

Indigenous fire practices in Wasur National Park Merauke, South Papua

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Abstract. Indigenous communities worldwide have traditionally employed fire as a land management tool to promote ecological enhancement. However, these practices are increasingly threatened by socio-economic changes, leading to a rise in uncontrolled wildfires. This research seeks to understand the traditional burning practices of the Kanume people utilizing a traditional ecological knowledge framework. A qualitative case study design was employed, with data gathered through in-depth interviews, observation, and document analysis. Participants included customary elders and fire practitioners within the Kanume community. The results reveal that fire is an integral component of the Kanume people's traditional farming, land management, and hunting practices. Shifts in these fire practices related to hunting now contribute to uncontrolled wildfires, resulting in the degradation of essential natural resources. These wildfires stem from both internal community dynamics and external factors. Addressing the challenges inherent in these indigenous fire practices is critical for the sustainable livelihood of the Kanume people and the ecological, socio-cultural, and economic functions of Wasur National Park

1 Introduction

Indigenous communities globally have long employed fire for diverse purposes [12, 14, 17, 20]. Fire serves as a vital tool for land management, including clearing land for agriculture, hunting, and conserving natural resources [6, 8, 13].

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Research demonstrates that traditional fire practices yield ecological advantages, such as diminishing the risk of large-scale wildfires, inhibiting the spread of invasive species, and preserving habitats that support biodiversity [22, 24].

The recognition of Indigenous fire practices is increasing, especially following destructive wildfires in regions like Australia [23], Brazil [26], and North America [8], underscoring the significance of varied fire knowledge for managing social-ecological systems [8]. Fire remains integral to Indigenous cultures, serving as a means of connecting with ancestral landscapes, responsibilities, and creation narratives. Indigenous oral histories and Western science corroborate the diverse benefits and outcomes achieved through these practices [8]. Cultural burning is attracting attention as a way to mitigate catastrophic fires [17] yet it needs to be integrated into a broader cultural land management framework.

Indigenous communities in North America [6], South America [21], and Australia [23] have long advocated for greater involvement in fire management, seeking recognition of their traditional fire knowledge. This knowledge, inherited from ancestors, holds invaluable insights into the local ecosystems and fire's role in maintaining their health and resilience.

While research indicates the ecological benefits of traditional burning practices, such as reducing the risk of large-scale fires, controlling invasive species, and maintaining habitats [22, 24], these approaches are often underutilized in contemporary fire management policies. Many governments prioritize fire prohibition strategies (i.e., zero-burning policies) or technology-driven fire suppression methods, often overlooking the proven effectiveness of local ecological knowledge [6, 9, 15]. However, an increasing number of countries are beginning to adopt TEK-based approaches [8]. For instance, in Australia, the integration of Indigenous knowledge into fire management has contributed to the reduction in the extent of wildfires and the maintenance of ecosystems [23]. Similarly, community-based projects in South America have demonstrated that controlled burning implemented by Indigenous communities can effectively reduce the incidence of large fires [14, 15].

Recognizing the value of traditional knowledge, several regions have begun incorporating Indigenous fire practices into fire management strategies. For example, initiatives in South America, such as in Brazil and Venezuela, have shown the benefits of incorporating local community involvement and traditional fire management techniques to reduce the scale of wildfires through controlled burning [15]. Similarly, the integration of indigenous fire knowledge has been recognized as vital for effective fire management in Australia [23] and North America as well [8].

Traditional communities in Indonesia possess significant local knowledge about fire management that has been adapted to local natural conditions [16]. This includes environmentally friendly burning techniques for land clearing [16] and prescribed burning applications [1]. For example, a study in Central Kalimantan found that local wisdom related to fire prevention still exists in villages around the forest area, including prescribed burning practices and imposed penalties for those who neglect customary rules [1]. The local wisdom of the Dayak Kanayatn community also plays a role in fire disaster prevention [16].

The Kanume people, a subgroup of Malind Anim, living in Wasur National Park in South Papua's Merauke region represent another Indigenous community in Indonesia with a deep connection to traditional fire practices. The Malind Anim have historically employed fire in diverse ways, including land management for controlled burns to mitigate uncontrolled wildfires at the end of the dry season, as well as to support their agricultural and hunting systems [10]. However, fire patterns in Wasur National Park have shifted in recent decades, with fires now occurring throughout the dry season. Consequently, uncontrolled wildfires increasingly threaten agricultural land and forest resources.

