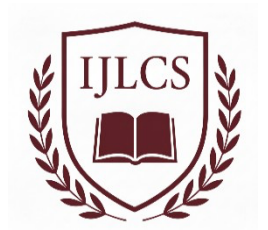


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WISDOM ROOTED IN THE WILD: AN EXPLORATORY STUDY OF TRADITIONAL ECOLOGICAL KNOWLEDGE AMONG INDIA'S TRIBES

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Abstract

India's tribal communities are custodians of one of the world's richest bodies of traditional ecological knowledge. Long before the language of the Sustainable Development Goals (SDGs) entered global policy discourse, tribal societies across the subcontinent had already built systems of resource management, agriculture, and healing that were both ecologically sound and socially embedded. Their traditions, craft economies, and community institutions continue to sustain cultural identity alongside environmental balance. Travelling from the Eastern Himalaya to the southern hill forests, this paper traces how customary rules around hunting, fishing, farming, and plant use have functioned, in practice, as conservation strategy verified here against census data, ethnobotanical research, and documented case studies rather than taken on faith. The paper argues that tribal India should not be read as a society lagging behind a modern developmental trajectory, but as one that had already internalised several of that trajectory's central goals, long before those goals acquired a name.

Keywords – Indian tribes, traditional ecological knowledge, sustainable development, biodiversity conservation, ethnomedicine, Scheduled Tribes.

I. INTRODUCTION

Human survival has always been bound to the plant world, and the diversification of human cultures has long tracked the diversification of the landscapes people came to inhabit. Distinct ecological settings gave rise to distinct ethnic groups, each carrying forward its own customs, beliefs, and modes of subsistence, refined and re-tested across generations. Securing a reliable food supply has been the central organising task of every human society, and the crops people domesticated for this purpose were themselves shaped, over centuries, by deliberate selection for yield, resilience, and taste. This slow co-evolution of people and crops has left a lasting imprint on biodiversity, and many tribal communities in India continue to farm in ways rooted in that older relationship rather than in the input-intensive methods of conventional agriculture.

As urbanisation and industrial agriculture have reshaped the human relationship with the land, food security and ecological protection have become urgent, interconnected priorities. It is against this backdrop that tribal custom becomes newly relevant: seasonal restraint, communal regulation of harvests, and reverence for particular species and groves already function as a living archive of resource conservation. Safeguarding this knowledge and ensuring it is documented and passed on

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before it is lost is the motivation behind the present study, which follows tribal ecological practice region by region, from the northeastern frontier down to the peninsula.

II. LITERATURE REVIEW

India's tribal communities, how they have been counted and governed, and what language has been used to describe them, are all shaped by a history worth understanding, since the terms themselves carry that history.

Vanvasi and Adivasi: Naming India's First People

India's tribal communities are referred to by two terms of long standing: Vanvasi (forest dweller) and Adivasi (original inhabitant). Vanvasi carries early literary resonance; the epic Ramayana describes forest-dwelling communities, most famously in the episode of Shabari, a woman of the Bhil community said to have waited years in the forest to receive Lord Rama during his period of exile. Adivasi, by contrast, foregrounds a claim to prior settlement: the term implies that every other community arrived later. Read together, the two terms point to the same underlying reality — India's tribal peoples have, since antiquity, organised their lives around forests and the natural landscape rather than apart from it. “Vanvasi” as the preferred modern term is itself a twentieth-century phenomenon, traceable to the Akhil Bharatiya Vanvasi Kalyan Ashram, a tribal welfare organisation established in 1952.¹ The word “Adivasi”, by one account, traces its underlying idea to the colonial anthropologist H.H. Risley's 1891 census, which divided Indians into Aryan and Dravidian racial categories based on measures such as skin colour and nasal index, and promoted the notion of “aadi nivasi,” casting Dravidians and non-Aryans as the original population.²

