

Trees for life: creating sustainable livelihood in Bundelkhand region of central India

S. B. Chavan*, A. R. Uthappa, K. B. Sridhar, A. Keerthika, A. K. Handa, Ram Newaj, Naresh Kumar, Dhiraj Kumar and O. P. Chaturvedi

*Trees have been a part of life for centuries in India for sustainable livelihood security. Under the difficult climatic situations, farmers are forced to adopt tree-based systems to secure their income and livelihood. Non-timber forest products (NTFPs) harvesting, collection and processing are creating several employment opportunities in the drought-prone Bundelkhand region of India. This article aims to document the livelihood dependency on trees of farmers, tribals and landless labourers for income generation. Surveys and interviews in Bundelkhand region provided an overview of the dependency of different rural communities on NTFPs such as gum, dona pattal, lac from *Butea*; brooms, jaggery and baskets from *Phoenix*; flowers and seeds from *mahua*; bidi leaves from *tendu* and sticks from *bamboo* for sustaining their livelihood. To promote NTFPs-based livelihood enterprises, more emphasis should be given for sustainable harvest, value-addition and marketing.*

Keywords: Employment generation, sustainable livelihood, trees.

INDIA has a huge diversity and population living close to the forest with their livelihoods critically linked to the forest ecosystem. People living in these forest fringe villages depend upon the forest for a variety of goods and services for their survival. Trees are a symbol of environmental as well as socio-economic sustainability of the globe. Traditionally, trees are being used for the interdependent benefits of 6 Fs, i.e. food, fruit, fodder, fuel fertilizer and fibre. The multivarious benefits and services generated from tree-based systems are recognized as a tool to improve the livelihood status of forest-dependent people¹. Johnson *et al.*² reported that non-timber forest products (NTFPs) have attracted considerable global attention due to their significant role in benefiting people and industries. More than 3000 plant species produce commercially useful NTFPs. This indicates that forests provide rural communities with both subsistence and cash income. There are around 1.73 lakh villages located in and around forests and 350–400 million people depend on tree products for their livelihood^{3,4}. In India, over 50 million people are dependent on NTFPs or non-wood forest products (NWFPs) for their subsistence and cash income⁵. Some 80% of the people living in developing countries depend upon NWFPs for their

primary health and nutritional needs⁶. Tribal populations in India account for about 8% of the total population. They occupy a major place in the Indian economy. According to the report of Forest Resource Assessment 2005, India has 42% share of total NWFP removal in the category of other plant products, such as *tendu* leaves and lac, followed by Brazil and Mexico⁷. Chopra⁸ has estimated the all-India average value of NTFPs to be Rs 1671.54/ha and the gross value of NTFPs harvested on average in India as Rs 41.89 billion. However, a field study in Sathy Forest Range of western Tamil Nadu, India found income from different NTFPs to be Rs 2720/ha (ref 9). Therefore, in the era of industrialization, modern techniques are replacing traditional knowledge and dependence on nature. Still there are people who completely depend on different tree products for sustenance and livelihood. Bundelkhand is one such region, where thousands of people collect different tree-based products for survival.

Bundelkhand region is located in Central India in the Indo-Gangetic plains on the Vindhyan hilly tracts consisting of seven districts of Uttar Pradesh (UP) and six districts of Madhya Pradesh (MP) (Figure 1). This region suffers from several limitations, mainly high vulnerability of natural calamities and poor infrastructural development, which has made agricultural productivity very low and livelihood uncertain. The region is characterized as drought-prone and resource-poor from agriculture point of view. The small and marginal farmers and landless labourers are the worst affected, particularly during drought years. The only way out for them is to migrate towards cities for ensuring their livelihood. The livelihood security

S. B. Chavan, A. R. Uthappa, K. B. Sridhar, A. K. Handa, Ram Newaj, Naresh Kumar, Dhiraj Kumar and O. P. Chaturvedi are in the ICAR-Central Agroforestry Research Institute, Jhansi 284 003, India and A. Keerthika is in the ICAR-Central Arid Zone Research Institute, RRS, Pali-Marwar 306 401, India.

*For correspondence. (e-mail: sangramc8@gmail.com)

