Non-timber Forest Products: Current Status and Development

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Abstract Non-Timber Forest Products (NTFP's) are biologically originated non-wood products derived from forests and constitute a vital source of livelihood. In India, approximately 275 million poor rural people inhabiting in harsh climatic conditions depend on NTFP's for their survival and cash livelihoods. There is a lack of accurate global level statistics about NTFPs from 1972 to 1995. After 1995, renewed interest in NFTP's may be due to increased interest in the value of biodiversity, Carbon sequestration, increased awareness about the use of NTFP's, and some environmental functions provided by NTFP's. NTFP's were called "Minor" forest products and undervalued in the past but nowadays the scenario is different. During recent decades much attention is paid on the exploitation of NTFP's without addressing the ecological factors and impact on the environment. In India, approx 40% of total official forest revenues and 55% of forest-based employment is provided by NTFP's. In the present era and coming future era NTFP's sometimes may be considered as misnomer due to severe degradation of forest areas. In the present investigation, an attempt has been made to elaborate on the NTFP's, their utilization, availability, and development along with ecological and environmental implications generated due to the exploitation of NTFP's.

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1 Introduction

With 2.4% of the total world's geographic area and 17.5% contribution in the world population, India has only 1.8% contribution to the world's forestry sector [1]. In India, an estimated 67% of people are involved in the agriculture sector. Approximately 350–400 million people living in 0.152 Million rural villages adjacent to forest depend on the forest for their various needs [2]. According to a Forest Research Institute report (2017), India has 1,47,127 forest fringe villages in 275 districts of India [3]. The maximum number of forest fringe villages was in Madhya Pradesh (18,263).

In global context forest covers approximately 31% (4.06 billion) of the total geographical area. Approximately 80 million green jobs were provided by forests worldwide more than and support the livelihood of approximately 880 million peoples life by providing different products [4] while in India 8.20% of the total geographic area (about 25 Million Hectare) is under agroforestry [5]. Forests are an important source of non-timber forest products (NTFPs) for health care, domestic consumption, and cash or non-cash income generation (Approx 50%) for one-third of the population living in the rural communities [6–8]. Available literature shows that NTFP's are not defined according to the wide range of potential they possess and it also shows the lack of consistency in the available literature. NTFP's are biologically originated non-wood products derived from forests, and trees outside forests. NTFP's may be collected from the wild or produced after processing or products of agroforestry. They include Food, fodder, medicine, oils, resins, fibres, dyes, and raw materials for baskets, traditional paper, houses, brooms, mats, and numerous other items [9]. In the last two decades, more than 2100% increase was observed in NTFP's related research item [10] and most of them are from rural areas till 2012 but in recent times it has been observed that the market of NTFP's shifted from rural to urban centres [11–13].

2 Definitions of NTFP

The term NTFP consists of three essential terms and aspects:

1. **Non-Timber:** The part non-timber of the term NTFP indicates the exclusion of all woody materials as timber, chips, charcoal, and fuelwood.
2. **Forest:** The part forest of the term NTFP indicates that these products should be derived from forests and related land areas.
3. **Products:** The part products of the term NTFP corresponds to biologically originated goods such as plants, animals, and their products other than wood.

4. Certain other functions such as ecotourism, grazing, bio-prospecting (Forest services), and soil conservation, soil fertility, watershed protection (forest benefits) are not included in the term NTFP.

In different parts of the country and at different time NTFP's are known by different other names such as [9]:-

1. Minor forest products
2. Other forest products
3. Other economic forest products
4. Special forest products
5. Non-wood forest benefits
6. Non-wood goods and services
7. Non-wood forest products

A very old definition of NTFP's was provided by de Beer and McDermott [14]. They define NTFP as "all biological materials extracted or obtained from forests for human use other than timber used for commercial purposes". The definition was given by the authors when they were working in the forest, thus they focus on the biological resources (bushmeat, seeds, mushrooms, resins, bulbs, thatch grass, insects, and bark). The definition is wrong with respect to the present scenario as abiotic resources (such as water, carbon, sand, and stone, to mention a few) and social resources (aesthetic use) are not included in it. Although the identity of forest products as NTFP's is due to the harvesting and consumption of these products in human day to day life if human harvest products of NTFP's group excessively then the NTFP's produce is known as crop or livestock [7]. After reviewing the literature we can say that a lot of definitions of NTFP's are available but to date, there is no exact definition available for NTFP's.

