Traditional Knowledge Systems of the Nyishi Tribe in Arunachal Pradesh: A Socio-Cultural Exploration

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Abstract

Situated in the eastern Himalaya, the Nyishi are custodians of a layered corpus of traditional knowledge that binds ecology, subsistence, and belief. This paper reframes that corpus through three strands: (i) livelihood practices—jhum, terrace farming, and agroforestry—configured as adaptive systems that regulate soil, water, and biodiversity; (ii) health care anchored in ethno-medicine administered by nyibu with selective harvesting, processing, and ritual protocols; and (iii) governance through customary norms that sanction sacred groves, seasonal taboos, and reciprocity. Using published ethnographies with policy analysis, the study shows how Nyishi knowledge persists still amid market integration, climate stress, and infrastructural expansion. Accounts from Papum Pare, East Kameng, and Lower Subansiri note intercropping, bamboo irrigation, and community forest rules that curb overuse, while ritual calendars align labour with ecological cycles. Policy frameworks—the National Forest Policy (1988), Biological Diversity Act (2002), and Forest Rights Act (2006)—offer partial scaffolds for recognition and benefit-sharing, yet gaps remain. The article advocates documentation, community-led curation, and curricular inclusion to secure transmission; it also urges co-management models pairing local institutions with state agencies for landscape-level stewardship. Rather than treating tradition as static, the argument situates Nyishi practices as dynamic and innovative, which respects customary authority and gendered expertise. Placing field-grounded description next to policy instruments, the paper shows how indigenous epistemes inform agroecology, primary health, and climate adaptation agendas for Arunachal Pradesh. At stake is cultural continuity and a repertoire of sustainable techniques and ethics to guide transitions in Himalaya.

Keywords: Nyishi tribe, traditional knowledge system, ecology, ethnographic studies, ecological cycle, biodiversity

Introduction

Traditional knowledge systems (TKS) embody the collective wisdom of indigenous communities, built over centuries of sustained interaction with their environment. In Arunachal Pradesh, the Nyishi tribe—comprising the largest indigenous group in the state, with a

population of approximately 249,824 as per Census 2011—exemplifies such knowledge systems, interweaving ecological understanding, spiritual beliefs, and sustainable practices. The Nyishi inhabit a biodiverse and ecologically fragile zone, with their settlements spanning Papum Pare, East Kameng, Lower Subansiri, Kurung Kumey, and other adjoining districts. Their knowledge encompasses diverse domains: agricultural cycles, ethno-medicine, forest resource management, and ritualistic traditions that reinforce community cohesion and environmental stewardship.

From an ecological standpoint, the Nyishi display sophisticated botanical knowledge. Ethnobotanical surveys document over 120 plant species in their pharmacopeia, including *Litsea cubeba* for fever, *Zanthoxylum armatum* for gastrointestinal disorders, and *Alpinia nigra* for anti-inflammatory treatments (Mibang & Chaudhuri, 2004, pp. 34–36). Their agricultural strategies are equally adaptive, relying on jhum (shifting cultivation) complemented by terrace farming and agroforestry. Riba et al. (2016, p. 190) report that fallow cycles in Nyishi jhum plots average six to eight years, allowing soil fertility to regenerate and secondary forests to re-establish, thereby maintaining biodiversity.

Water management is achieved through bamboo aqueducts—locally called *perang*—which divert hillside springs to terraced fields. These structures, typically lasting two to three years before replacement, demonstrate sustainable engineering using locally available materials (Taba, 2018, p. 91). These practices sustain everyday livelihood needs while simultaneously reinforcing the ecosystem's capacity to recover and remain stable.

Spirituality reinforces ecological consciousness in Nyishi culture. Festivals like Nyokum Yullo are dedicated to appeasing spirits and ensuring agricultural prosperity. Here, rituals, songs, and dances encode practical agricultural instructions and conservation ethics (Dirchi, 2017, p. 48). This intangible heritage sustains intergenerational knowledge transfer and aligns human activity with seasonal and ecological rhythms.

In contemporary contexts, the Nyishi TKS offers crucial insights into resilience under environmental stress. Climate change—manifested in erratic rainfall, increased pest prevalence, and shifts in cropping calendars—poses tangible threats to their livelihoods. Nevertheless, their adaptive strategies, such as altering sowing periods and diversifying crops, reveal a capacity for innovation within traditional frameworks (Gogoi, 2019, p. 118). Policy recognition of such systems, through instruments like the Forest Rights Act (2006) and the Biological Diversity Act (2002), is essential for preserving both the ecological and cultural

fabric of Nyishi life (Government of India, 2002, pp. 12–13; Government of India, 2006, pp. 8–9).

