

Full Length Research Paper

Assessment and valuation of provisioning ecosystem services (Non-Timber Forest Produce) in Medak Forest range, Telangana State

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The collection of Non-Timber Forest Products (NTFP) by communities living near forest fringe villages in India is a critical aspect of sustainable forest management and livelihoods. This practice involves the harvesting of various forest resources such as medicinal plants, fruits, nuts, resins, and fibers. The reliance on NTFPs by local communities contributes to biodiversity conservation and economic sustainability, with 25% of rural people in India depending on NTFPs. The study aimed to explore the significance of income derived from NTFPs to household livelihoods, as well as the socioeconomic factors shaping the collection and marketing of NTFPs. Employing a multistage sampling technique, quantitative data were meticulously gathered from 70 forest fringe villages in the Medak Forest range, covering 700 households via structured survey questionnaires. During the study, a total of 47 NTFPs were identified, which are prominently collected by the fringe village communities. During the study, a total of 47 NTFPs were identified, which are prominently collected by the fringe village communities. The market price and quantity of each NTFP were assessed, and a valuation analysis was conducted for the 700 households. The results from the study will be useful in designing better policy instruments to conserve forest resources and improve the livelihoods of forest communities. Additionally, the study will support the valuation of ecosystem services provided by forest ecosystems.

Key words: Non-Timber Forest Products (NTFP), ecosystem services, valuation, livelihoods.

INTRODUCTION

An ecosystem is a dynamic complex of plant, animal, and microbe populations interacting as a functional unit with the non-living environment. The advantages that humans derive from ecosystems are known as ecosystem services (Millennium Ecosystem Assessment [MEA], 2005). Ecosystem services, initially called environmental

services (Anonymous, 1970), include providing services like pollination, fisheries, climate regulation, and flood control. These services were termed 'public services of global ecosystem'. Eventually, in 1980, the term 'Ecosystem Service' (ES) was proposed (Ehrlich and Ehrlich, 1981). Among these are provisioning services

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like food, water, fiber, and timber; regulating services that impact climate, floods, disease, waste, and water quality; cultural services that offer leisure, aesthetic, and spiritual benefits; and supporting services like soil formation, photosynthesis, and nutrient cycling (MEA, 2005). The functioning of the Earth's life-support system depends on the services provided by ecological systems and the natural capital stocks that generate them (Costanza, 1997). Ecosystems provide many goods and services that enable and enrich human life, from traditional natural resources, such as timber, fish, and edible plants, to the aesthetic qualities and characteristics of a place, to clean water and air (Daily, 1997). Human ingenuity has enabled people to refine, re-allocate, and intensify the production of many goods and services by combining natural processes with human-created tools and labor. This has led to extraordinary advances in longevity and material well-being. However, it has also led to declines in some forms of natural capital and many non-marketed ecosystem services (Millennium Ecosystem Assessment, 2005). Ecosystems are collapsing at an unprecedented rate on a global scale, and biodiversity loss has become the norm (IPBES, 2019). Ecosystem services are the benefits derived from ecosystems that are quintessentially linked to human well-being and sustenance (Costanza, 1997; MEA, 2005; TEEB, 2010). In other words, they are the goods (food, fiber, medicinal plants, genetic resources, etc.) and services (pollution control, soil formation, pollination, recreation, disease control, etc.) that are directly or indirectly allied to human welfare (Leviston et al., 2018).

Humans continuously interact with ecosystems through various processes to derive these benefits (Fedele et al., 2017). The total area of forests worldwide is 4.06 billion ha, or 31% of the total land area. Even though forests are not dispersed equally across all peoples on Earth or in all geographic locations, this area is comparable to 0.52 ha per person. The world's forests are mostly found in the tropical domain (45%), followed by the boreal, temperate, and subtropical domains (FAO, 2020). Valuation studies assessing the ecosystem services provided by forests have been undertaken globally, leveraging a spectrum of methodologies meticulously crafted to suit distinct contexts and research aims.

Different studies on ecosystem services have been carried out in India, presenting various methods for estimating the valuation of these services. In one of the earliest studies on valuation, Chaturvedi (1992) calculated the advantages of Almora woods for water supply. India's vast biodiversity comprises sixteen agroclimatic zones and includes 45,000 plant species. Approximately 3,000 NTFP species have been identified, but only 126 of these are commercially viable (Maithani, 1994; FAO, 2002, 2005). These include herbs and spices, edible and medicinal plants, starches, gums, mucilage, oils and fats, resins and oleoresins, essential oils, medicines, tannins, natural colors, bamboos and canes, fibers and flosses, grasses, tendu leaf, animal

products, and edible goods. Over 50 million Indians rely on Non-Timber Forest Products (NTFPs) for both their financial earnings and subsistence (Hegde et al., 1996). In the category of other plant items, such as lac and tendu leaves, India accounts for 42% of the total removals, with Mexico and Brazil coming in second and third, respectively (FRA, 2005).