Demographic and Institutional Context

Tribal communities have been part of the Indian subcontinent since the era described in the Ramayana and the Mahabharata, and today number roughly 100 million people spread across the country's less-developed regions. The Scheduled Areas and Scheduled Tribes Commission, constituted by the President of India on 28 April 1960 under Article 339 of the Constitution, concluded in its 1961 report that these communities represent the oldest ethnological segment of the Indian population. This antiquity is borne out in the numbers. According to the 2011 Census, Scheduled Tribes (STs) number 10,42,81,034, constituting 8.6 per cent of the country's population, up from 8.2 per cent in 2001. Close to 90 per cent of this population lives in rural areas, and the decadal growth rate of the ST population between 2001 and 2011 (23.66 per cent) outpaced that of the general population (17.69 per cent), a reminder that these are expanding communities rather than vanishing ones. Madhya Pradesh (14.7 per cent), Maharashtra (10.1 per cent), and Odisha (9.2 per cent) between them account for over a third of India's ST population, while Punjab, Haryana, and

¹The Print, *Validating Aryan Invasion or Statement of Rights? A Political Remark Reignites 'Adivasi' vs 'Vanvasi' Debate* (Aug. 30, 2023), <https://theprint.in/politics/validating-aryan-invasion-or-statement-of-rights-rahul-remark-reignites-adivasi-vs-vanvasi-debate/1734956/>.

²Open Magazine, *Adivasi vs Vanvasi: Colonial Myths and the Politics of Tribal Identity in India* (Apr. 10, 2026), <https://openmagazine.com/columns/a-matter-of-pride-what-rahul-gandhi-doesnt-get-about-adivasis>.

the union territories of Chandigarh, Delhi, and Puducherry have no notified Scheduled Areas at all.³ Table 1 sets out this distribution across the states with the largest tribal populations.

State / UT	ST Population (in lakh)	% ST in State	% of India's ST Total
Madhya Pradesh	153.17	21.1	14.7
Maharashtra	105.10	9.4	10.1
Odisha	95.91	22.8	9.2
Rajasthan	92.39	13.5	8.8
Gujarat	89.17	14.8	8.5
Jharkhand	86.45	26.2	8.3
Chhattisgarh	78.23	30.6	7.5
West Bengal	52.97	5.8	5.1

Table 1. State-wise distribution of India's Scheduled Tribe population. Source: Office of the Registrar Gen., India, supra note 3.

This population is not administratively invisible. The Tribal Cooperative Marketing Development Federation of India (TRIFED) was established in August 1987 under the Multi-State Cooperative Societies Act, 1984, and operates under the Ministry of Tribal Affairs from its head office in New Delhi, supported by a network of regional offices across the country. Its mandate — institutionalising fair trade in minor forest produce and tribal handicrafts through outlets such as Tribes India — situates tribal livelihoods within the wider market economy while trying to protect the ecological base on which those livelihoods depend. Read alongside the census figures above, TRIFED's history suggests a policy apparatus that arrived relatively late to a population, and a set of practices, that had already been managing forest resources for generations.⁴

III. OBJECTIVES OF THE STUDY

With that context established, the study sets out to do three things: first, to document the cultural and ecological variety among tribal communities across India, with particular attention to the rituals and customary rules that protect flora and fauna; second, to examine how tribal agricultural and fishing practices function as informal, long-standing systems of ecological management rather than as pre-modern relics; and third, to record the medicinal uses of plants preserved and applied by tribal healers, situating these practices within the wider aims now associated with the Sustainable Development Goals.

³ Office of the Registrar Gen., India, *Scheduled Tribes in India: As Revealed in Census 2011* (2013), <https://censusindia.gov.in/census.website/>.

⁴TRIFED, *History of TRIFED*, Ministry of Tribal Affairs, Gov't of India, <https://trifed.tribal.gov.in/history-of-trifed> (last visited Sept. 6, 2026).

IV. RESEARCH METHODOLOGY

The study combines exploratory and descriptive research design. Its exploratory component draws on qualitative content analysis of published ethnographic and policy literature to build a preliminary picture of tribal ecological practice across regions. Its descriptive component cross-checks specific claims — population figures, named practices, institutional facts — against census records, peer-reviewed ethnobotanical studies, and government and news sources, so that synthesis follows verification rather than the reverse. Both strands required deliberate source selection and cross-referencing rather than reliance on any single account.