3 Importance of NTFP's

NTFP's are of various types and play a different role in the livelihood of millions of rural and urban people across the globe [10, 15–17]. The approximate role of NTFP's in different spheres of life of local people is given in the value ladder given in Fig. 1. Nearly 80% of the population of the developing world depend on NTFP's for their nutritional and health requirement. The people of developing countries usually put their hopes on potential gains generated from the marketing of NTFP's for poverty alleviation and for more conservation of the natural resource base. Approximately 1 billion peoples worldwide depend on the different wild foods such as meat, insects, fruits, mushroom, medicine and fishes to some extent [4].

The importance of NTFP's is greater in daily activities while they get the least attention in cultural activities. NTFP's can be an important source of income that can supplement farming and other activities. Their economic, cultural, and ecological

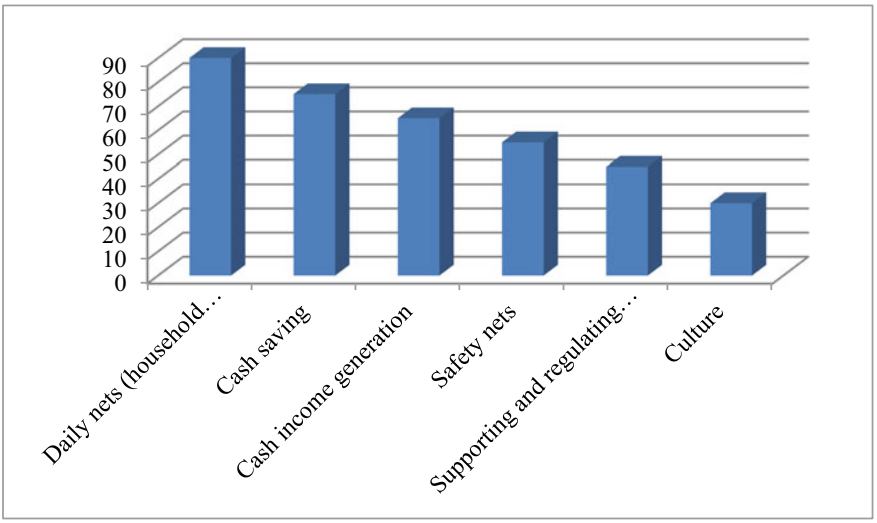

Fig. 1 Showing the role of NTFP's in different spheres of life of local people

value, when considered in aggregate, makes managing NTFP's an important component of sustainable forest management and the conservation of biological and cultural diversity. NTFP's also reduced incentives to convert forests for cattle ranching and farming. Therefore, NTFP's are a dependable source of income and food supply in rural areas.

Daily net refers to the basic necessities such as food, energy, shelter, and medicine [18] Female-headed households use more NTFP's in comparison to male-headed due to poor economic conditions [19, 20]. Similarly, rural areas collect more NTFP's than urban areas while consumption is highest in urban areas [21, 22]. NTFP's act as a safety net or self-insurance to the livelihood of peoples due to support in extreme climatic conditions such as drought and floods. During these calamities, these products help people in two ways. One is the increased use of already included products for their daily needs to reduce the expenditure and the second one is the use of non-included products in their daily nets [23]. Replacement of Kerosene oil or Electricity by the use of firewood is an example.

In certain areas or communities, NTFP's are inseparable parts of their daily essential activities. Some NTFP's are associated with cultures and are necessary for certain rituals and ceremonies. The association of NTFP's with the culture is both beneficial and harmful with respect to the conservation of these valuable products. Particular NTFP's associated with the culture or traditions of a particular community are conserved by that community and those areas become important from the biodiversity point of view [24, 25]. NTFP's also provide supporting and regularities services directly and indirectly. For example *Phragmites* reed and the fruit tree *Sclerocarya birrea* subsp. Caffra provides different services to other plants and animal and in turn support the communities [26, 27]. *Phragmites* and some other dense reeds help

in water purification in streams and rivers by removing different nutrients from the water [28].

