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The Role of Non-Timber Forest Products for Livelihood diversification in Bundelkhand Region of Uttar Pradesh

L. R. Lakshmikanta Panda[1*], Arun Uniyal[1], Jyoti Kukreti[1], Ritu[1] and Neelu Singh[2]

[1]Non-Timber Forest Product Discipline, Silviculture and Forest Management Division, Forest Research Institute, Dehradun, Uttarakhand (248 001), India

[2]Tropical Forest Research Institute, Jabalpur, Madhya Pradesh (482 021), India

Corresponding Author

L. R. Lakshmikanta Panda

e-mail: lrlakhmi@icfre.org

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Abstract

Various local communities living in India have been dependent on forests for centuries. The contribution of non timber forest products (NTFPs) has been recognized globallyfor their role in preservation, income generation, livelihood enhancement and rural development. About 275 million poor rural people in various regions of India are dependent on non-timber forest produce. The present study was conducted during the month of January to November, 2022 to assess the major NTFPs and their role in livelihood generation in Bundelkhand region of Uttar Pradesh. Through surveys and interviews conducted in 4 study area (Viz. Banda, Jhansi, Mahoba and Chitrakut) of Bundelkhand, among the people of local communities, it has been revealed that even today the people of study area show their dependency on forest based NTFPs. Through harvesting, collection and processing of non-timber forest produce, providing new employment opportunities in the Bundelkhand region of India. In this region local people provide an overview of the dependency of different rural communities on NTFP's such as salai gum, kullu gum, flowers and fruit of Mahua, baskets from bamboo and Harsingar, bidi from tendu leaves, Chironji seeds, jhadu from Date palm leaves, Amla, Bahera, Satavar and Nagarmotha for sustain their livelihood. Despite their significance to employment, NTFP markets are mostly informal andscattered, with no proper records maintained, leading to an insufficient information flowon the contribution of NTFP trade at the local as well as national level. There is an urgent need to promote all these things today so that the income of local collectors can be improved.

Keywords: NTFP, livelihood, rural communities

1. Introduction

All biological goods, other than wood or products of animal origin that are harvested from forests are known as non-timber forest products (NTFPs) (Ros-Tonen, 2012). NTFPs play anessential role in sustaining livelihood security, growth, and income generation, especially for the indigenous peoples staying inside forest and forest fringe villages (Lepcha et al., 2018). In relation to global concern about environmental issues, especially deforestation, pollution, rural poverty, and emergence of the concept of sustainable development, collection of NTFPs causes less damage to forests ecosystem as compared to timber felling (Belcher et al., 2015). It also has important cultural significance and value for various indigenous people around the World (Mipun et al., 2019).

NTFPs serve the important products for improving the rural growth, expands financial condition, cultural endurance, and environmental healthiness in local, national and global markets. (Lepcha et al., 2020). Some tree species have special importance for Indigenous peoples, as they are associated with social and cultural practices (Benner et al., 2021). Depends on the marketable value, some of the NTFPs are used for consumption, rather than for sales, due to the minimal cost. NTFPs are important especially for poor peoples, which provide the substitute to food as well as income source. In this respect, it is important to uncover that 250 million poor rural people in India totally dependent by NTFPs for their livelihood needs (Pandey et al., 2016). In India, more than half of its inhabitant's lives in rural areas and a large indigenous people are dependent on NTFPs for

their nourishment and income generation. From an analysis of Indian forest history, it is clear that NTFPs had a vast influence on Forest community's livelihoods (Zode et al., 2015).

During the colonial period, only wood and a few non-wood forest products (like, bamboo, grass, resin, gum etc.) got main concern for commercial importance. Now a day NTFPs are not only an important income generating activity for local people, but equally a source of food, medicines and serves other multi- purpose values (Endamana et al., 2016). The uses of NTFP's vary from place to place because of the heterogeneity of the group of people and different customary practices by tribalpeoples in the country. There is growing alertness that sustainable forest management should consist of measures for the effective conservation and management of NTFP resources in order to meet the real and future requirements of local community (Maske et al., 2011).

