



XV WORLD FORESTRY CONGRESS

Building a Green, Healthy and Resilient Future with Forests

2–6 May 2022 | Coex, Seoul, Republic of Korea

Use of Traditional Knowledge in Sustainable Forest Management and Provisioning of Ecosystem Services in Jharkhand, India

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Abstract

Before Scientific knowledge on forest management, local and indigenous communities living in and around forests managed forest and associated landscapes managed forests in such a way which conserved forests and ecosystem, sustained their livelihood and culture. The tribals and other rural people residing in and around forest areas of Jharkhand, an eastern state of India, have their own traditional knowledge (TK) which they acquired by experience during sustainable use of natural resources. Hence such knowledge has the potential value for sustainable forest management, biodiversity conservation and provisioning of Ecosystem services. Traditional Knowledge encompasses a profound belief system associated with ecosystem, livelihoods, ethno medicinal practices, use of natural resources etc. and pass from generation to generation through legends, folk stories, folk songs etc. A study was carried out to know trajectories of SFM development and the role of the TK for SFM in Jharkhand, India. The study reflects that these TK are associated with practices like conservation through Sacred Grove, celebrating festivals based on the nature, taboos, social belief and various other practices which have been helpful in SFM. But in the contemporary globalization and commercialization, there is risk of erosion of such TK. Hence their documentation is necessary. Documentation of data related to traditional use of medicinal plants and other NTFPs like Lac, Silk, and Bamboo etc. for livelihood were done involving three major steps. These are – identification of medicinal plants and other NTFPs used for livelihood and other purposes, documentation of traditional uses and traditional knowledge associated with these NTFPs, and finally exploring how TK and scientific knowledge can be harmonized for SFM. Government policy in India and Jharkhand in this regard has brought about radical changes. With the adoption of Resolution related to Joint Forest Management, enactment of Forest Right Act 2006, and implementing Forest Working plan Code 2014 by Government, there has been a perceptible change in approach towards assimilation of TK in SFM. The paper also presents how such knowledge and practices can be helpful in provisioning of ecosystem services.

Keywords: Ecosystem services, Jharkhand, SFM, TK

Introduction

Forests in India are prone to a complexity of biotic and abiotic problems which have created threat to endemic species, yielded fragmented forest ecosystem, low or no regeneration, high grazing pressure, accidental forest fires, and unauthorized collection of wood and non-wood forest produce. Such problems make Sustainable forest management a difficult task for foresters. In wake of aforesaid facts and circumstances, the concept of SFM has been conceptualized to conserve forests and create avenues of sustenance and livelihood to the people living in and around forests. During the Earth summit (1992) at Rio, the concept of sustainability of forests got highlighted and experts adopted the first global policy on Sustainable forest management. Sustainable development is defined as the needs of the present without compromising the ability of future generations to meet their own needs

Traditional Knowledge

For centuries indigenous people have been living in and around forests in a substantial way which rendered them profound knowledge of sustainable management of natural resources. This knowledge, which resulted from indigenous techniques and practices, cascade orally from generation to generation and called as traditional knowledge (TK). These are packaged in stories, folk songs, paintings, dances, ballads etc. Traditional environmental knowledge is a body of knowledge and beliefs transmitted through oral tradition and first-hand observation. It includes a system of classification, a set of empirical observations about the local environment and a system of self- management that governs resource use. Ecological aspects are closely tied to social and spiritual aspects of the knowledge system. With its roots firmly in the past, TEK is both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technological and socio-economic changes of the present. (Dene Cultural Institute 1995, cited in Stevenson 1996)

In recent years, apart from its historical perspectives and cultural values, traditional knowledge has been in prominence due to realization of its importance in Sustainable Forest Management, achieving Sustainable Development Goals (SDGs), biodiversity conservation and potential role in research, biotechnology and pharmaceutical applications.

Traditional Forest Related Knowledge has been defined by Fikret Berkes as “ a cumulative body of knowledge , practice and belief handed down through generations by cultural transmission and evolving by adaptive processes , about the relationship between living beings (including human beings) with one another and with their forest environment”. This definition has been adopted by the UN Forum of Forests 2004.

