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Integrating Local Wisdom and Vegetation Analysis in the Management of Spring Sources in the Bangket Bayan Customary Forest, North Lombok

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Abstract: Customary forests represent indigenous governance over forested landscapes, often encompassing cultural, historical, and ecological values. The *Bangket* Bayan Customary Forest in North Lombok, Indonesia, exemplifies a landscape where community-based conservation operates through spiritual rituals and local regulations. This study investigates how local wisdom, particularly the *Selamat Olor* ritual and *awiq-awiq* customary law, is employed in managing spring sources and maintaining ecological balance. A mixed methods approach was adopted, integrating qualitative data from interviews and observations with quantitative vegetation assessments through line transect plots (20 m × 20 m) near six springs. The findings reveal that local conservation values are deeply embedded in ritual practices and socially enforced regulations. Vegetation analysis identified 72 tree individuals belonging to 19 species and 15 families, with *Ceiba pentandra* and *Arenga pinnata* as the dominant species, showing Importance Value Index (IVI) values of 66.52% and 63.31% respectively. The Shannon-Wiener diversity index (H′ = 2.51) indicates moderate species diversity. This study demonstrates that the integration of traditional ecological knowledge and ecological assessment enhances community-based conservation strategies and supports socio-ecological resilience.

Keywords: Customary Forest; Local Wisdom; Spring Conservation; Vegetation Analysis; Community-Based Conservation

INTRODUCTION

Forests are not merely ecological assets but also embody cultural, spiritual, and governance dimensions—particularly when they exist within the territory of indigenous peoples. In Indonesia, customary forests (hutan adat) are legally defined as state forests located within indigenous territories, whose management is transferred to customary law systems, as stipulated in Article 1 of Law No. 41 of 1999 on Forestry. While indigenous communities are not granted ownership, they are recognized to hold management rights under certain legal conditions, particularly when their customary systems are still actively practiced. This recognition gained further clarity after the Constitutional Court Decision No. 35/2012, which affirmed that customary forests are not part of state forests, effectively giving legal weight to long-standing local management practices (Budiman et al., 2021; Rachman et al., 2021).

Despite this legal progress, challenges remain. Several studies (e.g., Madiong et al., 2023; Nugraha et al., 2023) highlight that the practical enforcement of indigenous rights often lags behind legal acknowledgment. Conflicts between indigenous communities and state or private forest concession holders still occur due to overlapping claims, unclear boundaries, or lack of institutional support. Furthermore, while customary governance systems are rooted in ecological stewardship and social cohesion, they are frequently marginalized by top-down policy frameworks that

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prioritize scientific forestry over lived, local experience (Mayastuti & Purwadi, 2023; Matuankotta & Holle, 2022). In this context, the integration of local wisdom with ecological data emerges not only as a conservation strategy but as a mode of justice and empowerment.

A growing body of research underscores the importance of incorporating traditional ecological knowledge (TEK) into formal conservation planning. For example, in Colombia, Torres-Romero and Prado (2022) found that local knowledge enriched tropical dry forest restoration by aligning interventions with historical land use patterns. Similarly, in Indonesia, Sulistiowati et al. (2023) demonstrated that conservation practices tailored to local community values—such as ritual-based taboos and seasonal access rules—were more effective and sustained over time. Fremout et al. (2021) emphasize that scientific knowledge alone is often insufficient, especially when species selection or ecological priorities do not match the socio-cultural realities of local communities.

In Indonesia's own diverse archipelago, multiple case studies highlight the role of indigenous ecological knowledge in managing ecosystems. The Dayak Ngaju in Kalimantan manage peatlands based on customary zoning (Sumarni et al., 2023), while the Towani Tolotang in Sulawesi integrate religious beliefs and ancestral taboos in forest preservation (Tahara, 2023). In Kalimantan's Krayan Highlands, the Dayak Krayan apply nuanced forest use regimes that sustain biodiversity, particularly in the Kayan Mentarang National Park (Susanti & Zuhud, 2019). These examples affirm that indigenous worldviews often hold complex, adaptive environmental governance mechanisms that must be taken seriously in conservation discourse.

Parallel to the call for socio-cultural integration is the emphasis on ecological evaluation. Vegetation structure, biodiversity indices, and species composition are essential metrics in understanding forest health and regeneration potential. Among these, the Shannon-Wiener Diversity Index (H') and Important Value Index (INP) provide insights into species dominance, richness, and distribution. However, ecological data alone cannot capture the dynamics of how communities interact with, manage, and protect these ecosystems.

The integration of socio-cultural and ecological perspectives is crucial. Ihemezie et al. (2023) advocate for conservation approaches that embrace traditional medicine and sacred forest practices to enhance biodiversity. Likewise, Govigli et al. (2020) argue that sacred forest networks preserve ecological functions precisely because they maintain distinct management regimes grounded in local belief systems. Even beyond Indonesia, conflicts between scientific conservation and traditional values are evident. For example, Ng'ang'a et al. (2022) describe the sidelining of indigenous water management in Kenya, which echoes the Indonesian experience where customary water governance (such as selamatan rituals or sacred water zones) is rarely recognized in statutory water management systems (Koppen, 2022).

