FOREST FIRES AND TENDU LEAF COLLECTION IN INDIA

An evidence-based analysis

FOREST FIRES AND TENDU LEAF COLLECTION IN INDIA

An evidence-based analysis

Acknowledgement: We are grateful to the following people from Angul, Chandrapur, Korba and Bidar districts for their valuable assistance in the primary surveys: Ashok Sathpathy, Chandan Kumar Naik, Bibhudhendra Dehury, Aruna Kumar Das, Bijoy Kumar Jena, Pranaya Ballav Mohapatra, Suryakanta Tripathy, Vijay Zungraji Dehte, Smita Vijay Dehte, Pranali Diwakar Yerojwar, Pravin Bhimrao Taksande, Manikrao Maru Madavi, Sachin Nattuji Pipare, Shankar Shravan Bharde, Dicson Masih, Satya Prakash Jaiswal, Santosh Patel, Abhishek Nirmalkar, Narendra Kumar Jaiswal, Roshan Sahu, Rajkumar Shriwas, Ashok Kumar Maravi and Santosh Pawar.

We greatly appreciate the support of the following state partners of the Union who helped in the mapping and data triangulation: Faith Foundation, Ahmedabad, Gujarat; Manbhum Ananda Ashram Nityananda Trust (MANT), Kolkata, West Bengal; Madhya Pradesh Voluntary Health Association (MPVHA), Indore, Madhya Pradesh; Marathwada Gramin Vikas Sanstha (MGVS), Aurangabad, Maharashtra; Shikshit Rojgar Kendra Prabandhak Samiti (SRKPS), Jaipur, Rajasthan; Socio-Economic and Educational Development Society (SEEDS), Bihar; State Tobacco Control Cell, Directorate of Health and Family Welfare Services, Government of Chhattisgarh; Uttar Pradesh Voluntary Health Association (UPVHA), Lucknow, Uttar Pradesh.

We thank Dr Amit Yadav, Dr Garima Bhatt and Dr Puneet Chahar from the International Union against Tuberculosis and Lung Disease (The Union) South-East Asia for reviewing this report. We also acknowledge technical and financial support from International Union against Tuberculosis and Lung Disease (The Union) under Bloomberg Initiative to Reduce Tobacco Use.

Authors:
Mandvi Singh, Programme Director, Energy and Climate Change, iFOREST
Prerna Sah, Senior Research Associate, Energy and Climate Change, iFOREST
Praveen Kumar, Assistant Professor, School of Habitat Studies, Tata Institute of Social Sciences

Technical support:
Chandra Bhushan, President and CEO, iFOREST
Pranay Lal, Natural Historian and Author
Dr P. S. Roy, Senior Fellow, World Resources Institute
Dr Pawan Joshi, Professor School of Environmental Sciences, Jawaharlal Nehru University
Dr Rana J. Singh, Deputy Regional Director, The Union (SEA), India
Ashish K. Pandey, Deputy Director, The Union, New York
Dr Shivam Kapoor, Technical Advisor, The Union, (SEA), India

Research support:
Deeksha Pande, Program Associate, iFOREST

Cover Illustration: Raj Kumar Singh, Graphic Designer, iFOREST
Design and layout: Raj Kumar Singh, Graphic Designer, iFOREST

iFOREST
INTERNATIONAL FORUM FOR ENVIRONMENT, SUSTAINABILITY & TECHNOLOGY

The Union
International Union Against Tuberculosis and Lung Disease

July 2023

ISBN Number: 978-81-962786-0-1

Citation: Mandvi Singh, Prerna Sah, Praveen Kumar. (2023). "*Forest fires and tendu leaf collection in India : An evidence-based analysis*". International Forum for Environment, Sustainability and Technology (iFOREST). New Delhi.

We would like to thank Vasudha Foundation for their support in publishing this research.

Published by: International Forum for Environment, Sustainability and Technology (iFOREST)

Printed at: Print Edge Inc – B- 80, Pocket B, Okhla Phase 1, New Delhi- 110020

Contents

List of Tables

Chapter 2:

Chapter 3:

Chapter 4:

List of graphs

Chapter 2:

Chapter 3:

Chapter 4:

List of Figures

Chapter 1:

Chapter 3:

List of Maps

List of Abbreviations

AIIMS	All India Institute of Medical Sciences
AR-CDM	Afforestation and Reforestation-Clean Development Mechanism
BAI	Burnt Area Index
CAGR	Compound Annual Growth Rate
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CFR	Community Forest Resource
CGMFPFED	Chhattisgarh State Minor Forest Produce (Trading & Development) Cooperative Federation Limited
CO_2	Carbon Dioxide
CO	Carbon Monoxide
CO_2e/CO_2-eq	Carbon Dioxide Equivalent
CDM	Clean Development Mechanism
CSO	Civil Society Organisation
DMF	District Mineral Foundation
FFP	Forest Fires Points
FFPM	Forest Fire Prevention and Management
FGD	Focus Group Discussion
FRA	Forest Rights Act
GATS	Global Adult Tobacco Survey
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GIS	Geographic Information System
GST	Goods and Services Tax
IPCC	Intergovernmental Panel on Climate Change
ISRO	Indian Space Research Organisation
JFMC	Joint Forest Management Committee
KL	Kendu Leaf
MFP	Minor Forest Produce
MIDH	Mission for Integrated Development of Horticulture
MODIS	Moderate Resolution Imaging Spectroradiometer
MoEFCC	Ministry of Environment, Forest and Climate Change
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
NASA	National Aeronautics and Space Administration
NDC	Nationally Determined Contribution
NRLM	National Rural Livelihoods Mission
NTFP	Non-Timber Forest Product
OBC	Other Backward Classes
OFDC	Odisha Forest Development Corporation
PCS	Primary Cooperative Societies
PES	Payment for Ecosystem Services
PESA	Panchayat (Extension to Scheduled Areas) Act
REDD	Reducing Emissions from Deforestation and Forest Degradation
SB	Standard Bag
SC	Scheduled Caste
SCC	Social Cost of Carbon
SDM	Species Distribution Model
SES	Socio-Economic Scale
S5P	Sentinel 5 Precursor satellite
ST	Scheduled Tribe
TDCCOL	Tribal Development Co-operative Corporation of Odisha Limited
TRIFED	Tribal Cooperative Marketing Development Federation of India
TROPOMI	Tropospheric Monitoring Instrument
VAT	Value Added Tax
VDVK	Van Dhan Vikas Kendras
VSS	Vana Samrakshana Samithi
WHO	World Health Organization

Executive summary

India's climate change goals are threatened by the growing incidence of forest fires, estimated to have increased tenfold in the last two decades. Forest fires are a serious ecological concern due to their adverse impact on biodiversity, terrestrial ecosystem productivity and fertility, and soil and water quantity and quality, among others. A serious cause for concern is that nearly 95 per cent of forest fire incidences in India are believed to be human-induced, whether accidental or deliberate. Understanding this is important to design and introduce policies, practices and schemes that can help arrest the growing number of forest fires in the country.

At present, there is some acknowledgement of the role that non-timber forest product (NTFP) collection practices play in the setting of these fires; however, there is limited inquiry into this relationship and the extent of the impact. This study attempts to build an inquiry into forest fires focusing specifically on the practice of tendu leaf collection. It is widely known that tendu trees/plants are often set on fire to facilitate the growth of tender and better-quality leaves.

While fires are also used to facilitate the collection of other NTFPs like mahua, the study focuses specifically on tendu leaf collection. This is because tendu is one of the largest NTFPs being collected in some of the most fire-prone areas of India. States across central India – Madhya Pradesh, Chhattisgarh, Jharkhand, Odisha, and Maharashtra – which collectively account for more than half of the forest fire incidences in India, account for over 80 per cent of the total tendu collection in the country. Moreover, tendu leaves are primarily used for the purposes of making bidi or the Indian cigarillo which has a massive contribution towards India's public health crisis.