Convention on Biodiversity Article 8(j) defines traditional knowledge as- “the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklores, proverbs, cultural values, beliefs, rituals, community laws, local language and agricultural practices including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture and forestry.” The potential of TK to SFM and biological conservation can be described through their totem, taboos, social belief and culture.

Jharkhand is home of ancient wisdom which had been transmitted from generation to generation. Forests have been the lifeline of people living here. Due to globalization, commercialisation, scientific dilemma, acculturation in the society, loss of traditional and cultural systems and lack of interest in young generation there has been decline in the practice of such traditional knowledge. Some of such TK are on the verge of being lost for ever. But it is a fact that a large percentage of

rural communities still rely upon local knowledge system to meet their day to day demands. Hence their documentation is necessary for the posterity.

Ecosystem services

Ecosystem services are the multitude of benefits accruing from the forests and nature for the benefit of the society (Costanza et.al., 1997; Farley and Costanza 2010). Ecosystem provides for types of services –(1)Provisioning Service : These are products people get from ecosystems for e.g. supply of food, water, fibre, natural medicines, wood and fuels.(2)Regulating Services : These are the benefits obtained from the regulation of ecosystem processes e.g. the regulation of air quality , climate regulation, soil erosion control, control of floods or crop pollination.(3)Supporting Services: These are necessary for the production of all other ecosystem services e.g. soil formation and retention, provisioning of habitat, diversity of species, nutrient cycling, production of oxygen and maintaining genetic diversity.(4)Cultural Services : These are non-material benefits people gain from ecosystems, for e.g. aesthetic and engineering inspiration, knowledge system, cultural heritage values and spiritual well-being (MEA,2005)

Sustainable Forest Management

Sustainable forest management (SFM) is defined as a “dynamic and evolving concept, which aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations” (proposed by ITTO,1992; Brundtland Commission 1987). Forests and trees, when sustainably managed, make vital contributions to people living in and around forests enhancing their livelihoods and providing ecosystem services to them and rest of the society. With the paradigm shift in the forest management there is emphasis on management of NTFPs.

Materials and methods

The study was conducted in Dhanbad, East Singhbhum (Jamshedpur) Saraikela, Simdega, Gumla, West Singhbhum (Chaibasa), Ranchi, Khunti, Hazaribagh, Jamtara, Deoghar districts of Jharkhand. The data and information presented in this paper have been collected after discussion with local people and members of Village Forest Protection Committees. These have also been verified through consultation with other literature.

Jharkhand

Jharkhand, an eastern state of India, was carved out of the southern part of Bihar State on 15 November 2000. Jharkhand shares its border with the states of Bihar to the north, and Chhattisgarh to the west, Orissa to the south, and West Bengal to the east. It has an area of 79,714 km² Or 30,778 sq. mi (79,710 km²). The name "Jharkhand" means "The Land of Forests". Jharkhand accounts for 3.4% of the total forest cover of the country and ranks 10th among all states. The recorded forest area of the state is 23,605 sq. km which is 29.61 % of the geographical area of the state. As per Champion and Seth (1968) Classification for Forests, the state has five forest types viz.Moist Peninsular Low Level Sal-3C/C2e (ii), Dry Peninsular Sal-5B/C1c, Northern Dry Mixed Deciduous Forest-5B/C2, Dry Deciduous Scrub-5/DS1, Dry Bamboo Brakes- 5/E9. These belong to two major forest type groups viz. Tropical Moist Deciduous-Group -3 and Tropical Dry Deciduous Forests-Group -5. The Forest Types of India: Revisited (2013) by ICFRE, Dehradun has revised them as Moist Peninsular Sal-III/IIID, Dry Mixed Deciduous Forests-V/VC, Dry Sal Bearing Forests-V/VD and Dry

Grasslands- V/VE. The important sps. which constitute the forests are-Sal, Teak, Mahua, Asan, Dhaura, Gamhar, Kusum, Palas, Arjun, Chiraunji etc. The richness of flora of Jharkhand (erstwhile Bihar) was described by H. H. Haines in his book titled The Botany of Bihar and Orissa (Haines 1921-1925) and the book A Forest Flora of Chotanagpur (Haines 1908). Working Plans of Forest Divisions are also valuable sources of information about flora of that area. Some excellent publication on ethnobotanical aspect of Jharkhand (or Erstwhile Bihar) appeared during last few decades are Boddington 1925, Das 1996, Goel 1997, Gupta 1974, Haines 1925, Hembrom 1991, Jain 91, Jain and Tarafder 1970, Pal and Srivastava 1976, Srivastava and Varma 1981, 1987, Sanjeev 2005, 2014, 2015.