V. TRADITIONAL ECOLOGICAL KNOWLEDGE ACROSS INDIA'S TRIBAL LANDSCAPES

The United Nations' Millennium Ecosystem Assessment popularised the idea of ecosystem services: the provisioning, regulating, cultural, and supporting functions that ecosystems perform for human wellbeing. Tribal India sits at the intersection of all four categories. Forests provide food and medicine, tribal custom regulates how much is taken and when, sacred groves and rituals give ecological protection a cultural anchor, and the water and soil cycles that sustain entire regions are, in many cases, maintained by exactly the communities least credited for maintaining them. What follows traces this intersection geographically, moving from the northeastern frontier through the Central Himalaya and into peninsular and central India.

Northeast India: Taboos, Traps, and Terraces

In Arunachal Pradesh, the Adi tribe treats tigers, sparrows, and pangolins as protectors of humankind and does not hunt them; the felling of banyan trees is believed to invite famine and death. Beliefs of this kind function, in effect, as species protection without ever being framed as conservation policy. A similar logic governs the Aka tribe's relationship with Mount Vojo Phu, a peak considered sacred; restrictions on who may climb it, and when, double as a de facto protected area for the flora and fauna the mountain shelters.⁵

Fishing practices in the region show the same pattern of built-in restraint. The Wancho and Nocte tribes of the Tirap district construct barriers of bamboo, stone, coir, and branches to trap fish in streams, a communal technique known as Bheta, with the catch shared across the community rather than claimed by individuals.⁶ Further along the Siang belt, the Adi and Galo communities practise Lipum fishing: large bamboo baskets lined with seaweed are lowered to stream beds, where the seaweed draws in small insects that in turn attract fish. Catches are inspected by hand, and juvenile fish are returned to the water. Because the technique is used mainly in winter, it steers clear of the breeding season altogether, keeping fish populations stable while still meeting local food needs.⁷

The most studied example from the region, however, is agricultural. The Apatani of the Ziro valley have practised a form of permanent wet-rice cultivation for roughly five centuries, carried out

⁵L. R.B., *3 Lessons from Indian Tribes on Ecosystem Conservation*, Earth.Org (Aug. 9, 2022), <https://earth.org/indian-tribes-ecosystem-conservation/>

⁶Id.

⁷Id.

entirely without draught animals or machinery.⁸ Fields are levelled into terraces fed by canals linking hill streams to the valley floor, so that nutrient run-off from higher ground continually replenishes the soil; rice bran, animal waste, and burnt straw are recycled back into the fields, and the same waterlogged plots are used to raise fish alongside as many as sixteen traditional varieties of rice.⁹ Closely bound up with this farming system is Dapo, a social-restriction mechanism administered by the traditional village council, or Builyang, which sets and enforces rules on hunting and the extraction of forest resources, including protections for the orange-bellied Himalayan squirrel, a species valued for both ceremony and medicine, with penalties attached to violation.¹⁰ Taken together, the Apatani case is often held up, including in UNESCO's own tentative World Heritage listing for the valley, as one of the more fully worked-out examples of indigenous sustainable agriculture anywhere in India.

The Central Himalaya: Grazing With the Seasons

Moving south and west into the Central Himalaya, the Bhotia communities of present-day Uttarakhand combine transhumant pastoralism with careful, seasonal collection of medicinal plants gathered while grazing livestock in high alpine pastures.¹¹ Herbs are harvested only once judged sufficiently mature, a safeguard against overharvesting documented across research on the Bhotiya of the Niti and Johar valleys.¹² In summer, tribe members cultivate barley and buckwheat in the higher valleys; once these crops are brought in, cattle and sheep are allowed onto the same land to graze, after which the valleys are prepared again for the next planting cycle. This annual rotation of farming and grazing lets the same land — transhumance pasture and cropland alike — be used repeatedly without being exhausted, a pattern of resource rotation that modern rotational grazing systems have only more recently formalised in principle.