Bundelkhand area is located in Central part of India in the Indo-Gangetic plains on the Vindhyan hilly tracts consisting of six districts of Madhya Pradesh (MP) andseven districts of Uttar Pradesh (Jhansi, Jalaun, Lalitpur, Mahoba, Hamirpur, Banda and Chitrakoot) (Jain et al., 2020). The soil of the area has been formed by the degradation of the Vindhyan hilly tracts and the deposition of soil carried by the rivers viz., Yamuna, Ken, Betwa, Dhassan, Bairma, Baghain, Paisuni and southern Tons. The forests of Bundelkhand is typically "Northern Tropical dry deciduous type". Natural and reserve forest areas are usually restricted to the hills of Vindhyanplateau (Sinha and Shukla, 2004).

This area affects from several limitations, generally high vulnerability of natural calamities and poor infrastructure, which has made farming productivity very low and uncertain employment. The area is characterized as drought-prone and resource-poor from cultivation point of view (Garg et al., 2020). The small and marginal farmers and landless laborers are the most affected, particularly during drought years (Singh et al., 2023). The single way out for them is to migrate towards cities for income. Approximately 33% of the area is covered by degraded forest, grazing land, and degraded wasteland (Gupta et al., 2014). The farmers of Bundelkhand region also keep trees on their farms to meet their diversified needs. For many of the landless tribals and farmers, are the mainly depends on forest for source of livelihood safety. They collect different products from the nearby forests, wastelands, roadside plantation and earn their livelihood.

The present article highlights various tree-based products sustaining the livelihood security of tribal communities and farmers of the Bundelkhand region. Most of the tribal families are selling their products to intermediaries because of the unavailability of proper markets. The intermediaries come to the villages during the harvesting season of the NTFPs and buy the products at a low rate. So the products need to be promoted and strengthened through market linkage between seller and buyer, value-addition and transportation for securing the livelihood sustenance of the resource-poor farmers of this region. The aim of the current study was to understand the role of NTFPs in household subsistence and synergy of local forest inhabitants' dependency on the NTFPs, as well as to analyses the employment and income generation through NTFPs.

2. Materials and Methods

2.1. Study area

A preliminary survey was conducted during the month of January to November, 2022. Conducted to assess the major NTFPs and their role in livelihood generation in Bundelkhand region of Uttar Pradesh. 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 this region Saharia, Kol, Gond and Bhaini are the dominat tribal communities. Formal and informal interviews were conducted with local villagers to document their NTFP harvesting practices. Selected villages are near forest fringe area of Babina range of Jhansi, Charkhari and Panwari range of mahoba, Kalinjar area in Banda and Karvi range of Chitrakoot. The information was collected from approximately 10% of the village population, who depended on the forest for various daily needs. The informants included old and experienced males and females who were well acquainted with the plants and who could thus easily identify them. During the study respondents belonged to