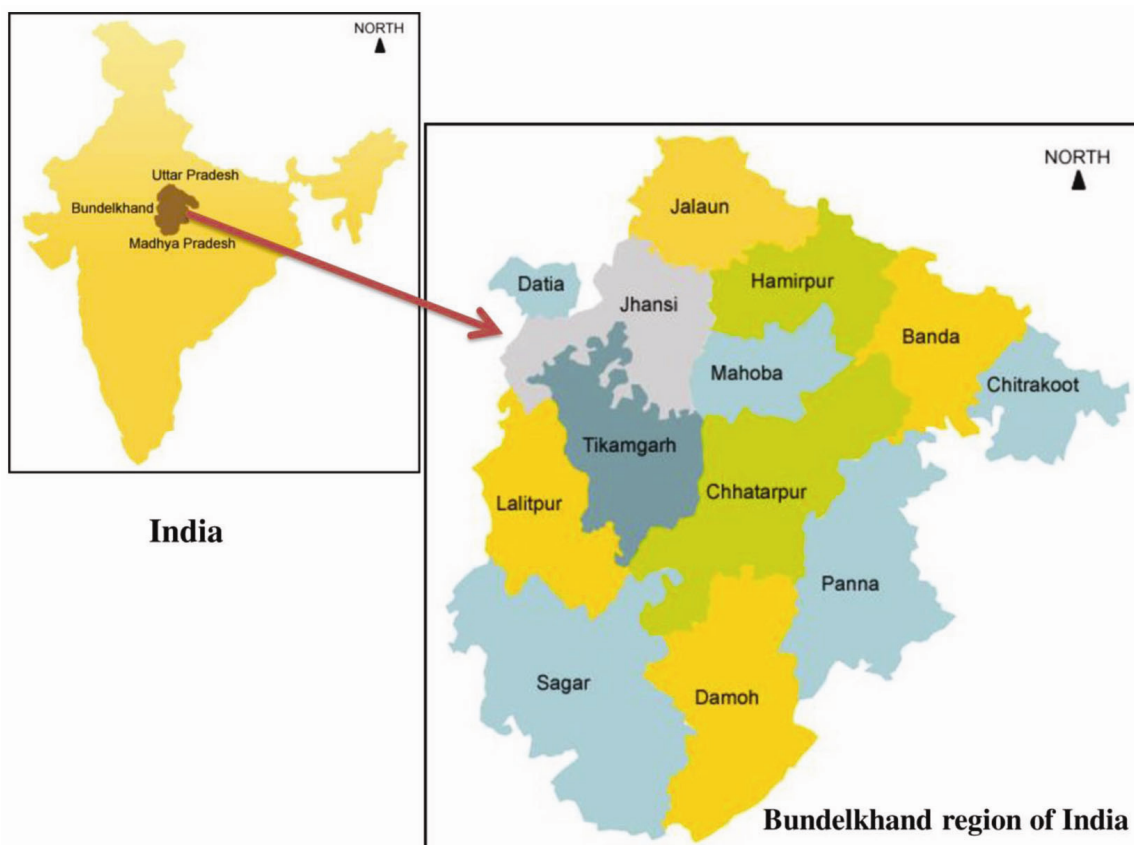


Figure 1. Synoptic view of Bundelkhand region of India (source: www.bundelkhandinfo.org.in).

of these rural masses can be intricately linked to the trees through numerous options and services. The nurturing trees in fields or homestead gardens are a way of life in Indian culture for centuries. In India, 27% of the total population depends on different tree species for their subsistence and livelihood¹⁰. They are integral to our traditional farming systems, and also form the backbone for practising integrated farming systems which are necessary for self-reliant and sustainable agriculture. The trees in agro-ecosystems provide different products like gum, resins, floss, fibres, fodder, brooms, fruits, etc. for the subsistence of tribals. Many useful trees grow in natural habitat and are commonly found in adjoining forest areas, wastelands, community reserves, common lands, panchayat lands and all along the canals and railway tracks. The farmers of Bundelkhand region also retain such trees on their farms to meet their diversified needs. For many of the landless tribals and farmers, these trees are the solitary source of livelihood security. They collect different tree-based products from the nearby forests, roadside plantations, wastelands, etc. and earn their livelihood. In order to secure livelihood security of the farmers of Bundelkhand region, the ICAR–Central Agroforestry Research Institute (CAFRI), Jhansi has intervened to support the NTFPs from trees like, *Butea monosperma* Lam., *Phoenix sylvestris* (Roxb.), *Madhuca indica* J.F. Gmel.,

Diospyros melanoxylon (Roxb.), and *Dendrocalamus strictus* (Roxb.). The present article highlights some of the tree-based products and enterprises supporting the livelihood security of farmers and tribal communities of the Bundelkhand region, which need to be promoted and strengthened through value-addition and infrastructure for ensuring and securing the livelihood sustenance of the resource-poor farmers of this region.