The study uses satellite data imagery and modelling to understand the linkages between forest fires and tendu leaf collection, and to assess its climate impact. Further, the study includes extensive primary research in the districts of Korba, Chandrapur and Angul across 1,147 households in 22 tendu-collecting villages and 60 households in six non-tendu-collecting villages. The survey was designed to understand the dependence of tendu collectors and availability of economic alternatives for them to assess policy options appropriate for the phase-out of tendu-linked forest fires. The focus of the study is on three states – Chhattisgarh, Odisha and Maharashtra – that collectively account for 35 per cent of the total tendu leaf collection in India, and 36 per cent of the total forest fires detected in the last forest fire season.

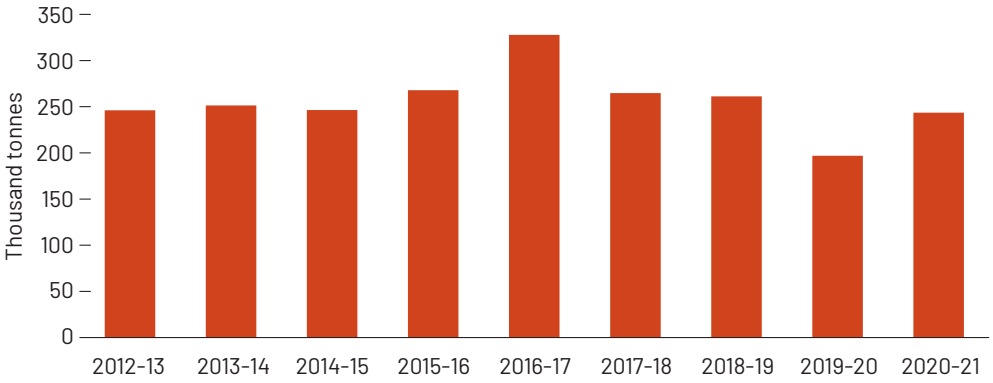
The key findings of the study are summarised below:

I. Tendu continues to be among the largest NTFPs being sourced from India's forests.

1. Comprehensive and consolidated data on tendu production at the national level is unavailable, but estimates suggest a large but declining share.

Tendu is one of the largest NTFPs being sourced from the deciduous forests of India. Consolidated data on its collection is not available for recent years, and there are also gaps in the data available at the state level. Based on the data shared by the Ministry of Environment, Forest and Climate Change (MoEFCC) till 2017, and the data available from a limited number of states post-2017, tendu collection in India is estimated to be around 243,473 tonnes in 2020-21. This indicates a significant decline in tendu collection over the past three decades, as tendu collection in the 1990s was reported to be around 450,000 tonnes. Over the past decade, tendu collection seems to have peaked in 2017, and since then it is estimated to have declined at a compound annual growth rate (CAGR) of about 7.5 per cent.

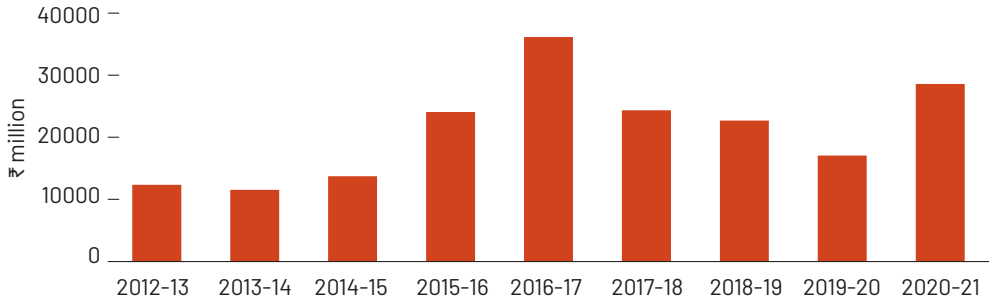
Graph 1: Estimated tendu leaf collection in India



2. Tendu's precedence is due to state-backed market linkages, and it generates significant revenues.

Tendu leaf collection was nationalised in most states of India during the 1960s and the 1970s with the stated objective of ensuring fair returns for the collectors. With the established trade monopoly, state Forest Departments developed intricate policies and robust organisational structures to facilitate collection and trade. While there is some degree of deregulation of the trade in the states, with the introduction of community forest resource rights under the Panchayat (Extension to Scheduled Areas) Act (PESA), 1996, and the Forest Rights Act (FRA), 2006, it is still largely within the ambit of the government. Tendu sale still makes massive contributions to the revenues of the Forest Departments, estimated at about ₹28.57 billion in 2020-21. It is especially significant in the states of Madhya Pradesh, Chhattisgarh, Jharkhand, Odisha, and Maharashtra which collectively account for more than 80 per cent of the total tendu collection in the country. While there are other NTFPs in these states that have huge potential, government support is either absent or less focused, and hence their potential remains largely untapped.

Graph 2: Estimated sales value of tendu leaf collection in India



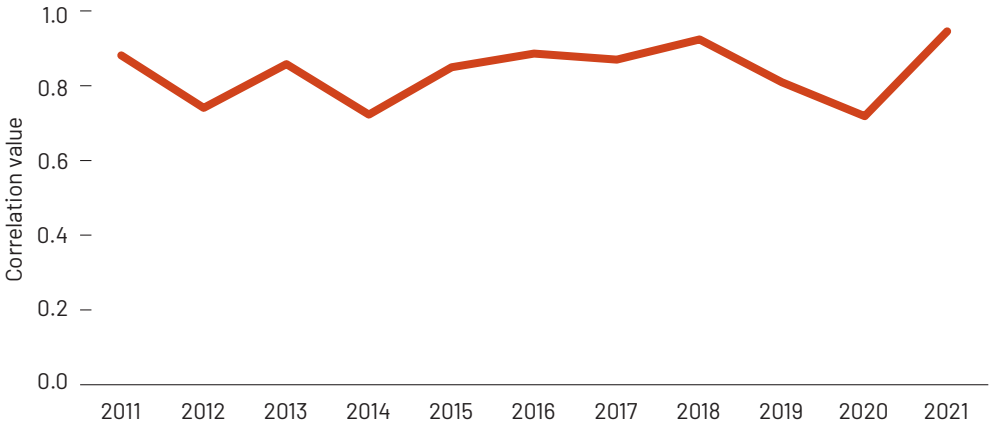
II. Prevalent tendu collection practice has a deleterious impact on the climate and environment.

1. There is a strong linkage appearing between tendu leaf collection practices and forest fires.

Forest fires are reported to be widely used in tendu leaf collection to promote the growth of tender leaves as well as to clear the undergrowth to support collection. So far, structured data on this has not been explored. Overlaying the satellite data pertaining to forest fires (sourced from NASA's MODIS dataset) and vegetation (sourced from ISRO's dataset) for three focus states of Chhattisgarh, Odisha and Maharashtra for the past decade establishes a clear linkage between tendu prevalence and that of forest fires.

The study finds that in the three focus states between the years 2011 and 2021 (the study period), the correlation between forest fire incidences and prevalence of tendu is over 0.8 for most years during the period. Tendu's range is present across 1,615 sample points of the geospatial grid in the three focus states. A total of 1,551 forest fire points (FFPs) were found to be located around each of the tendu sample points. Tendu-linked FFPs are observed to have fluctuated during the past decade. However, after a decline in 2019 and 2020, the FFPs witnessed an increase in 2021.