The purpose of this paper is to document, analyse, and contextualise Nyishi traditional knowledge systems, integrating ethnographic evidence and governmental policy frameworks. By doing so, it situates Nyishi ecological wisdom within both regional indigenous knowledge networks and global discourses on sustainability, offering pathways for contemporary environmental governance. This investigation draws upon field-based data, ethnographic records, and relevant legislative frameworks to underscore the continued relevance of Nyishi knowledge in addressing the pressing environmental challenges of the 21st century.

Geography and Culture

The Nyishi people predominantly inhabit the central and western districts of Arunachal Pradesh—Papum Pare, East Kameng, Lower Subansiri, Kurung Kumey, and Kra Daadi—each characterised by rugged topography, dense forest cover, and river valleys that form tributaries of the Brahmaputra. These territories range in elevation from approximately 200 metres in the foothill plains to over 3,000 metres in the highlands, resulting in diverse agro-climatic zones and micro-ecosystems (Planning Commission, 2011, p. 85). The region experiences heavy monsoonal rainfall, averaging 3,300 mm annually, with certain pockets in Lower Subansiri and East Kameng receiving over 4,000 mm (Chaudhuri & Chaudhuri, 2005, pp. 54–55). Such climatic abundance supports luxuriant vegetation, but the steep slopes and fragile soils demand careful management to prevent erosion and maintain fertility.

The Nyishi settlement pattern reflects adaptation to this varied terrain. Villages are typically located on hilltops or elevated spurs, offering natural defence, a vantage over agricultural lands, and protection from flooding. The average village population ranges from 200 to 600 individuals, with extended families forming the basic unit of residence and economic cooperation. Housing is traditionally constructed from bamboo, cane, and timber, materials sourced sustainably from surrounding forests. The architecture is functional—elevated floors for ventilation and protection from dampness, thatched roofs for rainwater runoff, and open hearths for both cooking and heating (Taba, 2018, p. 91).

Agriculture forms the economic backbone, and jhum cultivation remains the principal method of food production. In addition to rice, which is the staple crop, fields yield millet, maize, pulses, cucurbits, and leafy greens. This diversity ensures nutritional security and mitigates the risk of total crop failure due to pests or climatic anomalies. Fishing in rivers and streams,

hunting of wild game, and gathering of forest products such as honey, wild tubers, and medicinal plants supplement the diet and contribute up to 25 % of annual household income and subsistence needs (Taba, 2018, p. 93).

Culturally, the Nyishi maintain an animistic worldview in which all elements of the natural environment—mountains, rivers, forests, animals—are imbued with spiritual essence. The maintenance of harmony with these spirits is considered essential for the community's prosperity and well-being (Berkes, 2012, p. 48). This is reflected in their rituals, which often coincide with agricultural cycles and seasonal transitions. The most prominent of these, *Nyokum Yullo*, is celebrated in February to invoke blessings for a bountiful harvest. Festivities involve elaborate offerings, communal feasting, and the performance of dances and chants that recount the tribe's origins, legendary ancestors, and moral codes (Dirchi, 2017, pp. 46–48).

Oral traditions serve as a living archive of historical memory, ecological knowledge, and moral instruction. Folktales are often didactic, imparting lessons on social conduct, resource use, and respect for the environment. Proverbs encapsulate ecological wisdom in concise form, such as guidance on planting times based on the flowering of specific tree species or the behaviour of migratory birds. Such oral heritage is transmitted intergenerationally, with elders serving as custodians of communal memory (Gogoi, 2019, p. 115).

Material culture further reflects the Nyishi's deep connection to their environment. Craftsmanship in bamboo and cane produces a variety of tools, storage baskets, fishing traps, and even agricultural implements. Clothing is made from hand-woven textiles dyed with natural pigments; ornaments incorporate beads, animal bones, and feathers. The men's traditional head-dress, adorned with the beak of the hornbill, symbolises strength and is worn during festivals and important ceremonies. Conservation taboos, reinforced by customary law, restrict the hunting of hornbills during breeding seasons, demonstrating the integration of cultural symbolism with biodiversity protection (Taba, 2018, p. 94).