Status of NTFPs in Bundelkhand

The Bundelkhand region is one of the poorest in India and is currently experiencing recurring droughts. This has forced people to migrate towards towns/cities in search of food and livelihood. It is estimated that almost 6000 people are migrating from this region every day. According to the Census of India¹¹, Bundelkhand has a total population of 18.3 million (seven districts in UP having a population of 9.6 million, and six districts of MP with 8.6 million). In Bundelkhand Biyar, Kol, Bhaini, Saharia, Bedia and Khajurvanshi are the dominant tribal communities, who are mainly dependent on the forest for their livelihood. Approximately 60% of the population consists of workers and labourers. Among the workers, almost 60–70% are engaged in agriculture, collection of NTFPs and value-addition

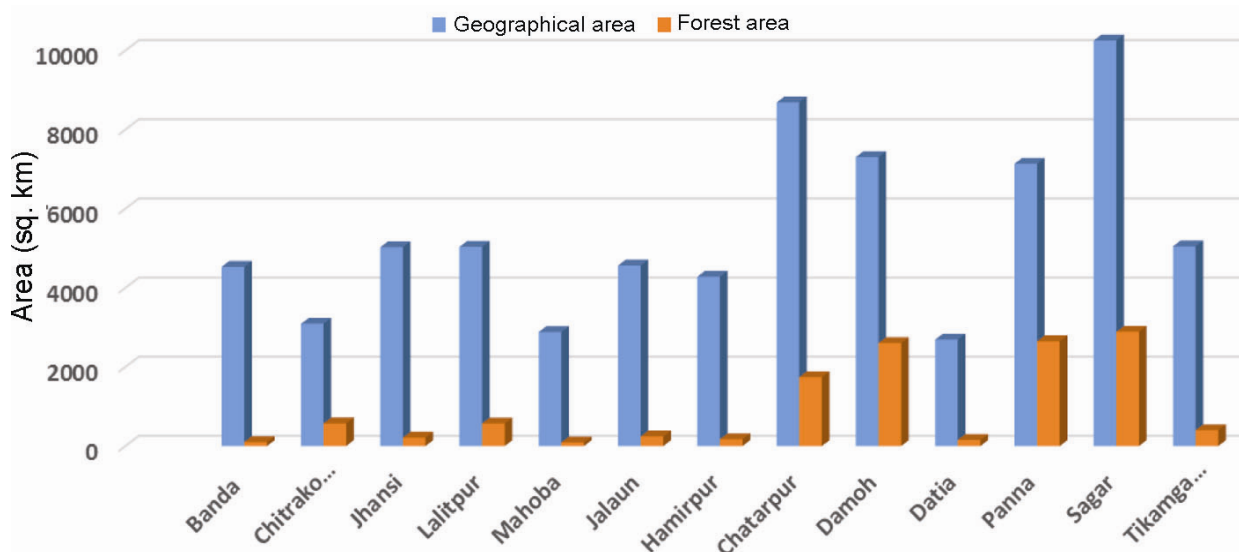


Figure 2. Geographical area and forest area in Bundelkhand region of Uttar Pradesh and Madhya Pradesh.

such as bidi industry, mahua flower collection and processing. Majority of the forest area of Bundelkhand falls under tropical dry deciduous and thorn forest. The total forest area of Bundelkhand is 1.24 m ha, which comprises about 17.62% of the total geographical area (Figure 2). The forest area in Bundelkhand region of UP is 6.72% and that of MP is 25.41% of the total geographic area¹². These ecological resources are considered as the 'treasure house' of livelihood for rural-tribal populations. More than 350 non-timber forest species of medicinal value have been reported, among which traditionally 82 species are abundantly utilized for collection and harvesting for income generation¹³. Other than medicinal shrubs, herbs and trees, mahua, chironji, tendu and gum-producing species are abundant in natural forest areas of Bundelkhand.

Venkatesh *et al.*¹⁴ reported that a single tribal family can collect up to 65 kg of palash gum and earn a maximum amount of Rs 2628 per month. Average return from NTFPs collection per household per season in three Bundelkhand forest division is found to be Rs 6225. A study in Lalitpur district, UP shows the income from NTFPs to be 12% (Rs 1587) of the total income¹⁵. NTFPs revenue of UP from the 18 divisions of Tarai, Bundelkhand and Bindhyan region constitutes about 80% of the total revenue of the state. In many divisions of UP, revenue from NTFPs is found to be higher than that from timber, where tendu leaf is harvested¹⁶. In this context, tree-based livelihood has a huge potential in creating sustainable income in drought-prone areas of Bundelkhand. In spite of recurrent drought conditions, trees are still producing NTFPs, thereby showcasing the climate resilience capacity of this region. A preliminary survey was conducted to assess the major NTFPs and their role in livelihood generation in Bundelkhand region. The findings of this survey are explained below.