Managing water sources within customary forests presents a microcosm of this broader tension. On the one hand, rituals and customary laws help regulate access and preserve ecological balance. On the other, formal water policies often ignore these informal systems. In response, several scholars suggest hybrid models. Asteria et al. (2021) and Maring (2022) propose that integrating customary laws into formal conservation strategies—especially in forested water catchments—can enhance both ecological outcomes and local legitimacy. Parwata et al. (2022) further emphasize that recognizing traditional water management strengthens the resilience of community-based forestry.

One promising method to bridge these paradigms is through mixed methods research, which combines qualitative insights (e.g., ritual practices, oral histories, and local governance) with quantitative ecological analysis (e.g., biodiversity metrics, species counts). In Thailand, Georgiadis (2022) demonstrated that mixed methods allowed for a more holistic understanding of Karen forest practices. In Ecuador,

Mariscal et al. (2022) showed that local knowledge shaped adaptive management strategies in cloud forest restoration. In Australia, Lindsay and Beames (2022) documented how Aboriginal communities contributed not only traditional insight but also co-management capacity through participatory science. These examples suggest that when TEK and ecological science are viewed as complementary, rather than hierarchical, forest governance becomes more inclusive, adaptive, and effective.

In this context, the Bangket Bayan Customary Forest, located in Bayan Village, North Lombok, West Nusa Tenggara, becomes an important case. This forest spans approximately 57.04 hectares and contains multiple springs that are ecologically significant for both biodiversity and community water needs. While much attention has been given to the cultural richness of Bayan—recognized as a stronghold of Sasak customs and rituals—the ecological functions of this customary forest remain underexplored in the literature. Current documentation tends to be either ethnographic or ecological, rarely integrating both perspectives.

This study addresses that gap by investigating how local wisdom—manifested in rituals like Selamat Olor and customary laws like awig-awig—interacts with the ecological conditions of spring-based vegetation in the Bangket Bayan Customary Forest. Specifically, this study combines qualitative and quantitative data to examine:

1. The forms and values of indigenous knowledge applied in spring conservation,
2. The composition and diversity of tree-level vegetation, as measured through biodiversity indices, and
3. How both elements together inform conservation strategies rooted in community participation.

Thus, this research contributes to the growing body of work advocating for integrated, socio-ecological conservation frameworks. It demonstrates that customary forests are not merely ecological landscapes, but also social arenas, where tradition and ecology converge. By highlighting both the scientific and cultural dimensions of forest management in Bayan, this study supports the call for community-based conservation that is both empirically rigorous and culturally rooted.

METHOD

Research Design

This research utilized a mixed methods approach, integrating both qualitative and quantitative techniques to explore the management of water sources and vegetation diversity in the Bangket Bayan Customary Forest. The mixed methods design was selected to ensure a comprehensive understanding of both the socio-cultural practices of the indigenous community and the ecological characteristics of the spring areas. This approach is widely adopted in community-based natural resource management (CBNRM) as it allows researchers to capture the dynamic interaction between human systems and ecological structures (Shereni & Saarinen, 2020; Luaba et al., 2023). Through the combined use of interviews, observations, and ecological assessments, this study aims to provide an integrated perspective on traditional conservation practices and forest ecosystem conditions.

Study Area and Duration

The research was conducted in Bangket Bayan Customary Forest, located in Bayan Village, Bayan District, North Lombok Regency, West Nusa Tenggara. The forest covers approximately 57.04 hectares and is managed entirely by the indigenous community based on customary laws (awig-awig). Within this forest are multiple springs that serve as critical water sources for surrounding agricultural land and residential areas. The study was conducted over four months, coinciding with the seasonal implementation of Selamat Olor, a traditional ritual performed at the springs.

Data Sampling, Collection, and Analysis

To collect qualitative data on local wisdom, the study employed a purposive sampling technique. This non-random method involves selecting individuals who are considered most knowledgeable about specific aspects of the local context. In this case, informants included traditional leaders, ritual functionaries (Inan Aiq), senior villagers, and local farmers who are actively involved in water management and ritual practices. Data collection involved in-depth interviews, participant observation during ritual events, and review of customary regulations (Peraturan Desa No. 1 Tahun 2016) related to forest and water management. Conversations were conducted in the Sasak language, with researcher translations recorded and transcribed for analysis. Field notes and photo documentation were used to support observations. The data were analyzed using a qualitative descriptive approach, focusing on recurring themes such as the spiritual significance of springs, enforcement mechanisms of awig-awig, and intergenerational knowledge transmission (Moleong, 2018).