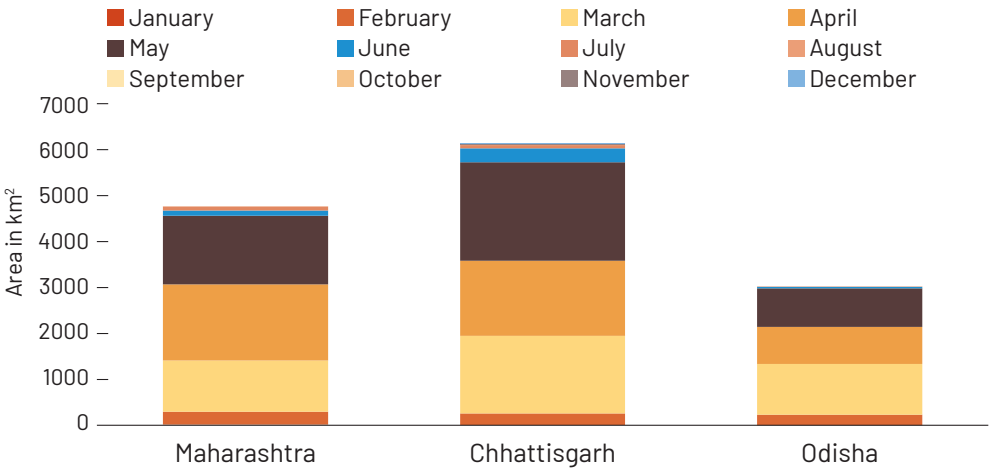
Graph 3: Year-wise correlation between forest fires and tendu in focus states (2011-21)



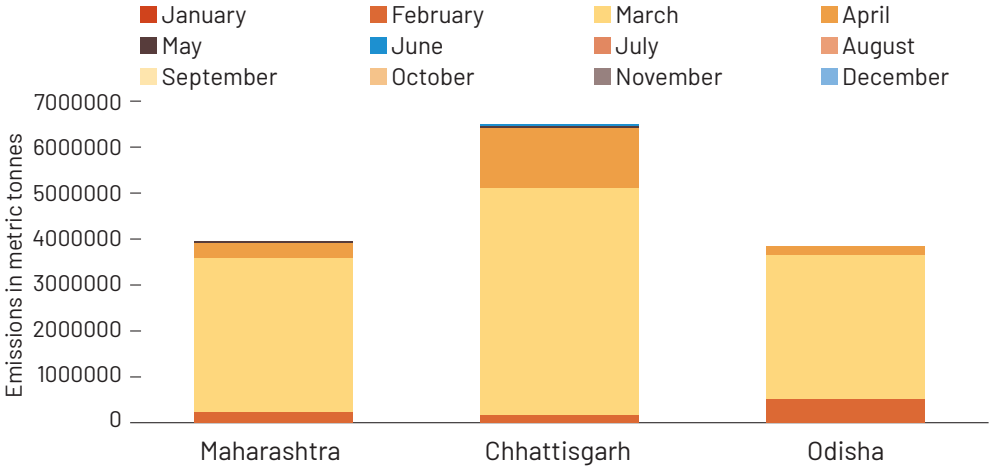
2. Tendu-linked forest fires are impacting large tracts of forest lands, with significant contribution to climate change.

The study finds that the impact of tendu-linked forest fires is significant. Around 13,904 sq km of area is estimated to have been burnt during the study period. To put things into perspective, this is slightly less than the combined land area of Tripura and Goa. Chhattisgarh has the highest burnt area amongst the three states with 6,120 sq km. This has significant implications for climate change, as CO_2 emissions from these tendu-linked fires in 2021 are estimated at around 14.15 million metric tonnes (MT) across the three states. These emissions translate to the collective average emissions from 5.6 million cars in a year. Besides this, forest fires have an adverse impact on soil and water quality and quantity, forest ecosystem productivity and local biodiversity, which needs to be further understood through detailed ground-level studies.

Graph 4: State-wise tendu-linked burnt area index for 2011-21



Graph 5: State-wise CO_2 emissions from tendu-linked forest fires during 2021

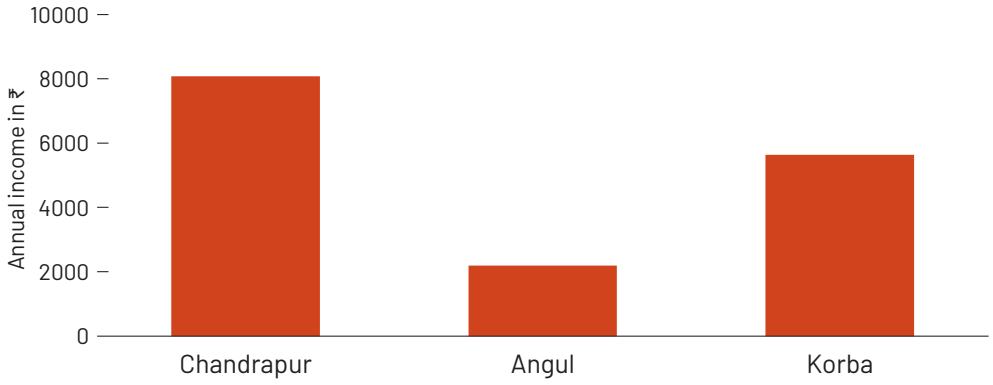


III. Dependence on tendu collection among forest-dependent communities is very high, but this has not helped address the massive challenge of underlying poverty.

1. There is a high dependence upon tendu collection as a source of supplementary income, with tendu collection providing about 11 days of work.

The income derived from tendu collection, along with its concurrent benefits like bonuses, insurance, etc., make it an attractive option for forest-dependent households, that typically represent some of the poorest and marginalised sections of India. Previous studies suggest that tendu leaf collection generates employment for around 7.5 million people. However, based on recent data from respective Forest Departments and state agencies of six leading tendu states which account for over 80 per cent of the total collection, the study estimates the total number of tendu collectors in India to be higher at around 8.57 million. On average, a major tendu-producing district in India could have around 26,000 collectors. As per the sample survey of 1,147 households in 22 tendu-collecting villages in the three tendu-producing districts of Chandrapur (Maharashtra), Angul (Odisha) and Korba (Chhattisgarh), tendu collection provides around 11 days of engagement for people during the lean agricultural months in summer. The earnings were between the range of ₹2,000 and ₹8,000 per household per year in the three focus states (in the three districts).

Graph 6: Average annual income from tendu collection in focus states



2. Tendu collectors agree on the inadequacy of returns from tendu collection, and the continued dependence on it due to a lack of alternative income sources.

The collection rates that are determined for each standard bag of tendu leaves by the government have increased only marginally. The surveys find that the tendu collectors in Angul and Chandrapur are unhappy with the collection rate for tendu. More than 88 per cent of the collectors in these districts expressed dissatisfaction with the rate. In Korba, 48 per cent of the collectors expressed dissatisfaction with the rate. The reasons for the collection of tendu despite the dissatisfaction, as expressed by the collectors, are the lack of work during the lean agricultural months across the surveyed districts and tendu collection being an easy source of supplementary income.

3. Tendu collection is a source of supplementary income; however, the underlying poverty remains unaddressed.

The dependence upon tendu collection is particularly high among the most marginalised sections of society, especially those belonging to the scheduled tribes. The tendu-collecting households are from some of the most socially and economically backward communities, and the study finds that these households typically earn less than ₹5,000 per month. These households are found to be dependent mostly on agricultural labour and have significant landlessness or marginal landholdings among them. Furthermore, these households fare poorly on the socio-economic scale (Udai Pareekh SES scale) which indicates their overall marginalised status in society. The market linkages being provided through a state-driven structure to tendu leaf collection have not contributed meaningfully to the uplift of these households.

IV. Alternatives to tendu collection can be developed to control forest fires as well as to provide a stable income source for the collectors.