This study aims to explore the traditional fire practices of the Kanume people using the Traditional Ecological Knowledge framework to assess the current status and dynamics of these practices. A deeper understanding of how the Kanume people use fire and how their

practices have evolved over time can provide valuable insights for more sustainable fire management strategies in Wasur National Park.

2 Method

2.1 Study area

Wasur National Park, located between 08°05' to 09°07' South latitude and 140°27' to 141°02' East longitude, borders Papua New Guinea to the east, Merauke City to the west, the Arafura Sea to the south, and the Maro River area to the north (Figure 2). Situated in the Australasian region, historically part of the Sahul landmass, Wasur National Park boasts unique biodiversity. The floras of the region exhibit similarities to those found in the savanna landscapes of northern Australia, with notable plant genera including *Melaleuca*, *Eucalyptus*, and *Acacia*. The park hosts approximately 350 species of native flora from 91 plant families, distributed across diverse ecosystems, including mangrove forests, monsoon forests, lowland forests, and grasslands.

This rich floral diversity supports a wide array of fauna. Wasur National Park is home to approximately 80 mammal species, 254 bird species, 67 fish species, and 54 species of reptiles and amphibians [25]. The park serves as a crucial stopover for migratory birds traveling from the Palearctic region to Australia and New Zealand, earning its designation as a site of the East Asia-Australasian Flyway Partnership in 1996. Moreover, the abundance of wetland ecosystems in the park contributed to its designation as a Ramsar Site in 2006, acknowledging its global significance as a vital wetland habitat [25].

Four Indigenous tribes, all originating from the Malin Anim major tribe, reside within Wasur National Park: the Kanume, Marori Men-Gey, Malind-Buti, and Yeinan. Nine villages are located within the park's boundaries: Wasur, Rawa Biru, Yanggandur, Sota, Kuler, Onggaya, Tomer, Tomerau, and Kondo [25].



Source: Wasur National Park (2024)

Fig 1. Wasur National Park Region

2.2 Traditional ecological knowledge framework

Traditional Ecological Knowledge represents a dynamic knowledge system, developed within Indigenous communities through generations of direct experience, keen observation, and sustained interactions with their environment [3]. TEK encompasses a deep understanding of ecosystems and species, reflecting sophisticated resource management practices passed down through generations and adapted to environmental changes [18]. A

prominent example of TEK, utilized by Indigenous communities worldwide, is the application of traditional fire practices.

Several scholars have highlighted that traditional knowledge can be examined at multiple levels of analysis, aligning with the concept of traditional ecological knowledge as an integrated system of knowledge, practices, and beliefs. There are four levels of the TEK analysis framework [3]. The first level consists of local and empirical knowledge related to animals, plants, soils, and landscapes. This includes insights into species identification, taxonomy, life cycles, distribution patterns, and behaviours. The second level of analysis involves a resource management system that integrates local environmental knowledge with a set of practices, tools, and techniques tailored to the ecosystem. At the third level, a traditional management system relies on social institutions, established rules, norms, and codes of conduct that regulate social interactions. For interdependent groups such as hunters, fishers, or farmers to operate efficiently, a structured social organization is essential to facilitate coordination, cooperation, and the development of regulatory frameworks. The fourth and final level of analysis is worldview, which influences how individuals perceive the environment and assigns meaning to their observations and interactions with nature