For the quantitative component, the study focused on the analysis of tree-level vegetation around springs to determine species composition and diversity. Vegetation data were collected using the line transect plot method, a standard approach in forest ecology for assessing plant communities (Marhamah, 2015). A total of five square plots, each measuring 20 m × 20 m, were established near the main springs in the Bangket Bayan forest. The plot locations were determined based on accessibility and representation of spring-associated vegetation, ensuring coverage of diverse ecological microhabitats. The chosen plot size followed best practices for biodiversity monitoring in tropical forests and allowed for the inclusion of larger tree specimens with a diameter at breast height (DBH) greater than 35 cm (Hasan et al., 2021; Esbach & Patra, 2022).

In each plot, researchers recorded all individual trees that met the DBH threshold. For each species identified, the scientific name, local name, and number of individuals were recorded. Tree measurements and identification were assisted by visual guides and verification from local community members with ecological knowledge. This integration of local ecological knowledge (LEK) improved species identification accuracy and ensured community participation in ecological assessment (Braga-Pereira et al., 2021).

The data from vegetation sampling were analyzed by calculating the Important Value Index (IVI) for each tree species. This index is derived from three main components: relative density (RD), relative frequency (RF), and relative dominance (RDo). These parameters quantify the ecological importance of a species in terms of how abundant it is, how widely it is distributed, and how dominant it is in terms of basal area. The INP values were calculated by summing the percentages of each parameter to assess species dominance within the forest ecosystem. This method is widely used in tropical forest research to identify key species that influence forest structure and function (Hidayat, 2017; Chandra et al., 2021).

In addition to INP, the study applied the Shannon-Wiener Diversity Index (H') to measure species diversity across the plots. The H' index considers both the richness (number of species) and evenness (relative abundance) of individuals among species, providing a more nuanced understanding of biodiversity. The formula used was:

$$H' = -\sum_{i=1}^{s} p_i \ln p_i$$

where p_i is the proportion of individuals belonging to species i and s is the total number of species observed (Syafrijal et al., 2019). The interpretation of H' values followed the standard categories: H' < 1 (low diversity), 1 ≤ H' < 3 (moderate diversity), and H' ≥ 3 (high diversity). In this study, no statistical tests such as t-tests or ANOVA were conducted; the data were analyzed descriptively to observe patterns in species distribution and dominance across the sample plots. This decision aligns with the

study's objective of emphasizing descriptive ecological assessment rather than comparative statistical inference.

To support data collection, the research utilized a combination of field equipment and documentation tools, including GPS devices, measuring tapes, bamboo stakes, digital calipers, questionnaires, audio recorders, and cameras. These instruments ensured consistency in ecological data gathering and accuracy in documenting socio-cultural practices.

By combining ethnographic exploration with vegetation analysis, this method provides a comprehensive view of how local knowledge systems and ecological patterns interact in the conservation of spring-based forest ecosystems. The mixed methods framework used here reflects an emerging consensus in CBNRM research: that sustainable forest management requires both community participation and ecological integrity (Robinson et al., 2021; Eufemia et al., 2023).

RESULTS AND DISCUSSION

Socio-Ecological Characteristics of the Study Site

Bayan Village, located in Bayan Subdistrict, North Lombok Regency, is a region rich in historical and customary values. Most of its population comprises the indigenous Sasak people, who continue to uphold traditional norms and a customary law-based social structure. Administratively, the area spans 2,600 hectares and features hilly topography at elevations ranging from 400 to 600 meters above sea level. The Bangket Bayan customary forest, which is the focus of this study, is situated in Teres Genit Hamlet and covers approximately 57.4 hectares. It hosts nine active springs that serve as the primary sources of irrigation and drinking water for five surrounding villages. Figure 1 presents the study site map.