1. A sustainable transition away from environmentally damaging tendu collection practices needs to be rooted in the identification and promotion of alternative livelihoods for dependent communities.

A transition away from tendu leaf collection to support improved environmental outcomes for the forests and improved economic outcomes for the communities has been demonstrated by Pachgaon village in Chandrapur district of Maharashtra. In Pachgaon, the village council or the Gram Sabha banned tendu leaf collection in 2012 as it witnessed the degradation of its forests and the adverse impact that bidi-smoking had on its people. To move out of the tendu trade, the Gram Sabha focused on leveraging the abundant bamboo found in its forests and put in action a comprehensive bamboo management plan for sustainable extraction. This has helped in nearly a tenfold increase in income of communities. In contrast, in the Bidar district of Karnataka, the state government in 2018 imposed a ten-year ban on tendu leaf collection because of excessive pruning, lopping, and burning of tendu trees. However, there was no comprehensive plan for livelihood promotion put in place. This has resulted in most (former) tendu collectors in the district being unhappy with the government's decision and wanting to get back to collection when the ban ends.

2. There are non-tendu NTFPs in tendu-collecting areas that have more economic potential than tendu and should be tapped into.

While tendu is the most widely collected NTFP in the surveyed districts, other NTFPs hold the potential to provide for good, if not better, incomes. In Chandrapur for instance, bamboo collection, though not widely practised, generates more income than tendu. In Angul and Korba, mahua generates more income than tendu despite government support for tendu. Building an alternative trade for NTFPs needs additional policies and mechanisms to build efficient market linkages for collectors. Co-operative models like

the one in Chhattisgarh point to how proper organisational and facilitative structures can help provide sustenance to forest-dependent communities.

3. There is a pressing need to improve productivity in the agricultural sector, which is the primary source of employment for tendu collectors.

Tendu leaf collectors are primarily dependent upon agriculture for sustenance. Over 90 per cent of the surveyed collectors in the three focus districts depend upon agriculture. However, landlessness is high and so is the dependence upon agricultural labour. For land-owning households, marginal landholdings mean that productivity is not high. Dependence upon rain-fed irrigation is extremely high and with few crops grown, and even fewer grown to be sold, the returns from agriculture for the collectors are low and not enough to sustain them economically. There is a need to invest in the agricultural sector to improve land and labour productivity to sustain communities that are forced to depend on tendu for their sustenance. While there are myriad central and state schemes for the promotion of the agricultural sector, there is a need to ensure better convergence of schemes and for better implementation of these schemes.

4. A convergence of livelihood and employment schemes and various funds is necessary to uplift tendu collectors from poverty.

Agriculture is the primary occupation of the collectors. However, the returns are marginal and there is a high prevalence of landlessness or marginal landholdings among them. Landlessness varied between 12% and 60% among the surveyed collectors in the three districts. Thus, there is a pressing need to leverage existing livelihood schemes as well as to formulate new and comprehensive schemes to ensure the employment of tendu collectors, especially during the lean agricultural months. While there is a plethora of schemes at the state and central levels to offer livelihood support to the rural poor, there is a need for better convergence of schemes as well as proper implementation to uplift tendu collectors from poverty.

5. Payment for Ecosystem Services (PES) and carbon markets can be leveraged to provide income as well as conserve the environment.

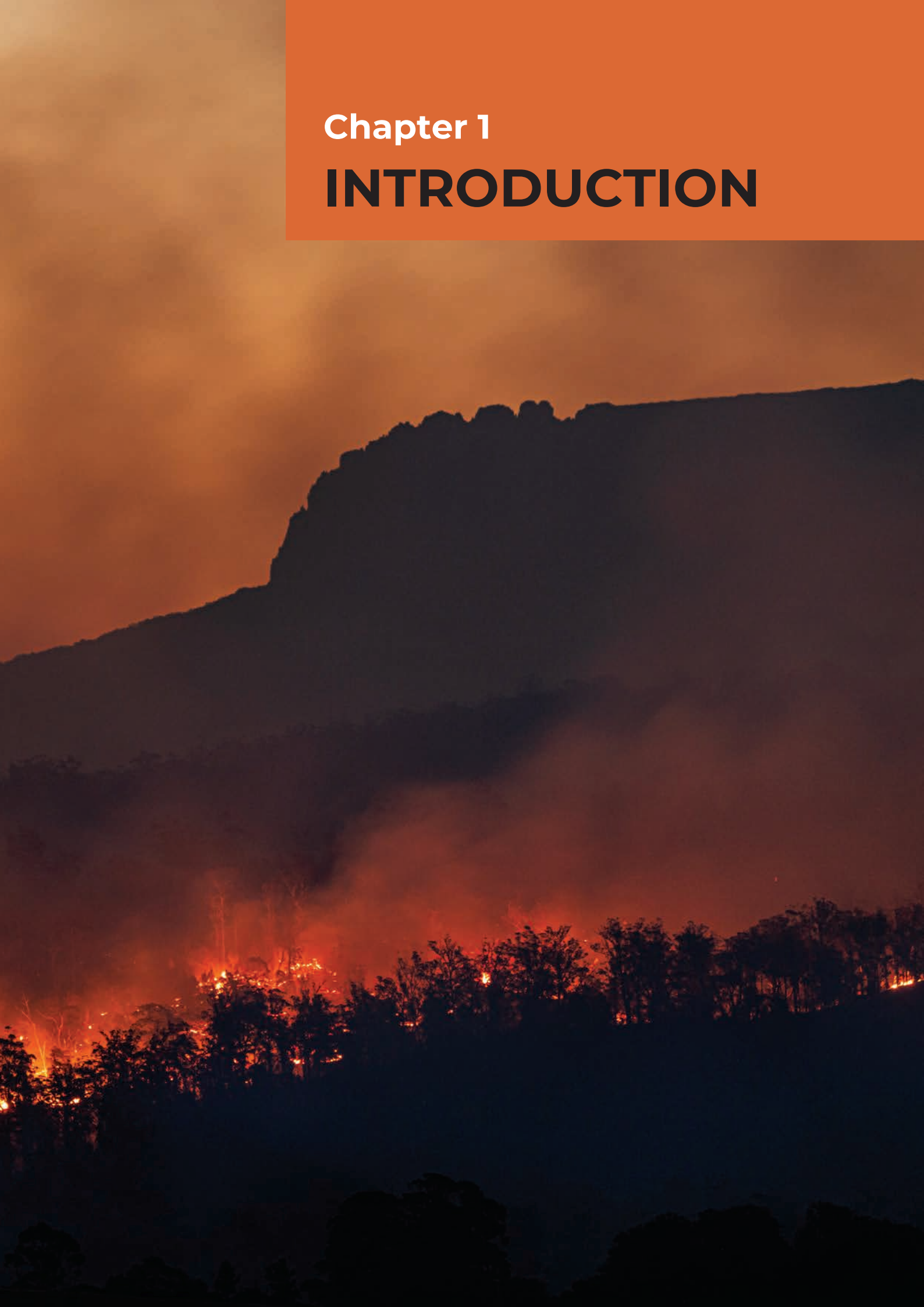
PES is a mechanism wherein to ensure the conservation of a certain ecosystem and to offer economic benefits to the local communities, the beneficiaries of the ecosystem service make payments to the providers/local communities. These include public schemes, market-based schemes as well as self-organised schemes. While the Clean Development Mechanism projects in India have had most traction, there are some examples globally of PES projects that can prove to models for the provision of economic benefits to tendu collectors for phase-out of forest fires-linked tendu collection, as to well as develop alternative livelihoods.