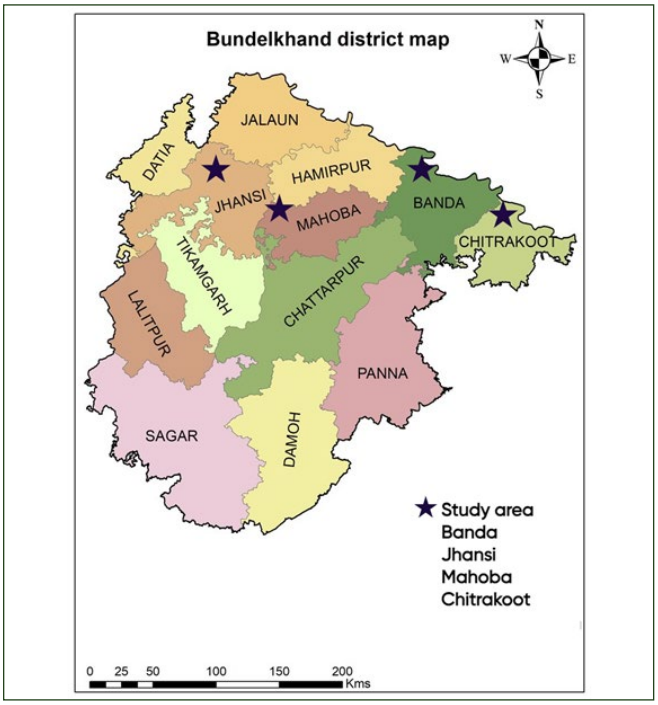

Figure 1: Bundelkhand region map

female category are 60% and 40% respondents be-longed to male category. The plants were personally identified by the informants and representative. Finally, a complete list was prepared. During the field surveys, the present status of the wild medicinal plants, and the local eco-geographic and meteorological conditions were also noted for each site (Uniyal et al., 2011).

3. Results and Discussion

The forests of the study area are usually multi-layered comprising a dry deciduous type of forest which yield rich and diverse types of forest products. The tribal community's of forest fringe areas are highly dependent on the collection of different products for domestic uses as well as commercial purposes. Non-Timber Forest Products continue to play a key role in the livelihoods of rural people, especially in forest-dependent communities. While many conventional uses of NTFPs persist, several emerging uses are gaining traction, driven by changing market dynamics, technological developments, and growing consumer preferences. Products derived from NTFPs, such as medicines, plant extracts, and essential and fatty oils, are gradually more being used in natural cosmetics and personal care products. Natural dyes used for textiles and handicrafts. Herbal and sustainable dyeing processes using plant-based extracts add to the increasing demand for organic produced textiles. The pharmaceutical industry is gradually exploring the remedial potential of plants, leading to the development of herbal medicines and Ayurvedic formulations for various health conditions. These budding uses of NTFPs show the versatility and potential of these products to contribute the sustainable development, economic growth of the people. It is the women of the tribal communities who are largely engaged in collecting NTFPs from the forests and selling this in the markets nearby. But local peoples of this region directly sell the raw products in the market rather than value addition. Creating value in the existing value chain by scientific and technological intervention can profit NTFP collectors. The public should be made aware about this and various training programs should also be organized by the government. It is the collective responsibility of the government and local stockholders to promote NTFP in this region for income generation of local villagers. In addition to technological contribution product value can be improved by understanding and complying with regulatory supplies of major markets. Such value enrichment to value chain will empower all actors of the supply chain pyramid such as primary producers, traders, manufacturing industry and consumers. A preliminary survey was conducted to assess the major NTFPs and their role in livelihood generation in that region. There are many forest based products collected by locals but these are some major NTFPs explain below.

3.1. Phyllanthus emblica (AMLA)

Emblica officinalis or Amla is a fruit of deciduous plant which belongs to family Euphorbiaceae. This fruit is commonly scattered in tropical and sub-tropical forests of India. In traditional medicine, the fruits, which are sour, astringent, bitter, acrid, sweet and anodyne exert several beneficial effects which includes ophthalmic, carminative, digestive, stomachic, laxative, dyspepsia, aphrodisiac, rejuvenative, diuretic, thermo regulation, antipyretic and tonic (Shrivastava et al., 2022; Singh et al., 2019).

The collection of Amla fruits begins with the start of winter (mid-November) when the crop reaches maturity, and remains till mid-February. Unlike other NTFPs, the removal of Amla is a highly organized group activity. Individual collections are not done because the fruits should reach the industry in huge quantities and readily (within 36 Hours of the harvest) to avoid deterioration of quality. In this region Amla fruit is harvested and sold by local collectors in the market at the rate of ₹ 60 kg^{-1}.