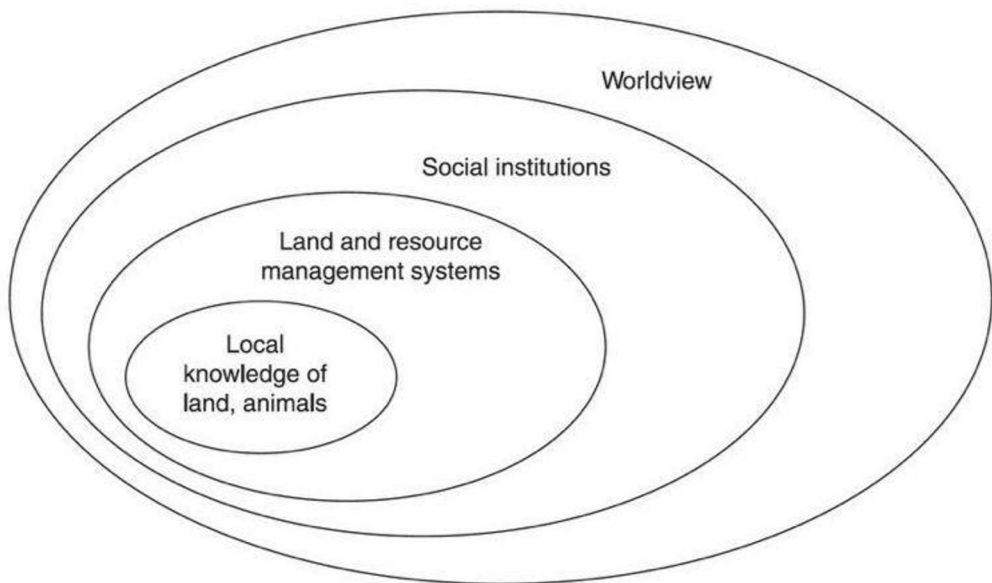


Fig 2. Level of analysis in traditional knowledge and management systems (Berkes, 2018)

2.3. Data Collection and Analysis

This study employed a qualitative research design using a case study approach. Data collection in the field was carried out in September 2023. Data were collected through in-depth individual and pair interviews, observations, and document analysis. Eight participants were involved in this study, including customary leaders (2 persons) and practitioners of burning practices, including both young (3 persons) and elderly individuals (3 persons). Interviews focused on their knowledge regarding natural resources, including landscape, plants, and animals; use of fire concerning livelihoods and its changes over time; and customary rules governing fire use.

Data from the interviews, observational notes, and documents were analyzed using thematic analysis. The analysis procedure involved: organizing and preparing the data, reading and reviewing all data, coding the data, generating descriptions and themes, and representing the descriptions and themes [11]. The TEK framework, serving as the basis for analysis, encompasses four levels; however, the scope of this study is limited to three levels of analysis—local knowledge of the landscape, plants, and animals; traditional fire practices; and rules governing burning practices—due to the specific focus of this research

3 Results

3.1 Kanume's community knowledge of landscape, plants, and animals

The Kanume people living in Wasur National Park possess an intricate understanding of their landscape, meticulously classifying it into distinct units: *belah-belah*, *tebe*, *wongko*, and *kerimu/deg* (Figure 3). This classification, far from being merely descriptive, reflects a deep-rooted knowledge of ecological processes and species interactions, particularly in relation to fire.

The Kanume people's livelihoods are intricately linked to the diverse resources provided by these landscapes. Forests are a source of sustenance, providing sago, fruits, medicinal plants, and game animals such as deer, wild pigs, kangaroos, and cassowaries. Melaleuca bark, harvested sustainably from the forests, is a vital material for traditional housing. Beyond their material importance, forests hold profound cultural significance, viewed as a life-giving mother and a dwelling place for ancestors. Sacred groves within the forests are a testament to this deep spiritual connection. Swamps, equally vital, provide a rich source of fish, including species like snakehead, tilapia, and climbing perch, which are consumed and traded.

Belah-belah, the marshlands characterized by *Melaleuca sp.* and *Eucalyptus sp.*, are recognized for their sensitivity to fire. The Kanume people employ controlled burns in these areas to manage specific resources, such as Melaleuca bark used for traditional housing. *Tebe*, the transitional zones between marshlands and savannas, require a different fire regime due to the presence of fire-resistant species and their role as corridors for wildlife. *Wongko*, the savannas dominated by grasslands, are managed with fire to promote grazing areas for hunted animals and encourage the growth of fire-adapted plant species. *Kerimu/Deg*, the forested areas, are treated with the utmost respect, as they are not only a source of food and medicinal plants but also hold deep cultural significance. Fire is used judiciously in these areas, often to clear undergrowth and encourage the regeneration of valuable tree species.

This intricate knowledge of landscape, plant, and animal responses to fire forms the foundation of the Kanume people's fire management practices, ensuring the sustainable use of resources and the maintenance of biodiversity within Wasur National Park.