Summary

Viewed in the context of the growing forest fire incidences and the burgeoning climate crisis, the need to tackle the threat of NTFP-related forest fires becomes imminent. One way to mitigate the threat of forest fires is to develop an environment for tendu pluckers with adequate economic opportunities which would lessen their dependence upon tendu collection. There is no single or simple alternative to this. A convergence of efforts by various stakeholders—government, civil society members, the private sector, and tendu collectors—is necessary to help facilitate a transition towards sustainable sources of livelihood.

Chapter 1

INTRODUCTION



Averting climate crisis is of utmost priority for governments across the world. The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2022 issued a 'now-or-never' warning. Global temperatures are certain to exceed 1.5°C, unless deep reduction strategies of greenhouse gas (GHG) emissions are put in place.[1] The impact of climate change in the form of extreme weather events is already visible across the world. Loss and damage caused by climate-related disasters have emerged as a key concern. The global community has agreed to create a dedicated fund to support climate-vulnerable countries and communities.[2] To achieve reductions in atmospheric GHG levels within prescribed timelines will require rapid phase-out of fossil fuel, which is backed by massive carbon sequestration efforts. Forests and forest soils, as natural carbon sinks, and communities that protect them have a crucial role to play in this.[3]

In India, the government has set a target of creating an additional carbon sink of 2.5-3 billion tonnes (bt) of carbon dioxide equivalent (CO_2-eq) through additional forest and tree cover by 2030, as part of the Nationally Determined Contribution (NDC) goals under the 2015 Paris Agreement. At present, Indian forests hold a carbon stock of 7.2 bt, which has noticeably increased by 79.4 million tonnes (mt) in the past two years.[4] However, the carbon sequestration benefits being delivered by India's forests are under serious threat by large-scale degradation, driven by rising incidences of forest fires.

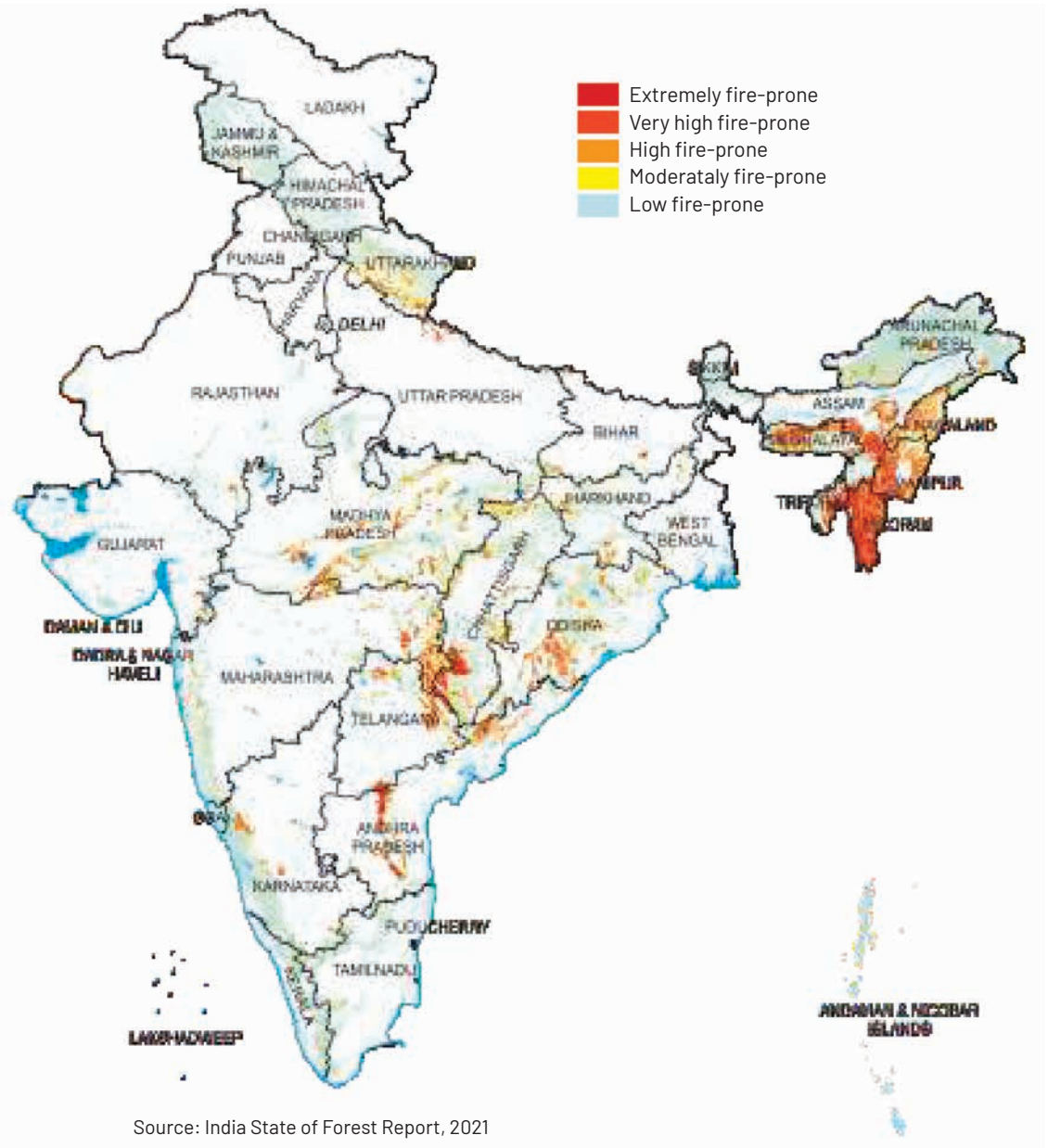
A 2020 study estimates that reported forest fires in India have gone up ten-fold in the last two decades.[5] Overall, 35 per cent of India's total forest cover of 713,789 square kilometre (sq km) is assessed as prone to frequent forest fires. This includes 11 per cent of the forest cover that is extremely to very highly prone, 12 per cent that is highly prone and the remaining 13 per cent that is moderately prone. The last fire season assessment made from November 2020 to June 2021 identified 52,785 fire incidences using satellite data from Moderate Resolution Imaging Spectroradiometer (MODIS), as against 22,447 in the previous year. The five states which form the belly of India, from Maharashtra in the west to Madhya Pradesh and Chhattisgarh in the centre and Odisha and Jharkhand in the east, accounted for nearly 55 per cent of all fires detected during the last assessed fire season.

Even beyond the climate change implications, forest fires are a serious ecological concern due to their adverse impact on biodiversity, depletion of terrestrial ecosystem productivity and fertility, decline in soil and water quantity and quality, and increase in air pollution. A recent study had assessed the impact of forest fires in India, during 2003–2017, to range from moderate to high on ecosystem production and terrestrial carbon emissions.[6]

It is widely accepted that 90 to 95 per cent of the forest fires in India are human-made, including both deliberate and accidental fires.[7] Available evidence suggests that forest fires are kindled to facilitate the collection of key non-timber forest products (NTFPs) like tendu leaves and mahua.[8] Such forest fires get widely reported in media, and are also acknowledged by the state governments.[9] However, there is limited systematic inquiry into understanding the causality and extent of the impact.