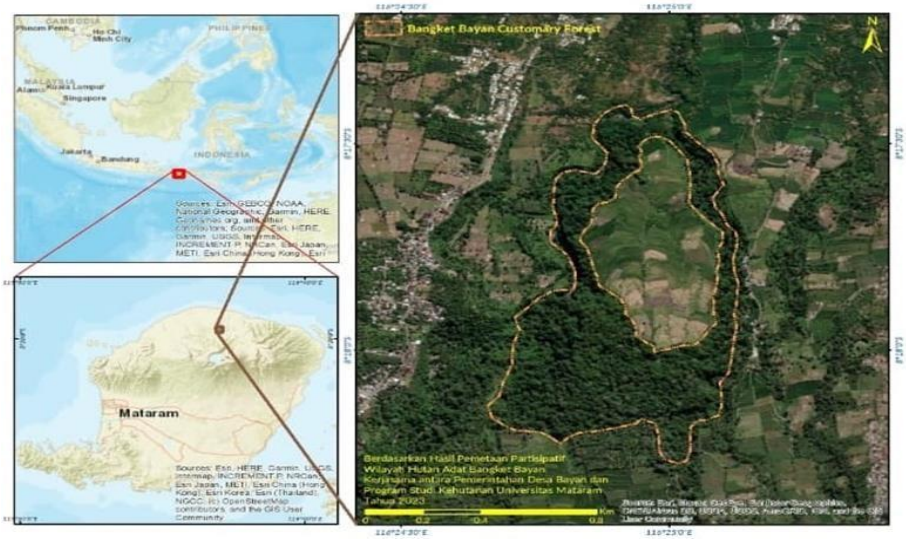

Figure 1. The study site map

This area is not only ecologically significant but also culturally essential. Each year, the Bayan community holds the "Selamat Olor" ritual—a spring thanksgiving ceremony reflecting the spiritual relationship between people and nature. This practice serves as a local mechanism for water conservation and vegetation preservation. Additionally, the application of awiq-awiq (customary law) reinforces the protection system of forest and water resources, including social sanctions for violators. This aligns with findings from the Dayak Ngaju and Kanayatn communities, who also use ecological rituals to manage natural resources (Usop & Perdana, 2021; Magiman et al., 2021).

Values of Local Wisdom in Spring Conservation

Interview and observation results reveal that the Selamat Olor ritual holds significant ecological functions. The ceremony is not only spiritual but also serves as a collective monitoring occasion for the springs and surrounding areas. Animal sacrifices at specific spring locations and prayers led by local religious leaders reinforce the symbolic and ecological values embedded in this practice.

Figure 2. Activities of the Mata Air blessing event (Selamat Olor)

In addition to rituals, awiq-awiq functions as a local legal instrument binding all community members. Sanctions for violations include social exclusion and the exclusion of customary figures from important ceremonies such as harvest thanksgiving. The existence of Village Regulation No. 1 of 2016, which formalizes the awiq-awiq for customary forests, shows the institutionalization of local legal systems. The integration of customary norms and village regulations represents a collaborative form between state law and local values that strengthens community-based conservation, as recommended by Tahara (2023) and Susanti & Zuhud (2019).

Composition and Dominance of Tree-Level Vegetation

Based on primary data from five observation plots (Table 1), 72 individual trees representing 19 species and 15 families were recorded. Table 2 provides detailed values for Relative Density (RD), Relative Frequency (RF), Relative Dominance (RDo), and Importance Value Index (IVI). The two most dominant species were Ceiba pentandra (kapok) with an IVI of 66.52%, and Arenga pinnata (sugar palm) with 63.31%.

Table 1. Recapitulation of RD, RF, RDo, and IVI Values for Tree Growth Level

Family	Local Name	Scientific Name	RD	RF	RDo	IVI
Malvaceae	Kapuk	*Ceiba pantandra*	11.11	11.11	44.30	66.52
Arecaceae	Aren	*Arenga Pinnata*	26.39	26.39	10.53	63.31
Lauraceae	Kayu manis	*Beillschmediaroxburghiana*	11.11	11.11	9.94	32.16
Dipterocarpaceae	Merawan	*Hopea griffithii* Kerz	5.56	5.56	9.91	21.02
Meliaceae	Suren kapar	*Toona ciliata*	8.33	8.33	5.88	22.55
Meliaceae	Mahoni	*Swietenia Macrophylla*	2.78	2.78	4.26	9.81
Fabaceae	Keranji	*Dialium gulanense*	1.39	1.39	3.42	6.19
Euphorbiaceae	Kemiri	*Aleuritas moluccanus*	4.17	4.17	3.14	11.47
Malvaceae	Sura	*Pterygota alata*	1.39	1.39	2.30	5.07
Sapindaceae	Leci	*Harpullia cupainoides*	4.17	4.17	1.68	10.01
Lecytdaceae	Jambu biji liar	*Carea arborea*	4.17	4.17	1.09	9.43

Family	Local Name	Scientific Name	RD	RF	RDo	IVI
Meliaceae	Sentul	*Sandoricum koetjape*	2.78	2.78	0.81	6.37
Dilleniaceae	Simpur	*Dillenia indica*	1.39	1.39	0.76	3.53
Myrtaceae	Jamblang	*Syzygium cumini*	6.94	6.94	0.64	14.53
Sapindaceae	Akye	*Blighia sapida*	1.39	1.39	0.56	3.34
Canabaceae	Rami	*Gironniera subaequaris*	1.39	1.39	0.28	3.06
Fabaceae	Johar	*Cassia grandis*	1.39	1.39	0.22	3.00
Moraceae	Karet kerbau	*Ficus elastica*	2.78	2.78	0.20	5.75
Cephalotaxaceae.	Chineseplumyeu	*Cephalotaxus fortunei* Hok	1.39	1.39	0.08	2.86
Total			**100**	**100**	**100**	**300**

Ecologically, Ceiba pentandra significantly contributes to carbon sequestration and provides essential canopy cover for diverse fauna (Ubaekwe, 2020; Hending et al., 2021). Meanwhile, Arenga pinnata acts as a habitat and food source for various fauna and has high economic value for the community (Caraballo et al., 2022). Both species demonstrate multifunctional roles within Bayan's ecological and social systems, supporting the argument that species dominance has implications for landscape sustainability.