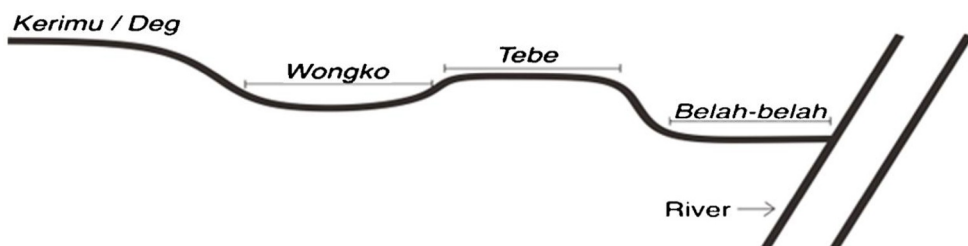


Fig 3. Interpretation of Landscape in Wasur National Park from the Kanume people's perspective

Within these five landscape categories, the Kanume people have identified at least 15 distinct grass species, each recognized by its local name: 'seu,' 'tornargo keterba,' 'bebesi,' 'sasakla,' 'merkren,' 'tranjin,' 'pemel,' 'kuku,' 'semin,' 'brobot,' 'papater,' 'supri,' 'mbinggun,' and 'were.' Furthermore, collaborative identification efforts within the 'Kerimu' landscape have revealed at least 85 tree species valued for their fruits, bark, resin, and timber.

This detailed knowledge of flora is paralleled by an equally profound understanding of fauna. The Kanume people primary quarry includes deer, kangaroos, wild pigs, and cassowaries. Successful hunting hinges on an intimate awareness of each animal's behavior. For instance, deer and kangaroos typically graze in the early morning until around 9:00 am, seek shade during the midday heat, and resume foraging in the late afternoon around 3:00 pm. This understanding dictates the timing of hunts and the selection of appropriate tools.

To ensure the sustainability of their harvesting practices, the Kanume people have developed sophisticated management systems. In hunting, totemism plays a crucial role. Specific clans are prohibited from hunting certain species that serve as their totemic emblems. Examples include the 'Samsakai' (kangaroo), 'Balagaiza' (crocodile), and 'Basik-Basik' (pig). This totemic system embodies the Malind Anim's ecological wisdom. By restricting the hunting of certain species, totemism indirectly limits overexploitation, thereby preserving species diversity and maintaining population equilibrium.

3.2 Traditional fire practices

3.2.1 Farming

For the Kanume people, farming constitutes a vital process intrinsically linked to their livelihood, cultural identity, and social fabric. Cultivated crops extend beyond daily sustenance, encompassing ceremonial needs for events ranging from marriages and births to funerals. This annual obligation underscores the profound significance of farming within the community, extending even to newly initiated members.

A diverse range of crops is cultivated, including staple foods like *kumbili*, bananas, and sago, alongside culturally significant plants like kava, sugarcane, wild Arenga palms, cassava, and coconut. Each plays a distinct role in customary rituals, with taro holding particular importance as both a dietary staple and a ceremonial element.

The agricultural cycle unfolds in four stages: land preparation, planting, maintenance, and harvesting. Fire plays a crucial role in the initial phase, clearing the land through controlled burning of dried vegetation. This practice is meticulously managed to prevent uncontrolled spread.

Prior to burning, a ritual known as "Sagu Sep" takes place, involving the communal preparation and consumption of a traditional sago dish. This gathering, often encompassing multiple families, reinforces kinship ties and reaffirms shared beliefs. The ritual is repeated at various stages of the farming cycle, each iteration carrying distinct prayers for protection, fertility, and gratitude for the harvest.

The controlled burning practiced by the Kanume people, executed collectively with meticulous care, effectively mitigates the risk of wildfires. Furthermore, the "Sagu Sep" ritual underscores the social dimension of this practice, fostering community bonds and transmitting cultural knowledge across generations. The resulting ash from the burn is believed to enrich the soil, highlighting the Kanume people's understanding of ecological processes.