Reported forest fires in India have gone up tenfold in the last two decades. However, there is limited systematic inquiry into understanding them

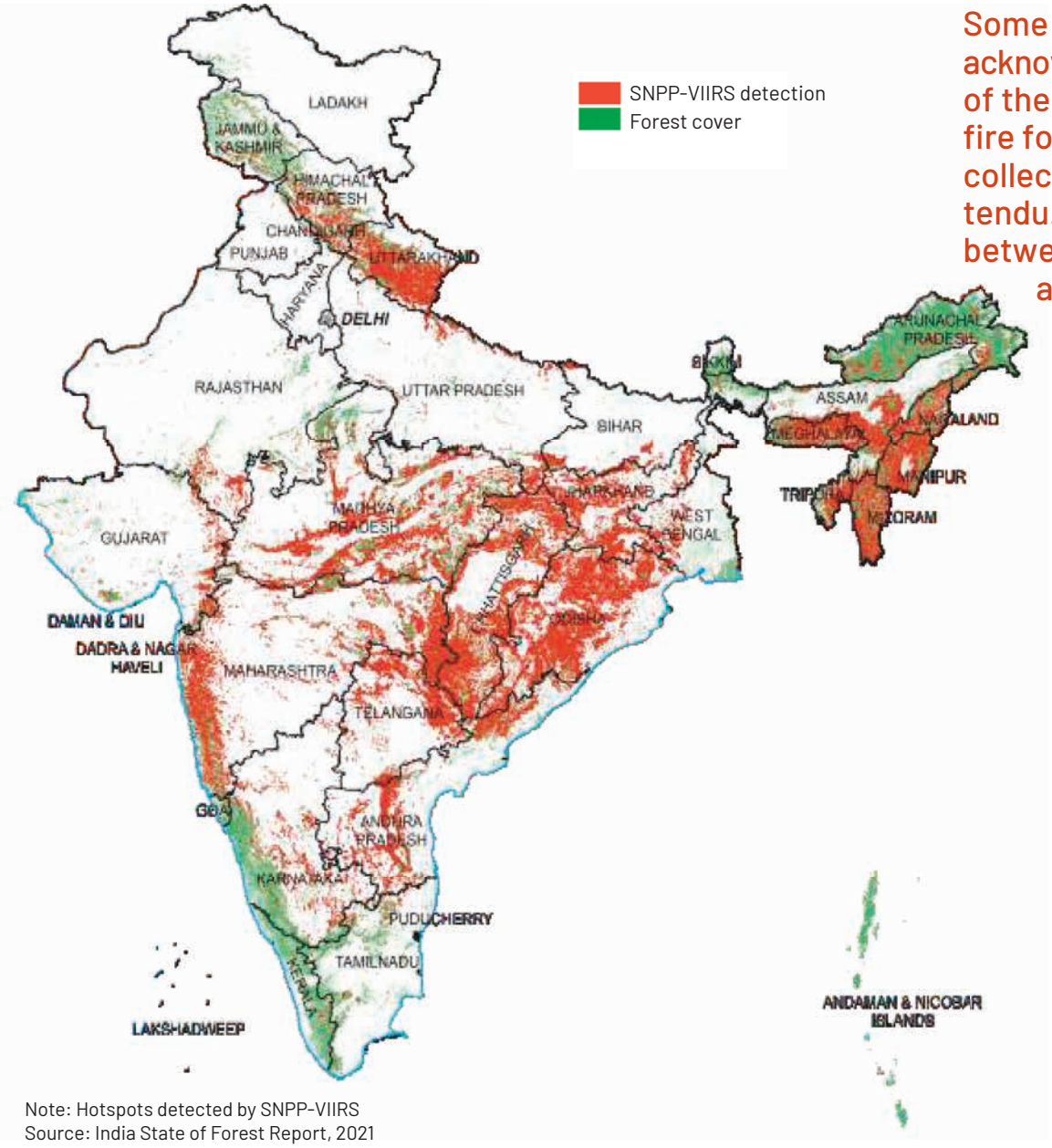
Map 1.1: Forest-fire-prone regions in India



Source: India State of Forest Report, 2021

35% of India's total forest cover assessed as prone to frequent forest fires

Map 1.2: Hotspots detected during 2020-21 forest fire season



Note: Hotspots detected by SNPP-VIIRS
Source: India State of Forest Report, 2021

Some acknowledgement of the use of fire for the collection of tendu. Linkages between the two aren't widely known or understood

1.1 Focus on tendu leaf collection

This report attempts to build an inquiry into forest fires focusing specifically on the practice of tendu leaf collection in India. Tendu (Diospyros melanoxylon) is a tree found mostly in India's dry deciduous forests, whose leaves are widely used for making bidis, hand-rolled inexpensive cigarettes smoked widely in India. The reasons for focusing on tendu leaf collection for a detailed inquiry are as follows:

- **Use of fire in tendu leaf collection:** To support tendu leaf collection, fires are used to clear the undergrowth which gives collectors easy access to the trees.
- **Use of fire to promote growth of tendu:** Fire is also used to cut back the young exposed shoots of the tendu plant and to injure its roots so that they may coppice.[10] After the fire is applied to the base and around the tendu trees, very little vegetation grows around it in the next season. Trees like tendu are labelled as "fire climax" species. Fire

eliminates competition from other plants in the undergrowth.[11] There is a commonly held belief that deliberate fires stimulate more and better quality leaves.[12] These fires are set from January onwards, but are mostly concentrated in the dry season of April and May.[13] While these are intended to be small and limited to the base of the tendu tree, they often engulf large portions of forests due to dry combustible undergrowth, and also due to negligence and lack of supervision.[14] Uncontrolled fires deployed during tendu harvesting usually go unreported.

- **One of the largest NTFPs in forest-fire-affected states:** Tendu is one of the largest NTFPs being produced in India. States across central India — Madhya Pradesh, Chhattisgarh, Jharkhand, Odisha and Maharashtra — that collectively account for more than half of the forest fire incidences in India, are also among the largest tendu producers. These states collectively account for over 80 per cent of the total tendu collection in the country. While tendu collection may not be the only source of fires in these regions, it is a significant contributor.[15]
- **Policy support of state governments:** Since the mid-1980s, tendu leaf collection has grown significantly in India due to the explicit support provided by the state governments and the international donor community. Legal structures have been designed to create seamless market linkages for its production, processing and marketing, making it one of the most commercially lucrative NTFPs in India. In this, the government's stated objective has been to support forest-dependent communities that otherwise have limited livelihood opportunities. The tendu-collecting households often come from some of the most economically and socially backward communities whose access to economic opportunities are limited.

ILLICIT TENDU AND BIDI TRADE IN INDIA

Bidi or tobacco consumption, with its hand in the massive health crisis in India, is a huge cause for concern. While bidi consumption, whether through legal or illegal channels, causes widespread deaths, the problem is compounded by the scale of the illicit trade. A study estimated the size of the illicit trade in bidi and tendu in 2007 to be around Rs 12 billion of which ₹9 billion could be attributed to the illicit tendu trade (Lal, 2012). As per CAG reports, between 2009 and 2018, the quantum of violations for bidis was around ₹42 million. Violations for tendu, which totalled to about ₹0.6 million between the same period, seem to be an underestimation if one keeps in mind the figures cited for 2007 by Lal (REACT). The gap in the amount of tendu produced and the number of bidis produced hints at the scale of the illicit trade.

An illicit trade in bidi, that comes about through tax evasion, means that tobacco consumption is more widespread, with vulnerable populations like adolescents gaining easy access to the same. While an illicit trade in tendu fuels the bidi trade and bidi consumption, it also contributes to revenue loss to the state and Central governments. More importantly, the illicit trade means that the tendu collectors are deprived of crucial income and livelihood support.

Source: 1. Lal P. (2012). Estimating the size of tendu leaf and bidi trade using a simple back-of-the-envelop method. Ambio, 41(3), 315–318
2. REACT.(Undated). Illicit Tobacco Trade In India.