According to the India State of the Forest Report (2021), forests covered 21% of the country in 2021. Some 300 million people live in villages bordering forests and directly depend on them, according to the India State of the Forest Report (2019). NTFPs are a good source of income, especially for the indigenous tribes living in and around the forest ecosystem. Increasing anthropogenic pressure, which directly affects the biodiversity of the region, also adversely impacts the diversity of NTFPs (Sharma et al., 2016). At least 150 NTFPs, such as honey, gums, rattan, bamboo, cork, nuts, mushrooms, essential oils, and plant or animal parts used in pharmaceutical products, are currently important in terms of international trade (FAO, 1997). In Telangana, a diverse array of 113 NTFP species have been documented, each serving various purposes such as providing edible fruits, timber, medicinal properties, fuel wood, fodder, and other miscellaneous uses. Remarkably, a significant proportion, totaling 90 taxa, possesses valuable medicinal attributes, underscoring the region's abundant botanical diversity and its practical significance (Kanneboyena, 2022). This study recorded 47 species from the Medak Forest range, which encompasses six mandals and 70 forest edge settlements. The communities harvest the NTFPs for their own use and resell them in the market to make a living. For the purpose of valuing ecosystem services, particularly NTFPs, a price list for each species in the local and regional markets is supplied, together with an appraisal and analysis of the NTFPs' worth (Table 1). This would help policymakers improve ecosystem services through afforestation in the forest area and on the forest borders, preserving the livelihoods of the communities that depend on the forest.

MATERIALS AND METHODS

Study area

Medak is located between 17°27' to 18°19' North Latitudes and 77°28' to 79°10' East Longitudes. The district is bordered by Sangareddy to the west, Rangareddy district to the south, Hyderabad and Medchal-Malkajiri to the east, and Kamareddy and Siddipet to the north. The forest area of Medak Division is divided into six forest ranges, namely Medak, Kowdipally, Narsapur, Ramayampet, Shankarampet-A, and Toopran. The district is located on the Deccan plateau and is surrounded by various hill ranges. During the investigation, it was discovered that forests are affected by a variety of factors, the majority of which are natural, such as alien species, forest fires, pests, and diseases, and anthropogenic, such as grazing and encroachment. The forest types of the Medak Forest Division include Southern Tropical Dry

Table 1. List of NTFPs collecting by the forest fringe villages of Medak Forest range.

Botanical name	Parts collection	Collection season	Purpose for collection	No. of villages collecting	No. of households collecting	Leaf (Rs./kg)	Fruit (Rs./kg)	Seed (Rs./kg)	Gum (Rs./kg)	Root (Rs./kg)	Whole plant (Rs./kg)	Flower (Rs./kg)	Total
<i>Aegle marmelos</i> (L.) Correa	Fruit/Leaf	Sept-Dec	Own use/Selling in the market	30	10	30	50						₹ 2.40.000
<i>Annona squamosa</i> L.	Fruits/Seeds	June-Oct	Own use/Selling in the market	70	50		50						₹ 17.50.000
<i>A. latifolia</i> (Roxb Ex DC.) Wall. ex Guillem. & Perr.	Gum	All seasons	Own use/Selling in the market	30	10			300					₹ 23.50.000
<i>Asparagus racemosus</i> Willd.	Root	All seasons	Own use/Selling in the market	20	10					300			₹ 6.00.000
<i>Azadirachta indica</i> A.Juss.	Leaves, fruit, bark	All seasons	Selling in the market	70	20	25		30					₹ 3.85.000
<i>Bauhinia vahlii</i> Wight & Arn.	Leaf	All seasons	Own use/Selling in the market	25	10	90							₹ 2.25.000
<i>Borassus flabellifer</i> L.	Fruit	April-May	Own use/Selling in the market	70	10		50						₹ 3.50.000
<i>Boswellia serrata</i> Roxb. ex Colebr.	Gum	March-June	Selling in the market	54	10				150				₹ 8.10.000
<i>Buchanania lanzan</i> Spreng.	Fruit/seeds	Jan-April	Own use/Selling in the market	63	10		200						₹ 12.60.000
<i>Butea monosperma</i> var. <i>monosperma</i>	Leaf	March-June	Own use/Selling in the market	70	10	100							₹ 7.00.000
<i>Capparis grandis</i> L.f.	Leaf	All seasons	Selling in the market	34	10	300							₹ 10.20.000
<i>Careya arborea</i> Roxb.	Seed/bark	Oct-Dec	Selling in the market	39	10			100					₹ 3.90.000
<i>Chloroxylon swietenia</i> DC.	Leaves, Stem, Root	Dec-March	Selling in the market	55	20	150				150			₹ 16.50.000
<i>Cochlospermum religiosum</i> (L.) Alston	Seed/Gum	April-June	Selling in the market	30	20			300	200				₹ 15.00.000
<i>Cordia dichotoma</i> G.Forst.	Fruit	March-June	Own use/Selling in the market	30	10			50					₹ 1.50.000
<i>Decalepis hamiltonii</i> Wight & Arn.	Root	All seasons	Selling in the market	18	10					300			₹ 5.40.000
<i>Dendrocalamus strictus</i> (Roxb.) Nees	Whole plant/seed	March-May	Selling in the market	30	10			500					₹ 15.00.000
<i>Dioscorea hispida</i> Dennst.	Root/seed	April-May	Selling in the market	10	10					200			₹ 2.00.000
<i>Diospyros chloroxylon</i> Roxb.	Fruit	March-July	Own use/Selling in the market	70	10		200						₹ 14.00.000
<i>Diospyros melanoxylon</i> Roxb.	Leaves	March-July	Own use/Selling in the market	70	10		200						₹ 14.00.000
<i>Gardenia gummifera</i> L.f.	Whole plant	All seasons	Selling in the market	10	10						300		₹ 3.00.000
<i>Gloriosa superba</i> L.	Whole plant	July-Oct	Selling in the market	70	10						350		₹ 24.50.000
<i>Gymnema sylvestris</i> (Retz.) R.Br. ex Sm.	Leaf	All seasons	Selling in the market	60	10	200							₹ 12.00.000
<i>Holarrhena pubescens</i> Wall. ex G.Don	Whole plant	All seasons	Selling in the market	25	10						500		₹ 12.50.000
<i>Lagerstroemia parviflora</i> Roxb.	Fruit	Feb-May	Selling in the market	43	10		200						₹ 8.60.000
<i>Lannea coromandelica</i> (Houtt.) Merr.	Gum, Bark	Feb-May	Selling in the market	70	10				200				₹ 14.00.000
<i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev.	Flowers, Fruits	Nov-January	Selling in the market	45	10							20	₹ 94.000
<i>Mundulea sericea</i> (Willd.) A.Chev.	Leaves, bark and seeds	All seasons	Selling in the market	46	10			50					₹ 2.30.000
<i>Nyctanthes arbor-tristis</i> L.	Leaf	All seasons	Selling in the market	33	10	50							₹ 1.65.000
<i>Phoenix sylvestris</i> (L.) Roxb.	Fruit	Jan-March	Own use/Selling in the market	70	10		50						₹ 3.50.000
<i>Phyllanthus emblica</i> L.	Fruit	Sept-Dec	Own use/Selling in the market	60	10		300						₹ 18.00.000
<i>Pongamia pinnata</i> (L.) Pierre	Fruit	Feb-May	Selling in the market	56	10		100						₹ 5.60.000
<i>Sapindus emarginatus</i> Vahl	Fruit	Feb-May	Own use/Selling in the market	45	10		300						₹ 13.50.000
<i>Semecarpus anacardium</i> L.f.	Fruits, marking ink on clothes	May-July	Own use/Selling in the market	70	10		50						₹ 3.50.000
<i>Soymida febrifuga</i> (Roxb.) A. Juss.	Flower/Seed	Feb-May	Selling in the market	70	10			200					₹ 14.00.000
<i>Firmiana simplex</i> (L.) W.Wight	Seed/Gum	Dec-March	Selling in the market	70	10				150				₹ 10.50.000
<i>Strychnos nux-vomica</i> L.	Fruit	Nov-March	Selling in the market	30	10			50					₹ 1.50.000
<i>Strychnos potatorum</i> L.f.	Fruit	Dec-March	Selling in the market	30	10			150					₹ 4.50.000
<i>Syzygium cumini</i> (L.) Skeels	Fruit	May-June	Own use/Selling in the market	55	10		100						₹ 5.50.000
<i>Tamarindus indica</i> L.	Fruit	Oct-Dec	Own use/Selling in the market	55	10		50						₹ 2.75.000
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Fruit	Nov-March	Own use/Selling in the market	55	10		20						₹ 1.10.000
<i>Terminalia chebula</i> Retz.	Fruit	May-June	Own use/Selling in the market	55	10		60						₹ 3.30.000
<i>Thysanolaena latifolia</i> (Roxb. ex Hornem.) Honda	Grass	Jan-March	Own use/Selling in the market	55	10		50						₹ 2.75.000