Fig 4. Land preparation in traditional farming (*left*) and *kumbili* (*right*)

3.2.2 Customary land management

Beyond hunting and farming, fire serves a critical role in customary land management practices, particularly in maintaining *dusun* and *bevak*. *Dusun* is a traditional landscape system comprising gardens, sago forests, *Melaleuca* stands, wetlands, water sources, savannas, forests and sacred sites. It is managed through customary practices to fulfill economic, social, cultural, and spiritual needs while maintaining ecological balance. Common activities in the *dusun* include gardening, hunting, fish harvesting, and harvesting forest resources such as eucalyptus leaves, ant nests, and medicinal plants. *Bevak*, or garden shelters, serve as temporary accommodations for individuals tending to the *dusun*.

To safeguard these vital spaces, controlled burning is employed to clear vegetation surrounding the *dusun* and *bevak*. This practice mitigates the risk of wildfires fueled by dry-season grasses and undergrowth, which could threaten valuable trees and crops.

The burning is carefully executed, typically at the onset of the dry season, to ensure controlled flames and prevent the risk of runaway fires that can occur with burning later in the season. This task is usually undertaken by families who manage the *dusun*, highlighting the collective responsibility in safeguarding shared resources.

This strategic use of fire exemplifies the Kanume people's deep understanding of their environment and their ability to utilize fire as a tool for ecological management. By strategically applying controlled burns, they effectively reduce fire hazards while protecting areas crucial for their livelihoods.

3.2.3 Hunting

While historically fire may have been used directly in hunting practices, today the Kanume people primarily employ fire as a tool to facilitate hunting. This involves the controlled burning of savanna grasslands, typically during the dry season, to encourage the growth of fresh shoots favored by prey such as deer and wallabies. Hunters demonstrate sophisticated local knowledge in determining the appropriate timing for burns, considering factors like wind direction, proximity to culturally significant sites (e.g., forest gardens, sacred groves), and the presence of dew on the grass. Burning usually occurs in the late morning or late afternoon to capitalize on dry conditions. This practice attracts game animals to the rejuvenated grasslands, increasing hunting success. This targeted use of fire highlights the Kanume people's nuanced understanding of ecological processes and their ability to manipulate the landscape to enhance their livelihoods.

Among the Kanume people, hunting is primarily undertaken by younger community members. This is likely due to the increasing distance of hunting grounds from settlements, often requiring 2-3 hours of travel by motorbike. Youth typically hunt in groups of two or more, sharing the labor and resources required. The economic benefits of hunting, particularly the sale of game meat, provide crucial income for these young hunters. This highlights the evolving role of traditional hunting practices as a means for youth to support themselves within a changing socioeconomic environment. This has led young hunters to engage in hunting without adhering to fire use regulations, such as restrictions on burning during the peak of the dry season. As a result, uncontrolled wildfires occur, posing a significant threat to forest groves and local ecosystems.

3.3 Customary rules in fire use

The Kanume people possess a set of rules for fire use in various activities related to their livelihood. It is important to note that these rules are often unwritten, passed down through generations via customary practices and traditions. Fire use regulations were established to prevent uncontrolled wildfires that may cause environmental damage and to ensure adaptation to seasonal conditions.

Table 1. The Kanume people's rules for burning practices in Wasur National Park

Activities	Rules
Hunting	Timing burns strategically, considering wind direction, and avoiding <i>dusun</i> , gardens, and sacred sites.
Farming	Observing seasonal calendars and selecting appropriate land for clearing. Burning is strictly prohibited during Tebrasaro, the peak dry season (typically late October to early November).
<i>Dusun</i> & Garden Maintenance	Conducting controlled burns at the beginning of the dry season to ensure manageable flames and carefully considering wind direction.

These rules of fire use reflect several overarching principles that guide the Kanume people Fire management:

- Seasonal restrictions: Burning is prohibited during the peak dry season to prevent uncontrollable fires.
- Timing burns: Controlled burns are conducted in the late afternoon when temperatures are lower, minimizing fire intensity.
- Creating firebreaks: Paths, waterways, and swampy areas are used as natural firebreaks to contain burns.
- Observing wind patterns: Wind direction is carefully assessed by observing the movement of leaves and delicate flowers.
- Protecting crops: Burning is prohibited after *kumbili* planting to safeguard the growing crops.

Considering terrain: Uneven terrain frequented by wild pigs requires careful consideration during burns due to the potential for fire spread.