Tendu one of the largest NTFPs in some of the most fire-prone states of India

- **Contributing to tobacco consumption and public health issues:** Tendu leaves are exclusively used to manufacture bidi. Bidi is a hand-rolled cigarillo consumed by the poorest segments in India and is the largest form of smoked tobacco product. The numbers of bidi sticks consumed in the country is seven times higher than the number of cigarettes consumed. Nearly 379 billion bidi sticks are consumed every year as per

the Global Adult Tobacco Survey[16] (GATS) Round-2 with an overall prevalence of 7.7 per cent bidi smokers (15 years and above) in the country.[17]

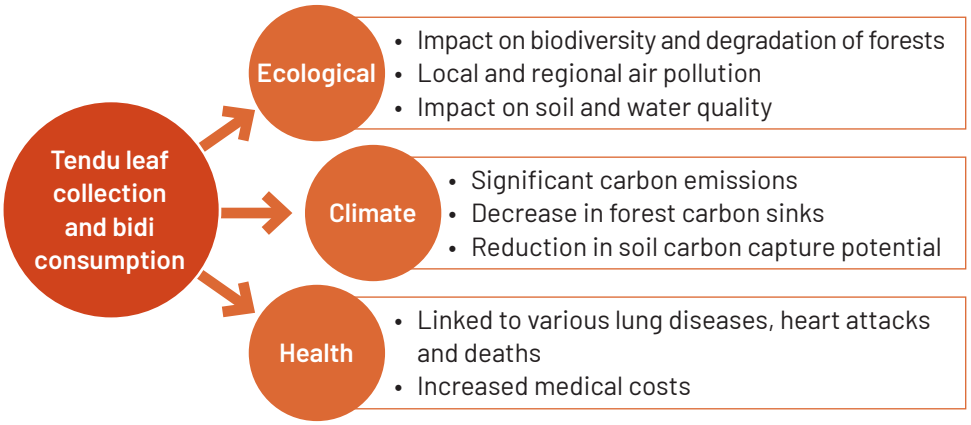
In addition to the state support extended to tendu collection, the bidi industry has also been provided considerable support in the form of tax relaxations. Till 2019, manufacturers with production up to two million sticks were exempted from taxation. This was later changed to four million sticks.[18,19] This support has been extended despite clearly established risk factors associated with tobacco-related diseases and deaths, with a stated objective of supporting cottage industry and livelihood for the 'poorest-of-the poor' communities.

Studies have also shown that bidi delivers higher levels of nicotine and cancer-causing chemicals than manufactured cigarettes, and has been linked to various lung diseases, heart attacks and tuberculosis.[20] A study estimates that between 1910 and 2010, of the 100 million premature deaths that occurred due to smoking, 77 million premature deaths could be attributed to bidi smoking alone.[21] While the correlation between tobacco consumption and poor health is well established, the consumption of bidis is encouraged by the perception among the masses, fuelled by the market itself, that bidis are a safer and healthier alternative to cigarettes.[22] Young adults are attracted to bidis because of their exotic appearance, flavoured options, easy affordability and accessibility.[23]

Tendu leaf extraction is detrimental, not only impacting forest health by causing ecological damage to the local flora and fauna, but also contributing to greenhouse gas (GHG) emissions due to the use of fires. Extraction of other forest products like mahua also deploy the use of fire but the scale and intensity of extraction of tendu makes it particularly deleterious.

Tendu linked to various adverse environmental and health impacts, and hence, its importance needs to be revisited

Figure 1.1: Impact of tendu collection and bidi trade



1.2 Objective and methodology

The study is set in the backdrop of the adverse consequences of tendu leaf collection on ecological, planetary and public health. While the health consequences of bidi consumption are well documented and largely understood, there is limited appreciation of the environmental consequences of tendu collection by policy makers. Their argument for supporting tendu industry is often related to its contribution to the livelihood of the 'poorest-of-the-poor'. However, it remains to be assessed empirically if tendu collection has contributed in uplifting forest communities from poverty.

The objective of this study is to first assess the scale of environmental damage caused by tendu leaf collection. It also estimates the contribution made by tendu towards the livelihood of forest-dependent communities. Based on these assessments, the study aims to propose an effective strategy to enhance livelihood options for dependent communities that can effectively discourage tendu leaf collection and, consequentially, the associated forest fires.

To develop a robust evidence base, the study uses a mixed-methods approach, relying on both primary and secondary data sources. This entails:

- Secondary research: The secondary research involved literature review, analysis of government and non-government data, scholarly articles, and research papers. The research helped form the basis for an understanding of the various aspects of the tendu (and other NTFPs) collection in India; the relationship between tendu collection and forest fires; the impact of forest fires in terms of the area burned and on carbon dioxide (CO_2) and other GHG emissions; the bidi trade and the adverse health impact of bidi usage; scale of tendu collection and trade in India; the dependence of communities on tendu and other NTFPs; and examples of phase-out of tendu collection and alternative livelihoods.
- Primary research on impact on livelihoods: To deep dive into the livelihood impact of tendu leaf collection practices in India, primary research was conducted in three focus states of Maharashtra, Odisha and Chhattisgarh. These three states collectively account for over 35 per cent of the total tendu leaf collected in India, as well as 36 per cent of the total forest fires detected in the last fire season. These states also provide distinct examples in tendu collection and trade. While Odisha is a unique state given that it produces processed tendu leaves, Chhattisgarh is important from the perspective of its robust organisational structure for the trade of tendu and other NTFPs. Meanwhile, Maharashtra is important from the perspective of the increased recognition of community rights over the collection and sale of tendu and other NTFPs.
    - » Methodology for climate impact assessment: Satellite data imagery and modelling have been used to establish the linkages between forest fires and tendu prevalence, and the impact of these forest fires in terms of the CO_2 emissions contribution. The linkages between forest fires and tendu have been established by using three data points — forest fires dataset sourced from NASA's MODIS dataset for the 2011-21 period, and the vegetation type and tendu sample points maps sourced from Indian Space Research Organisation (ISRO).[24] Both mapping and spatial analysis tools as well as statistical analysis tools were used to derive results to understand the extent of damage caused by tendu-linked forest fires. For calculating the damage, the Burnt Area Index (BAI) for the period 2011-21, sourced from MODIS (MCD64A1 Ver. 6) burnt area dataset, was overlaid with the Species Distribution Model (SDM) developed for tendu. CO_2 emissions from tendu-linked forest fires have been estimated based on carbon monoxide (CO) emissions data tracked by TROPOMI on the Sentinel 5 Precursor (S5P) satellite.

The objective is to, through a robust evidence base, build a case for sustainable alternatives to tendu leaf collection

» Methodology for livelihood impact assessment: A three-fold primary research methodology has been used for understanding the livelihood contribution of tendu. This includes:

- Household surveys: District level, socio-economic household surveys covering tendu-collecting villages and non-tendu-collecting villages in the focus districts of Angul (Odisha), Chandrapur (Maharashtra) and Korba (Chhattisgarh).
- Focus group discussion (FGD): FGDs were carried out in each of the surveyed villages of every (focus) district. Two focus group discussions in Bidar district, Karnataka, were also carried out to understand the shift away from tendu collection.
- Stakeholder interviews: Individual interviews were conducted with key actors, including state and district officials, various civil society organisations (CSO) and academics.

The study is the first independent analysis of the impact of forest fires from tendu extraction

1.3 Structure of the report

The study begins with the analysis of the size and scale of the tendu trade in India; the dependence of communities and the state on tendu collection; the production, procurement and sale structures; and policy frameworks that enable its collection and trade. This can be found in the second chapter, Tendu leaf collection, trade and dependence. The report then explores the ecological impact of tendu leaf collection by establishing the linkages between tendu collection and forest fires in the third chapter titled Environmental impact of tendu collection. The study brings out the impact through the area burnt and the resultant CO_2 emissions.

The fourth chapter, Economic dependence on tendu: evidence from the ground, highlights the socio-economic status of tendu collectors and their dependence upon tendu and other NTFPs based on the sample surveys conducted in the focus districts. The fifth chapter, Lessons on moving away from tendu collection, highlights how and why some villages and regions have moved away from tendu collection. Case studies of Pachgaon in Chandrapur and Bidar in Karnataka have been taken up to explore the possibility of non-tendu, NTFP-based livelihoods. Chapter six, Strategies for tendu-linked fire mitigation, maps a framework to enable a shift towards alternative livelihoods.