Southern and Central India: Mixed Fields and Sacred Groves

In Tamil Nadu, the Kadar tribe harvests only the mature stems of a plant, replanting cuttings to renew future yields, while the Irula, Muthuva, and Malayali communities practise mixed cropping — several crop varieties grown together in the same plot. Because different crops draw differently on soil nutrients and water, this spreads the ecological load across species rather than concentrating it, and helps limit soil erosion in the process.¹³

⁸ *A Thousand Words: Dive into the World of Ziro Valley's Apatani Tribe*, Down To Earth (2024), <https://www.downtoearth.org.in/forests/a-thousand-words-dive-into-the-happy-obscure-world-of-ziro-valleys-apatani-tribe>.

⁹ C.P. Kala, M. Dollo, N.A. Farooque & D.C. Choudhury, *Land-Use Management and Wet-Rice Cultivation (Jebi Aji) by the Apatani People in Arunachal Pradesh, India*, 37 Outlook on Agric. 247, 247 (2017) <https://doi.org/10.5367/000000008784648906>.

¹⁰ P. Chaudhry, M. Dollo, K. Bagra & B. Yakang, *Traditional Biodiversity Conservation and Natural Resource Management System of Some Tribes of Arunachal Pradesh, India*, 18 Int'l J. Sustainable Dev. & World Ecology 270, 270 (2011); R.B., *supra* note 5. DOI: [10.1504/IER.2011.043342](https://doi.org/10.1504/IER.2011.043342).

¹¹ Mitra Rawat, D. (n.d.) *Practice of Transhumance among the Bhotiyas of Central Himalaya – A Case Study*. Academia.edu. Available at: https://www.academia.edu/7271222/Practice_of_Transhumance_among_the_Bhotiyas_of_Central_Himalaya_A_Case_Study.

¹² R.B., *supra* note 5.

¹³ R.B., *supra* note 5.

Central India offers two further examples of the same underlying logic. The Gond, Pradhan, and Baiga communities of Madhya Pradesh practise utera farming, sowing the next crop's seeds directly into standing paddy fields before the main harvest to make use of residual soil moisture before the land dries out, alongside a Badi system in which trees and fruit-bearing crops are planted along field boundaries to buffer against drought and heavy rain while limiting erosion; retained roots and stumps, mulching, and controlled burning of residue all help sustain soil fertility over time.¹⁴ The utera system in particular has travelled beyond tribal fields into formal agricultural science: the Indian Council of Agricultural Research tested it under its National Agricultural Technology Project in 1999, an unusually direct instance of state research building on, rather than replacing, tribal method.¹⁵

Sacred groves recur across this region as a third, distinct conservation mechanism: patches of forest deliberately left undisturbed because they are held to house local deities. In the Sirohi district of Rajasthan, the Garasia tribe holds detailed knowledge of ethnomedicinal plants, several of which appear on the IUCN Red List of Threatened Species, and has set aside grove land to protect them.¹⁶ Comparable groves, documented in the Dindori, Balaghat, and Mandala districts of Madhya Pradesh and in Kawardha and Bilaspur in Chhattisgarh, reflect the same underlying belief that particular trees and plants are the dwelling places of gods and goddesses, a belief that has, in effect, kept these small forest patches out of cultivation and largely intact.¹⁷ Table 2 lists a sample of the plants associated with these groves.