Other tree species such as Hopea griffithii, Swietenia macrophylla, and Toona ciliata recorded medium IVI values, reflecting a mix of native and introduced species. Variations in RD, RF, and RDo values indicate spatial competition and adaptation to microclimatic conditions, moisture, and light availability.

Species Diversity Index and Its Implications

Table 2 presents the Shannon-Wiener diversity index (H'), calculated at 2.51. According to Fachrul's (2012) classification, this falls within the moderate diversity category. This result aligns with findings from tropical agroforestry systems, which report H' values ranging between 2.5 and 3.4, depending on ecological conditions and land management (Bieng et al., 2022; Haggar et al., 2019).

Table 2. Species Diversity Index Value (H') based on Shannon-Wiener

Species Name	Local Name	Individual Sum.	Pi (Ni/N	In Pi	Pi.In Pi
Aleuritas moluccanus (L) willd	Kemiri	3	0.04	-3.18	-0.13
Arenga Pinnata (Wurmb) Merr	Aren	19	0.26	-1.33	-0.35
Beillschmedia roxburghiana Nes	Kayu Manis	7	0.10	-2.33	-0.23
Blighia sapida K.D. Koening	Merawan	1	0.01	-4.28	-0.06
Carea arborea Roxb	Jambu biji liar	3	0.04	-3.18	-0.13
Cassia grandis L,f	Johar	1	0.01	-4.28	-0.06
Castilla elastica Cerv	Karet Kerbau	2	0.03	-3.58	-0.10
Ceiba pantandra (L) Gaertn	Kapuk	8	0.11	-2.20	-0.24
Cephalotaxus fortunei Hook	Chineseplumyeu	1	0.01	-4.28	-0.06
Dialium gulanense (Aubl)	Keranji	1	0.01	-4.28	-0.06
Dillenia indica L.	Simpur	1	0.01	-4.28	-0.06
Gironniera subaequaris	Rami	1	0.01	-4.28	-0.06
Harpullia cupainoides Roxb	Leci	3	0.04	-3.18	-0.13
Hopea griffithii Kerz	Merawan	4	0.06	-2.89	-0.16
Pterygota alata (Rexb.) R.Br.	Sura	1	0.01	-4.28	-0.06
Sandoricum koetjape	Sentul	2	0.03	-3.58	-0.10
Swietenia Macrophylla king	Mahoni	2	0.03	-3.58	-0.10
Syzygium cumini (L) Skeels	Jamblang	5	0.07	-2.67	-0.19
Toona ciliata M.Roem	Suren kapar	7	0.10	-2.33	-0.23
Total		**72**		**H'**	**2.51**

The moderate diversity value at Bangket Bayan indicates that although human pressure is relatively low due to customary protection, factors such as species dominance and habitat heterogeneity still influence species distribution. Moreover, the presence of species like Cephalotaxus fortunei with a low IVI (2.86%) suggests the existence of rare or less competitive species, highlighting the need to strengthen the conservation of minority species.

A moderate H' value also correlates with ecosystem stability. According to Sahira et al. (2016), the higher the H' value, the greater the community stability. In this context, a value of 2.5 indicates a relatively stable but not optimal ecosystem condition. Conservation strategies should reinforce both cultural values and species diversity to maintain ecological and social balance.

Cultural and Ecological Synergy in Conservation Strategies

The results confirm the importance of integrating socio-cultural systems with ecological approaches in the conservation of customary territories. The Selamat Olor ritual and awiq-awiq not only safeguard spiritual values but also create effective institutional frameworks for managing access, use, and protection of resources.

These traditions establish a participatory conservation mechanism that reinforces compliance and collective monitoring. As noted by Jamera et al. (2020) and Rahayu et al. (2023), rituals also serve as a medium for strengthening the ecological identity of indigenous communities and a tangible method for biodiversity preservation. In this context, the Bayan community demonstrates that local traditions hold both cultural value and ecological function, which are highly relevant in addressing environmental crises.

Furthermore, vegetation structure and diversity index values provide evidence that traditionally managed customary forests possess high ecological potential. This supports findings from Wurz et al. (2022) and Zhang et al. (2023), stating that vegetation diversity in spring areas is crucial for maintaining hydrological functions, soil stability, and ecosystem productivity.

Implications for Sustainable Management

Considering the findings above, conservation in the Bangket Bayan Customary Forest should continue to be based on local wisdom and community participation. The role of customary institutions and traditional leaders is key to the success of holistic conservation. Environmental education programs rooted in tradition should be implemented, engaging younger generations and fostering collaboration between indigenous communities, local governments, and environmental organizations.