Table 1. Contd.

<i>Tinospora cordifolia</i> (Willd.) Miers	Stem	Sept–Oct	Own use/Selling in the market	55	10		50	₹ 2.75.000
<i>Ximenia americana</i> L.	Fruits	June–Oct	Own use/Selling in the market	70	10	200		₹ 14.00.000
<i>Ziziphus mauritiana</i> Lam.	Fruits	Oct–Nov	Own use/Selling in the market	70	10	200		₹ 9.40.000
<i>Ziziphus xylopyrus</i> (Retz.) Willd.	Fruits	Oct–Nov	Own use/Selling in the market	70	10	200		₹ 9.40.000
								₹ 3.89.24.000.00

Deciduous Forests (Champion and Seth, 1968). There are 26 forest sections and 98 beats in the six territorial ranges present in this district. The total Medak forest area covers 57,623.424 ha (Figure 1).

The Medak Forest range has 70 forest fringe villages covering 6 mandals, Medak, Haveli Ghanpur, Shankarampet (A), Yeldurthy, Ramayampet and kulcharam (Figure 2).

There are 265 forest fringe villages in the division out of a total of 469 villages (Figure 3). According to the Census of India conducted in 2011, the population of Medak district was recorded as 767,428, comprising 378,654 males and 388,774 females. These individuals resided in a total of 168,677 households spread across 469 villages.

Sample selection

The research, spanning from 2019 to 2023, encompassed the entire Medak Forest range, meticulously covering all 70 forest fringe villages. The Medak Forest range within Medak district was purposefully selected for this study due to its significant concentration of tribal households who rely on NTFPs to secure their livelihoods. A multi-stage random sampling technique was used for the selection of households (Ray and Mondol, 2004), and all the forest fringe villages within a 3-km radius were selected (National Working Plan Code, 2014). The sample consisted of 700 (10%) randomly selected households from the 70 study villages, representing all kinds of land ownership. Interviews were conducted with household heads and the eldest members.

Data collection and analysis

Data pertaining to the collection of NTFPs by fringe village communities were gathered through structured interviews

conducted with respondents, utilizing a pre-tested interview schedule. Additionally, non-participant observations were employed to supplement the data collection process (Mukherjee, 1993). The collected parameters encompassed details such as the type of NTFP, plant part utilized, species name, plant habit, seasonality, usage patterns, annual collection rate, annual consumption rate, sales rates, annual sales volume, and income generated. The monetary values assigned to NTFPs were based on current local market rates. Furthermore, the annual household income from various sources was recorded.

Data were analyzed using simple descriptive statistics such as frequency (f), percentage (%), mean (\bar{x}), and range (Snedecor and Cochran, 1967). This comprehensive approach was followed to examine the role of NTFPs in household income and shed light on several factors influencing their collection and marketing dynamics in the Medak Forest range.