Local Name	Scientific Name	Family	Recorded Significance
Aam	Mangifera indica	Anacardiaceae	Sacred / revered tree
Arjun	Terminalia arjuna	Combretaceae	Sacred / revered tree
Bilva	Aegle marmelos	Rutaceae	Sacred / medicinal
Nimba	Azadirachta indica	Meliaceae	Sacred / medicinal
Basil (Tulsi)	Ocimum sanctum	Lamiaceae	Sacred / medicinal
Karavira	Nerium indicum	Apocynaceae	Sacred / ritual use

Table 2. Plants conserved within tribal sacred groves. Source: R.R. Nath¹⁸

Elsewhere in central and southern India, the same instinct extends to the protection of animals rather than plants. Soliga communities in Karnataka, for instance, harvest wild honeycombs while deliberately leaving a portion on the forest floor for bear and tiger cubs, and set small, controlled

¹⁴R.B., *supra* note 5; P.G. Khatoon, *Traditional Practices of Tribal Communities Assist in Environment Conservation*, 2 Hans Shodh Sudha 21, 21–30 (2022), <https://www.hansshodhsudha.com/volume2-issue4/Manuscript%203.pdf>

¹⁵R.B., *supra* note 5.

¹⁶R.B., *supra* note 5.

¹⁷Khatoon, *supra* note 14.

¹⁸R.R. Nath, *The Role of Ethnic and Tribal People of India and Their Culture in the Conservation of Biodiversity*, Food & Agric. Org. of the U.N. (2003), <https://www.fao.org/4/XII/0186-A1.htm> ; Khatoon, *supra* note 14.

fires to check invasive plant growth before it can choke out native forest cover, a practice credited with helping the Soliga secure continued legal residence within a tiger reserve. Similarly, the Chenchu, Baiga, and Mising tribes regard the tiger as a companion species rather than a threat, and tiger numbers in areas where these communities remain settled have, if anything, held up better than in areas from which tribal residents were removed. Cumulatively, these cases suggest that tribal presence in a forest is frequently a condition of that forest's health, not an obstacle to it.

Tribal Ethnomedicine: Plants as Living Pharmacies

Running alongside these systems of land and animal management is an equally old tradition of plant-based medicine. Plants have been used to treat illness since the earliest human societies, and this practice forms much of the empirical foundation of Ayurveda. Within tribal communities specifically, traditional healers act as custodians of both medicinal and ecological knowledge, occupying a role that blends the functions of doctor, botanist, and archivist.¹⁹ The Tangkhul of Ukhrul district, Manipur, rely heavily on spice-producing plants for treatment;²⁰ communities near the Kakrajhore forest in West Medinipur, West Bengal, use species such as *Smilax ovalifolia*, *Emblica officinalis*, and *Asparagus racemosus*;²¹ and the Kani of Kerala's Thodu hills use *Plumbago zeylanica* and *Ocimum tenuiflorum* as first-aid remedies for cough, fever, and bites.²² In the Churah subdivision of Chamba district, Himachal Pradesh, 78 distinct plant species have been documented in use against cutaneous, respiratory, and digestive ailments;²³ while in Anuppur, Madhya Pradesh, a belief that forests are the dwelling place of the divine has directly supported the preservation of natural forest cover.²⁴

Beyond internal medicine, tribal herbal healers use rhizomes of *Acorus calamus* and *Moringa oleifera*, among other species, as antidotes for snakebite and scorpion sting, while pastes made from powdered roots, stems, and leaves — including *Vanda tessellata*, *Alternanthera sessilis*, and *Cassia* species — are used to bandage and set fractures over ten- to fifteen-day treatment periods.²⁵ Food and medicine overlap here as much as medicine and ecology do: many of the same forest and field plants that heal also feed. Table 3 lists a sample of species documented as sources of food among tribal communities.

Scientific Name	Local Name	Part Used
Aegle marmelos	Bel	Fruit

¹⁹Hariwal, M., Verma, S., Shah, P., Patel, P. and Kumar, S. (2024) 'Some Potential Traditional Ethnomedicinal Plants Among the Tribals of India', in Kumar Srivastava, A., Ahirwar, R.K., Yadav, D. and Kumar, D.G. (eds.) *Ethnomedicinal Plants for Drug Discovery*. Singapore: Springer, pp. 27–53. Available at: https://doi.org/10.1007/978-981-97-3405-4_2.

²⁰S. Salam & N.S. Jamir, *Common Spices Plant Used as Medicine by the Tangkhul Tribe of Ukhrul District, Manipur, India*, 6 Int'l J. Sci. & Rsch. Publ'ns (2016), <https://www.ijsrp.org/research-paper-0716/ijsrp-p5504.pdf>.