Butea – a 'kalpvruksha' for livelihood security

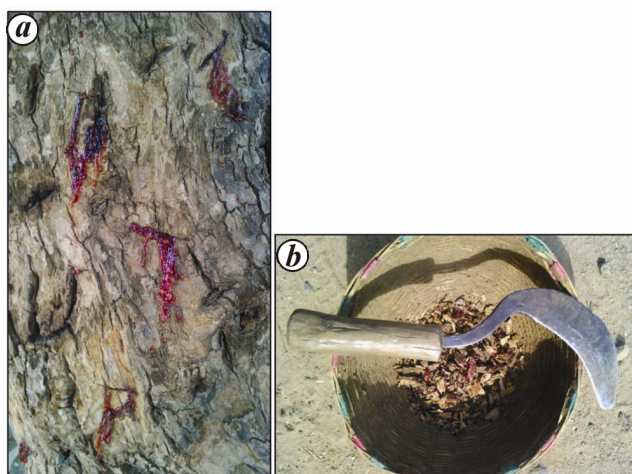
Butea monosperma Lam., popularly known as palash, belonging to the Fabaceae family, is a source of several NTFPs such as a gum, water-soluble dye, lac resin, fodder, leaves for platters, etc. It is common throughout India, according to the Forest Survey of India¹⁷, there are around 359.7 million stems of this species in the country, out of which 46.7% is outside forest areas. Keeping in view the potential contribution of this species in supporting the livelihood security of farmers and tribals, ICAR-CAFRI, Jhansi developed *B. monosperma*-based agroforestry system for production of lac and gum.

Gum from palash: Gum is extracted from its bark and sold in the local market. The nomadic tribe, Saharia of Bundelkhand, moves in small groups to various densely populated palash trees along the roads or farmers' field during November–December (the peak gum-oozing season) for gum extraction. They earmark the areas where trees are found in abundance and select a stretch of 5–6 km area along the roadside or farmers' field. Initially for two days, the rough barks of the first batch of trees are peeled-off. On the third day, notching is done using iron sickle and left as such for gum to ooze for another three days (Figure 3). Finally on the seventh day, gum is collected in bamboo baskets. On an average, 300 g of gum is collected from one tree and a family of 4–5 persons collects about 100 kg of gum in a year. This gum is purchased by the middlemen at the rate of Rs 80/kg and thus a family earns Rs 8000/year from this enterprise (Table 1). The middlemen do the cleaning of this crude gum and around 70 kg of clean gum is obtained from 100 kg of crude gum, which is further sold in the market at Rs 400–500/kg.

Table 1. Economic analysis of different non-timber forest products trees in Bundelkhand

Species	Products	Period of collection	Stakeholder	Production/tree/year	Rate/unit or kg (Rs)	Income		Employment/person (man-days/annum)
						Per tree (Rs)	Per family/year	
<i>Butea monosperma</i>	Gum	December–January	Sahariya tribe	300 g	60–80/kg	25	6000–8000	15
	Lac	October–November	Farmer	1.5–2.0 kg	400–450	700–800	–	
	Dona	Whole year	Farmer	1200–1500	1 for 4 dona	400–500	20,000–22,000	300–320
<i>Phoenix sylvestris</i>	Broom	Except rainy season	Landless/Bargunda tribes	5–8	10/broom	50–60	40,000–50,000	200–250
	Crown	December–March	Artisans	1	800–1000/crown	800–1000	4000–4500	30–45
	Jaggery	September–January	Farmers	10–12 kg	30–40/kg	350–400	8000–10,000	60–100
	Basket	–	Bargunda tribes	1	30–40/piece	30–40	1500–2000	
<i>Madhuca indica</i>	Flowers	March–April	Farmers and tribals	50–100	10–20/kg	800–1000	12,000–15,000	30–45
	Seeds	May–June		70–100	4–5/kg	500	2500–3000	30–45
<i>Diospyros melanoxylon</i>	Leaves	April–May		500 leaves (10 bundles)	1/bundle	15–20	120,00–15,000	40–60
<i>Dendrocalamus strictus</i> *	Bamboo sticks	Year around		5–8	60–70/stick	300–450	20,000–22,000	250–300

*Bamboo clump.

**Figure 3.** a, Gum oozing from notches. b, Notching sickle and collection basket.

Dona pattal from palash: Few farming families of Bundelkhand region collect fresh leaves of palash for making dona pattal (a bowl made from the leaves), which has been used traditionally to serve popular snacks in the rural market in the northern parts of India. We interacted with a farmer who makes and sells dona pattal. He has around 15 palash trees in his farm for collection of

leaves; he also collects leaves from his neighbour's field and pays for it. Every fourth day of the week he sells the donas in the local market and earns around Rs 500. The remaining days his entire family spends on collecting leaves and making the donas. The whole family is involved in this enterprise based on palash tree. They make about 2000 bowls in a day. Each bundle of 50 donas fetches around Rs 12. In this way his entire family is totally dependent on palash trees for day-to-day livelihood. The promotion of palash for donna pattal is also important from the environmental point of view to reduce the use of plastic bowls.

