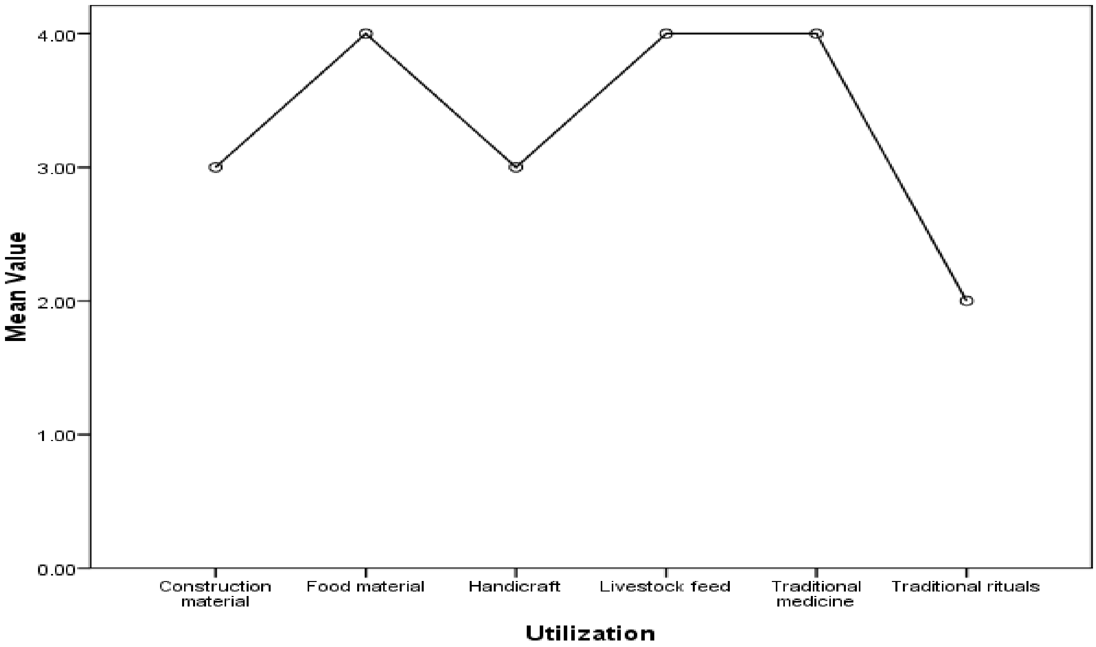

Figure 3. Most utilization of wetland vegetation in Burai community

Therefore, the local wisdom in utilizing wetland vegetation in Burai Village not only enhances economic and social well-being but also strengthens the ecological sustainability of the area. Integrating traditional knowledge with scientific approaches in wetland vegetation management should continue to be developed as an effective community-based conservation strategy (Ogawa et al., 2021).

The Role of Ethnobotany in Community Life

Ethnobotany serves not only practical functions, such as fulfilling daily needs, but also plays a crucial role in strengthening cultural identity. Knowledge of wetland vegetation is passed down orally through storytelling and direct practice, making it an inseparable part of Burai's local wisdom. Among the efforts of the Burai community in utilizing wetland vegetation can be seen, in Figure 4 and Figure 5.

Figure 4. Purun utilized by the community of Burai Village for crafting mats, tanjak (a traditional male headpiece used in Palembang ceremonial events), bags, tissue boxes, and sandals.

Eleocharis dulcis in Burai Village is used to produce mats, tanjak, bags, tissue boxes, and sandals items that play a significant role in both local culture and the village economy (Abdullah et al., 2020). This traditional craft supports village tourism, empowers local women, and helps preserve traditional skills across generations (Monika et al., 2024; Wondirad et al., 2021). The utilization of purun also contributes to environmental conservation through paludiculture (cultivation in wetland ecosystems), while simultaneously attracting modern, eco-conscious consumers (Ema et al., 2024). Innovations in design that follow global market trends further strengthen purun's role as a symbol of cultural heritage and sustainable creative economy (Mbaka, 2023)