²¹S. Biswas, R. Shaw, S. Bala & A. Mazumdar, *Inventorization of Some Ayurvedic Plants and Their Ethnomedicinal Use in Kakrajhore Forest Area of West Bengal* (2017), <https://agris.fao.org/search/es/records/65decabc47c7033e84bebe5ed>.

²²T.F. Xavier, M. Kannan, L. Lija, A. Auxillia, A.K.F. Rose & S. Senthil Kumar, *Ethnobotanical Study of Kani Tribes in Thoduhills of Kerala, South India*, 152 J. Ethnopharmacology 78, 78 (2014).

²³D. Rana et al., *Ethnomedicinal Plants Used by Local Inhabitants of Churah Subdivision, Chamba, Himachal Pradesh*, Env't, Dev. & Sustainability (2021), <https://doi.org/10.1007/s10668-020-00617-0>.

²⁴R. Ahirwar, *Forest Conservation Among the Tribal People of Anuppur, Madhya Pradesh* (2015), as cited in Khatoon, *supra* note 14.

²⁵Khatoon, *supra* note 14; Nath, *supra* note 18.

Amorphophallus paeoniifolius	Suran	Petiole / bulb
Achyranthes aspera	Chirchita	Tender shoots
Bauhinia purpurea	Keolar bhaji	Leaves, flowers, seeds
Dioscorea alata	Dudhia aru	Tubers
Curculigo orchioides	Kali musli	Roots and tubers

Table 3. Plants conserved by tribal communities for food. Source: Nath, *supra* note 18.²⁶

A Case of Anticipatory Knowledge: The Jarawa and the 2004 Tsunami

If the practices above show tribal knowledge functioning as slow, generational conservation, the clearest demonstration of that knowledge functioning as urgent, real-time protection comes from the Andaman Islands. When the Indian Ocean tsunami of 26 December 2004 struck the Andaman and Nicobar archipelago, members of the Jarawa tribe were reported to have moved to higher ground before the waves arrived, and all members of the tribe were later confirmed safe.²⁷ Government officials and anthropologists attributed this outcome to inherited knowledge of natural warning signs — the recession of the sea, the silence of birds, the movement of other animals — passed down across generations rather than to any modern early-warning system.²⁸ The pattern held across the archipelago's indigenous communities more broadly: while the more assimilated Nicobarese population suffered heavy casualties, the Great Andamanese, Onge, Jarawa, Sentinelese, and Shompen — all considerably less integrated into the mainland economy — reportedly survived with no recorded loss of life.²⁹ The episode is frequently cited as evidence that traditional ecological knowledge can, under the right conditions, outperform formal disaster infrastructure; it is best read, however, as one well-documented case rather than a general guarantee that could be extended uncritically to every tribal community or every disaster.

VI. TRIBAL CONSERVATION OF PLANT BIODIVERSITY IN INDIA

The data presented above demonstrate that tribal communities conserve biodiversity not merely for subsistence but through an integrated ecological knowledge system that combines food security, healthcare, spirituality, and environmental stewardship. Sacred groves function as in-situ biodiversity conservation sites where culturally significant species are protected from exploitation. The species preserved by tribal communities reveal that conservation practices are closely linked with everyday livelihood requirements and traditional belief systems.

²⁶Nath, *supra* note 18.

²⁷*Ancient Tribe Survives Tsunami*, CBS News (Jan. 6, 2005), <https://www.cbsnews.com/news/ancient-tribe-survives-tsunami/>; Mariana Budjeryn, *And Then Came the Tsunami: Disaster Brings Attention and New Challenges to Asia's Indigenous Peoples*, Cultural Survival Q. (May 7, 2010), <https://www.culturalsurvival.org/publications/cultural-survival-quarterly/and-then-came-tsunami-disaster-brings-attention-and-new>.