The study identified the various services and classified the recipients who used the NTFPs for household or commercial purposes. To gain insights into the socioeconomic dynamics, the research targeted 10 families from each village, ensuring a representative sample.

Furthermore, market surveys were conducted to ascertain the prevailing market prices for each NTFP species under consideration. The data collection process also involved direct interactions with community members, traders, middlemen, and forest officials. For a comprehensive understanding, data was gathered on pricing information for a total of 47 NTFP species at the local level. Our approach extended beyond the local community, as state-level markets such as those in Hyderabad, including "Dawa Saaj dukan" in Begum Bazar, a hub for bulk trading of NTFPs, were also visited. This engagement with traders provided valuable insights into market dynamics and pricing structures.

The dependability and depth of our dataset are enhanced by the combination of exacting data collection

techniques and a wide range of sources, including both public and private organizations. This method provides a strong basis for future study and publishing by enabling a comprehensive investigation of the interaction between local communities, NTFP trading habits, and market dynamics.

RESULTS

The Medak Forest division serves as a significant source of fruits, seeds, and medicinal plants for the local population. Key biological resources collected include teak, neem, mahua, sal, beedi leaves, and various fruits such as sitaphal and chironji seeds. Medicinal herbs are also extensively sourced from the forest. Substantial portions of the recorded forest area consist of open forests, shrub forests, and areas devoid of trees. The availability of NTFPs is notably high in the Medak Forest range, with important species including mahua flower and seed, custard apple, chironji, and marking nut.

Both men and women engage in the collection of these NTFPs from the forest, selling them in local markets. Beedi leaves were traditionally sold to the forest department, though collection has ceased since 2020. Women typically sell custard apple in retail markets. Medicinal plants, particularly from the Narsapur area, are extracted and sold to traders in Hyderabad and other locations without undergoing value addition. Villagers also collect fiber and fuelwood from the

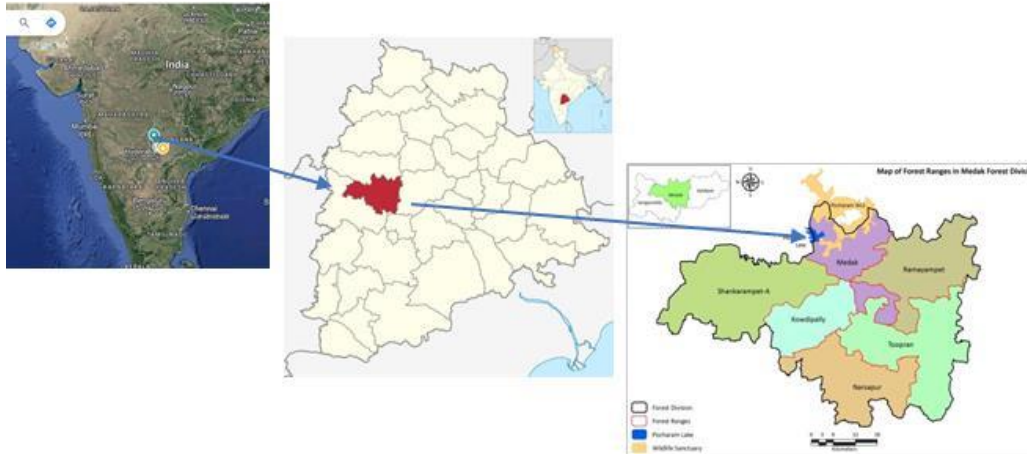


Figure 1. Location Map for Medak District.

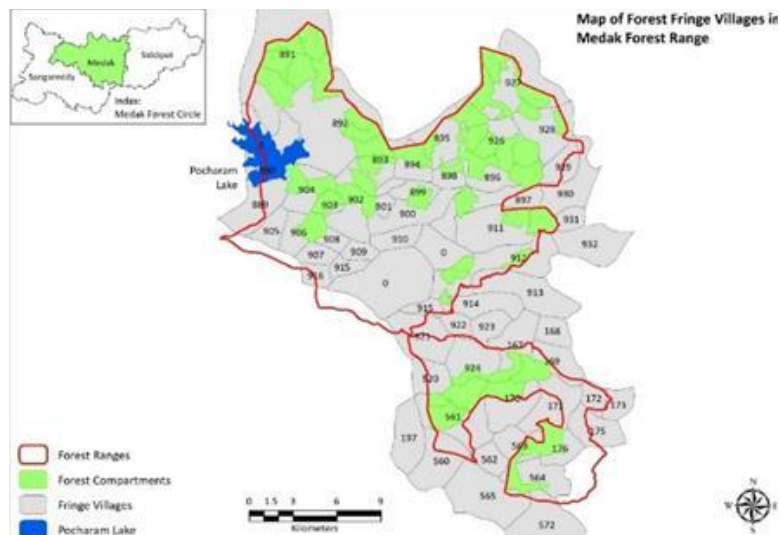


Figure 2. Map of Forest Fringe Villages in Medak forest range.

forest, although the availability of alternatives has reduced the necessity for collection.

The local population, especially indigenous communities heavily relies on these natural resources for medicinal purposes and livelihood sustenance. The research identified species such as *Annona squamosa*, *Buchanania cochinchinensis*, *Diospyros melanoxylon*, *Phyllanthus emblica*, and *Semecarpus anacardium* frequently sold in local markets. Custard apple ('Seethaphal') is harvested in significant quantities from the wild and transported to markets in Hyderabad. Medicinal plants like *Asparagus racemosus*, *Cochlospermum religiosum*, *Gloriosa superba*, *Holarrhena pubescens*, *Kavalama urens*, *Marsdenia sylvestris*, *Terminalia chebula*, *Tinospora cordifolia*, *Dioscorea hispida*, *Dioscorea pentaphylla*, and *Dioscorea bulbifera* are harvested extensively, providing a subsistence

economy for nearby village inhabitants.