3.2. Terminalia arjuna (Arjun bark)

Terminalia arjuna is a deciduous tree 20–30 m above ground level. It belongs to Combretaceae family. It is found in widely throughout Indo-sub Himalayan tracts of Uttar Pradesh, South Bihar, Madhya Pradesh, Delhi and Deccan region near ponds and rivers. The bark, leaves and fruits of *T. arjuna* have been used in traditional system of medicine for different diseases. The bark powder has been used to possess cardio protective properties (Khaliq and Fahim, 2018)

Many tribal groups possess indigenous knowledge about the use of Arjuna bark Figure 1. The harvesting of bark from mature Arjuna plant is done in the month of April to May. But it is sold at a very low rate at the local level till the price ₹ 1 $kilo^{-1}$. Due to lack of proper market or awareness, villagers of this region are not getting the right price.

3.3. Phoenix sylvestris (Date palm leaves)

Phoenix sylvestris is generally known as Indian date and is native to India and southern portions of Pakistan. *P. sylvestrisis* is mainly found in drier-to-moist tropical and subtropical areas. (Jain et al., 2018) The dry leaves are commonly used by local peoples for preparing brooms, floormats and hand fans among other things Figure 2 and 3. Women's mainly collect the leaves for preparing broom. Brooms made from its leaves are sold at local market in ₹ 30–40 each broom. The sweet fruits of this plant are consumed as picked as well as in the form of a jelly.

3.4. Nyctanthes arbor-tristis (Harsingar)

Nyctanthes arbor-tristis belongs to Oleaceae family. The name *Nyctanthes* indicate "Night Flowering". It is a indiginous medicinal plant generally known as night jasmine or coral jasmine. The flowers used as carminative, stomachic, astringent to bowel, expectorant, antibilous, hair tonic and in the medication of many skin diseases and ophthalmic purposes (Singh et al., 2020). Tender stems of this plant generally used for preparing of basket Figure 6, and sold at

local market in ₹ 100–150 each.

3.5. Madhuca latifolia (Mahua)

Madhuca latifolia or *Madhuca indica* named as Mahua belongs to the family Sapotaceae, an important forest plant growing throughout central India. It is an important tree having vital socioeconomic value. It is a deciduous tree that grows commonly on dry tropical and subtropical climatic conditions

The tree, known under the name of mahua, produces edible flowers and fruits Figure 7. The leaves of Mahua tree contain saponin, an alkaloid glucoside (Singh, 2018). Mahua seeds sold at 50 ₹ kg^{-1} and Mahua flowers sold at 60 ₹ kg^{-1} in local markets in this area.

All portions of mahua tree have a therapeutic value. The study indicate that mahua is a truly versatile tree of Bundelkhand, which has been protected on bunds of agriculture field for receiving number of benefits by indigenous people of this region since generations.

3.6. Buchanania lanzan (Chironji)

*Buchanania lanzan*is an Indian native plant commonly called as chironji or achar. *Buchanania* species mainly found in dry deciduous and dry mixed deciduous forests of Central parts of India including Vindhyan Zone and the Bundelkhand area of Uttar Pradesh. Ethnic groups largely collect the dry fruits from the forest and sell it to the local market to earn the money for their income. It is widely used by Indian tribes for treating various diseases. The tribal people often consume and sale the highly nutritious seeds to earn their livelihood. Chironji kernel encompasses about 52% oil. The kernel is used for extraction of chironji oil. This extracted oil is used mostly in cosmetic manufacturing and substitute for olive and almond oils. (Neeraj et al., 2020)

Harvesting time of Chironji seeds is April-May Figure 8. In India, the approximate rate of chronji kernel is ranged from ₹ 750 to 1000 kg^{-1} but collector's sold to the local market in very low price. Peoples of this region collected seeds in an unsustainable way like unripe fruits are collected from the forest so there is a urgent need for sustainable management practice of this plant. Fully ripened fruits turning black from green in colour should be collected. Fruits should be collected after April preferably in the 2nd or 3rd weeks of May. Trees should be selected from the area where they are more in number and only 70% to 80% fruit should be collected. 20-30% of the fruits should be left out for animal and natural regeneration.