²⁸*Id.*

²⁹*Id.*

The sacred grove data indicate that nearly all the documented plant species possess medicinal value, highlighting the intimate relationship between forest ecosystems and indigenous healthcare. Species such as *Rauvolfia serpentina*, *Boswellia serrata*, *Alstonia scholaris*, and *Helicteres isora* have recognized medicinal applications, while species like *Butea monosperma* and *Cordia dichotoma* provide additional economic benefits through dyes and edible fruits. The presence of bamboo further demonstrates the multiple ecological and livelihood functions of sacred groves.

Similarly, the edible plant inventory illustrates that tribal food systems depend extensively on wild biodiversity. Rather than relying exclusively on cultivated crops, communities utilise leaves, fruits, bulbs, roots, tubers, petioles, and seeds from naturally occurring species. Such diversity contributes to nutritional security, dietary resilience during periods of food scarcity, and preservation of indigenous crop knowledge. Species including *Aegle marmelos*, *Amorphophallus paeoniifolius*, *Dioscorea alata*, *Curculigo orchiodes*, and *Dioscorea bulbifera* demonstrate how forests function as supplementary food reserves.

The cultural dimension of biodiversity conservation is equally significant. Tribal societies regard many plant species as sacred abodes of deities, resulting in their protection through customary norms rather than statutory regulations. Plants such as Tulsi (*Ocimum sanctum*), Bilva (*Aegle marmelos*), Neem (*Azadirachta indica*), Lotus (*Nelumbo nucifera*), and Mango (*Mangifera indica*) are preserved because of their association with Hindu gods and goddesses. Such religious beliefs establish community-based conservation mechanisms that effectively safeguard biodiversity without formal institutional intervention.

Table 4. Functional Classification of Conserved Plant Species

Conservation Function	Examples of Species	Primary Purpose	Approx. Share in Tables
Medicinal	<i>Rauvolfia serpentina</i> , <i>Boswellia serrata</i> , <i>Alstonia scholaris</i> , <i>Helicteres isora</i>	Treatment of diseases	Highest (≈80–90%)
Food & Nutrition	<i>Aegle marmelos</i> , <i>Dioscorea alata</i> , <i>Curculigo orchiodes</i> , <i>Amorphophallus paeoniifolius</i>	Fruits, roots, tubers, bulbs, leaves	High
Religious & Cultural	Tulsi, Bilva, Neem, Lotus, Mango	Worship and sacred conservation	High
Economic/Utility	Bamboo, <i>Butea monosperma</i> , <i>Cordia dichotoma</i>	Dye, bamboo products, edible fruits	Moderate

Source: Nath, *supra* note 18.³⁰

³⁰Nath, *supra* note 18.

Traditional ecological knowledge further extends to healthcare practices. Tribal herbal healers conserve medicinal plants used in treating snake bites, scorpion stings, fractures, wounds, fever, oedema, skin diseases, and women's health disorders. Species including *Acorus calamus*, *Bombax ceiba*, *Achyranthes aspera*, *Bauhinia purpurea*, *Curculigo orchoides*, and *Albizia lebbeck* demonstrate the depth of indigenous pharmacological knowledge developed over generations. These practices represent valuable ethnobotanical resources with significant potential for modern medicinal research.

Table 5. Plant Parts Utilized by Tribal Communities

Plant Part Used	Examples	Major Purpose
Fruits	Bael, Mango	Nutrition
Leaves	Bauhinia, Sehar	Vegetables, medicine
Seeds	Xylia, Entada	Food
Bulbs	Suran	Vegetable
Tubers	Dioscorea spp., Curculigo	Food security
Roots	Curculigo, Acorus	Medicine
Rhizomes	Acorus calamus	Snake bite, scorpion sting
Stem/Bark	Boswellia, Bamboo	Medicine, utility

Source: Nath, *supra* note 18.³¹

Table 6. Ecosystem Services Provided by Conserved Plants

Ecosystem Service	Contribution
Biodiversity conservation	Protection of native flora through sacred groves
Food security	Supplementary nutrition from wild edible plants
Healthcare	Indigenous medicinal treatments
Cultural heritage	Conservation through religious beliefs
Livelihood support	Bamboo, dye plants, edible fruits
Climate resilience	Maintenance of forest ecosystems and ecological balance

Source: Nath, *supra* note 18.³²

³¹Nath, *supra* note 18.