Teak stands out as the most sought-after timber-yielding tree, extensively harvested across the Medak Forest range, particularly prevalent in areas like Parvathapur, Kondapur, and Gundaram. Other species exploited for timber and agricultural implements include *Albizia* species, *Dalbergia* species, *Chloroxylon swietenia*, *Desmodium oojeinense*, *Lagerstroemia parviflora*, *Givotia moluccana*, *Haldina cordifolia*, *Mitragyna parvifolia*, and *Terminalia* species. Lac collection is widespread throughout the Medak division, primarily on host trees such as *Butea monosperma*, *Albizia lebbeck*, *Samanea saman*, and *Dalbergia lanceolaria*.

Forty-seven NTFPs harvested by local communities were identified across 70 forest fringe villages (Table 1). The study documented which parts of the species were used domestically or sold in the market, such as leaves,

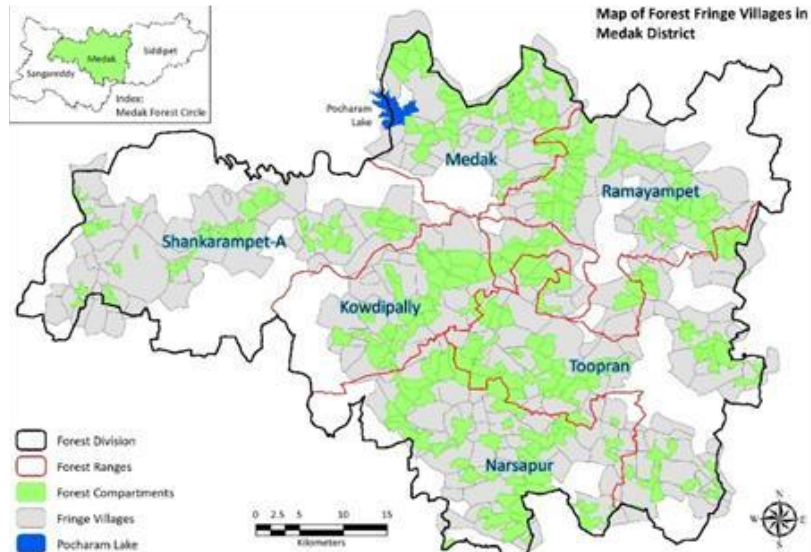


Figure 3. Map of Forest Fringe Villages in Medak District.

fruits, seeds, gums, stems, roots, whole plants, and flowers. Information on harvesting seasons and value addition through utilization, including market sales and local use, was also gathered. Twenty-four species were identified for local use, while 23 were utilized for both local use and market sales.

In Telangana state, a total of 113 commercially important NTFPs are recorded, utilized extensively by forest fringe communities (Kanneboyena, 2022). This study in Medak identified 47 such species harvested by forest fringe communities for both commercial and local purposes, amounting to a total valuation of Rs. 3,89,24,000.00 earned from resource collection in the forest area. Notably, there have been no studies conducted on the valuation of ecosystem services in Telangana State. However, this paper provides valuable documentation of these 47 species and their values, which can support future assessments of NTFPs and their broader ecosystem services. These findings can contribute to showcasing the overall ecosystem values within the division and state.

During the study, it was observed that NTFPs are utilized in various ways at the village level, including medicinal and food purposes. Once these products reach the market, they are often processed into powders, liquids, pastes, and exported to various countries for the preparation of pharmaceuticals and other products. While there are limited studies on the valuation of biological resources and their value additions, this research underscores the significant economic impact of raw material sales in markets such as Begum Bazar, Hyderabad. From there, these materials are purchased by traders and middlemen and supplied to major companies for the production of medicinal products and drugs.

As per the collection and value assessment, five species stand out in terms of their economic importance in the Medak range: *Anogeissus latifolia* at 24%, *G. superba* at 24%, *A. squamosa* at 17%, *P. emblica* at 18%, and *C. swietenia* at 17% (Figure 4). These species require attention for preservation and enhancing plantation efforts in the division to promote the flow of ecosystem services.

Figure 5 illustrates the dominance of these species in terms of the quantity of NTFPs collected. Specifically, *A. squamosa* (Custard apple) collection from the Medak Forest range is notably high. During the study, it was observed that near the Toopran toll plaza, numerous traders procure custard apple and supply it to Hyderabad for processing into custard apple pulp used in ice cream production.

Focus group discussions held with local communities in each village revealed diverse uses of each NTFP, summarized in Table 2.