3.7. Diospyros melanoxylon (Tendu leaves)

Tendu or Kendu tree (*Diospyros melanoxylon* Roxb.) belonging to Family Ebenaceae, that is native to India. *Diospyros melanoxylon* is one of the most characteristic trees of the dry deciduous forests throughout India. Moreover, tendu leaves are resistant to decay and have medicinal properties due to presence of pentacyclic triterpines and flavones (Guleria et al., 2021).

Leaves of tendu tree are taken by tribals to make "*bidi*" the conventional cigarettes by rolling them around tobacco. Bidi production is the one of the minor occupations of tribal and rural people. Primary collectors collect mature leaves of Tendu and sold it to industries in 250 ₹ 100 $leaves^{-1}$. Harvesting time is mostly in the month of April to June.

3.8. Bamboo spp.

Bamboos are mainly used in this region for making tokri and baskets Figure 9. In the Bundelkhand area, *Dendrocalamus strictus* (male bamboo) commonly known as 'lathi bass', is grown widely in forests as well as agricultural fields. The people of Bundelkhand are reliant on male bamboo for their usual needs. Through the sale of bamboo lathis, theycan earn a meager income of ₹ 20,000–22,000 $year^{-1}$. These lathis can be used for safety, as a support, as axe handle by farmers. The bamboo stick business is mainly widespread in Jhansi, Hamirpur, Mahoba and Banda districts of Bundelkhand. (Chavan et al., 2016).

3.9. Butea monosperma (PALASH)

Butea monosperma (Lam.) is locally known as palash, belongs to the family Leguminosae. Flower is used cure the stomach related problems like digestion problem, stomach ache etc. (Yadav et al., 2020). The Sahariatribe, of Bundelkhand collected palash gum during November–December for gum extraction. On an average, 500 g of gum is collected from one tree and a family of 4–5 individuals collects about 100 kg of gum in a year. This gum is purchased at the rate of ₹ 80 kg^{-1} and thus a family earns ₹ 8000 $year^{-1}$ from this enterprise. Fresh leaves of palash used for making biodegradable leaf plates. Local people also collected dry palash flower for preparation of medicine and herbal dye.

3.10. Sterculia urens (Kulu gum)

Sterculia urens Roxb. (Family: Combretaceae) commonly known as 'Karaya' or 'Kadaya'. It is used as a thickening component, particularly in textile printing paste, and is also used commercially as a food preservative. It is used as a pulp binder in the paper industry (Shukla and Agnihotri, 2022) White color gum locally known as kullu gum collected by the tribal people in this region.

3.11. Boswellia serrata (Salai gum)

Salai gum also identified as *Olibanum*, is an aromatic oleogum-resin obtained from the bark of trees belonging to the genera *Boswellia* Figure 10. In India, it distributed in dry hilly forests of Rajasthan, Madhya Pradesh, Gujarat, Bihar, Assam, Odisha as well as central peninsular regions of Andhra Pradesh, Assam etc. It is an important element in cosmetic industry and it is extensively marketed as a food supplement (Prasad et al., 2019). This gum is tapped by local tribes by traditional methods using iron plates. Harvesting of Salai gum from a mature tree is started from November to May every year. But due to lack of proper knowledge salai gum is sold at local village level at a very cheap price which is 200 ₹ kg^{-1}.

3.12. *Terminalia chebula (Harad)*

Terminalia chebula (Family-Combretaceae) generally known as Harad. It is an important herb in Unani Matericamedica for treatment of asthma, hemorrhoids, sore throat, gastric

Figure 1: Collection of *T. arjunabark*

Figure 2: Collection of *P. sylvestris* leaves

Figure 3: Sun Drying of *P. sylvestris* leaves

Figure 4: broom Made by *P. sylvestris*

Figure 5: *Boswellia serrata* Tree

Figure 6: Tokri made by Harsingar

Figure 7: Flowers of *Madhucalatifolia*

Figure 8: Chironji seeds

Figure 9: Tokri and baskets made by Bamboo

disorders (vomiting, anorexia, flatulence), diarrhea, dysentery, spleenomegaly, epilepsy, leprosy, skin disorders, melancholia, gout and joints pain. Also it is useful in renal calculi, dysurea, retention of urine and skin disorders with discharges like allergies, urticaria and other erythematous disorders (Bag et al., 2013). Harvesting time of Harad fruit Figure 12 is in the month of January to march. And primary collector sold it in

Figure 10: Collection of *Sterculiaurens gum*

Figure 11: Salai gum collected by local tribal people

Figure 12: Baheda Fruit

the local market at very cheap price which is 15 ₹ kg^{-1}.