4 Challenges for NTFP's Development

1. Most of the NTFP's are not widely known by the peoples due to their traditional uses.
2. Use of NTFP's is not on the record as the production of most of the NTFP's is seasonal; therefore their potential is underestimated to date.
3. Trade of NTFP's falls under the category of the unorganized and informal sector due to their transaction mostly in households and small-scale units or outside the well-established marketing /channels systems and this is a major bottleneck in the development of NTFP's.
4. Policy planners and forestry professional mostly focuses on timber-orientation and promote timber forestry.
5. Lack of knowledge regarding the role of NTFP's in the livelihood of local people is a major constraint.

5 Current Status and Development of NFTP's

Worldwide 12 countries are blessed in terms of diversity of vegetation and animals and termed as mega biodiversity countries and India in one of them (ranked 12) due to its unique climatic and physiographic factors. During the recent decades, NTFP's become popular in developed as well as developing countries due to shifting of human beings from conventional to non-conventional sources. Vegetation is divided into tropical, subtropical, temperate, alpine and sub-alpine type. NTFP's can be derived from approx. 3000 species of plants. Less than half (about 40%) of all the NTFP's are accounted into revenue generation and the remaining large fraction is consumed by local people for their livelihood [29]. As per the National Forest Policy of 1988, NTFP's should be protected and improved as they sustained the local communities. In northern Brazil NTFP (*Himathantus drasticus* -janaguba -Apocynaceae) contribute 30–50% in the household income.

Based on their importance and marketing, NTFP's are classified as nationalized and non-nationalized. Nationalised NTFP's is controlled by the state and have high economic values while the state has no control over non-nationalized NTFP's and their market is controlled by local communities. Minor Forest Product Federation promotes in-situ conservation, ex-situ cultivation, propagation, value addition, processing, and marketing of NTFP's to provide benefit to the local communities. Tendu (*Diospyrus melanoxylon*) leaves also known as bidi patta, sal seed, bamboo, etc. are nationalized NTFP's while mahua, aonla, neem, mahul patta, chironji, tamarind, and honey are non-nationalized NTFP's [2] are extracted from NTFP's

[30]. More than 85% of herbal drugs used are derived from medicinal plants [31] and the production of these drugs provides livelihoods to millions of people in the Indian Himalayan region [32]. NTFP's play an important role in the economic upgradation of India because NTFP's helps in the livelihood of millions (nearly 400 million) of peoples living in forest areas such as tribal, landless people, women, and other rural poor [15, 33, 34]. About 70% of the total NTFP's is collected in the tribal belt.

Demand of basket increased from 4791 in 1992 to 15,000 in 2007 in Uganda [35]. Welford and le Breton [36] reported 15–20% increase per annum in global natural products industry. Nearly 1.6 billion US dollar was generated from a commercial collection of NTFP's in India, at the forest gate in 2010 [37, 38]. NTFP's contribute to about 75% of the total forest export revenue. NTFP's contribute to about half of the cash income for 30% of rural forest-dependent communities across India [39–41]. Nearly 17% of landless laborers get their wage labor from the collection of NTFP's directly and nearly 39% indirectly. During the last 15 years, world has shown tremendous progress in the contribution of forests in empowering people by providing ownership of NTFP's, which results in their poverty remediation.

Among all the medicinal plants of, some plants are used in the preparation of medicines and raw extracts for Ayurveda, Unani, modern medicines, Siddha, Homeopathy, and other herbal health products [42]. Threat along with employment also increased due to the demand for medicinal plants in national and international markets for the preparation of herbal medicines and nutritious food products [43]. The revenue generated from the global market of the Medicinal, Aromatic, and Dye Plants (MADP's) and other NTFP's beside the household consumption is about 59 billion US$ per year [29]. NTFP's used in the pharma sector developed to a large extent in comparison to other NTFP's.