Lac cultivation on Palash: Lac cultivation is a natural heritage of our country. It has been associated with tribals and the rural poor for providing regular income in the absence of other cash crops. In India, about 90% lac is produced on the three conventional lac host trees, i.e. kusum (*Schleichera oleosa*), palash and ber (*Ziziphus* spp.). Rangeeni strain grows well mainly on palash trees. In Bundelkhand, lac insects grow on newly emerged branches of palash trees (Figure 4). They take nearly 4–5 months to produce lac encrustation and are harvested after maturity. Normally, the crop is harvested completely (October to November) and some amount of mature lac is left on the tree to act as a brood for developing the next

crop. A single tree of palash can produce 1.5–2.5 kg of lac with annual income of Rs 700–800. In 2015, the price of Rangeeni lac ranged between Rs 200 and 500/kg in the local market. The palash-based agroforestry systems in Budelkhand region can generate an income of Rs 1200–1500/tree, which can be further enhanced by including dye extraction as another viable option from the same tree.

Broom – a traditional livelihood over generations from Phoenix

Broom-making from wild date palm (*P. sylvestris* Roxb.) is common among the Bargundas belonging to the 'Kha-juravanshi' community from Khandwa village, MP. The tree is known for its multiple uses, i.e. edible fruits, tapping for toddy or neera, jaggery from the juice, trunk as supporting beam in the construction of houses and leaves for making brooms, baskets, fans, floor mats, etc. Making broom from wild date palm leaves is common among rural areas of MP, UP, Rajasthan, Chhattisgarh, etc. During a survey, it was noticed that whole families were involved in broom-making. We interacted with a tribal from the Bargundas community. He is a traditional hand broom-maker, who migrated with his family to Bundelkhand region in search of raw material for preparation of brooms. He harvests leaflets on a regular basis and dries them under the sun for 3–4 days, during which the very young white-coloured pinnae are shredded into fine fibre and then bundled at one end to make brooms which are sold in the local or nearby market. He prepares around 25–100 brooms per day depending upon availability of raw material. The demand peaks during the festival period (18,000 to 20,000 brooms), resulting in a net profit of Rs 4000–4500/month. There is about 30,000 estimated people of Bargundas community distributed in



Figure 4. Lac growing on palash.

Central India expecting more sustainable income and effective role for their traditional knowledge in the wake of the 'Clean India Campaign'. An effective mechanism and support from financial institutions can help them; in turn, they can pass on this tradition to subsequent generations.

Phoenix provides more livelihood options for the resource poor as noticed in Mahoba district of Bundelkhand, where farmers are engaged in collecting juice from the crown of tree (near inflorescence), which is used to prepare jaggery. The jaggery can fetch around Rs 300/day. Also the newly emerged golden–yellowish leaves are used to prepare crown for bridegrooms in the Chitrakoot district of Bundelkhand, which fetches Rs 800–1000 per piece (Figure 5).

Mahua – a tree of million livelihoods

Madhuca latifolia (syn. *M. indica*) belonging to the family Sapotaceae, and commonly known as mahua, is considered a boon by the tribals. Mahua flower is one of the top five minor forest produces in the country, and tribal communities are permitted to collect and sell the yield in the market of central and northern plains of India¹⁸. This forms an essential part of the local economy, especially during a summer season when water is unavailable for agriculture. Mahua produces numerous flowers during March–April, which are collected widely to make alcohol for domestic consumption and sale. Also, the seeds of mahua play a dominant role in the production of medicine and edible oil. Mahua flower collection is distributed among almost 13 districts of Bundelkhand. We had an opportunity to discuss with a middleman in Chitrakoot district of Bundelkhand (Figure 6). He informed us that during flowering season, the whole family is engaged in collection of mahua flowers from adjoining forest and



Figure 5. Leaves of Phoenix used to prepare crown for Bridegrooms in marriages at Bundelkhand.

agricultural fields. An average-sized tree yields about 50–100 kg of flowers in a season that lasts around a month; and flower yield depends on rainfall, size and age of trees. Large amounts of mahua flowers are kept in a bigger basket which is locally known as kadagi. On an average one family member manages to collect 10–15 kg (one basket) of mahua in a day. The effective period of mahua flower collection is only 22–27 days. One family of 4–5 people can collect up to 1 tonne of dried mahua flowers during a good year. At present, mahua flowers are sold at Rs 10–20/kg. So a tribal family can generate Rs 12,000–15,000/season. According to sources from the Forest Department at Lalitpur, the forest area provides livelihood to 70% of the tribal population and Lalitpur Division alone collects around 500 tonnes of dried mahua every year; however, no clear records are available.

After the flowering season, tribals collect mahua seeds which also have the potential to provide income. On an average middle-aged trees can produce 70–100 kg of seeds, which fetch around Rs 500. In some parts of India, people worship the mahua tree as it provides food to poor people. Mahua Sub Sector report by Chattisgarh State Institute of Rural Development mentions that ‘Collection of mahua flower and seeds generates about 90 man days of work involving about 7.5 millions of tribal people throughout mahua growing belt of India for their livelihood’. However, in this scenario, the prime requisite is to establish proper markets with storage facilities. Some states like MP, Chhattisgarh and Odisha have a well-established market chain with minimum support prize.