Contemporary pressures are leading to shifts in traditional fire practices, posing significant challenges for ecological balance. According to a prominent tribal leader and traditional leader, the customary prohibition on burning during the peak dry season is increasingly disregarded. This neglect of traditional timing restrictions has led to the unintended burning of valuable sago forests, Melaleuca stands, other parts of the *dusun*, and even sacred sites.

Furthermore, they are increasingly concerned about the use of fire in hunting activities, which tends to be uncontrolled. Throughout the dry season, hunting continues without regard for the peak dry period. Young hunters seek quick ways to earn money from hunting, rather than engaging in other labor-intensive activities such as farming or producing eucalyptus oil, which require more time and effort. The use of fire to burn grasslands for hunting often disregards traditional rules of fire practices, increasing the risk of wildfires.



Fig 5. Comparison of two *dusun* conditions: one burned due to wildfire and one preserved as a result of fire for preservation.



Fig 6. Savanna ecosystem burned

Fig 7. Melauca sp burned

4 Discussion

Based on the results presented previously, it is evident that the TEK framework aids in understanding the burning practices of the Kanume people and also fire practices. Regarding the rules of fire practices, changes in fire use among the Kanume people are evident, driven by various factors that impact the sustainability of these practices.

Regarding fire practices in farming and customary land management, specifically the maintenance of *dusun*, fire use is implemented in a controlled manner. Farming activities, such as land preparation for planting kumbili (sweet potato) and other crops, are conducted communally within the same clan, with cooperation (gotong royong) being key. The use of fire during land preparation is integrated with traditional ceremonies and is carefully controlled. The maintenance of *dusun* is generally carried out at the beginning of the dry season, resulting in localized, non-extensive burning that corresponds to the dryness of understory vegetation like grasses. This contrasts with fire practices in hunting activities, which occur throughout the dry season, including its peak. Fire practices aimed at stimulating new grass growth are typically carried out by only two individuals, raising concerns about

their ability to control fire spread during the peak of the dry season or prolonged dry periods, and to prevent wildfires.

Uncontrolled burning poses significant risks to the biodiversity and delicate ecosystems of Wasur National Park. Unmanaged fires can lead to the destruction of valuable *Melaleuca* spp. stands and sensitive savanna ecosystems, jeopardizing the ecological integrity of the park. As widely highlighted [2, 19], these ecosystems are particularly vulnerable to fire damage. The alteration of fire-burning practices within the people, marked by an increasing disregard for established rules of fire use, stems from a combination of external and internal pressures. The primary external factor is the expansion of the market economy, which has shifted the community's production orientation from subsistence-based to market-oriented activities. Contributing to this shift is the introduction of modern communication technologies, such as mobile phones, which require monetary resources for access and usage. Internally, the weakening enforcement of fire-use rules plays a significant role. While every rule is inherently linked to sanctions, these sanctions are not consistently applied. The severity of the sanctions is determined by landowners based on the extent of damage caused by the fire. However, identifying those responsible for starting fires can be challenging due to the remote locations of hunting activities. Furthermore, when the responsible individuals are family members of the landowner, sanctions are often not imposed. In addition, areas experiencing fire damage are typically those that have not been maintained through firebreak construction or vegetation management, such as the removal of weeds in sago forest areas.

Similar shifts in fire practices have been observed among other Indigenous communities, such as the Maasai in Kenya. The Maasai traditionally employed controlled, small-scale burns throughout the dry season to create mosaic patterns and prevent catastrophic fires [5]. However, in the last 10–15 years, traditional fire management has dramatically declined, influenced by factors such as federal fire suppression policies, unpredictable rainfall patterns, increasing population pressures, and a subsequent increase in the number of catastrophic accidental fires [5]. The reduction in traditional burning practices has led to concerning consequences, including increased late-season fuel loads and more catastrophic fires [5]. Key factors influencing these changes in fire regimes include: 1) unreliable rainfall patterns making burning risky due to uncertain vegetation recovery; 2) government policies that restrict traditional burning, leading many Maasai to fear fines or jail time, despite unclear specific regulations; and 3) population pressure, with village populations increasing significantly, making burning riskier near inhabited areas [5]. This also threatens the open grasslands in the region.