5.1 Management of NTFP's

Due to logging and shifting, a large amount of forest area has degraded as a result NTFP's are continuously degrading, affecting the plant species distribution [44]. After recognizing the importance of indigenous plant species to improve the bread and butter and income of poor people, a program for the domestication of all these was initiated in the early 1990s, now enter in the fourth decade [45]. The new term used for the domestication of trees is Horticulture, in which the local people are actively engaged which ultimately empowers the rural peoples [46–49].

In India, it is the joint responsibility of national and state governments to manage the non-timber forest resources. Ownership of NTFP's was provided to Gram Sabhas/panchayats (village assemblies) by "Panchayats (Extension to Scheduled Areas) Act 1996" (PESA) while the Scheduled Tribes and other Traditional Forest Dwellers (Recognition and Forest Rights) Act 2006 popularly known as Forest Right Act 2006 was enacted by which a right was provided to forest dweller for inhabitation, cultivation on the forest land occupied before 13th December 2005 to manage,

protect and regenerate the forest land. This also allows the collection and disposition of minor forest products (NTFP's) for their development. Here the word "ownership" means the right to net revenue after retaining all the additional charges (access and controlling charges) and administrative expenses of the department.

5.2 Contribution in the Economy

At global level, NTFP's generate 88 billion US dollar in 2011 [39]. No report or study is available about the exact contribution of the NTFP's to total employment or in the revenue generated in a particular state. A report suggests that NTFP's contribute to about 25% in rural household income in developing world [50]. More than 64% contribution in household income in Northeast Peru was reported by L'Roe and Naughton-Treves [51] while less than 5% was reported from Northeast and Eastern South Korea by Van Gevelt [52]. According to a report of NCFRA [53] around 100 million people in India derive their source of livelihood directly from the collection and marketing of NTFP's. Most of NTFP's collections take place in the six-state of India like Maharashtra, Madhya Pradesh, Chhattisgarh, Bihar, Orissa, and Andhra Pradesh [54] and in small amount from Uttarakhand, Arunachal Pradesh and Uttar Pradesh. Production and collection potential of Rs 3777 crore and Rs 1908 crores per annum is estimated from 14 different NTFP's. Tendu leaf, Bamboo, Mahuwa seed, and flower and Gum karaya are the major contributor NTFP's in the economy of different countries worldwide. According to an estimate, equivalent to 2.7 billion US dollars per year revenue is contributed by all these biological resources in India. NTFP's contributed to about 55% in the total forestry sector employment, 70% in the forest-based export income, and about 50% in forest revenues [55]. In the 60 billion US$ global herbal industry, 40 billion US$ is contributed by pharmaceuticals, 5.9 billion US$ by spices and herbs, 7 billion US$ by natural cosmetics, and 4 billion US$ by the essential oil. The industry is expected to reach 5 trillion US$ by the year 2050 with the present growth rate of % per year [56].

Sal seed possesses high commercial values and is a constituent of different products as soap, oil, animal or poultry feed, chocolates, rocket fuel, and tanning processes. Chhattisgarh, Madhya Pradesh, and West Bengal are considered as a major producer of sal seed among all these, the average yearly production of Chhattisgarh (14,000 Tonnes/year) is the highest. Collection of sal seed is a complex task and an individual is able to collect approx. 8–10 kg of seed per day worth INR 50, far less than daily minimum wages given in the National Rural Employment Guarantee Scheme of the Government of India. Thus the production of sal seed decreases in recent years [1]. Economically and socially weaker sections of the community of hilly regions mostly depend for their livelihood on Cane or Rattans. Rattans are mainly used for the production of ropes, furniture, walking sticks, umbrella handles, polo sticks, baskets, mat, sports goods, wickerwork, stuffing, and packaging. They are also used for medicinal purposes.