DISCUSSION

According to the study findings, there is no timber extraction from the entire Medak Forest range, but the marginal communities collecting the fallen wood from the forest fringe for fuelwood purposes. Moreover, the Forest Conservation Act of 1980 bans the felling of trees even in forest areas; and this act has also played a very significant role in conservation and preservation of forests. Timber requirements in the area are met from illegal felling in the forest area and from the private *patta* lands. Mainly the timber coming in from Maharashtra, Madhya Pradesh, Chhattisgarh States also caters to the requirements. The most sought-after species are *Tectona grandis*, *Azadirachta indica*, *Mangifera indica*, etc. The

TOP 5 SPEICES IN TERMS OF HIGH ECONOMIC VALUE

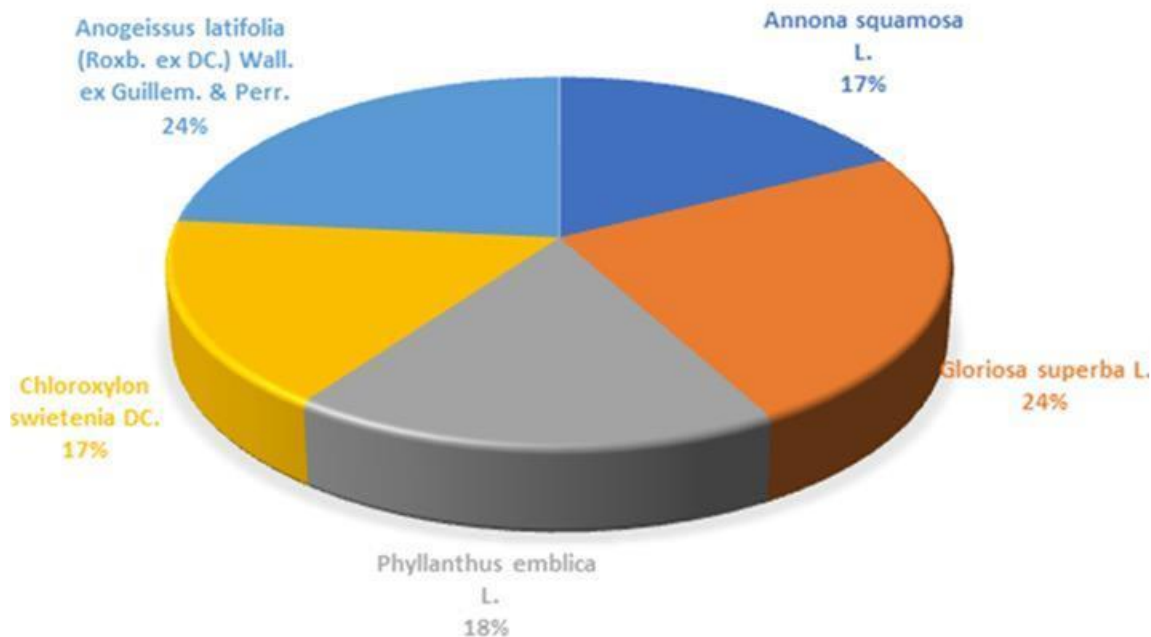


Figure 4. Top five species in terms of economic value.

Species wise collections in the villages

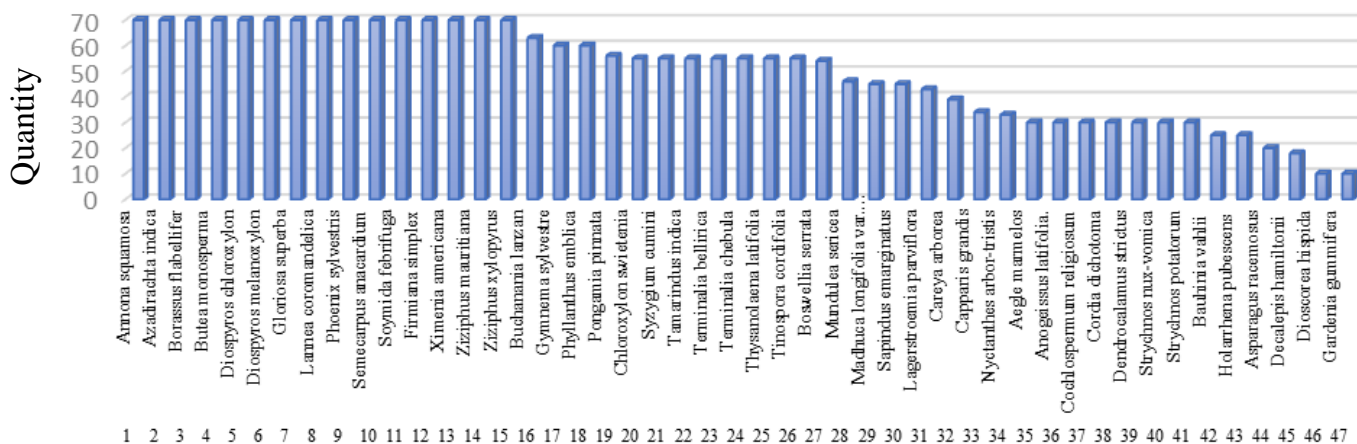


Figure 5. Species wise collections in the villages.

slow growing local timber species are used for making doors and window frames. Further Malaysian teak imported by local traders also comes to Medak to meet the local requirements. The small timber is collected by middle-class communities for house construction, alternative species used are *Acacia nilotica*, *A. indica*, *M. indica*, *Terminalia tomentosa*, *Terminalia arjuna*, etc. Bamboo, the poor man's timber, is used for roofs in

thatched dwellings, for baskets, thatties and mats. Cattle sheds and enclosures are built with bamboo splits, posts, and thorns. The requirements of the villagers on the plains are met by local markets and sometimes by stealing from reserves. The bamboo growth is minimal at present in the plain forests, occurring sporadically. Thatch is a popular roofing material in many villages.

It is generally laid 10 to 16 cm thick over a layer of

Table 2. Different plant parts are used by traditional healers of fringe village communities.