3.13. Terminalia belerica (Baheda)

In Ayurveda, the fruit of *T. belerica*is recognized as an expectorant. It is an integral part of Ayurvedic laxative, astringent, anthelmic, and antipyretic which is helpful in hepatitis, bronchitis, piles, coughs, eye disease such as myopia, corneal opacity etc. hoarseness of voice, it is also used as hair tonics. (Sharma et al., 2021) Harvesting of Baheda fruit Figure 13 is mainly done in the month of November-February. And it sold at the 25 ₹ kg^{-1} in local markets of this region.

3.14. Bauhinia vahlii (Mahulpatta)

Bauhinia vahlii (Family-Leguminosae) is a gigantic, generally evergreen climber, commonly known as Mahul. It is also called as camel's foot climber as the leaves are similar to a camel's foot print. It is the major creeper in India, and can grow up to 10–30 m long (Singh et al., 2017)

Bauhinia vahlii is a great climber and one of the most abundant Indian Bauhinia species. The species is spread in sub-Himalayan region up to 3,000 m above sea level and in Assam, Central India, Bihar, Eastern and Western Ghats. Harvesting of leaves is done in Madhya Pradesh, Odisha and Andra Pradesh (Chauhan and Saklani, 2013). Indigenous people of this region mainly collected these leaves for preparation of biodegradable plates.

*3.15. Anogeissus pendula (*Kardhai gum)

Anogeissus pendula (Edgew) is one of the most valuable multi-purpose tree species belongs to the family Combretaceae and is spread throughout the tropical Asia and Africa. It grows in dry, hot region of India, frequently occurring in the dry tropical forest and dry mixed deciduous forests.

Sahariya peoples collect this as a kardhai gumwhich is edible and has therapeutic value Figure 11. Primary collector sold it in the local market at very cheap price which is 30 ₹ kg^{-1}.

3.16. Helicteres isora (Marodfali)

Helicteres isora L. (Sterculiaceae) locally called as marodfaliis a small tree 2–3 m tall, bark thin and strong distributed from Jhelum Eastwards to Nepal, Bihar, West Bengal, Central, Western and Southern India (Tiwari et al., 2012). This plant mainly used in folk medicine in treating diarrhea, constipation of newborn babies, and snakebite. (Pandey et al., 2021). Harvesting time of Marodfali fruit Figure 14 in the month of June and sold it in local market at 20 ₹ kg^{-1}.

3.17. Cyperus rotundus (Nagarmotha)

Cyperus rotundus also known as Nagarmotha or 'Nut grass' has many medicinal properties and is widely used in ayurvedic medicine. Nagarmotha is belongs to the family Cyperaceae. The essential oil obtained from the tuber is used in making soap, perfumery, and insect repellent cream. Nagarmotha powder or Nagarmotha churna is extracted from the roots Figure 15 of Nagarmotha plant. Nagarmotha powder has been

Figure 13: Amla Fruits

Figure 14: Marodfali

Figure 15: Nagarmotha selling in local market

widely used for the treatment of the disorders of skin, hair, stomach, joints, kidney, etc. Harvesting time of Nagarmotha roots in the month of December. And sold it very cheap price in local markets of study area which is 20–25 ₹ Kg^{-1}.

4. Conclusion

NTFP is a main source for livelihood and income generation of tribes, found not only in India but in various regions of the world. Many NTFPs are found in the study area, but out of these, 17 types of NTFPs can be identified through interview. NTFP collected in the study area is mainly sold to rural level. Hence there is a great need for promotion and marketing of NTFPs found naturally in the area of Bundelkhand UP.