With 65% of the world's total lac production, India stands on the first rank. The annual production of India is estimated at 16,000 Tonnes per Year. Major lac producing states are Chhattisgarh, Jharkhand, West Bengal, Madhya Pradesh, Odisha, Uttar Pradesh, and Gujarat. Chhattisgarh and Jharkhand contribute to about 40% of India's Lac production. Lac is mainly used in pharmaceuticals, food, perfumes, varnishes, cosmetics, adhesives, polishes, paints, and textile industries. Commercial production of Gums is restricted to *Leguminosae, Sterculiaceae,* and *Combretaceae,* although it can be produced by a large number of families. Gums are also extracted from seeds, seaweeds, micro-organisms, and Aloe barbadensi, wood chips of Laris accidentals, seed coat of wheat, brans, barley, rice, and soybean. Maximum gum production in the country is contributed by Maharashtra (30%), Madhya Pradesh (21%), Jharkhand (16%), and Telangana (10%).

Resins are mostly extracted from branches and cones spontaneously and sometimes from wounded plants. Hard, oleo, and gum resin are three categories of resins. The highest amount of resin in India is collected from tapping from pine trees. Uttarakhand, Jammu & Kashmir, Himachal Pradesh, and Arunachal Pradesh are the major resin producing states of India, among all these states, the Major contributor in Uttarakhand. More than 70% of the total consumption is exported from China due to the policy to reduce the number of tapping trees. Tendu (*Diospyrus melanoxylon*), is a high commercial value nationalized NTFP used in the Bidi industry. Major producing states are Chhattisgarh, Jharkhand, West Bengal, Madhya Pradesh, Odisha, Uttar Pradesh, Karnataka, Arunachal Pradesh, and Gujarat. The estimation of the contribution of any sector in the economy of a country is listed in detail in the National Industrial Classification (NIC) abstracted from the International Standards of Industrial Classification (ISIC). Forestry is a subgroup of Section A (Agriculture, forestry, and fishing) and a part of Division 02 and named as Forestry and logging (Table 1).

5.3 Forest Certification

The public becomes more conscious of environmental issues both in developed and developing countries [57, 58]. Forest certification is a tool to link sustainable management practices with that of the environmentally-conscious person [59–61]. Forest certification is a major challenge for the sustainable management of NTFP's. Forest management unit certification (FMU) and chain-of-custody certification (CoC) are two separate processes in forest certification. FMU is the process in which it is verified that the area from where the NTFP's are extracted is being managed by a pre-defined standard while the process of certification that the product has originated from a certified forest is known as CoC [58]. Forest Stewardship Council (FSC) and the Program for Endorsement of Forest Certification Schemes (PEFC) are two international certification programs available for forest certification to date. Besides these two, there are other certification programs working on the national level such as American Tree Farm System (ATFS), Canadian Standards Association (CSA), Sustainable Forestry Initiative (SFI), Malaysian Timber Certification Council (MTCC), and China Forest

Table 1 Detailed industrial structure in respect of forestry and logging sector according to the NIC [1]

Section A		Agriculture, forestry and fishing
Division 02		**Forestry and Logging**
Group 021		**Silviculture and other forestry activities**
Class 2010		Silviculture and other forestry activities **Exclusion:** Growing of Christmas trees, Operation of tree nurseries, Production of wood chips and articles
	Sub-class 02,101	Growing of standing timber,
	Sub-class 02,102	Operation of forest tree nurseries
	Sub-class 02,109	Other forestry activities including growing of pulp and fire wood etc
Group 022		**Logging**
Class 0220		Logging **Exclusion:** Growing of Christmas trees, Growing of standing timber, gathering of wild growing NWFP's, Production of charcoal through distillation of wood
	Sub-class 02,201	Gathering and preparation of firewood
	Sub-class 02,202	Logging camps and loggers primarily engaged in felling timber and producing wood in the rough such as pitprops, split poles, pickets hewn
	Sub-class 02,203	Railway ties
	Sub-class 02,209	Production of charcoal in the forest and other logging activities
Group 023		**Gathering of NWFP's**
Class 0230		Gathering of NWFP's **Exclusion:** Managed production of any of these products, growing of mushroom or truffles, growing of berries and nuts, gathering of firewood, production of wood chips
	Sub-class 02,301	Gathering of Tendu leaves
	Sub-class 02,302	Gathering of Lac, Resins and Rubber like Gums
	Sub-class 02,303	Gathering of wild growing truffles, mushroom, nuts, berries, cork, balsams, vegetable hair, eelgrass, mosses, lichens
	Sub-class 02,309	Gathering of NWFP's
Group 024		**Support services to forestry**
Class 0240		Support services to forestry **Exclusion:** Operation of forest tree nurseries
	Sub-class 02,401	Forestry services activities
	Sub-class 02,402	Logging services activities such as transport of logs within the forest