Botanical names	Common Name	Vernacular name	Habit	Parts used	Uses
<i>Aegle marmelos</i> (L.) Correa	Beal	Maredu	Tree	Fruit/Leaf	Jaundice, Leprosy, Leucoderma, Ophthalmia Hiccups, Joint pains, piles Dysentery, High blood pressure, ringworm controle, ulcers, maggot infested sores
<i>Annona squamosa</i> L.	Custard apple	Seethapal	Tree	Leaf	Febrifuge, tonic, cold remedy, digestive, clarify the urine, drastic treatment for dysentery and other ailments, Ephemeral fever
<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr. <i>Asparagus racemosus</i> Willd.	Axle Wood Tree Satawari	Tiruman, Velama Satavari, Pilli Teegalu, Yellammagadda	Tree Climbing shrub	Gum Root	Scorpion sting, Snake bite. Dyspepsia, ulcers, and diarrhea
<i>Azadirachta indica</i> A.Juss.	Neem, Margosa	Vepa	Large tree	Leaves, fruit, bark	Organic farming, fungal infections, Neem leaves and oil are used to treat wounds and cuts due to their antiseptic properties, promoting faster healing, toothbrushes (datun) to prevent cavities, pesticides and insect repellents
<i>Bauhinia vahlii</i> Wight & Arn. <i>Borassus flabellifer</i> L.	Camel's foot climber Toddy palm	Addaku, Paretaku Thati	Liana Tree	Leaf Fruit	Biodegradable leaf plates making Pulp of the ripe fruit, palm sugar or jaggery,
<i>Boswellia serrata</i> Roxb. ex Colebr.	Indian frankincense	Andugu, Sambrani	Large tree	Gum	Arthritis and Joint Pain, anti-inflammatory, gum has been used traditionally to treat asthma, wounds and sores and psoriasis
<i>Buchanania lanzan</i> Spreng.	Chironji Tree	Morli, Kukka-morri, Chinna-morri	Medium tree	Fruit/seeds	Eaten raw, roasted, or ground into a paste to be used in sweets, desserts, and savory dishes. Diarrhea, dysentery, and constipation.
<i>Butea monosperma</i> var. <i>monosperma</i> <i>Capparis grandis</i> L.f. <i>Careya arborea</i> Roxb. <i>Chloroxylon swietenia</i> DC. <i>Cochlospermum religiosum</i> (L.) Alston <i>Cordia dichotoma</i> G.Forst. <i>Decalepis hamiltonii</i> Wight & Arn. <i>Dendrocalamus strictus</i> (Roxb.) Nees <i>Dioscorea hispida</i> Dennst. <i>Diospyros chloroxylon</i> Roxb. <i>Diospyros melanoxylon</i> Roxb. <i>Gardenia gummifera</i> L.f. <i>Gloriosa superba</i> L. <i>Gymnema sylvestre</i> (Retz.) R.Br. ex Sm. <i>Holarrhena pubescens</i> Wall. ex G.Don <i>Lagerstroemia parviflora</i> Roxb. <i>Lannea coromandelica</i> (Houtt.) Merr. <i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev. <i>Mundulea sericea</i> (Willd.) A.Chev. <i>Nyctanthes arbor-tristis</i> L. <i>Phoenix sylvestris</i> (L.) Roxb.	Flame of the forest Tree Caper Wild Guava East Indian Satinwood White Silk Cotton Indian Cherry Swallow-Root Male bamboo, solid bamboo Intoxicating Yam Green Ebony Persimmon Coromandel Ebony Gummy cape jasmine Glory Lily Gurmar - Small Flowered Crape Myrtle Indian Ash Tree Indian Butter Tree Cork Bush, silver bush Coral Jasmine, Parijat Indian wild date	Moduga Regutti, magasiri gadda Budda Darmi Billudu/Tella bitla Adavi Buruga, Kondagogu, Varagogu Bankiriki, Iriki, Chinna Iriki Maredu Kommulu/gaddalu Pothu veduru Tellaagini-Geddalu Illinta Tuniki/Beedi leaf/ Abney Chinna Karinga Nabhi Podapatri Istari Pala, Tedla Pala Chennangi Gumpena Ippa chettu/ Mahuva Neelimari Karise, Parijatam Eetha	Medium tree Small tree Tree Tree Tree Climbing shrub Herb Vine Small tree Tree Small tree Climber Woody climber Large shrub Tree Large tree Tree Shrub Small tree Tree	Leaf Leaf Seed/bark Leaves, Stem, Root Seed/Gum Fruit Root whole plant/seed Root/seed Fruit/leaf Leaves/Fruits Whole plant Whole plant Leaf Whole plant Fruit Gum, Bark Flowers, Fruits Leaves, bark and seeds Leaf Fruit	Biodegradable leaf plates making Arthritis, joint pain, and muscle aches Body swellings/Maternal pain Mosquito repellent, Shivering, Neck pain, wounds, Piles, Bone fracture, Ulcers, Hairtonic Dyspepsia, Astringent Digestion, diarrhea and dysentery. Oedema, Construction, Food Food, Aphrodisiac, animal diseases Fruit Edible, Leaf used for snake bite, Rheumatic pain in cattle Beedi making, Food, Rafters, Diuretic, Carminative, Laxative Snake bite Insect bite, Lice eradication, Rheumatism, Abortion, Stupifying Ephemeral fever, Gastric, Diabetes, Galactogogue Dysentery, Headache, Cough, Stupifying Boils, Blisters, Cuts Rheumatism, Bone fracture, cracked heels, Wounds healing Galactogogue, Liquor, Food, Stupifying Hair dye Fits Food, cooling effect, thatching, toddy, preparing mats,

Table 1. Contd.