Analyses of shifting fire practices among communities such as the Kanum and the Maasai indicate that both external and internal factors drive these changes. This pattern demonstrates how the loss of indigenous fire knowledge can negatively impact ecosystem health across different regions. The shift in fire practices, particularly in hunting activities, poses serious challenges to the sustainability of the Kanume people's way of life. This is a critical concern because: uncontrolled burning can damage their own *dusun* (groves) and destroy the habitat of game animals and primary food sources; in the long term, severe ecosystem degradation can threaten their food security and livelihoods [7] and dwindling forest resources may increase their dependence on external economies, potentially making them more socially and economically vulnerable. Thus, the transformation of these practices not only impacts the environment but also threatens the long-term well-being of the Kanume people. Therefore, it is important to seek alternative solutions that can maintain a balance between cultural practices, ecosystem preservation, and livelihood sustainability. A multidisciplinary approach may offer a path toward exploring alternative solutions to the fire practice issues of the Kanume people, including:

1. Customary Institutions

To ensure the sustainability of the Kanume people's way of life amidst changing fire practices, a vital step is strengthening their customary institutions. This involves revitalizing the rules of fire use so that they remain relevant to the current ecological and social conditions. Besides that, the enforcement of customary regulations on fire use should be reinforced to maintain a balance between traditional practices and environmental conservation. Then, the customary institutions of the Kanume people should be strengthened as part of natural resource governance. For instance, cultural burning practices can be integrated into public forest management through partnerships that recognize Aboriginal groups' cultural authority and safety requirements.

2. Sustainable Fire Management

The traditional controlled burning practices of the community should be integrated with fire management systems overseen by park authorities to ensure sustainability and prevent uncontrolled wildfires.

3. Economic and Incentive-Based Approaches

It is important to create an alternative livelihood development should focus not only on raw material production but also on value-added processing to enhance economic sustainability. Economic incentives should be provided to communities that actively participate in ecosystem conservation and implement controlled burning practices responsibly.

4. Community Fire Safety-Awareness

Education and training programs for Indigenous communities on the negative impacts of wildfires on forests and their livelihoods, fostering awareness and capacity-building for sustainable fire management.

To develop alternative solutions, Collaborative Fire Management Planning [4, 21]. can serve as a platform that engages all relevant stakeholders and addresses issues related to indigenous fire practices, ecosystem conservation, and the sustainability of local livelihoods.

Active stakeholder participation is essential. The key stakeholders include central government actors, represented by national park authorities responsible for managing protected areas and their ecosystems, as well as local communities and regional governments, which oversee the well-being of populations residing within national park areas. Additionally, non-governmental organizations (NGOs) and civil society organizations (CSOs), including universities and researchers, play a crucial role in providing scientific and technical support, as well as research-based perspectives, to promote collaborative and sustainable fire management practices.

5 Conclusion

The traditional ecological knowledge framework offers a valuable lens through which to explore traditional fire practices, which are integral to the Kanume people's traditions in Wasur National Park, and to understand the transformations these practices have undergone. Fire has historically been employed for traditional farming, particularly in land preparation, as well as for customary land management and hunting. The application of fire is governed by customary rules, reflecting local wisdom in managing fire to ensure the sustained availability of natural resources, which underpin their livelihoods and the long-term viability of their way of life.

However, shifts in fire practices have become evident, particularly in hunting activities. Increasingly, younger generations engage in hunting year-round, disregarding the peak dry season and other rules of fire use, which significantly elevates the risk of uncontrolled wildfires. Meskipun ini juga dipengaruhi oleh kondisi internal masyarakat dan faktor dari luar seperti ekonomi pasar.

Further research is needed to examine the coupled social and ecological impacts of these uncontrolled fires, which are increasingly detrimental to forest ecosystems. Additionally, a deeper investigation into the drivers of change in fire practices is crucial. Understanding these dynamics will contribute to the development of effective fire management strategies for Wasur National Park. Although a comprehensive solution necessitates in-depth study, we propose several preliminary approaches that could serve as alternative solutions to address the issue of uncontrolled fire practices in Wasur National Park: strengthening customary institutions to reinforce traditional governance of fire use; integrating controlled burning practices into the official fire management system, developing rural economic opportunities to reduce dependence on fire-intensive hunting activities; and building community capacity in sustainable fire management to ensure a long-term and ecologically sound approach. These strategies could serve as a foundation for harmonizing traditional ecological knowledge with modern fire management, aiming to achieve both environmental sustainability and community resilience in the region.

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