Long-term monitoring of vegetation diversity and spring sustainability should be conducted periodically to assess ecological changes and the impact of social or climatic shifts. This aligns with views from Cornacchia et al. (2020) and Zhang & Ouyang (2019), who emphasize that diverse vegetation around springs enhances water retention, stabilizes soil quality, and supports overall ecosystem function. This study demonstrates that tradition preservation and ecological conservation are not mutually exclusive. Instead, they can operate synergistically and reinforce each other as a model for community-based conservation.

CONCLUSION

The findings of this study highlight the crucial interplay between local wisdom and ecological knowledge in the sustainable management of the Bangket Bayan Customary Forest. The community's ritual practices, such as Selamat Olor, and regulatory systems, such as awiq-awiq, are not only deeply rooted in cultural identity but also serve as effective frameworks for environmental governance. The presence of dominant tree species such as Ceiba pentandra and Arenga pinnata, combined with a moderate Shannon-Wiener diversity index (H′ = 2.51), indicates a relatively stable ecological structure that supports biodiversity and critical ecosystem functions. The

study affirms that indigenous conservation mechanisms, when aligned with ecological assessments, offer a viable model for preserving forest landscapes and water sources. Community-based conservation that integrates spiritual, cultural, and ecological values provides not only ecological benefits but also strengthens social cohesion and resilience.

RECOMMENDATIONS

To enhance the sustainability of the Bangket Bayan Customary Forest, several actions are recommended. First, it is essential to strengthen the role of traditional institutions by providing support for environmental education programs rooted in local culture, particularly targeting the younger generation. This will ensure the continuity of traditional knowledge and conservation practices. Second, the integration of indigenous governance with local government policies should be institutionalized to support co-management arrangements that respect customary rights and forest stewardship. Third, long-term ecological monitoring should be implemented to track changes in biodiversity and water resource conditions, providing data to inform adaptive management strategies. Lastly, collaborations between indigenous communities, environmental NGOs, and academic institutions should be fostered to promote research, policy development, and resource mobilization for the protection and restoration of customary forests. These efforts will ensure that local traditions and ecological sustainability advance hand-in-hand as part of inclusive environmental conservation initiatives.

REFERENCES

Asteria, D., Brotosusilo, A., Negoro, H., & Sudrajad, M. (2021). Contribution of customary law in sustainable forest management for supporting climate action. *IOP Conference Series: Earth and Environmental Science, 940*(1), 012080. https://doi.org/10.1088/1755-1315/940/1/012080

Bieng, M., Delgado-Rodríguez, D., Vílchez-Mendoza, S., López-Sampson, A., García, E., Sepúlveda, N., & Somarriba, E. (2022). Tree diversity in a tropical agricultural-forest mosaic landscape in Honduras. *Scientific Reports, 12*(1). https://doi.org/10.1038/s41598-022-21280-7

Braga-Pereira, F., Morcatty, T., Bizri, H., Tavares, A., Mere-Roncal, C., González-Crespo, C., & Mayor, P. (2021). Congruence of local ecological knowledge (LEK)–based methods and line-transect surveys in estimating wildlife abundance in tropical forests. *Methods in Ecology and Evolution, 13*(3), 743–756. https://doi.org/10.1111/2041-210X.13773

Budiman, I., Fujiwara, T., Harada, K., & Sato, N. (2021). Customary forest managements and its challenges in East Nusa Tenggara, Indonesia: An implication of Constitutional Court Decision 2012. *Jurnal Manajemen Hutan Tropika (Journal of Tropical Forest Management), 27*(2), 69–79. https://doi.org/10.7226/jtfm.27.2.69

Caraballo, D., Amario, J., Lafont, J., & Espitia, A. (2022). Análisis fisicoquímico del aceite de la *Ceiba pentandra*. *Facultad De Ciencias Básicas, 1*(1), 71. https://doi.org/10.21897/rfcb.v1i1.2878

Chandra, A., Naithani, H., Verma, P., Saxena, J., & Prajapati, S. (2021). Plant diversity assessment of selected forest sites of Gaya district of Bihar, India. *Journal of Applied and Natural Science, 13*(2), 424–432. https://doi.org/10.31018/jans.v13i2.2523

Cornacchia, L., Wharton, G., Davies, G., Grabowski, R., Temmerman, S., Wal, D., … Koppel, J. (2020). Self-organization of river vegetation leads to emergent buffering of river flows and water levels. *Proceedings of the Royal Society B: Biological Sciences, 287*(1931), 20201147. https://doi.org/10.1098/rspb.2020.1147

Eufemia, L., Wawrzynowicz, I., Bonatti, M., Partelow, S., Fischer, J., & Sieber, S. (2023). Governing landscapes: an agenda for the assessment of grasslands and

savannahs. *Frontiers in Sustainable Resource Management, 2*. https://doi.org/10.3389/fsrma.2023.1134393

Esbach, M., & Patra, R. (2022). Distance sampling from curving transects in dense tropical forests. *Biotropica, 54*(5), 1182–1189. https://doi.org/10.1111/btp.13141

Fachrul, M.F. (2012). *Metode sampling bioekologi*. Jakarta: Bumi Aksara.