<i>Phyllanthus emblica</i> L.	Amla	Usiri	Tree	Fruit	Food, Dandruff, pickles, Anorexia, Impaction
<i>Pongamia pinnata</i> (L.) Pierre	Indian Beech Tree	Kanuga	Tree	Fruit	Oil used for Skin disease, wounds, Commerce, twigs used for Tooth brush
<i>Sapindus emarginatus</i> Vahl	Soap nut	Kunkudu	Medium tree	Fruit	Traditional shampoo, Cooling effect, Dandruff, Juice used in asthma treatment
<i>Semecarpus anacardium</i> L.f.	Marking nut, Dobhi nut	Nalla Jeedi	Tree	Fruits	Marking ink on clothes,
<i>Soymda febrifuga</i> (Roxb.) A. Juss.	Indian Redwood	Somi, Somidi	Medium tree	Flower/ seed	Stomachache, Agricultural implements, Fuel/Diarrhoea, Gout, Shivering, Tonic, Corneal opacity
<i>Firmiana simplex</i> (L.) W.Wight	Gum karaya	Tapasi, Kovila	Tree	Seed/Gum	Gum used for digestion, sterculin tablets, Dysentery,
<i>Strychnos nux-vomica</i> L.	Poison Nut	Vishamushti	Tree	Fruit	Snake bite
<i>Strychnos potatorum</i> L.f.	Clearing Nut Tree	Chilla	Small tree	Fruit	Detergent, Water purification
<i>Syzygium cumini</i> (L.) Skeels	Jamun	Neredu	Tall tree	Fruit	Adoration, eye sight, Making carts, fruit edible and used for kidney stones
<i>Tamarindus indica</i> L.	Tamarind	Chinta	Tree	Fruit	Piles, seed used for scorpion bite
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Belliric Myrobalan	Tani, Tandra	Tree	Fruit	Triphala (<i>Terminalia chebula</i> , <i>Terminalia bellarica</i> , <i>Phyllanthus emblica</i> used for immune buster)
<i>Terminalia chebula</i> Retz.	Chebulic Myrobalan	Karakkaya	Tree	Fruit	Triphala (<i>Terminalia chebula</i> , <i>Terminalia bellarica</i> , <i>Phyllanthus emblica</i> used for immune buster)
<i>Thysanolaena latifolia</i> (Roxb. ex Hornem.) Honda	Tiger Grass, Asian broom grass	Konda chepuru	Herb	Grass	Traditional medicine often uses a decoction of its leaves or other parts to help lower body temperature, Anti-inflammatory, Wound Healing, Antimicrobial
<i>Tinospora cordifolia</i> (Willd.) Miers	Heart-leaved moonseed/guduchi	Thippa teega	Climber	Stem	Immune System Booster, Antipyretic (Fever Reducer), Anti-inflammatory (arthritis and gout), Antidiabetic, Detoxification, Antioxidant, indigestion, hyperacidity, and constipation, treating respiratory issues such as asthma, bronchitis, and chronic cough, Anti-cancer, urinary tract infections and promotes overall urinary health
<i>Ximenia americana</i> L.	Hog plum	Nakkera	Bushy stragglers	Fruits	Immune System Booster, treating chronic fevers and diseases like dengue and malaria, management of diabetes
<i>Ziziphus mauritiana</i> Lam.	Ber	Regu	Small tree	Fruits	Gastrointestinal issues, colds and infections, to treat bacterial and fungal infections
<i>Ziziphus xylopyrus</i> (Retz.) Willd.	Kath Ber	Gotti, Gotiki	Small tree	Fruits/Leaf	Fodder, Wounds, Snake bite, Ephemeral fever, Wounds

closely woven bamboo reapers and keeps the hut cool and reasonably safe from rain for a few

years. The grass for roofing and for brooms is removed in considerable quantities from reserves.

Generally, both *Cymbopogon* grass for roofing and *Aristida* grass for brooms are used. Villagers

living close to forests require fodder grass for stall feeding, and the same is removed in appreciable quantities from forests.

The demand for fencing materials exists over the entire range for the needs of fringe area population. Out of this demand, a limited extent is met from the areas with shrubs from the forest at present. Most of the demand is met from reserves illegally.

In our study, we discovered that NTFPs are utilized in various ways at the village level, including for medicinal purposes and as food. When these raw materials reach the market, they are often processed into powders, liquids, and pastes, which are then exported to various countries for the preparation of drugs and other products. Despite the extensive use of NTFPs, there has been limited research on the valuation of these biological resources and their value addition processes. It is crucial to conduct further studies on NTFPs and their value addition to accurately assess their economic value. Our observations indicate that raw NTFP materials are primarily accessed in local markets such as Begum Bazar in Hyderabad. From these markets, traders and middlemen purchase the raw materials and supply them to major companies for drug preparation and other commercial uses. The need for comprehensive studies on the valuation and value addition of NTFPs is evident. Such research would provide a clearer understanding of the economic impact and potential of these resources, from their initial collection at the village level to their final use in various industries worldwide. This knowledge is essential for developing sustainable practices and maximizing the benefits derived from NTFPs.

Conclusion

The study highlights the significant role of forest resources in the livelihoods of communities in the Medak Forest range, Telangana. It identifies 47 commercially valuable NTFPs harvested by locals, contributing Rs. 3,89,24,000.00 to their economy. Medicinal plants and timber play crucial roles in both domestic use and trade.

Despite the Forest Conservation Act of 1980, illegal felling and reliance on fallen wood for fuel persist, indicating ongoing challenges in forest management. Timber needs are met through imports and illicit felling, with high demand for species like *T. grandis*. Bamboo and thatch are vital for construction purposes, while fodder and fencing materials are heavily sourced from forests. The study underscores the necessity for sustainable forest management and ecosystem service valuation to support both conservation efforts and community livelihoods.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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