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6. Reference

Bag, A., Bhattacharyya, S.K., Chattopadhyay, R.R., 2013. The development of *Terminalia chebula* Retz. (Combretaceae) in clinical research. Asian Pacific Journal of Tropical Biomedicine 3(3), 244–252.

Belcher, B., Achdiawan, R., Dewi, S., 2015. Forest-based livelihoods strategies conditioned by market remoteness and forest proximity in Jharkhand, India. World Development 66, 269–279.

Benner, J., Nielsen, J., Lertzman, K., 2021. Using traditional ecological knowledge to understand the diversity and abundance of culturally important trees. Journal of Ethnobiology 41, 209–228.

Chauhan, R., Saklani, S., 2013. *Bauhinia vahlii:* Plant to be explored. International Research Journal on Pharmacy 4(8), 5–9.

Chavan, S.B., Uthappa, A.R., Sridhar, K.B., Keerthika, A., Handa, A.K., Newaj, R., Kumar, N., Kumar, N., Chaturvedi, O.P., 2016. Trees for life: creating sustainable livelihood in Bundelkhand region of central India. Current Science 111(6), 994–1002.

Endamana, D., Angu, K.A., Akwah, G.N., Shepherd, G., Ntumwe, B.C., 2016. Contribution of non-timber forest products to cash and non-cash income of remote forest communities in Central Africa. International Forestry Review 20, 1–16.

Garg, K.K., Singh, R., Anantha, K.H., Singh, A.K., Akuraju, V.R., Barron, J., Dev, I., Tewari, R.K., Wani, S.P., Dhyani, S.K., Dixit, S., 2020. Building climate resilience in degraded agricultural landscapes through water management: A case study of Bundelkhand region, Central India. Journal of Hydrology (TSI) 591, 1–12.

Guleria, C., Gautam, K., Gupta, H., Choudhary, S., 2021. NTFPs a key tribal livelihood source: a Case of Tendu Leaves. Agriculture and Environment E-newsletter 2(7), 19-22.

Gupta, A.K., Nair, S.S., Ghosh, O., Singh, A., Dey, S., 2014. In: Bundelkhand Drought: Retrospective Analysis and Way Ahead. National Institute of Disaster Management, New Delhi, 148.

Jain, P., Jain, S., Sharma, S., Paliwala, S., 2018. Diverse application of *Phoenix sylvestris*: A potential herb. Agriculture and Natural Resources 52(2), 107–114.

Jain, R., Chand, P., Rao, S., Agarwal, P., 2020. Crop and soil suitability analysis usingmulti-criteria decision making in drought-prone semi-arid tropics in India. Journal of Soil and Water Conservation 19, 271–283.

Khaliq, F., Fahim, M., 2018. Role of *Terminalia arjuna* in Improving Cardiovascular Functions: A Review. Indian Journal of Physilogy and Pharmacology 62(1), 8–19.

Lepcha, L.D., Shukla, G., Pala, N.A., Vineeta, S.G., Chakravarty, S., 2018. Contribution of NTFPs on livelihood of forest-fringe communities in Jaldapara National Park, India. Journal of Sustainable Forestry 38, 213–229.

Lepcha, L.D., Vineeta, S.G., Chakravarty, S., 2020. Livelihood dependency on NTFPs among Forest dependent communities. Indian Forester 146, 603–612.

Maske, M., Mungole, A., Kamble, R., Chaturvedi, A., 2011. Impact of non timber forest produces (NTFP's) on rural tribes economy in Gondia District of Maharashtra, India. Archives of Applied Science Research 3(3), 109–114.

Mipun, P., Bhat, N.A., Borah, D., Kumar, D., 2019. Non-timber forest products and their contribution to healthcare and livelihood security among the Karbi tribe in Northeast India. Ecological Processes 8(41), 1–21.

Neeraj, Bisht, V., Purwar, S., 2020. Chironji (*Buchanania lanzan*) wonder tree: nutritional and therapeutic values. International Journal of Current Microbiology and Applied Sciences 9(2), 3033–3042.