Tendu – a leaf of hope for distressed Bundelkhand

The tendu tree (*D. melanoxylon* (Roxb.)) is found widely across Central India. Leaves of this trees are used to wrap bidis. In terms of value, tendu leaves are the most important forest produce in Bundelkhand and their collection and sale is done through state agencies in both UP and



Figure 6. Mahua flowers collection in Bundelkhand.

MP. Moreover, gathering tendu is labour-intensive and employs millions of tribals during the lean month of May, when they have very little source of income. Tendu leaves collected by tribals are used to wrap bidis after drying and curing. Mature leaves are collected from around the middle of April to the middle of May, over a period of around six weeks (Figure 7). Whole families are engaged in tendu leaf collection, receiving wages according to the number of bundles. In MP, collection is organized through cooperative societies of people involved in the job. The societies sell leaves packed in bags to the Madhya Pradesh State Minor Forest Produce Federation, which fixes the rate every year. According to the All-India Bidi Industry Federation, about 550 billion pieces of bidi (rolled by 10 million people) are sold every year in the country.

In the drought-hit districts of Bundelkhand regions, UP and MP, tendu has the potential to generate employment and revenue to farming and tribal communities. An interview with local farmers at Jhansi Forest Division revealed that, a person can earn Rs 40–80/day by selling tendu leaves in the local market. The Forest Department also engages the tribals in the collection of tendu leaves. The tribals are paid Rs 75–100/100 bundles of the leaf. Tendu leaf-plucking generates about six weeks employment for about 7.5 million people¹⁹, while rolling of bidis engages nearly 4.4 million women and children; their collective efforts result in 600 billion to one trillion bidis being produced every year, making bidis perhaps the most produced commodity in India²⁰.

Wages from tendu collection are a crucial source of supplementary income to tribal families in the lean agriculture season. However, compared to final sale value,



Figure 7. Drying of tendu leaves at forest fringe villages of Jhansi Forest Division.

quantity-based wages paid for collection are low and instances of delayed or improperly calculated wage payments are common. Positive interventions and support from Government agencies will help change the fate of the drought-hit farmers of Bundelkhand.

Bamboo – the poor man’s timber

Bamboo is a versatile NWFP. It is grown on approximately 37 m ha area worldwide, comprising more than 1200 species²¹. In India, 136 species of bamboo in 36 genera are found, which is second largest in the world after China. According to an estimate of the National Bamboo Mission (NBM), total standing growing stock is 80.43 MT (metric tonne) distributed on an area of 13.96 m ha, which supplies 13.47 MT in India. Through efforts of different programmes, the ‘golden goose’, i.e. bamboo is grown on community lands, Joint Forest Management (JFM) area, roadside and agricultural fields to create livelihood opportunities. In India, bamboo currently generates 432 million work-days annually, employing nearly 10 million people. It constitutes majority in some craft industries, and 50% of the tribal population of 68 million people depend on utilization of bamboo for their livelihood dependence²². In the Bundelkhand area, *D. strictus* (male bamboo), locally known as ‘lathi bass’, is grown extensively in forests as well as agricultural fields. The people of Bundelkhand are dependent on male bamboo for small timber. ICAR–CAFRI has implemented R&D programme under NBM during 2006 and conducted bamboo-based trials on the farmer’s field.

During our field visit we met a person, who was selling bamboo lathis on the roadside (Figure 8). He collects bamboo from the forest area, processes it and gives beautiful colours to make it attractive. A small culm costs



Figure 8. Bamboo sticks.

Rs 60 and a bigger one costs Rs 75. He is landless farmer deriving livelihood through the sale of these bamboo culms. His entire family is involved in the collection and processing of bamboo culms. The removal of side branches and drying of culms is taken care by women, and the painting, sorting and pricing is done by the men. Through the sale of bamboo lathis, one can earn a meagre income of Rs 20,000–22,000/year. These lathis can be used for safety, as a support, as axe handle by farmers for cutting down fodder and fuel wood trees in forests as well as agricultural fields. The bamboo stick business is mainly prevalent in Jhansi, Hamirpur, Mahoba and Banda districts of Bundelkhand, and chiefly sold in village fairs and festivals.