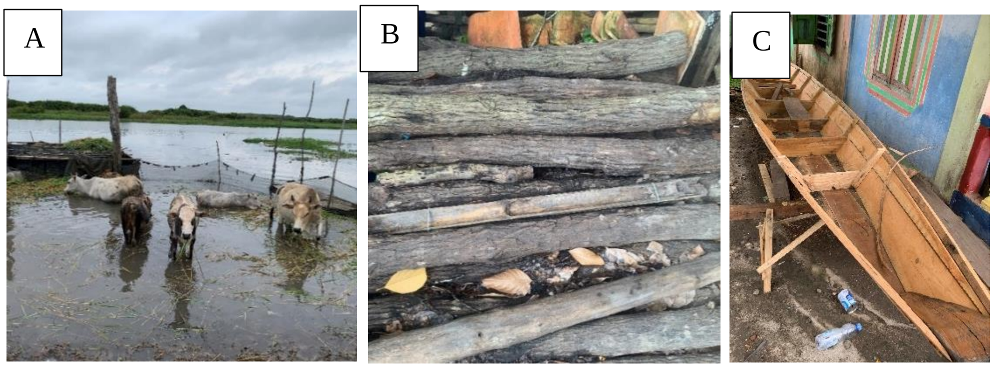

Figure 5. Kumpai grass utilized by the community of Burai Village as livestock feed (A); Tembesu wood utilized by the community for building houses and traditional casket (*pedapuran*) (B); Traditional boat building from Tembesu wood (C).

Hymenachne amplexicaulis in Burai Village is primarily used as livestock feed. However, its high fiber content limits digestibility, making it necessary to combine it with other types of forage (Hidayat, 2023; Riswandi et al, 2021; Riswandi et al., 2020)). In Burai Village is primarily used as livestock feed. However, its high fiber content limits digestibility, making it necessary to combine it with other types of forage (Riswandi et al., 2021; Syafria & Jamarun, 2021). *Fagraea crenulata* is traditionally used by local residents for constructing houses and *pedapuran* (traditional casket), valued for its durability and strength. This practice not only supports the local economy but also reflects the close interconnection between culture, economy, and natural resources in Burai Village. Sustainable management of these resources plays a critical role in conserving biodiversity and enhancing climate adaptation (Qin et al., 2022), hile also strengthening the village’s ecological and social resilience (Riswandi et al., 2021, 2020).

Challenges and Conservation Efforts

A key challenge today is the declining reliance on wetland plants, as modern products become more accessible. The declining dependence on wetland plants due to the rise of modern products threatens wetland ecosystem sustainability and traditional knowledge (Kettenring & Tarsa, 2020; Lodge & Tyler, 2020). Wetland restoration efforts often fail to restore biodiversity due to invasive species dominance and limited availability of native plant materials (Henry et al., 2024; Rohal et al., 2019). Urbanization, agricultural runoff, and eutrophication further accelerate wetland degradation, reducing the ecosystem's ability to provide essential services (Maltby, 2022; Ramachandra et al., 2024) Moreover, engineered approaches often overlook the ecological potential of native plants (Zhu et al., 2020), emphasizing the need for adaptive restoration involving native species and local communities (Henry et al., 2024) Promoting synergy between biodiversity conservation, traditional agricultural practices, and community-based management is essential to ensure the sustainability of wetland vegetation and its ecological functions (Ruswinarsih et al., 2024). Furthermore, younger generations show diminishing interest in learning traditional ecological knowledge. Therefore, documenting ethnobotanical knowledge and incorporating environmental education rooted in local culture are critical efforts to ensure its preservation. The findings of this research indicate that wetland vegetation in Burai Village has extensive benefits in community life, serving as sources of food, traditional medicine, building materials, and cultural rituals. Beyond its crucial ecological role, the use of these plants reflects the close relationship between humans and their environment while enriching the local knowledge passed down through generations.

In the educational context, these findings can be utilized to enhance school teaching materials, particularly in the subject of natural sciences (IPA). Junior high school students in Burai Village can study biodiversity and the benefits of wetland plants directly from their surrounding environment. This approach can increase the relevance of learning and motivate students to better understand their local ecosystem. Additionally, developing teaching materials based on local wisdom can be an effective strategy for raising awareness about the importance of environmental conservation from an early age. By leveraging these research findings, teachers can design learning modules that integrate scientific knowledge with local culture, such as case studies on the use of purun for handicrafts or pandan for traditional rituals. Consequently, this research not only benefits the community in general but also has a positive impact on the education sector. The integration of ethnobotany into science education aligns with the concept of environmental education, which aims to instill awareness and a positive attitude towards environmental preservation. By understanding the benefits of wetland plants and their connection to daily life, students are expected to become agents of change in maintaining ecosystem balance and ensuring the sustainability of natural resources in their village.