Fremout, T., Gutiérrez-Miranda, C., Briers, S., Peña, J., Cueva-Ortiz, E., Linares-Palomino, R., & Thomas, E. (2021). The value of local ecological knowledge to guide tree species selection in tropical dry forest restoration. *Restoration Ecology, 29*(4). https://doi.org/10.1111/rec.13347

Haggar, J., Pons, D., Domínguez, L., & Vides, M. (2019). Contribution of agroforestry systems to sustaining biodiversity in fragmented forest landscapes. *Agriculture, Ecosystems & Environment, 283*, 106567. https://doi.org/10.1016/j.agee.2019.06.006

Hidayat, M. (2017). Analisis vegetasi dan keanekaragaman tumbuhan di kawasan manifestasi geotermal Ie Suum Kecamatan Mesjid Raya Kabupaten Aceh Besar. *Biotik, 5*(2), 114–124.

Hasan, F., Jones, D., Syaukani, S., & Eggleton, P. (2021). Termite transects from Buton Island, Sulawesi, have a low diversity compared with Sundaland sites. *Journal of Tropical Ecology, 37*(4), 161–164. https://doi.org/10.1017/S0266467421000146

Hending, D., Randrianarison, H., Holderied, M., McCabe, G., & Cotton, S. (2021). The kapok tree (*Ceiba pentandra*) as a food source for native vertebrate species during times of resource scarcity and its potential for reforestation in Madagascar. *Austral Ecology, 46*(8), 1440–1444. https://doi.org/10.1111/aec.13076

Ihemezie, E., Albaladejo-García, J., Stringer, L., & Dallimer, M. (2023). Integrating biocultural conservation and sociocultural valuation in the management of sacred forests: What values are important to the public? *People and Nature, 5*(6), 2074–2092. https://doi.org/10.1002/pan3.10542

Jamera, J., Manting, M., & Dapar, M. (2020). Ritual plants used by the Manobo tribe of Surigao del Sur, Philippines. *Asian Journal of Ethnobiology, 3*(2). https://doi.org/10.13057/asianjethnobiol/y030201

Koppen, B. (2022). Customary water tenure. *Blue Papers, 1*(1), 35–41. https://doi.org/10.58981/bluepapers.2022.1.03

Law No. 41/1999 on Forestry, Article 1. (1999). Republic of Indonesia.

Luaba, K., Mulle, K., Vedeld, P., & Nyirenda, V. (2023). A comparative analysis of collaborative natural resource governance in two protected areas in Zambia. *Panafrican Journal of Governance and Development, 4*(2), 36–68. https://doi.org/10.46404/panjogov.v4i2.4847

Madiong, B., & Karim, A. (2023). Conflict between indigenous peoples and forest concession rights holders in customary forest management in Gowa Regency, South Sulawesi. *International Journal of Law and Politics Studies, 5*(5), 18–25. https://doi.org/10.32996/ijlps.2023.5.5.4

Magiman, M., Sulistyo, A., & Francoise, J. (2021). The meaning of Nyangahatn ritual of Dayak Kanayatn community for disaster mitigation. *International Journal of Culture and Art Studies, 5*(2), 87–96. https://doi.org/10.32734/ijcas.v5i2.7249

Marhamah, M. (2015). *Teknik vegetasi pohon*. Departemen Konservasi Sumber Daya Hutan dan Ekowisata, Fakultas Kehutanan, Institut Pertanian Bogor.

Maring, P. (2022). Conflict transformation and collaboration in developing social forestry in Flores, Indonesia. *Forest and Society, 6*(1), 40–66. https://doi.org/10.24259/fs.v6i1.13199

Moleong, L. (2018). *Metodologi Penelitian Kualitatif*. Bandung: PT. Remaja Rosdakarya.

Matuankotta, J., & Holle, E. (2022). State recognition and respect for the rights of customary law communities in the Maluku Islands region in the exploitation of forest resources. *Sasi, 28*(1), 107. https://doi.org/10.47268/sasi.v28i1.852

Mayastuti, A., & Purwadi, H. (2023). Customary forest designation policy: A realization of Sustainable Development Goal achievements in Indonesia (study of indigenous peoples in Lebak Regency, Banten). *IOP Conference Series: Earth and Environmental Science, 1180*(1), 012016. https://doi.org/10.1088/1755-1315/1180/1/012016

Nugraha, X., Wibisono, A., Angelia, A. S., & Answendy, P. (2023). Strengthening customary forest rights for indigenous people in Indonesia's Green Constitution framework. *Jurnal Kajian Pembaruan Hukum, 3*(2), 217. https://doi.org/10.19184/jkph.v3i2.43367

Parwata, A., Pusparini, N., & Harmini, A. (2022). Indigenous village autonomy on forest resource management in Padangtegal Indigenous Village. *Jurnal Hukum Prasada, 9*(2), 117–122. https://doi.org/10.22225/jhp.9.2.2022.117-122

Peraturan Desa Nomor 1 Tahun 2016 tentang Awiq-awiq Hutan Adat Desa Bayan, Kecamatan Bayan, Kabupaten Lombok Utara.