Economic analysis of NTFPs–livelihood linkage

From time immemorial, NTFPs are used as a traditional source of food, fibre, medicine, etc. by the farmers, tribals and landless labourers in Bundelkhand region. Low crop productivity, harsh climatic conditions, recurrent droughts, high incidences of migration, limited entrepreneurial skills in human resources and high dependence on forest and NTFPs are some of the critical issues in the region. The NTFPs are considered as a hidden treasure for the drought-hit Bundelkhand region and generate employment throughout the year. Trees are the second largest source of income after agriculture for the rural communities in the region. NTFPs business is a renewable and reliable source of income, but faces many obstacles such as market linkage, warehouses, wages, processing, value addition and product pricing. Information on economics, trade, number of collectors and market of NTFPs is limited to mahua and tendu leaves. Tewari²³ estimated that 17–35% of annual household income of many village communities in India is mainly derived from the sale of NTFPs, whereas it reaches up to

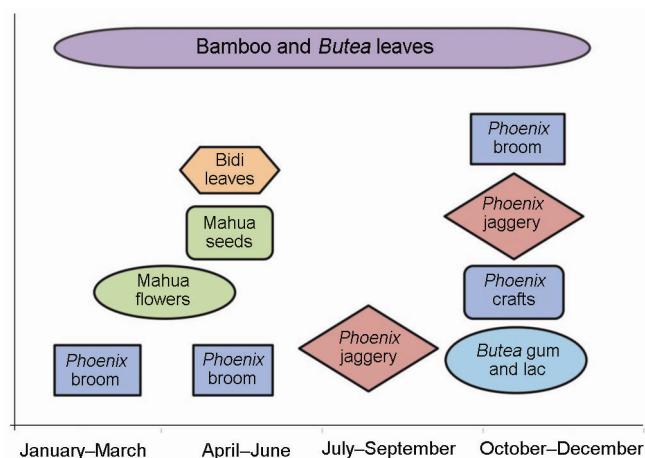


Figure 9. Seasonal calendar of non-timber forest products collection in Bundelkhand.

40% in Odisha²⁴. In terms of share of total household income, the income from sale of NTFPs varies from an average 1% in certain villages to 48%, with an overall average of around 19% (ref. 16).

In this study we have recorded NTFPs-based livelihood generation and economic analysis (Table 1). In Bundelkhand region, people are mainly dependent on five tree species for 11 NTFPs. In the present study, the various NTFPs were found to provide an income of Rs 1500–50,000. The income obtained from trees is less and requires hard work. Still development and integrated tree-based system will maximize the output from these trees in Bundelkhand region.

Seasonal analysis

The NTFPs have variable abundance according to season and their collection varies with seasonal occupation of the local people²⁴. The availability of NTFPs is least during rainy season, whereas the summer, spring and autumn seasons witness a large quantum of NTFPs influx in the Bundelkhand region. The reduction in the number of NTFPs in the monsoon season is due to the fact that the villagers are engaged in agricultural activities. Also people face difficulties in collection, drying and storage of NTFPs. The NTFPs plant parts, viz. leaf, flower, fruit, seed, gum, lac, culm and twig are available throughout the year in the area. Except bamboo and *Butea* leaves, all the major NTFPs of this region are available only for 2–3 months in a year (Figure 9). Seasonal analysis generates knowledge regarding the phenology and harvesting period of different NTFPs. Proper utilization of this knowledge will help the tribal and farming communities in achieving maximum output²⁵. It will further help in designing NTFPs-based agroforestry systems, which could provide employment and income throughout the year.

Way forward

1. The traditional knowledge of the tribal and rural masses regarding NTFPs needs to be surveyed and documented.
2. Refining of value-addition and developing a comprehensive value-chain analysis of key NTFPs, including untapped and under-utilized products can create demand resulting in economic empowerment of these communities.
3. Deregulation and decentralization of NTFPs collection and trade. Empowering community-based institutions to manage the trade and its benefits.
4. Self-Help Groups and cooperatives integrated with marketing channels need to be promoted.
5. Subsidy to NTFPs gatherers can be explored. Premium pricing of NTFPs is necessary for sustainable profit.

6. Different NTFPs-based agroforestry models may be promoted in tribal-dominated areas for sustainable livelihood.
7. National Agroforestry Policy, 2014 should be provided clear guidelines on the above discussed issues for creating sustainable livelihood opportunity.

Conclusion

NTFPs are the backbone of tribal communities and the major source for their livelihood. Many NTFPs grow naturally in Central India, particularly in dry tracts of Bundelkhand, which need to be promoted. The market for NTFPs is unorganized and mostly characterized by higher degree of exploitation at the lower level. Besides, there is also absence of aggregation, intermediate processing/storage and collective selling of NTFPs at the village level. In the Bundelkhand, NTFPs can act as insurance during the drought period. Improved processing techniques, market creation, and training and awareness programmes will help in popularizing these hidden treasures of Bundelkhand region. Therefore, it is a collective responsibility of all stakeholders, including Government agencies to support livelihood options of NTFPs gatherers. As long as the bottom of the pyramid is supported, enriched and equipped, rest of the strata can sustain for a long time.