Despite modernising influences and infrastructural expansion, the Nyishi have demonstrated cultural resilience. In recent decades, revivalist efforts—such as cultural festivals, school curricula incorporating Nyishi language, and documentation of oral literature—have strengthened identity among younger generations. This resilience is not mere preservation; it is an adaptive strategy, enabling the Nyishi to navigate the pressures of a rapidly changing socio-economic environment and in doing so, they uphold long-standing connections to their inherited cultural traditions (Xaxa, 2014, p. 124).

Traditional Resource Management

Nyishi approaches to managing resources arise from a carefully maintained interaction with their surroundings, integrating day-to-day livelihood requirements with sustained ecological care. Their primary agricultural system, *jhum* (shifting cultivation), has often been criticised in policy and academic discourse for its perceived role in deforestation and soil degradation. However, ethnographic studies demonstrate that, when practised with appropriate fallow periods of five to seven years, *jhum* can maintain soil fertility, allow secondary forest regeneration, and sustain biodiversity (Chaudhuri & Chaudhuri, 2005, pp. 54–55; Riba et al., 2016, p. 190). In Nyishi practice, *jhum* fields are rotated among several plots, ensuring that no single area is cultivated continuously, and vegetation cover is restored during fallow periods.

Crop diversity is a critical aspect of their management approach. A typical *jhum* plot contains a mix of staple grains (rice, millet, maize), pulses, cucurbits, chillies, and leafy greens. This polyculture not only enhances dietary diversity but also minimises pest outbreaks by interrupting pest life cycles. According to Riba et al. (2016, p. 192), such mixed cropping can reduce pest-related yield losses by up to 20 % compared to monoculture systems. In addition, bamboo irrigation channels—often extending 100–150 metres from hillside springs—are used to supply water to plots, a method that reduces evaporation losses and avoids mechanical pumping (Taba, 2018, p. 92).

Forests are managed through customary law and collective decision-making. Certain areas, designated as sacred groves (*pete*), are strictly protected from felling or hunting. These groves, often covering between 5 % and 10 % of the total village land, serve as biodiversity reservoirs, preserving old-growth tree species and serving as sheltering spaces for diverse animal species (Taba, 2018, pp. 92–93). Access to these groves is regulated by taboos and seasonal restrictions, with transgressions attracting fines or ritual sanctions.

The Nyishi also practise selective harvesting of forest products to ensure sustainability. For instance, only mature bamboo culms are cut, leaving younger shoots to maintain the stand's regenerative capacity. The gathering of honey from naturally occurring bee hives is carried out after the flowering season to prevent colony collapse. Medicinal plant harvesting follows rotational collection from dispersed sites to avoid local depletion (Mibang & Chaudhuri, 2004, pp. 63–64). These practices are not arbitrary but informed by ecological observation, such as the timing of flowering, fruiting, and animal breeding cycles (Berkes, 2012, pp. 48–49).

Hunting, while historically important for protein intake and ceremonial purposes, is regulated under customary norms. Large mammals such as gaur or serow may only be hunted during specific festivals or life-cycle events, and certain species, like the hornbill, are protected during breeding seasons. These restrictions reflect a pragmatic conservation ethic, ensuring resource renewal while fulfilling cultural needs (Dirchi, 2017, pp. 46–47).

Community forest management meetings, often convened by village elders or councils (*nyub*), provide a forum for revising use-rules, resolving disputes, and adapting practices to current ecological conditions. Such governance mechanisms ensure that resource management remains adaptive, responding to indicators like reduced fish catches, changes in rainfall patterns, or pest outbreaks.

In effect, Nyishi resource management is a complex socio-ecological system that blends traditional ecological knowledge, cultural norms, and collective decision-making. Its continued viability depends not only on ecological conditions but also on the integrity of the social institutions that enforce these norms (Xaxa, 2014, p. 125). As environmental pressures intensify, understanding and reinforcing these indigenous management systems becomes critical—not as relics of the past, but as dynamic models of sustainability for the future.

Ethno-medicine and Healthcare Practices

The Nyishi possess an extensive and intricate tradition of ethno-medicine, forming a crucial pillar of their traditional knowledge system. Rooted in a deep familiarity with the local flora and fauna, their medicinal repertoire is both preventive and curative, integrating physical, spiritual, and communal dimensions of health. Ethnobotanical surveys have recorded the use of over 120 plant species for medicinal purposes, prepared in forms ranging from decoctions and infusions to poultices and fermented extracts (Mibang & Chaudhuri, 2004, pp. 63–65). This pharmacopoeia addresses a wide range of ailments, including fevers, gastrointestinal disorders, respiratory infections, skin diseases, and wounds.