Conclusion

In conclusion, this research highlights the vital role of wetland vegetation in Burai Village, where 16 plant species are used for food, medicine, handicrafts, construction, and cultural ceremonies. Species like *Hymenachne amplexicaulis, Melaleuca leucadendron, Nelumbo nucifera, Eleocharis dulci*, and *Nypa fruticans* are key to the community's daily life. The findings will also serve as a resource for science learning at MTs Nurul Ula, focusing on ecosystems and biodiversity. The study emphasizes the importance of integrating local knowledge into sustainable wetland management for ecological and cultural preservation.

References

Abdullah, A., Khan, S.M., Pieroni, A., Haq, Z.U., & Ahmad, Z. 2020. Mazri (*Nannorrhops Ritchiana* (Griff) Aitch.): A remarkable source of manufacturing traditional handicrafts, goods and utensils in Pakistan. *Journal of Ethnobiology and Ethnomedicine*, 16(1): 1-17. https://doi.org/10.1186/s13002-020-00394-0

Adame, M.F., Franklin, H.M., Waltham, N.J., Rodríguez, S.D.A., Kavehei, E., Turschwell, M.P., & Ronan, M. 2019. Nitrogen removal by tropical floodplain wetlands through denitrification. *Marine and Freshwater Research*, 70(11):1513-1521. http://dx.doi.org/10.1071/MF18490

Amalia, R.H.T. 2019. Water quality analysis of kelekar river in Burai Village Kecamatan Tanjung Batu/Tanjung Batu Subdistrict Kabupaten Ogan Ilir/ Ogan Ilir District to identify the toxic effects caused. *Jurnal Biota*, 5(1):48–54. https://doi.org/10.19109/biota.v5i1.2655

Ardiansah, A., & Oktapani, S. 2020. Pemahaman hak dan kewajiban masyarakat Desa Tanjung Karang. *Community Development Journal: Jurnal Pengabdian Masyarakat*, 1(2):95–103. https://doi.org/10.31004/cdj.v1i2.721

Arifin, A., Zubaidah, T., Syarifuddin, S., Irfa'i, M., Juanda, J., Santoso, I., & Mulyaningsih, B. 2023. Unlocking nature's elixir: Harnessing kiambang (*Salvinia molesta*) for sustainable water quality improvement in post-coal mine ponds. *Journal of Law and Sustainable Development*, 11(12):1374-1384. https://doi.org/10.55908/sdgs.v11i12.1374

Bernard, H.R. 2018. *Research Methods in Anthropology: Qualitative and Quantitative Approaches (6th ed.)*. Rowman & Littlefield.

Chen, Y., & Zhang, H. 2022. Research on the influence of information technology on china's higher education in the post-epidemic era. *In Proceedings of the 4th International Conference on Education Development and Quality Assurance (EDQA 2022)*, pp.726–736. Atlantis Press. https://doi.org/10.2991/978-94-6463-034-3_75

Creswell, J.W. 2012. *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. Pearson Education.

Dang, A.T.N., Reid, M., & Kumar, L. 2023. Coastal *Melaleuca* wetlands under future climate and sea-level rise scenarios in the Mekong Delta, Vietnam: Vulnerability and conservation. *Regional Environmental Change*, 23(1):20-29. https://doi.org/10.1007 /s10113-022-02009-8

Dülger, E., Heidbüchel, P., Schumann, T., Mettler-Altmann, T., & Hussner, A. 2017. Interactive effects of nitrate concentrations and carbon dioxide on the stoichiometry, biomass allocation and growth rate of submerged aquatic plants. *Freshwater Biology*, 62(6):1094–1104. https://doi.org/10.1111/fwb.12928

Elshehawi, S., Bregman, E., Schot, P.P., & Grootjans, A.P. 2019. Natural isotopes identify changes in groundwater flows affecting wetland vegetation in the Drentsche Aa Brook Valley, the Netherlands. *Journal of Ecological Engineering*, 20(3):112–125. https://doi.org/10.12911/22998993/99743

Ema, E.P., Mulyana, A., Adriani, D., & Antoni, M. 2024. Perceptions of farmers regarding peatland restoration model of paludiculture in South Sumatra, Indonesia. *Heritage and Sustainable Development*, 6(1):315–334. https://doi.org/10.37868/hsd.v6i1.418

Feng, X., Zhao, Z., Ma, T., & Hu, B. 2023. A Study of the effects of climate change and human activities on NPP of marsh wetland vegetation in the yellow river source region between 2000 and 2020. *Frontiers in Ecology and Evolution*, 11:1123645. https://doi.org/10.3389/fevo.2023.1123645