Jharkhand has 32 tribal groups. These are the Asur, Baiga, Banjara, Bathudi, Bedia, Binjhia, Birhor, Birjia, Chero, Chick-Baraik, Gond, Gorait, Ho, Karmali, Kharia, Kharwar, Khond, Kisan, Kora, Korwa, Lohra, Mahli, Mal-Paharia, Munda, Oraon, Parhaiya, Santal, Sauria-Paharia, Savar, Bhumij, Kol and Kanwar. These people not only obtain all the resources necessary for their survival from their surrounding forests but also have a sacred cultural tie to these forests. Their traditional knowledge play significant role in conservation effort.

Results and discussion

Jharkhand is home of ancient wisdom which had been transmitted from generation to generation. Forests have been the lifeline of people living here. Due to globalization, commercialisation, scientific dilemma, acculturation in the society, loss of traditional and cultural systems and lack of interest in young generation there has been decline in the practice of such traditional knowledge. Some of such TK are on the verge of being lost for ever. But it is a fact that a large percentage of rural communities still rely upon local knowledge system to meet their day to day demands. Hence their documentation is necessary for the posterity. The potential of TK to SFM and biological conservation can be described through their totem, taboos, social belief and culture. These can be summarised in table -1.

Table-1: Some Elements of TK

Elements of TK	Examples
Festival and culture	Plants are used in festivals and other religious and cultural occasions.
Taboo	Cutting certain plants in common and prohibiting felling of trees near water reservoir
Totem	Wild animals and plants
Conservation	Sacred groves
Common belief	Practice shifting cultivation in sustainable manner and leave forests to recuperate fertility

Tribes of the region regard that *Ficus religiosa* L, *Ficus racemosa* L, *Ficus bengalensis* L, *Shorea robusta* Gaertn. , *Syzygium cuminii* (L.) Skeels, *Terminalia sps etc.* should not be felled. This system has a protective effect on the trees. They even use flowers of tree *Shorea robusta* (Sal) only after their worship in the festival -Sarhul.

In Jharkhand every tribal group has totems. Many plant and wildlife species are regarded as totems. Totem animals and plants vary from tribe to tribe and clans. These include Garwa (Stork), Lakra (Tiger), Bara (Ficus), Rori (Mallotus) etc. As a general rule, a tribal abstain from killing, cutting or destroying the plants or animals of his totem.

Sacred groves are pieces of forests conserved for religious purposes. These have rich floristic composition. Their size may be from a few square meters to several hectares. They use plants during their festival eg. Twigs and flowers of *Shorea robusta* in festival Sarhul; flowers and twigs of tree *Adina cordifolia* during the festival Karma; flowers and twigs of tree *Butea monosperma* during festival Magh Parab ; branch of *Semecarpus anacardium* during the festival Hira Bonga etc. *CHHATH Festival* is celebrated during harvesting season of October-November where God Sun is worshipped.

These TK has helped in forest management on sustainable basis. The forests are the source of NTFP. The study reveals many types of NTFPs which are found in the forests of Jharkhand. Traditional Knowledge has contributed a lot their regeneration and conservation. These NTFPs are excellent source of Ecosystem services. These are used in various ways by the local people using their Traditional Knowledge (TK). Their documentation and inventarization have been done. Accordingly they have been grouped in –

1. Edible Products,
2. Grasses,
3. Mats, Ropes and Baskets,
4. Medicinal Plants,
5. Oil Seeds,
6. Tans and Dyes
7. Fodder Trees,
8. Gums and Resins
9. Fibres,
10. Animal Products,
11. Religious & Cultural Items,
12. Colours and Minerals.