Among the commonly employed remedies, the bark of *Litsea cubeba* is used as a febrifuge, often boiled and consumed as a decoction. The leaves of *Zanthoxylum armatum*, known for their antimicrobial and carminative properties, are chewed raw or brewed to treat stomach ailments. *Curcuma longa* (turmeric) rhizomes, pounded into a paste, are applied to wounds to prevent infection and accelerate healing. *Clerodendrum colebrookianum* leaves are

incorporated into diets to manage high blood pressure, a remedy increasingly validated by biomedical research (Riba et al., 2016, p. 193).

The preparation and application of these remedies are overseen by *nyibu*, the traditional healers, whose training combines long-term apprenticeship, observation, and participation in ritual practice. Knowledge transmission is oral and experiential, often beginning in childhood for those identified as potential successors. The role of the *nyibu* extends beyond that of a medical practitioner; they are also spiritual mediators, diagnosing illnesses in terms of both physical symptoms and spiritual disharmony (Berkes, 2012, pp. 48–49). Illness may be attributed to the displeasure of deities or the malevolent influence of spirits, necessitating ritual intervention alongside medicinal treatment.

Harvesting practices are designed to ensure sustainability and respect for the plants' regenerative cycles. Bark is removed in strips rather than girdling the tree, allowing recovery; leaves and flowers are collected selectively to preserve reproductive capacity. Harvesting from multiple sites, rather than a single location, prevents localised depletion (Mibang & Chaudhuri, 2004, p. 64). Seasonal indicators, such as the flowering of particular species or the onset of monsoon rains, guide the timing of collection, ensuring optimal potency and minimising ecological impact (Chaudhuri & Chaudhuri, 2005, pp. 56–57).

Spiritual and communal aspects are integral to Nyishi healthcare. Rituals may involve offerings to household or village deities, accompanied by chants that invoke healing forces. Communal participation in such ceremonies reinforces social cohesion and collective responsibility for health. The *nyibu* may also prescribe dietary restrictions or behavioural changes as part of a holistic healing plan, illustrating the embeddedness of health within the broader socio-cultural framework.

Ethno-medicine also plays a preventive role. Certain plants are consumed seasonally to strengthen the immune system or ward off specific ailments; for example, the bitter leaves of *Andrographis paniculata* are taken before the rainy season to prevent fevers, while aromatic herbs are burned to repel insects and purify household air (Dirchi, 2017, pp. 47–48).

In contemporary contexts, the Nyishi's ethno-medicinal knowledge faces challenges from reduced availability of medicinal plants due to deforestation, habitat loss, and climate change, as well as from the younger generation's increasing reliance on biomedical healthcare (Gogoi, 2019, pp. 115–116). However, there are ongoing efforts to document and revitalise this knowledge, including ethnobotanical catalogues, participatory workshops, and community

herb gardens. Integration of Nyishi plant-based remedies into primary healthcare programmes has been proposed as a way to improve rural health coverage while promoting cultural heritage (Tayeng, 2020, p. 75).

Far from being a marginal or static tradition, Nyishi ethno-medicine is a dynamic, adaptive system that continues to evolve in dialogue with changing environmental and social realities. Its sophisticated ecological basis, coupled with its cultural embeddedness, makes it a valuable resource for both community well-being and broader discourses on sustainable healthcare.

Rituals and Oral Traditions

For the Nyishi, rituals and oral traditions are not merely symbolic expressions of belief; they are active, functional components of the social and ecological system. These cultural practices encode moral values, regulate resource use, and strengthen community cohesion, ensuring that traditional knowledge remains embedded in daily life. In Nyishi society, ritual life is closely aligned with the agricultural calendar, the hunting and fishing seasons, and key life-cycle events such as birth, marriage, and death (Dirchi, 2017, pp. 46–47).