Ferina, I.S., Aspahani, Budiman, A.I., & Bayusari, I. 2024. Sosialisasi teknologi informasi bagi aparat desa dalam rangka meningkatkan pelayanan masyarakat di Desa Burai Kabupaten Ogan Ilir Sumatera Selatan. *Jurnal Abdimas Mandiri*, 8(1):37-44. https://doi.org/10.36982/jam.v8i1.3752

Fevria, R., Aliciafarma, S., Vauzia, V., & Edwin, E. 2021. Comparison of nutritional content of water spinach (*Ipomoea* aquatica) *cultivated hydroponically and non-hydroponically*. *Journal of Physics Conference Series*, 1940(1):1-4. https://doi.org/ 10.1088/1742-6596/1940/1/012049

Firdawati, K., Syamswisna, S., & Fajri, H. 2021. Etnobotani tanaman pangan dari masyarakat Desa Mekar Pelita Kecamatan Sayan Kabupaten Melawi. *Bioscientist Jurnal Ilmiah Biologi,* 9(2):402-411. https://doi.org/10.33394/bioscientist.v9i2.4206

Haryanti, N.H., Banowati, L., & Manik, T.N. 2022. The long microfiber of water-chestnut (*Eleocharis dulcis*) as composite reinforcing material. *International Journal of Biosciences (IJB)*, 21(6):322-330. https://doi.org/10.12692/ijb/21.6.322-330

Hasan, H.H., Razali, S.F. M., & Shah, A.S.M. 2022. *Performance* of greywater treatment using iron removal media (IRM) and cattail *Typha* angustifolia. *Pertanika Journal of Science and Technology*, 30(2):1421–1438. https://doi.org/10.47836/pjst.30.2.32

Henry, A., Robinson, R.G., Sinnott, K., Tarsa, E.E., Brunson, M.W., & Kettenring, K.M. 2024. Lay of the wetland: Manager practices and challenges in wetland revegetation. *Restoration Ecology*, 32(5):14167. https://doi.org/10.1111/rec.14167

Hidayat, Z. 2023. Nutritional status and smallholder farmer characteristic of Bali cattle-oil palm integration system in the rural dryland area of Bangka Island, Indonesia. *The Pakistan Journal of Agricultural Sciences*, 60(4):603–613. https://doi.org/10.21162/pakjas/23.90

Huang, Q., Kuang, Y., Zhou, H., Li, X., & Yin, L. 2024. Biodiversity conservation in Xishuangbanna, China: Diversity analysis of traditional knowledge related to biodiversity and conservation progress and achievement evaluation. *Diversity*, 16(5): 260-267. https://doi.org/10.3390/d16050260

Ibrahim, M.H., Abas, N.A., & Zahra, S.M. 2019. Impact of salinity stress on germination of water spinach (*Ipomoea aquatica*). *Annual Research & Review in Biology*, 31(5): 1–12. https://doi.org/10.9734/arrb/2019/v31i530060

Kettenring, K.M., & Tarsa, E.E. 2020. Need to seed? ecological, genetic, and evolutionary keys to seed-based wetland restoration. *Frontiers in Environmental Science*, 8(109): 1-30. https://doi.org/10.3389/fenvs.2020.00109

Kim, M., Yoo, S., Jeong, H.E., & Kwak, M.K. 2022. Fabrication of *Salvinia*-inspired surfaces for hydrodynamic drag reduction by capillary-force-induced clustering. *Nature Communications*, 13(1):1-9. https://doi.org/10.1038/s41467-022-32919-4

Kitamura, R.S.A., Fusaro, T., Marques, R.Z., Brito, J.C.M., Juneau, P., & Gomes, M.P. 2023. The Use of aquatic macrophytes as a nature-based solution to prevent ciprofloxacin deleterious effects on microalgae. *Water*, 15(12):1-14. https://doi.org/10.3390/w15122143

Konrad, W., Roth-Nebelsick, A., Kessel, B., Miranda, T., Ebner, M., Schott, R.T., & Nebelsick, J.H. 2021. The Impact of raindrops on *Salvinia molesta* leaves: effects of trichomes and elasticity. *Journal of the Royal Society Interface*, 18(185):1-12. https://doi.org/10.1098/rsif.2021.0676

Lahiri, C., & Davidson, G.R. 2020. Heterogeneous oxygenation of wetland soils with increasing inundation: redox potential, water depth, and preferential flow paths. *Hydrological Processes*, 34(6):1350-1358. https://doi.org/10.1002/hyp.13654