1. Chavan, S. B., Keerthika, A., Dhyani, S. K., Handa, A. K., Ram Newaj and Rajarajan, K., National Agroforestry Policy in India: a low hanging fruit. *Curr. Sci.*, 2015, **108**, 1826–1834.
2. Johnson, T. S., Agarwal, R. K. and Agarwal, A., Non-timber forest products as a source of livelihood option for forest dwellers: role of society, herbal industries and government agencies. *Curr. Sci.*, 2013, **104**, 440–443.
3. MoEF, Report of the National Forest Commission, Ministry of Environment and Forests, Government of India (GoI), 2006, p. 421.
4. MoEF, Asia-Pacific Forestry Sector Outlook Study II: India Country Report. Ministry of Environment & Forests, Government of India, Working Paper No. APFSOS II/WP/2009/06, FAO, Bangkok, 2009, p. 78.
5. Hegde, R., Suryaprakash, S., Achoth, L. and Bawa, K. S., Extraction of non-timber forest products in the forests of Biligiri Rangan Hills, India: 1. Contribution to rural income. *Econ. Bot.*, 1996, **50**, 243–251.
6. FAO, Non wood forest products, Food and Agricultural Organization, Rome, Italy, 2008.
7. Shivaprasad, T. M. and Chandrashekar, H. M., Impact of new forest policies on collection and marketing of minor forest produce in Karnataka, with special reference to LAMPS. *IOSR J. Hum. Soc. Sci.*, 2014, **19**, 9–14.
8. Chopra, K., Measuring contribution of informal sector/informal employment to GDP—informal sector contribution to GDP: a study of the forestry sector (paper no. 3) Expert Group on Informal Sector Statistics (Delhi Group) 11 and 12 May 2006 New Delhi, Ministry of Statistics and Programme Implementation, GoI, 2006.
9. Sekhar, C., Rai, R. S. V. and Surendra, C., Price regime analysis, marketing and trade of minor forest produce, CMFP Dehradun, 1993.
10. Malhotra, K. C. and Bhattacharya, P., *Forest and Livelihood*, CESS Publication, Hyderabad, 2010, p. 246.

GENERAL ARTICLES

11. Census of India, SRS Statistical Report 2011, GoI, 2011.
12. FSI, India State of Forest Report – 2015. Forest Survey of India, Dehradun (MoEF, GoI), 2015.
13. Uttar Pradesh Forest Department, Special project for Bundelkhand region 2009–10 to 2011–2012, 2013, pp. 1–16.
14. Venkatesh, A. *et al.*, Livelihood opportunities in drought prone Bundelkhand: lessons learnt from Garhkundar–Dabur watershed. *Indian J. Dryland Agric. Res. Dev.*, 2011, **26**, 72–82.
15. GDS, Assessment of livelihood security of poor households in Lalitpur district of UP: a study conducted by Grameen Development Services, Lucknow, 2004.
16. Choudhury, P. R., Forest-route to poverty alleviation – myths and realities: analysis of NTFP-livelihood linkages in some Indian states. In Poster presented at the RRI Conference, Bangkok, 4–7 September 2007.
17. FSI, India State of Forest Report – 2013. Forest Survey of India, Dehradun (MoEF, GoI), 2013.
18. Chavan, S. B., Keerthika, A., Ankur Jha, Handa, A. K., Ram Newaj and Dhyani, S. K., Abnormal seedlings in *Madhuca latifolia* – an important biodiesel tree. *Life Sci. Leaflets*, 2014, **58**, 18–21.
19. Arnold, J. E. M., Socio-economic benefits and issues in non-wood forest product use. Report of the International Expert Consultation of Non-wood Forest Products, FAO, Rome, 1995.
20. Pranay, G. L. and Wilson, N. C., The perverse economics of the bidi and tendu trade. *Econ. Polit. Wkly.*, 2012, **47**, 77–80.
21. FAO, World bamboo resources: a thematic study prepared in the framework of the Global Forest Resources Assessment 2005 (eds Lobovikov, M. *et al.*), Non-wood Forest Products 18, FAO, Rome, 2007.
22. Adkoli, N. S., Employment generation from bamboos in India. In *Proceedings Bamboo, People and the Environment* (eds Ramanuja Rao, C. I. V. and Sastry, B.), IV International Bamboo Congress, 19–22 June 1995, Ubud, Bali, 1996.
23. Tewari, D. D., Developing and sustaining non-timber forest products: policy issues and concerns with special reference to India. *J. World For. Resour. Manage.*, 1994, **7**, 151–178.
24. Dash, S. S. and Misra, M. K., Studies on hill agro-ecosystems of three tribal villages on the Eastern Ghats of Orissa, India. *Agric. Ecosyst. Environ.*, 2001, **86**, 287–302.
25. Islam, M., Sulaiman, A., Quli, S. M., Rai, R. and Sofi, P. A., Livelihood contributions of forest resources to the tribal communities of Jharkhand. *Indian J. Fundam. Appl. Life Sci.*, 2013, **3**, 131–144.

ACKNOWLEDGEMENT. We thank all those who directly/indirectly provided information during this study.

Received 4 January 2016; accepted 9 May 2016

doi: 10.18520/cs/v111/i6/994-1002