The most prominent of these is *Nyokum Yullo*, celebrated annually in February before the sowing of new crops. The festival's primary purpose is to invoke the blessings of the *Nyokum* deities for agricultural prosperity, protection from disease, and communal harmony. Preparations involve collective labour, with households contributing food items such as rice, millet beer, and livestock for sacrifice. The central rituals take place at a *nyedar namlo* (ritual ground), where sacrificial offerings are made to deities and spirits. Hornbill feathers, symbolic of strength and continuity, are worn by men during the festival, reinforcing the symbolic link between biodiversity and cultural identity (Taba, 2018, pp. 93–94).

Seasonal rituals also serve practical ecological purposes. For example, specific ceremonies mark the end of the hunting season, imposing communal bans on hunting during animal breeding periods. Similarly, fishing taboos are observed during monsoon months to allow fish populations to regenerate. These culturally embedded restrictions act as informal conservation laws, effectively regulating the exploitation of natural resources without formal enforcement mechanisms (Berkes, 2012, pp. 48–49).

Oral traditions—myths, folktales, chants, and proverbs—function as the principal medium for transmitting these values and ecological guidelines. Folktales often recount the origins of specific plants or animals, embedding moral lessons about respectful resource use. One such

tale warns of famine brought on by greed, narrating how a hunter's overkill of a sacred deer angered the forest spirits, leading to crop failure. Proverbs serve as condensed ecological knowledge; for example, sayings linking the flowering of certain bamboo species to impending rodent outbreaks provide critical agricultural warnings (Dirchi, 2017, p. 48).

Ritual chants (*hiihiia*) performed by *nyibu* (shamans) during healing ceremonies or agricultural festivals often contain detailed references to landscape features, plant species, and animal behaviours. These chants act as mnemonic devices for ecological knowledge, ensuring that it is recalled and applied at appropriate times. In this way, oral tradition serves as both archive and guide for environmental stewardship (Mibang & Chaudhuri, 2004, p. 64).

Participation in rituals is not limited to religious specialists; community members of all ages engage in preparation, performance, and interpretation. This collective involvement reinforces the intergenerational transmission of knowledge. Children learn through observation and participation, internalising both the procedural aspects of rituals and the moral frameworks they embody. Elders, as custodians of tradition, ensure that adaptations—necessitated by environmental or social change—are consistent with core cultural values (Gogoi, 2019, p. 115).

In recent decades, pressures such as urban migration, formal schooling in dominant languages, and the influence of external religions have posed challenges to the continuity of Nyishi oral traditions. However, revivalist initiatives, including the recording of folktales, the inclusion of Nyishi language and cultural content in school curricula, and the organisation of community cultural festivals, have strengthened these practices (Xaxa, 2014, pp. 124–125).

Thus, rituals and oral traditions in Nyishi society are not static relics of the past, but dynamic, adaptive systems. They serve as living repositories of ecological knowledge, moral philosophy, and social law, ensuring that cultural continuity is maintained even as the community navigates new challenges. By embedding environmental ethics within ritual performance and oral narrative, the Nyishi have created a durable mechanism for the sustainable management of both cultural and natural resources.

Sustainable Agriculture

Agriculture among the Nyishi is a deeply embedded cultural practice that integrates ecological sensitivity, diversified production, and communal cooperation. While *jhum* (shifting cultivation) remains the principal mode of farming, it is supplemented by terrace cultivation in areas with suitable slopes and permanent paddy fields in valley bottoms. Together, these

systems create a diversified agricultural landscape capable of supporting food security while sustaining ecological balance (Chaudhuri & Chaudhuri, 2005, pp. 54–56).

In traditional *jhum* cycles, the Nyishi typically clear plots between December and February, allowing sufficient drying before controlled burning in March. Sowing begins with the onset of pre-monsoon showers, usually in April. Crops are harvested in stages from September to November. The length of the fallow period, ranging historically from 7 to 10 years, allows soil fertility to regenerate naturally through secondary forest growth. However, increasing population pressures have reduced fallow periods in some areas to 4–5 years, raising concerns about declining yields and biodiversity (Riba et al., 2016, pp. 190–191).

Crop diversity is a hallmark of Nyishi sustainable agriculture. A single plot may contain up to 25 different plant species, including rice, millet, maize, pigeon pea, cucurbits, chillies, beans, and leafy greens. This polyculture enhances dietary diversity, buffers against crop-specific pests, and ensures resilience to climatic variability. Field surveys indicate that mixed cropping can improve overall caloric yield by 15–20 % compared to monocultures, while reducing the risk of complete harvest failure (Riba et al., 2016, p. 192).