Liao, Y., Zhao, S., Zhang, W., Zhao, P., Lu, B., Moody, M.L., Chen, L. 2023. Chromosome-level genome and high nitrogen stress response of the widespread and ecologically important wetland plant *Typha angustifolia*. *Frontiers in Plant Science*, 14:1-14. https://doi.org/10.3389/fpls.2023.1138498

Liu, H., Hao, N., Jia, Y., Liu, X., Ni, X., Wang, M., & Liu, W. 2019. The Ethylene receptor regulates *Typha angustifolia* leaf aerenchyma morphogenesis and cell fate. *Planta*, 250(1):381–390. https://doi.org/10.1007/s00425-019-03177-4

Liyanage, J.F.S. 2019. Potentiality of water resources in the kirala kele partial-nature-based wetland of Southern Sri Lanka. *Advances in Social Sciences Research Journal*. https://doi.org/10.14738/assrj.67.6815

Lodge, K.A., & Tyler, A.C. 2020. Divergent impact of grazing on plant communities of created wetlands with varying hydrology and antecedent land use. *Wetlands Ecology and Management*, 28(5):797–813. https://doi.org/10.1007/s11273-020-09750-z

Lourenço, L.L., Farnese, F.D.S., Alves, R.D.F.B., Dario, B.M.M., Martins, A.C., Aun, M.A., & Menezes-Silva, P.E. 2022. Variations in bark structural properties affect both water loss and carbon economics in neotropical *Savanna* trees in the Cerrado Region of Brazil. *Journal of Ecology*, 110(8):1826-1843. https://doi.org/10.1111/1365-2745.13908

Maltby, E. 2022. The wetlands paradigm shift in response to changing societal priorities: a reflective review. *Land*, 11(9):1526-1531. https://doi.org/10.3390/land11091526

Maroti, A., & Hutchinson, J. 2024. Evaluating the suppression of *Hydrilla verticillata* by manual removal and planting natives for small-scale restoration efforts in a spring-fed river. *Knowledge and Management of Aquatic Ecosystems*, 1(425):4-18. https://doi.org/10.1051/kmae/2024001

Mazurczyk, T., & Brooks, R.P. 2021. Native biodiversity increases with rising plant invasions in temperate, freshwater wetlands. *Wetlands Ecology and Management*, 30(1):139–160. https://doi.org/10.1007/s11273-021-09842-4

Mbaka, J.G. 2023. Local communities' perceptions about the impacts of water hyacinth infestation in Lake Victoria on economic activities in Nyalenda B Ward, Kisumu County, Kenya. *East African Journal of Environment and Natural Resources*, 6(1): 350–366. https://doi.org/10.37284/eajenr.6.1.1462

Molnár, Z., Fernández-Llamazares, Á., Schunko, C., Teixidor-Toneu, I., Jarić, I., Díaz-Reviriego, I., & Hill, R. 2023. Social justice for traditional knowledge holders will help conserve Europe's nature. *Biological Conservation*, pp.285-292. https://doi.org/10.1016/j.biocon.2023.110190

Monika, A., Lupikawaty, M., Ridho, S.L.Z., Fadila, D., Nurcahaya, C., Angguna, W M., & Fawwazi, S. 2024. The Impact of financial literacy and saving behavior on financial well-being: evidence among women in Burai Village, pp.92–98. https://doi.org/10.2991/978-2-38476-220-0_11

Munfarida, I., Auvaria, S.W., Suprayogi, D., & Munir, M. 2020. Application of *Salvinia molesta* for water pollution treatment using phytoremediation batch system. *IOP Conference Series Earth and Environmental Science*, 493(1):1-5. https://doi.org/10.1088/1755-1315/493/1/012002

Napisah, K., & Annisa, W. 2020. Peran purun tikus (*Eleocharis dulcis*) sebagai penyerap dan penetral Fe di lahan rawa pasang surut [The role of purun tikus (*Eleocharis dulcis*) as an absorber and neutralizer of Fe in tidal swamp land]. *Jurnal Sumberdaya Lahan*, 13(1):53-59. https://doi.org/10.21082/jsdl.v13n1.2019.53-59

Nurchayati, N. 2022. *Wild edible* plants sebagai pendukung ketahanan pangan pada masyarakat Desa Kebondalem Kecamatan Bangorejo Kabupaten Banyuwangi. *Simbiosa*, 11(1):36-47. https://doi.org/10.33373/sim-bio.v11i1.4343

Ogawa, M., Soga, M., & Yoshida, T. 2021. Participation of diverse actors and usage of traditional and local knowledge in local biodiversity strategies and action plans of Japanese municipalities. *Ecology and Society*, 26(3):12-26. https://doi.org/10.5751/es-12612-260326