³²Nath, *supra* note 18.

Overall, the evidence illustrates that tribal conservation is multidimensional, simultaneously supporting biodiversity protection, food security, public health, cultural identity, and sustainable resource management. The conservation ethic is embedded within customary practices and religious traditions rather than being driven solely by external environmental policies.

Observation	Analysis
Medicinal plants dominate	Approximately three-fourths of the documented species possess medicinal value, indicating that healthcare is the principal motivation behind tribal conservation.
Food diversity	Tribal communities utilise multiple plant parts (fruits, bulbs, roots, tubers, leaves, and seeds), reducing dependence on cultivated crops and strengthening food security.
Religious institutions support conservation	Sacred beliefs protect ecologically valuable species without formal legal enforcement, demonstrating an effective indigenous conservation mechanism.
Traditional healthcare	Ethnobotanical knowledge enables treatment of snake bites, fractures, fever, skin diseases, and women's health conditions through locally available medicinal plants.
Sustainable Development Goals (SDGs)	These practices contribute directly to SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), SDG 13 (Climate Action), and SDG 15 (Life on Land).

Source: Nath, *supra* note 18.³³

VII. CONCLUSION

Tribal communities in India have long demonstrated that biodiversity conservation is not merely an environmental practice but an integral component of their cultural identity, livelihood systems, and worldview. Their dependence on forests, marginal agricultural lands, and natural ecosystems has given rise to sophisticated indigenous knowledge systems that regulate resource use through customary institutions, ecological ethics, and spiritual beliefs. Practices such as the *Dapo* system of the Apatani, transhumance among the Bhotia, mixed cropping in southern India, *utera* and *Badi* farming in central India, and the preservation of sacred groves exemplify sustainable resource management that has evolved through centuries of observation and adaptation. These practices have ensured ecological resilience while simultaneously supporting food security, healthcare, and cultural continuity.

Importantly, tribal conservation is founded not on exclusionary policies but on the principle of coexistence with nature. Sacred groves, ethnomedicinal knowledge, traditional farming systems, and community-managed forests illustrate that conservation is embedded within social norms and religious values rather than imposed through external regulation. While certain indigenous practices, such as *utera* farming, have been recognised and incorporated into formal agricultural policy, a

³³Nath, *supra* note 18.

substantial body of tribal ecological knowledge remains undocumented and vulnerable to erosion due to urbanisation, socio-economic transformation, and the declining transmission of oral traditions across generations.

The findings underscore that India's biodiversity has been preserved not only through statutory conservation measures but also through the sustained stewardship of tribal communities. Contemporary environmental challenges — including climate change, habitat degradation, biodiversity loss, and unsustainable resource exploitation — necessitate a paradigm shift in conservation policy. Rather than treating indigenous knowledge as supplementary to scientific approaches, it should be recognised as an equally valuable knowledge system capable of informing biodiversity governance, climate adaptation, ecosystem restoration, and sustainable development. Conservation strategies must therefore integrate in situ and ex situ approaches with community participation, secure land and forest rights, and meaningful recognition of tribal communities as custodians, knowledge holders, and equal partners in environmental governance.

The experience of the Jarawa community during the 2004 Indian Ocean tsunami offers a compelling illustration of the value of indigenous ecological knowledge. Their ability to interpret environmental cues and respond effectively to natural hazards demonstrates that traditional knowledge systems embody generations of empirical understanding of ecosystems. Such examples challenge conventional assumptions about development and reveal that many tribal societies have practised principles now associated with sustainability, resilience, and ecosystem-based adaptation long before these concepts were articulated in international policy frameworks. Preserving and integrating this knowledge is therefore not only essential for safeguarding India's biological and cultural diversity but also for advancing inclusive, resilient, and sustainable models of environmental governance in the twenty-first century.