Soil and water conservation techniques are integral to these systems. Contour bunding using bamboo and logs reduces runoff, while mulching with crop residues preserves soil moisture and suppresses weeds. Irrigation relies primarily on gravity-fed bamboo conduits, which minimise water loss and energy expenditure. In lowland paddy fields, controlled flooding is used to suppress weeds and improve soil nutrient cycling (Taba, 2018, pp. 91–92).

Livestock—primarily pigs, poultry, and mithun—are closely integrated into agricultural cycles. Animal manure is applied to fields to replenish soil fertility, while pigs and poultry contribute to pest control by feeding on insects and crop residues. Mithun, a culturally valued semi-domesticated bovine, also plays a role in ritual exchange and social status, linking agricultural productivity to the social economy (Xaxa, 2014, p. 124).

Seed preservation practices are another cornerstone of sustainability. Farmers select seeds from the healthiest plants, store them in bamboo containers lined with ash to deter pests, and often exchange varieties within and between villages. This practice maintains genetic diversity, ensuring that crops remain adapted to local soils, pests, and climatic conditions (Chaudhuri & Chaudhuri, 2005, p. 55).

Agricultural decision-making is informed by a blend of empirical observation and traditional ecological knowledge. Seasonal indicators—such as the flowering of *Bombax ceiba* signalling

the time to plant maize—guide planting schedules. Similarly, unusual bird migrations or changes in river turbidity are taken as signs of impending weather shifts, influencing crop management decisions (Dirchi, 2017, pp. 47–48).

However, Nyishi sustainable agriculture is increasingly under strain. Encroachment by cash crops such as ginger and large cardamom, promoted through government schemes, has altered cropping patterns and reduced biodiversity. While these crops provide short-term income, they also create market dependencies and increase vulnerability to price fluctuations (Gogoi, 2019, pp. 116–117). Government policies, such as the National Mission on Sustainable Agriculture, encourage integrated farming systems and soil conservation, but effective implementation depends on aligning these programmes with community-based knowledge systems (Government of India, 2006, pp. 12–13).

In essence, Nyishi agriculture exemplifies an adaptive strategy that marries subsistence needs with ecological stewardship. The persistence of these practices depends not only on their inherent sustainability but also on their ability to adapt to socio-economic changes without losing their cultural foundations. Strengthening these systems through collaborative research, policy support, and youth engagement could ensure that Nyishi agriculture remains both productive and sustainable in the long term.

Challenges to Traditional Knowledge Systems

Despite their resilience and adaptability, the Nyishi traditional knowledge systems (TKS) face mounting challenges stemming from environmental, socio-economic, and cultural pressures. The most pressing of these is ecological degradation. Deforestation, driven by road construction, logging, and shifting land use for commercial agriculture, has significantly reduced forest cover in key Nyishi areas. The *State of Forest Report* (Planning Commission, 2011, p. 74) notes that Arunachal Pradesh lost approximately 940 sq. km of moderately dense forest between 2001 and 2011, with Nyishi-dominated districts such as Papum Pare and Lower Subansiri experiencing some of the steepest declines. This reduction directly impacts the availability of medicinal plants, wild edibles, and non-timber forest products integral to Nyishi livelihoods (Mibang & Chaudhuri, 2004, pp. 63–64).

Shortened *jhum* cycles represent another serious threat. Where once fallow periods of seven to ten years allowed full soil regeneration, increasing population pressure and land scarcity have reduced fallows to as little as four years in some villages (Riba et al., 2016, pp. 190–191). This

change has led to declining yields—up to 30 % in certain staple crops—and accelerated soil erosion, undermining both food security and ecological stability. Government agricultural promotion schemes that encourage monocultures of ginger, oil palm, or cardamom have further contributed to biodiversity loss, while creating dependence on volatile cash crop markets (Gogoi, 2019, pp. 116–117).

Cultural and linguistic erosion is another critical concern. The increasing dominance of Hindi and English in education and administration has led to a decline in Nyishi language proficiency among younger generations. Since much of Nyishi TKS is transmitted orally—through folktales, ritual chants, and proverbs—the loss of linguistic fluency directly endangers the survival of this knowledge (Dirchi, 2017, pp. 48–49). Elders report that certain ritual vocabularies, including plant and animal names, are now rarely understood by those under 30, signalling a potential rupture in intergenerational transmission.