Osland, M.J., Chivoiu, B., Enwright, N.M., Thorne, K.M., Guntenspergen, G.R., Grace, J.B., & Swarzenzki, C.M. 2022. Migration and transformation of coastal wetlands in response to rising seas. *Science Advances*, 8(26):1-11. https://doi.org/10.1126/sciadv.abo5174

Pan, Y., Cieraad, E., Armstrong, J., Armstrong, W., Clarkson, B.R., Colmer, T.D., & Bodegom, P.M.V. 2020. Global patterns of the leaf economics spectrum in wetlands. *Nature Communications*, 11(1):1-9. https://doi.org/10.1038/s41467-020-18354-3

Prihandini, P.W., Tribudi, Y.A., Hariyono, D.N.H., Sari, A.P.Z.N.L., Praharani, L., Handiwirawan, E., & Wiyono, A. 2023. Biodiversity of Indonesian indigenous buffalo: first review of the status, challenges, and development opportunities. *Veterinary World*, 16(11):2217-2229. https://doi.org/10.14202/vetworld.2023.2217-2229

Putra, N.H.M.S., Dharmono, D., & Mahrudin, M. 2021. Validitas buku ilmiah populer etnobotani tumbuhan *Gliricidia maculata* di Kawasan Hutan Bukit Tamiang Kabupaten Tanah Laut. *Wahana-Bio Jurnal Biologi dan Pembelajarannya*, 12(1):1-11. https://doi.org/10.20527/wb.v12i1.8489

Qin, X., Zhang, Y., Yu, R., Chang, X., Yue-fei, Y., Qiu, Q., & Wei, X. 2022. Biological conservation measures are better than engineering conservation measures in improving soil quality of eroded orchards in Southern China. *Soil Science Society of America Journal*, 86(4):932-945. https://doi.org/10.1002/saj2.20423

Radeva, K., Velizarova, E., & Dancheva, A. 2019. Land cover monitoring as part of a survey on wetland ecosystem conservation in the Negovan Village Area using remote sensing tools. *Glasnik Sumarskog Fakulteta*, 119:175–188. https://doi.org/10.2298/gsf1919175r

Rahayu, R.S., Ramadhani, I., Masrukhin, M., Riastiwi, I., Prawestri, A.D., & Yuliani, Y. 2021. Confirmation of endophytic microbes causing contamination in water spinach (*Ipomoea aquatica* Forssk.) tissue culture. *Jurnal Bioteknologi & Biosains Indonesia (JBBI)*, 7(2):234–249. https://doi.org/10.29122/jbbi.v7i2.4381

Ramachandra, T.V, Asulabha, K.S., & Jaishanker, R. 2024. Editorial wetlands for human well-being. *Journal of Environmental Biology*, 45(2):1–4. https://doi.org/10.22438/jeb/45/2/editorial

Ramadhan, M.H., Utami, N.H., & Mahrudin. 2023. Studi etnobotani tumbuhan jeruju (*Achantus ilicifolius*) pada masyarakat Banjar Desa Pagatan Besar, Kabupaten Tanah Laut. *Jurnal Jeumpa*, 10(1):1–11. https://doi.org/10.33059/jj.v10i1.7319

Riswandi, R., Abrar, A., Wijaya, A., & Hamzah, B. 2021. The Effect of supplementation of cassava leaves, palm oil sludge and yeast in kumpai grass-based rations on ruminal fermentation and gas methane concentration in-Vitro. *International Journal on Advanced Science Engineering and Information Technology*, 11(5):1921-1925. https://doi.org/10.18517/ijaseit.11.5.11999

Riswandi, R., Hamzah, B., Wijaya, A., & Abrar, A. 2020. Bali heifers performance on cassava leaves, palm oil sludge and yeast supplementation in a ration based on kumpai grass (*Hymenachne amplexicaulis* (Rudge) Nees). *Advances in Animal and Veterinary Sciences*, 8(8):813-818. https://doi.org/10.17582/journal.aavs/2020/8.8.813.818

Robinson, J.M., Gellie, N.J.C., MacCarthy, D., Mills, J.G., O'Donnell, K., & Redvers, N. 2021. Traditional ecological knowledge in restoration ecology: a call to listen deeply, to engage with, and respect indigenous voices. *Restoration Ecology*, 29(4):13381. https://doi.org/10.1111/rec.13381

Rohal, C., Cranney, C., & Kettenring, K.M. 2019. Abiotic and landscape factors constrain restoration outcomes across spatial scales of a widespread invasive plant. *Frontiers in Plant Science*, 10(481):1-17. https://doi.org/10.3389/fpls.2019.00481