These are described as below:

Edible Plants

Among the basic requirements of humans, food is the most important one. Wild edible plants occupy an important place in the dietary of tribes of Jharkhand. Leaves, stems, inflorescence, roots, tubers or entire plants, depending upon the species, are consumed by these people. Collection and consumption of these plants depend upon the season of their maturity or period of flowering. Fruits, roots, bulbs of wild plants eg. *Alocasia macrorrhiza* (L.)Schott., *Amaranthus spinosus* L., *Anacardium occidentale* L., *Annona reticulata* L, *Artocarpus heterophyllus* Lamk., *Artocarpus lakoocha* Roxb., *Boerhavia diffusa* L., *Ficus bengalensis* L., *F. religiosa* L., *Ficus racemosa* L., *Buchanania lanzan* Spr., *Carissa carandas* L., *Dioscorea alata* L., *Dioscorea belophylla* Voigt., *D. pentaphylla* L., *Diospyros melanoxylon* Roxb., *Madhuca longifolia* (Koen.)Mac.Br., *Pueraria tuberosa*, *Schleichera oleosa* (Lour.)Oken, *Tamarindus indica* L. etc. are used.

Medicinal Plants

The use of folk medicines is attributed to their (people) decade long experience and faith in the herbal treatment. Among the plant parts, leaves, shoots, fruits, bark, flowers, rhizomes, roots, tubers, seeds and bulbs are commonly used. These are used as fresh plants as a whole, powder, extract, juice, paste or decoction and taken with water, milk, ghee, candy or honey. People use medicinal plants for the treatment of various ailments on the basis of traditional knowledge

passed to them intergenerational. These are readily available and cheaper also. Some important species which are used as medicinal plants are- *Abelmoschus moschatus* L., *Abrus precatorius* L., *Acorus calamus* L., *Justicia adhatoda* L., *Allemanda cathartica* L., *Asparagus racemosus* Willd, *Bacopa monniera* (L.), *Bryonia palmata* L., *Catunaregam nutans* (DC) Tiruv, *Centella asiatica* (L.)Urban. , *Curculigo orchioides* Gaertn., *Gloriosa superba* L., *Hemidesmus indicus* R.Br., *Litsea monopetala* (Roxb.) Pers. , *Pureria tuberosa* DC., *Rauwolfia serpentina* Benth.ex Kurtz., *Saraca asoca*(Roxb.)De Wilde, *Semecarpus anacardium* Linn.f., *Sphaeranthus indicus* L., *Sterculia urens* Roxb. , *Terminalia balerica* Roxb., *Terminalia chebula* Retz., *Terminalia tomentosa* Bedd. etc. People collect plants based on traditional knowledge. Medicinal plants are used not only by local practitioners as household remedy but through local markets these reach bigger places and are used as raw material for various pharmaceutical industries.

Products from Insect Origin

The most important tangible benefits from insect's origin are- Lac Cultivation, Silk rearing and honey collection.

Lac Cultivation - Lac is a resinous protective secretion of tiny lac insect, *Kerria lacca* (Kerr.) which belongs to the family Tachardidae in the super family Coccoidea of the order Hemiptera. It is a biodegradable, non-toxic and odourless secretion. The tiny red-coloured larvae of lac insects settle on the young succulent shoots of the host plants and secrete a resinous fluid which covers their bodies. Some important host plants are - *Acacia auriculiformis* A.Cunn., *Butea monosperma* (Lam.) Taub., *Schleichera oleosa* (Lour.) Oken etc. The secretion from the insects forms a hard encrustation over the shoots which are harvested and scraped off. These are then dried and processed to yield the lac of commerce. This is a source of income to the rural people with a low investment. They have been doing this cultivation from time immemorial. The scrapped lac are then processed and used in production of Varnishes, Printing ink, Fireworks , Decorative items, Confectionery, Electrical appliances etc.