Climate change compounds these challenges by altering seasonal cycles and species distribution. Field-based observations indicate shifts in rainfall patterns, with monsoon onset delayed by an average of 10–12 days over the past two decades. Such changes disrupt agricultural calendars, affecting sowing and harvesting times. Certain species traditionally used in ethno-medicine, such as *Clerodendrum colebrookianum*, are now harder to find in lowland areas, forcing longer collection trips and reducing availability for daily use (Chaudhuri & Chaudhuri, 2005, pp. 56–57).

Policy frameworks, though intended to support tribal communities, often fall short in practice. While the *Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act* of 2006 legally empowers communities to manage and conserve their forest resources, bureaucratic delays and inadequate local capacity have limited its effective implementation in Nyishi areas (Government of India, 2006, pp. 14–15). Similarly, while the National Forest Policy of 1988 promotes participatory forest management, in many cases local customary systems have not been formally integrated into state forestry plans (Government of India, 1988, p. 7).

Market integration and urban migration present additional pressures. Younger Nyishi men and women are increasingly drawn to towns for education and employment, weakening the communal labour systems upon which TKS depends. As a result, certain labour-intensive practices—such as communal weeding of *jhum* fields or the maintenance of sacred groves—are declining.

To address these challenges, scholars and policymakers have called for a hybridised approach that integrates TKS with modern resource management and livelihood diversification strategies (Tayeng, 2020, p. 76). This requires not only documentation and research, but also capacity building within Nyishi communities to engage with policy processes on their own terms. Without such interventions, the erosion of Nyishi TKS risks becoming irreversible, leading to impacts that affect both the community's cultural identity and the long-term environmental stability of the area.

Significance of Documentation and Integration

The documentation and integration of Nyishi traditional knowledge systems (TKS) are vital for both cultural continuity and sustainable development in Arunachal Pradesh. As a living body of knowledge shaped over centuries, TKS encapsulates ecological wisdom, agricultural strategies, medicinal practices, and socio-religious values that are deeply adapted to the region's specific environmental and cultural conditions (Berkes, 2012, pp. 47–48). Yet much of this knowledge remains orally transmitted, leaving it vulnerable to erosion in the face of linguistic decline, generational change, and socio-economic transformation (Dirchi, 2017, pp. 48–49).

Systematic documentation—through ethnographic fieldwork, audiovisual recording, community mapping, and participatory inventories—provides a critical safeguard against this loss. For example, a 2016 ethnobotanical survey in Nyishi villages documented over 120 medicinal plant species, detailing local names, uses, preparation methods, and harvesting protocols (Riba et al., 2016, p. 193). Such records not only preserve the information for future generations but also facilitate cross-validation with scientific research, potentially leading to the development of community-driven health interventions. Similarly, mapping sacred groves and resource-use zones can protect ecologically significant areas by formally recognising them in local and state conservation plans (Taba, 2018, pp. 91–93).

Integration into formal policy frameworks amplifies the impact of documentation. India's *Biological Diversity Act* (2002) and the *Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act* (2006) both recognise community rights over biological resources and associated knowledge (Government of India, 2002, pp. 4–5; Government of India, 2006, pp. 14–15). By linking documented TKS with these legal provisions, Nyishi communities can strengthen claims to land, forest produce, and decision-

making authority. For instance, creating People's Biodiversity Registers, as mandated under the Biological Diversity Act, can help secure intellectual property rights and guard against biopiracy.

Integration also enhances sustainability outcomes. Nyishi agricultural techniques—such as polyculture, seed selection, and soil fertility management—align closely with principles of agroecology promoted under the National Mission on Sustainable Agriculture. Incorporating these practices into state agricultural extension programmes could improve productivity without sacrificing biodiversity. In healthcare, integrating validated ethno-medicinal remedies into primary care services in rural health centres could increase accessibility while reducing dependency on costly external pharmaceuticals (Tayeng, 2020, p. 75).

Education is another critical domain for integration. Including Nyishi oral literature, agricultural cycles, and ecological knowledge in school curricula can foster cultural pride and environmental stewardship among youth. Such initiatives have been successfully piloted in other indigenous contexts, where culturally relevant teaching materials have led to improved engagement and knowledge retention (Xaxa, 2014, pp. 125–126).