Ruan, Z., Xie, R., Li, Y., Luo, Y., Weng, Z., & Liu, W. 2024. Effect of an *Ipomoea aquatica* floating raft on the water quality, antioxidant system, non-specific immune responses, and microbial diversity of penaeus vannamei in an aquaculture system. *Fishes*, 9(5): 1-14. https://doi.org/10.3390/fishes9050175

Rupidara, A.D., Tisera, W.L., & Ledo, M.E.S. 2020. Studi etnobotani tumbuhan mangrove di Kupang [Ethnobotanical study of mangrove plants in Kupang]. *Jurnal Ilmu dan Teknologi Kelautan Tropis*, 12(3):875–884. https://doi.org/10.29244/jitkt.v12i3.33243

Ruswinarsih, S., Reski, P., Norkamaliah, N., & Situmorang, T. 2024. Adaptation of wetland farming communities to modernization: case study in Jelapat 1 Village, Indonesia. *Sinthop Media Kajian Pendidikan Agama Sosial dan Budaya*, 3(1):1–8. https://doi.org/10.22373/sinthop.v3i1.3981

Sambo, C., Heng, S., Vong, P., Te, K., Keo, S., Seng, M., & Ven, S. 2023. Supplementation of water spinach (*Ipomoea aquatica*) on the utilization of *Mimosa pigra* and *Leucaena leucocephala* leaf for in vitro fermentation. *Veterinary World*, 16(1):215-221. https://doi.org/10.14202/vetworld.2023.215-221

Shan, V., Singh, S.K., & Haritash, A K. 2021. Evaluation of water quality and potential metal contamination in ecologically important Bhindawas bird sanctuary, India. *Applied Water Science*, 11(1):1-9. https://doi.org/10.1007/s13201-020-01334-9

Shen, X., Liu, Y., Zhang, J., Wang, Y., Ma, R., Liu, B., & Jiang, M. 2022. Asymmetric Impacts of diurnal warming on vegetation carbon sequestration of marshes in the Qinghai Tibet Plateau. *Global Biogeochemical Cycles*, 36(7):07396. https://doi.org/10.1029/2022gb007396

Song, U. 2021. Comparison of water depth tolerance in two major wetland macrophytes, *Phragmites australis* and *Typha angustifolia*. *Photosynthetica*, 59(2):238–244. https://doi.org/10.32615/ps.2021.016

Sranujit, R.P., Noysang, C., Tippayawat, P., Kooltheat, N., Luetragoon, T., & Usuwanthim, K. 2021. Phytochemicals and immunomodulatory effect of *Nelumbo nucifera* flower extracts on human macrophages. *Plants*, 10(10):1-12. https://doi.org/10.3390/plants10102007

Steigleder, A.P., & Roldo, L. 2019. Surface morphology and repellency mechanism investigation of *Salvinia molesta* plant. *Matéria (Rio De Janeiro)*, 24(4):0805. https://doi.org/10.1590/s1517-707620190004.0805

Strickland, L.R., Dahlin, K., Cleemput, E.V, Adhikari, S., & Castillioni, K. 2024. Comparisons of biodiversity metrics reveal dissimilarities in biodiversity hotspot identification. *Research Square,* pp.1-22. https://doi.org/10.21203/rs.3.rs-4522774/v1

Sujarwo, W. 2023. Kekinian etnobotani Indonesia: peran, potensi, tantangan, dan peluang dalam mendukung pemanfaatan sumber daya tumbuhan berkelanjutan. *Badan Riset dan Inovasi Nasional*. pp.64-69. https://doi.org/10.55981/brin.782

Sun, H., Zheng, Z., Chen, S., Cao, J., Guo, M., & Han, Y. 2023. Source apportionment of heavy metals and their effects on the species diversity of plant communities in the Caizi Lake Wetland, China. *Environmental Science and Pollution Research*, 30(21): 60854–60867. https://doi.org/10.1007/s11356-023-26815-7

Sunarno, A., & Supriatna, N. 2023. Ecological intelligence in local wisdom of the tengger tribe as learning sources of social studies. *Paedagogia*, 26(1):10-21. https://doi.org/10.20961/paedagogia.v26i1.71215

Supriani, S., Ramadhan, M.F., Harira, L.W., & Fadlilah, N.M. 2023. Studi etnobotani ramuan obat batuk dan pijat bayi. *Jurnal Farmasetis*, 12(2):151–162. https://doi.org/10.32583/far.v12i2.1063