Certification Council (CFCC). At the global level, two-third of the forest area is certified by PEFC while 28% is by FSC. The first forest certification (FSC CoC) in India was reported in 2001 (to a toy manufacturer in UP for Babul (*Acacia nilotica*) and Shisham (*Dalbergia sissoo*). There were 328 FSC CoC certifications and 11 PEFC CoC certifications issued till July 2012. However, to date, there is no certification reported for NTFP's. Shanley et al. [62] reported that standards for certification have been approved for approximately forty-six commercial NTFP's and the evaluations are under process. At the international level, the first certification of NTFP was reported in 1998 to SmartWood's Chicle operation in Mexico, in 1999 [63]. The first FSC certified NTFP- Chicle gum failed in the market place due to explosive global demand for chewing gum [64]. There are 17 criteria and 55 indicators in certification including the ecological, social, and economic perspective of NTFP's. The major challenges in the certification of NTFP's are the availability of secure forest land and insufficient scientific knowledge about the distribution, life cycle, population density, regeneration, and level of sustainable harvesting.

5.4 Marketing or Trade of NTFP's

Literature suggests that tribal involvement in NTFP's collection since time immemorial for their daily need but later they start collection and harvesting at the commercial level [65]. The use of NTFP's started with human existence. In the old era, the domestication of wild varieties of plants and animals starts to such an extent that the modern world forgot the natural origin of most of the modern-day staple foods [66]. Selected NTFP's such as medicinal plants (US$ 689.9 million), nuts (593.1), ginseng roots (389.3), cork and cork products (328.8), and essential oils (312.5) contributing to international trade [67]. Despite India's rich biodiversity (45,000 plant species in 16 Agro-climatic zones), only 3000 NTFP species yield is found. Among them, marketability of only 126 has developed [68–70]. NTFP and eco-tourism contribute to about 16% of the Forestry sector's gross value [71, 72]. At present, about 150 NTFP's are important in terms of national as well as international trade in India. The international market for medicinal use NTFP's is estimated to be 60 billion US dollars with a growth rate of 7% per annum [1, 73]. Vietnam exports NTFP's to about 90 countries [74]. The following two channels were identified for the marketing of NTFP's by Kumar and Meena [65].

Channel I: Tribe seller's → Village traders → Regulated Market (Laghu Van Upaj Mandi).

Channel II: Tribe seller's → Large Sized Aadivasi Multipurpose Co-operative Society (LAMPS).

Trade-in case of NTFP's is categorized as in the house, local level, regional level, national level, and international level. The income generated at each level of trade varies depends upon the engagement of a person in particular full-time or part-time and raw or processed NTFP's [73]. The rich people focus on the trade of low volume and high value while poor people trade in the opposite patterns [75]. The poor

people focus on the collection of NTFP's of their own while rich people focus on buying instead of the collection [76, 77]. The increasing awareness in India regarding Ayurveda and PM Modi's Aatma Nirbhar Bharat Abhiyan will make many folds increase in the business of NTFP's.

6 Harvesting of NTFP's

Harvesting and extraction of NTFP's provide income to local communities without destroying the habitat [78, 79]. In olden times, the collection and utilization of NTFP's were on a low scale but as the awareness about their potential has increased among the peoples, their collection and utilization also increased which raised the issue of their sustainability. According to the definition of sustainability, sustainable harvesting of non-timber forest resources is defined as the harvesting of NTFP's in which the nuts, fruits, barks, latexes, roots, rhizomes, and different other products can be harvested in undefined quantity from a limited area of the forest without any impact on the structure and dynamics of the particular plant population. In other words, sustainable harvesting is defined as "the harvesting of particular species without any change in the species composition to maintain its population at natural or near-natural levels".