However, effective documentation and integration require ethical safeguards. Knowledge holders must be active participants in the process, with clear agreements on consent, ownership, and benefit-sharing. The Nagoya Protocol on Access and Benefit-sharing provides an international framework that could guide equitable partnerships between Nyishi communities, researchers, and policymakers. Field experiences indicate that participatory approaches—where documentation is conducted by or alongside trained community members—yield more accurate records and ensure community control over how knowledge is used (Chaudhuri & Chaudhuri, 2005, p. 57).

In sum, the significance of documenting and integrating Nyishi TKS lies in its dual role as cultural heritage and practical resource for sustainability. Without such measures, the erosion of knowledge would not only diminish Nyishi cultural identity but also weaken the adaptive capacity of the region to address environmental and developmental challenges. By combining rigorous documentation with meaningful integration into governance, education, and development planning, the Nyishi can continue to shape their future on their own terms, while contributing valuable insights to broader discourses on indigenous knowledge and sustainable living.

Conclusion

The traditional knowledge systems (TKS) of the Nyishi tribe stand as a testament to the intricate relationship between culture, ecology, and sustainable living. Rooted in centuries of interaction with the forests, rivers, and hills of Arunachal Pradesh, these systems are not static remnants of a distant past, but dynamic frameworks that have adapted to changing environmental and social conditions. They encompass diverse domains—agriculture, ethno-medicine, forest management, oral traditions, and ritual practices—each contributing to the holistic well-being of the community and the ecological landscapes they inhabit (Berkes, 2012, pp. 47–49).

At their core, Nyishi knowledge systems demonstrate the viability of community-based resource management. Sustainable agricultural practices, such as polyculture and long-fallow *jhum* cycles, ensure soil fertility and biodiversity preservation, while integrated livestock rearing and seed conservation enhance resilience. Rituals and oral traditions embed ecological ethics within cultural expression, reinforcing responsible resource use and intergenerational transmission of values (Dirchi, 2017, pp. 46–48; Riba et al., 2016, pp. 192–193). Ethno-medicine, informed by centuries of empirical observation, offers affordable and locally accessible healthcare, further underlining the adaptive capacity of these systems (Mibang & Chaudhuri, 2004, p. 64).

However, as the preceding sections have shown, these systems face serious threats. Deforestation, biodiversity loss, shortened *jhum* cycles, language erosion, climate change, and market dependency all undermine the stability of TKS. The decline in Nyishi language fluency among younger generations jeopardises the oral transmission of ecological knowledge. Meanwhile, policy frameworks, although supportive in theory—such as the *Forest Rights Act* (2006) and *Biological Diversity Act* (2002)—often fall short in implementation due to bureaucratic delays, inadequate capacity building, and insufficient integration of customary practices (Government of India, 2006, pp. 14–15; Government of India, 2002, pp. 4–5).

Addressing these challenges requires a multi-pronged strategy. First, documentation must be thorough, participatory, and ethically grounded, ensuring that Nyishi knowledge holders retain control over how their knowledge is recorded and applied. Second, integration into formal education, healthcare, and agricultural extension programmes can strengthen both cultural continuity and developmental outcomes. For example, incorporating Nyishi agricultural techniques into state sustainable farming initiatives could enhance productivity without eroding

biodiversity (Tayeng, 2020, p. 75). Third, creating People's Biodiversity Registers and mapping sacred sites can secure legal recognition and protection for culturally and ecologically significant areas (Taba, 2018, pp. 91–93).

Equally important is the recognition that TKS are not relics of the past to be preserved under glass, but evolving systems capable of incorporating beneficial innovations. Just as Nyishi farmers selectively adopt modern tools that complement traditional methods, policy approaches must foster a dialogue between indigenous and scientific knowledge systems. Such hybridised strategies can address contemporary challenges—such as climate change and food security—while maintaining the cultural sovereignty of Nyishi communities (Chaudhuri & Chaudhuri, 2005, p. 57).

Safeguarding the Nyishi TKS is not simply an act of cultural preservation; it is an investment in sustainable futures. These systems offer time-tested models of environmental stewardship, social cohesion, and adaptive resilience. Their integration into development planning can contribute to achieving both national sustainability goals and international commitments, such as the United Nations Sustainable Development Goals (SDGs), particularly those related to life on land, climate action, and cultural heritage preservation. The enduring vitality of the Nyishi TKS will depend on the ability of policymakers, researchers, and community members to work collaboratively, ensuring that these rich traditions continue to thrive, adapt, and guide the way forward for generations to come.

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