Susanti, R., & Zuhud, E.A. 2019. Traditional ecological knowledge and biodiversity conservation: the medicinal plants of the Dayak Krayan people in Kayan Mentarang National Park, Indonesia. *Biodiversitas Journal of Biological Diversity*, 20(9):0943. https://doi.org/10.13057/biodiv/d200943

Syafria, H., & Jamarun, N. 2021. Growth and results forage *Hymenachne amplexicaulis* (Rudge) ees in former coal mining land. *Agricultural Science Digest: a Research Journal*. https://doi.org/10.18805/ag.d-224

Syamsiah, S., Karim, H., Arsal, A.F., & Sondok, S. 2021. Kajian etnobotani dalam pemanfaatan tumbuhan obat tradisional di Kecamatan Pana Kabupaten Mamasa, Sulawesi Barat [Ethnobotanical study on the use of traditional medicinal plants in Pana District, Mamasa Regency, West Sulawesi]. *Bionature*, 22(2):23992. https://doi.org/10.35580/bionature.v22i2.23992

Teoh, E.Y., Teo, C.H., Baharum, N.A., Pua, T., & Tan, B.C. 2022. Waterlogging stress induces antioxidant defense responses, aerenchyma formation and alters metabolisms of banana plants. *Plants*, 11(15):2052. https://doi.org/10.3390/plants11152052

Tippery, N.P. 2023. Subspecies classification of *Hydrilla verticillata* (Hydrocharitaceae). *Journal of the Botanical Research Institute of Texas*, 17(2):401-412. https://doi.org/10.17348/jbrit.v17.i2.1319

Tittel, J., Musolff, A., Rinke, K., & Büttner, O. 2021. Anthropogenic transformation disconnects a lowland river from contemporary carbon stores in its catchment. *Ecosystems*, 25(3):618-632. https://doi.org/10.1007/s10021-021-00675-z

Trinidad, L., Arianna, D., Vázquez, P., Newell, A., Elisabeth, G., Albarado, J.C.G., & Jácome, A.G. 2021. Food security strategies of an indigenous community in Veracruz, Mexico. *Ethnobiology and Conservation*, pp.10:16. https://doi.org/10.15451/EC2021-11-10.41-1-16

Wibowo, A.P. 2021. Pemodernan atap rumah tradisional Jawa sebagai upaya pelestarian kearifan lokal. *Sinektika Jurnal Arsitektur*, 18(2):141-147. https://doi.org/10.23917/sinektika.v18i2.15337

Wondirad, A., Bogale, D., & Li, Y. 2021. Practices and challenges of developing handicrafts as a core tourism product in Chencha and Konso, Southern Ethiopia. *International Journal of Cultural Policy*, 28(3):306-326. https://doi.org/10.1080/10286632.2021.1938560

Xing, Z., Li, X., Mao, D., Luo, L., & Wang, Z. 2023. Heterogeneous responses of wetland vegetation to climate change in the amur river basin characterized by normalized difference vegetation index from 1982 to 2020. *Frontiers in Plant Science*, 14: 1290843 https://doi.org/10.3389/fpls.2023.1290843.

Yamauchi, T., Abe, F., Tsutsumi, N., & Nakazono, M. 2019. Root cortex provides a venue for gas-space formation and is essential for plant adaptation to waterlogging. *Frontiers in Plant Science*, 10:0259. https://doi.org/10.3389/fpls.2019.00259

Yan, X., Wang, R., & Niu, Z. 2021. The response of China's wetland vegetation to climate changes. *Reseach Square*, pp.1-19. https://doi.org/10.21203/rs.3.rs-810019/v1

Yang, R., Li, X., Mao, D., Wang, Z., Tian, Y., & Dong, Y. 2020. Examining fractional vegetation cover dynamics in response to climate from 1982 to 2015 in the Amur River Basin for SDG 13. *Sustainability*, 12(14):5866. https://doi.org/10.3390/su12145866

Zhu, X., Zhang, Y., & Wei, Z. 2020. Differences in environmental information acquisition from urban green a case study of Qunli National Wetland Park in Harbin, China. *Sustainability*, 12(19):8128. https://doi.org/10.3390/su12198128

Zou, Z., DeVries, B., Huang, C., Lang, M., Thielke, S., McCarty, G., & Du, L. 2021. Characterizing wetland inundation and vegetation dynamics in the arctic coastal plain using recent satellite data and field photos. *Remote Sensing*, 13(8):1492. https://doi.org/10.3390/rs13081492