Silk Rearing (Sericulture) - Sericulture is an important source of livelihood to the rural areas. Jharkhand generally produces Tassar silk. But in some pockets e.g. Gumla district, mulberry silk is also reared. Tassar Silk is produced by *Antheraea mylitta*. The main host plants are *Terminalia tomentosa*, *Terminalia arjuna*, *Shorea robusta*, *Lagerstroemia parviflora*.

Plants Used For Making Rope, Mats

During survey, it was found that these people use plant parts for making ropes and mats eg. *Agave americana* L., *Bauhinia vahlii* (Wt. & Arn.)Benth., *Butea monosperma* (Lam.) Taub., *Dendrocalamus strictus* (Roxb.) Nees, *Eriolaena hookeriana* W. & A. Bundan, *Eulaliopsis binata* (Retz.)Hubbard, *Ichnocarpus frutescens* (L) Br., *Lannea coromandelica* (Hout.)Merr., *Thespesia lampas* (Cav.)Dalz.&Gibs, *Tinospora cordifolia* (Willd.)Hook.f. &Thoms., *Typha domingensis* Pers. etc. These are then sold in market. They also use them for own purpose.

Plants Used in Religious and cultural Ceremonies

Plants related to religious and cultural activities and plants are employed in musical instruments have been recorded. Cultural programs, dance, songs, drama, art are interwoven with the day to day life of people. The festivals like Sarhul, Karma etc. are based on nature. There is no season when there is no festival here. Beverages are integral component of these celebrations. *Handia* is an important beverage and there is no substitute to it. Its consumption during all socio- religious is indispensable and is consumed freely by all the members of the community. Some plants used in

religious ceremonies are *Adina cordifolia* Hk.f., *Ficus bengalensis* L., *Ficus religiosa* L., *Mangifera indica* L., *Shorea robusta* Gaertn.f., *Vitex negundo* L. etc. . Some plants which are used in making musical instruments are *Bombax ceiba* L., *Dendrocalamus strictus* (Roxb.) Nees, *Gmelina arborea* Roxb., *Mangifera indica* L., *Plumeria acuminata* Ait., *Toona ciliata* Roemer etc. Plants used in preparation of Beverages are *Asparagus racemosus* Willd., *Borassus flabellifer* L., *Catunaregam nutans* (DC) Tiruv., *Cissampelos pareira* L., *Elephantopus scaber* L., *Holarrhena antidysentrica* Wall. etc.

Fuel wood

Species like *Acacia auriculiformis* A.Cunn, *Bauhinia purpurea* L., *Butea monosperma* (Lam.) Taub., *Mallotus philippensis* Muell.-Arg, *Pongamia pinnata* (L) Pierre, *Shorea robusta* Gaertn.f. etc. are used as fuel wood. The wood is used by the villagers in their houses and small hotels in the area. Fuel wood is also stored for the rainy season.



Photographs: collection of NTFPs and sell in local market and self-consumption in house ;Photo by Sanjeev Kumar



Pics: Medicinal plant *Gloriosa superba*



Saraca indica



Costus speciosus



Nature based festival- Sarhul



Karam festival



Holy offerings of Chhath festival

Conclusion

Traditional forest-related knowledge and practices have continued to sustain the rich cultures and livelihoods of people living around forests. Traditional Knowledge, its historical Contributions in forest management, livelihoods, health system and resilience is still under-recognized and in many regions are at the threshold of being lost. Hence efforts to preserve and enhance it are increasing .There have been efforts from government also to conserve medicinal plants and practices of traditional knowledge. There is paradigm shift in forest management. Now there is emphasis on management of NTFPs which are good source of ecosystem services. The working Plan Code 2014, prepared for the management of forests envisages various aspects of management of NTFPs. It also emphasises uses of traditional knowledge. Similarly the Forest Right Act (The Scheduled Tribes and

Other Traditional Forest Dwellers ,Recognition of Forest Rights, Act 2006) also underpins right of forest dwellers to traditional knowledge related to biodiversity and cultural diversity. It will have bearing on SFM in India.

Acknowledgements

The author is thankful to members of Village Forest Management and Protection Committees, local 'vaidyas' (herbalists/medicine men) and other villagers for sharing valuable facts.

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