Rahayu, S., Batoro, J., Sukenti, K., & Hakim, L. (2023). Ethnobotanical study of Peraq Api ritual in Sasak tribe of Lombok Island, Indonesia and its potential for sustainable tourism. *Biodiversitas Journal of Biological Diversity, 24*(10). https://doi.org/10.13057/biodiv/d241030

Rachman, S., Nawawi, M., & Umanailo, M. (2021). Yuridis putusan Mahkamah Konstitusi nomor 35/PUU-X/2012 tentang keberadaan hutan adat masyarakat. *Journal of Education, Humaniora and Social Sciences (JEHSS), 3*(3), 823–828. https://doi.org/10.34007/jehss.v3i3.410

Robinson, L., Eba, B., Flintan, F., Frija, A., Nganga, I., Ontiri, E., & Moiko, S. (2021). The challenges of community-based natural resource management in pastoral rangelands. *Society & Natural Resources, 34*(9), 1213–1231. https://doi.org/10.1080/08941920.2021.1946629

Sahira, M., Solfiyeni, S., & Syamsuardi, S. (2016). Analisis vegetasi tumbuhan asing invasif di kawasan Taman Hutan Raya Dr. Moh. Hatta, Padang, Sumatera Barat. 10.13057/psnmbi/m020112.

Shereni, N., & Saarinen, J. (2020). Community perceptions on the benefits and challenges of community-based natural resources management in Zimbabwe. *Development Southern Africa, 38*(6), 879–895. https://doi.org/10.1080/0376835X.2020.1796599

Sumarni, S., Wijaya, M., & Sugiana, A. (2023). Safeguarding indigenous rights and territories: Integrating Dayak Ngaju wisdom in peatland ecosystem management. *Udayana Journal of Law and Culture, 7*(2), 121. https://doi.org/10.24843/ujlc.2023.v07.i02.p01

Sulistiowati, D., Hakim, L., & Yanuwiadi, B. (2023). Local knowledge-based conservation partnerships in the Tengger tribe community in Poncokusumo and Senduro, East Java Province, Indonesia. *World Journal of Advanced Research and Reviews, 20*(1), 625–631. https://doi.org/10.30574/wjarr.2023.20.1.2112

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

Syafrijal, S., Mukarramah, N., & Ahadi, R. (2019). Indeks keanekaragaman Echinodermata di perairan Pantai Desa Deudap, Pulo Aceh, Aceh Besar. In *Prosiding Seminar Nasional Biotik* (Vol. 6, No. 1).

Tahara, T. (2023). Cultural resilience and syncretism: The Towani Tolotang community's journey in Indonesia's religious landscape. *Journal of Ethnic and Cultural Studies, 10*(4), 233–246. https://doi.org/10.29333/ejecs/1863

Torres-Romero, F., & Prado, J. (2022). Knowledge management practices and ecological restoration of the tropical dry forest in Colombia. *Land, 11*(3), 330. https://doi.org/10.3390/land11030330

Ubaekwe, R. (2020). Carbon stock and storage capacity of tree species in strict nature reserve of Omo Biosphere Reserve, Ogun State, Nigeria. *Asian Journal of Environment & Ecology*, 26–36. https://doi.org/10.9734/ajee/2020/v13i330184

Usop, L., & Perdana, I. (2021). Ritual Hinting Pali as resistance of the Dayak Ngaju community (case study of expansion of large-scaled palm oil company to ecology, Dayak Ngaju community). *Lakhomi Journal: Scientific Journal of Culture, 2*(2), 73–81. https://doi.org/10.33258/lakhomi.v2i2.472

Wurz, A., Tscharntke, T., Martin, D., Osen, K., Rakotomalala, A., Raveloaritiana, E., … & Graß, I. (2022). Win-win opportunities combining high yields with high multi-taxa biodiversity in tropical agroforestry. *Nature Communications, 13*(1). https://doi.org/10.1038/s41467-022-30866-8

Zhang, J., Feng, Y., Maestre, F., Berdugo, M., Wang, J., Coleine, C., … & Delgado-Baquerizo, M. (2023). Water availability creates global thresholds in multidimensional soil biodiversity and functions. *Nature Ecology & Evolution, 7*(7), 1002–1011. https://doi.org/10.1038/s41559-023-02071-3

Zhang, L., & Ouyang, Z. (2019). Exploring the relationships between key ecological indicators to improve natural conservation planning at different scales. *Forests, 10*(1), 32. https://doi.org/10.3390/f10010032