Pandey, A., Tripathi, Y., Kumar, A., 2016. Non timber forest products (NTFPs) for sustained livelihood challenges and strategies. Research Journal of Forestry 10, 1–7.

Pandey, S., Patel, D., Mishra, P., Tiwari, R., 2021. Morphological, phytochemical and pharmacological study of *Helicteres isora* (Marorphali). International Journal of Research in Pharmacy and Pharmaceutical Sciences 6(3), 13–17.

Prasad, R., Handa, A.K., Alam, B., Singh, R., Shukla, A., Singh, P., Tripathi, V.D., Prasad, N., 2019. Integration of natural resins and gums yielding trees in agroforestry systems for enhancing livelihood security. Indian Journal of Agroforestry 21(2), 1–12.

Ros-Tonen, M., 2012. The role of non-timber forest products in sustainable tropical forest management. Holz alsRoh- und Werkstoff 58, 196–201.

Sharma, R.S., Ramakrishnan, R.S., Sharma, S., Kumar, A., Singh, M., Dwivedi, N., Singh, S.V., Purohit, A., 2021. Present status and future outlook for conservation of Chironji (*Buchanania lanzan* Spreng). Octa Journal of Biosciences 9(1), 12–20.

Shrivastava, S., Kaur, J., Mehraj, M., Feroz, F., Chawla, J., Kumari, S., 2022. *Emblica officinalis* (Amla): A comprehensive review of the miracle berry. The

Pharma Innovation 11(6), 06–16.

Shukla, R., Agnihotri, S.K., 2022. *Sterculia urens*: Traditionally important medicinal tree. International Journal of Advanced Academic Studies 4(3), 109–111.

Singh, D., Bahadur, V., Wilson, D., Ttopno, S.E., Kerketta, A., 2019. Value addition of aonla (*Emblica officinalis*) Murabba with Cardamom. International Journal of Current Microbiology and Applied Sciences 8(12), 433–438.

Singh, N., Mishra, R.K., Roychoudhury, N., 2017. Mahul leaves collection as livelihood option of tribal people in Achanakmar-Amarkantak biosphere reserve. Van Sangyan 4(5), 51–52.

Singh, P., Gautam, S., Patel, A., Singh, B., 2023. Statistical study of rainfall variations across different districts of Bundelkhand region, India. International Journal of Environment and Climate Change 13(8), 1447–1454.

Singh, R., Singh, D.K., Agnihotri, R.K., 2020. Ethnobotanical studies of Harsingar (*Nyctanthes arbor-tristis* L.) of Agra region: A traditional medicinal plant. International Journal of Botany Studies 5(4), 121–124.

Sinha, B.K., Shukla, B.K., 2004. Floristic diversity of Bundelkhand region of Uttar Pradesh. Bulletin of the botanical survey of India 46(1-4), 60–76.

Tiwari, V., Singh, A., Tiwari, A., 2012. *Helicteres isora* L.-"Mrigashringa"- Current strategies and future aspects. The Natural Products Journal 2(1), 9–19. DOI: 10.2174/2210315511202010009.

Uniyal, A. K., Singh, C., Singh, B., Kumar, M., Silva, J.A.T., 2011.Ethnomedicinal use of wild plants in bundelkhand region, Uttar Pradesh, India. Medicinal and Aromatic Plant Science and Biotechnology 5(1), 81–86.

Yadav, R.S., Sharma, S., Pasi, A.K., Patel, S., 2020. *Butea monosperma* (PALASH): Plant review with their phytoconstituents and pharmacological applications. Journal of Pharmacy And Biological Sciences 15(1), 18–23.

Zode, R.B., Shambharkar, R.B., Chaturvedi, A.K., 2015. Current status of non-timber forest products and its use pattern by villagers of tirora tehsil of gondia district Maharashtra, India. International Journal of Institutional Pharmacy and Life Sciences 5(5), 2249–6807. www.ijipls.com.