The increasing demand for the commercialized herbal industry at the national and international levels put pressure on the management and harvesting procedures for the maintenance of NTFP's. The first and most important step in sustainable harvesting is sustainable collection. Sustainable collection of NTFP's requires skilled labor. Due to low prices, the collectors use unskilled labor and use unfriendly harvesting processes to increase the income. Due to a lack of knowledge and skills, they destroy the whole plant in spite of the required parts of the plant.

Conservation of genetic diversity, habitat loss, quality, consistency, and certification of products is a major concern that arises due to increasing demand for NTFP's. Inadequate supply of quality raw material and processing infrastructural facilities, documentation, storage and transportation, standards operating procedures, marketing linkages, regulation of trade, and conservation of resources are the big challenges in front of NTFP's sector [29]. The tendency to collect unripe fruits, damaging whole tree, repeated forest fires, uncontrolled grazing, technical issues, institutional issues, lack of market transparency, and illicit removal are some of the problems in the sustainable harvesting of NTFP's. All these problems occur due to lack of knowledge, competition between the collectors, and unhealthy forest policies. On the basis of the parts used, the NTFP's species have been classified as follows [29, 80]:-

1. Fruit/seeds
2. Flowers
3. Leaves
4. Root / rhizome leaves and flower
5. Bark

6. Gum/ resin
7. Entire plant (All plant parts being useful)

Collection of used parts, stage of collection, time of collection, method of collection, and quantity required are five important factors for the sustainable harvesting of NTFP's. Checklist to assess harvesting sustainability [29]:-

1. Knowledge of the natural distribution of the species
2. Frequency of occurrence or abundance
3. Population structure (age/size/class distribution)
4. Dynamics of the species (growth and reproduction rates)
5. Variation among habitats
6. Role played within the ecosystem

7 Impact of Harvesting on the Biodiversity and the Environment

Harvesting of NTFP's has short and long-term effects on the ecosystem and overall biodiversity. Short term effects of harvesting are the growth rate or reproduction capacity of the plant while long term effects can be observed on ecosystem levels. Harvesting of NTFP's can be sustainable when sufficient time is given between the two harvestings so that there will be no negative impact on the ecosystem functions, abundance species, or community [81]. The two basic problems in the study of the impact of harvesting on the ecosystems are the duration of the study {assessment needs long study period and a separate study of impact (as in nature it is very difficult to study the impact of harvesting of particular NTFP's on other species)}. In practical cumulative impacts are observed. The other factors affecting sustainability is the harvesting of plant parts, time of harvesting, and care taken during harvesting. The trees with a large number of fruits are least affected by the harvesting while the impact is opposite with less number of fruits [81, 82].

Although justified harvesting of NTFP's is useful for the livelihood of rural peoples and tribal. Overexploitation of these natural commodities exerts a negative impact on the environment. A study conducted in Rajasthan reported the degradation of the environment due to the exploitation of NTFP's [83, 84]. The persons trapped in the confusion of socio-economic dilemma often work innovatively and cooperatively as reported by Ostrom [85, 86] and other common property [87] and collective action theorists [88]. A study conducted by Murli et al. [89] also reported the degradation of species yielding NTFP's resulting in environmental degradation. Ticktin [90] also reported the impact on different ecological processes from individuals to the ecosystem level.

8 Conclusion

The present paper aimed to find out the exact definition, importance, harvesting, certification, current status, and development of NTFP's in India. To solve the objectives of the present study, a survey of the available literature on NTFP's at national and international was performed. NTFP's plays an important role in poverty reduction by the sustainable and judicious uses of the product other than wood. Among all the sectors, pharma is the largest sector of NTFP's contributing to the economy of the country which results in the economic up-gradation of the country as well as rural and tribal people. Among all the products, the production of tendu leaves is highest in recent years. In India certification of forest products was started long back but certification of NTFP's is not started yet. Certification of NTFP's will help in the development of NTFP's. There is a need for sustainable harvesting of NTFP's as the exploitation of NTFP's effect on the environment and biodiversity to a large extent. Training and awareness programs in the rural and adjacent areas of the forest region will help in sustainable harvesting with more economic benefits and fewer environmental impacts.

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