Chapter 2

TENDU LEAF COLLECTION, TRADE AND DEPENDENCE

Tendu or Diospyros melanoxylon tree is best known for the use of its leaves in the bidi industry, for rolling the handmade cigarettes. Although bidis are known to have been invented in the 17th century, the widespread use of tendu for rolling them became commonplace in the beginning of the 20th century. The tendu tree grows abundantly in the degraded deciduous forests of peninsular India and its leaves are widely available after the harvest of the tobacco crop.[1] The large size and pliability of the tendu leaves, their leathery texture, ability to roll without cracking, their complementarity with the flavour of tobacco, resistance to decay and capacity to retain fire made them highly suitable for rolling bidis.[2]

Tendu trees grow under dominant trees such as teak (Tectona grandis) and sal (Shorea robusta). Once sal and teak are cleared, trees from the undergrowth such as tendu dominate. They are found in abundance in the entire state of Madhya Pradesh, Chhattisgarh, Jharkhand and Odisha; central and eastern Maharashtra, northern Andhra Pradesh and Tamil Nadu; southern Bihar and Uttar Pradesh; eastern Rajasthan and Gujarat, and western and southern West Bengal. It is known as tendu in Madhya Pradesh, abnus in Andhra Pradesh, kendu in Odisha and West Bengal, tembru in Gujarat, kari in Kerala, tembhruni in Maharashtra and bali tupra in Tamil Nadu.

Over the years, tendu collection and trade has expanded in India backed by strong government support in certain states. State patronage has enabled organised collection and robust market linkages for its sale. It has also assured decent earnings and benefits to the tendu collectors who belong to economically backward forest-dependent communities.[3]

Tendu leaf's prominence vis-a-vis other NTFPs largely due to government patronage, including its nationalisation

2.1 State support to tendu trade

Tendu leaf has emerged as one of India's most prominent non-timber forest products (NTFPs) largely due to government patronage which includes nationalisation of trade, organised procurement structures, wages, incentives and benefits for collectors as well as tax exemptions. This is largely unique to tendu in most states, as other NTFPs do not typically enjoy such state backing.

2.1.1 Laws promoting tendu leaf collection and trade

Since the 1970s, states have introduced laws to create monopoly rights of the Forest Departments over tendu leaf procurement and trade. This nationalisation was done with a stated objective of protecting tendu-collecting tribal communities from being exploited by private agents and bidi makers. An additionally strong push towards nationalisation was due to the commercially important and highly remunerative nature of the commodity.

Madhya Pradesh was the first state to nationalise tendu leaves in 1964, followed by Maharashtra and Andhra Pradesh in 1969, Bihar and Orissa in 1973, Uttar Pradesh and Rajasthan in 1974, and Gujarat in 1979. These laws and rules enacted by the states lay down specific provisions to operationalise the state's monopoly over the tendu leaf trade, including the business logistics and the chain of command. These laws entrusted state governments with the authority to assign definite values to the tendu leaves and to tend to the quantity and quality requirements.

At present, the nationalized structure of the tendu trade is under scrutiny with the introduction of community forest rights under Panchayat (Extension to Scheduled Areas) Act (PESA), 1996, and the Forest Rights Act (FRA), 2006.[4] In some areas of Maharashtra and Odisha, the trade has been deregulated and communities are exercising their rights over the collection and sale of tendu leaves. However, the process of community rights introduction has been slow and the tendu trade is still predominantly centralised.[5] Overall, the nationalisation of tendu trade laid a strong foundation for its growth in India by providing clear market linkages, trading procedures and payment assurance.

Table 2.1: Tendu-related laws in key states of India

State	Law
Madhya Pradesh	• Madhya Pradesh Tendu Patta (Vyapar Viniyaman) Adhiniyam, 1964 • Madhya Pradesh Tendu Patta (Vyapar Viniyaman) Niyamavali, 1966 • Madhya Pradesh Tendu Patta Mantrana Samits Tatha Mulya Prakashan Niyam, 1964
Jharkhand	• Jharkhand Kendu Leaves (Control of Trade) Act, 1973 • Jharkhand Kendu Leaves (Control of Trade) Rules, 1972
Chhattisgarh	• Chhattisgarh Tendu Patta (Vyapar Viniyaman) Adhiniyam, 1964 • Chhattisgarh Patta (Vyapar Viniyaman) Niyamavali, 1966
Maharashtra	• Maharashtra Minor Forest Produce (Regulation in Trade) Act, 1969 • Maharashtra Minor Forest Produce (Regulation of Trade) Act (Amendment), 1997 • Gram Sabha Adarsh Guidelines (ideal framework) for Tendu Patta Collection and Trade
Odisha	• The Orissa Kendu Leaves (Control of Trade) Act, 1961 • The Orissa Forest Produce (Control of Trade) Act, 1981
Andhra Pradesh	• Andhra Pradesh Minor Forest Produce (Regulation of Trade) Act, 1971
Telangana	• Telangana Minor Forest Produce (Regulation of Trade) Act, 1971
Gujarat	• Gujarat Minor Forest Produce (Regulation of Trade) Act, 1979
Bihar	• Bihar Kendu Leaves (Control of Trade) Act, 1973 • Bihar Kendu Leaves (Control of Trade) Rules, 1972
Uttar Pradesh	• The Uttar Pradesh Forest Corporation Act, 1974 • The Uttar Pradesh Tendu Patta (Vyapar Viniyaman) Niyamawali, 1972
Rajasthan	• Tendu Patta Leaves (Regulation of Trade) Act, 1974

2.1.2 Organised procurement structures

No central authority to monitor trade. States have introduced laws to create monopoly rights of the Forest Departments over the tendu leaf trade

In most states, the state government's monopoly on the procurement of tendu leaves is operationalised through Forest Department-managed cooperatives or federations or state government-run forest development corporations. However, the specific structures of trade vary across states. While procurement is undertaken by cooperative societies in states like Madhya Pradesh and Chhattisgarh, it is being done by approved agents in Maharashtra and Andhra Pradesh. In Odisha, the procurement activity is controlled directly by the Forest Department and the sale of the leaves is done by the Odisha Forest Development Corporation (OFDC). Distinct trading structures existing in the three focus states are discussed as follows:

- **Cooperative system in Chhattisgarh:** After nationalisation of the tendu trade in 1964, Madhya Pradesh adopted a three-tier cooperative system for the procurement and marketing of tendu leaves. This cooperative system continued in Chhattisgarh after its creation in 2000. This three-tier system consists of Primary Cooperative Societies (PCS) at the village cluster level, District Forest Produce Cooperative Unions at the district level and the Chhattisgarh State Minor Forest Produce (Trading & Development) Cooperative Federation Limited at the state level. Each PCS has 10 to 20 tendu leaves collection centres called phad, where the leaves are purchased from the collectors.

Chhattisgarh has about 916 PCS. District Forest Produce Cooperative Unions are the forest division-level units, which are responsible for the collection, transport and storage of NTFPs. These division-level units are federated to form the state apex agency. The state-level federation opens tender bids for tendu sale in November, before the harvesting season.

Tendu is the only NTFP categorised by the state as 'Specified Minor Forest Produce', which means its trade is monopolised by the government. All other NTFPs are categorized as 'Non-Specified' and thus remain largely unorganised. Their collection prices remain low and the market linkages imperfect.

- **Department-driven procurement in Odisha:** Tendu (known as kendu in Odisha) leaf trade was brought under state control in 1973, which was previously being managed through monopoly leases awarded to a few traders. The State Forest Department through a dedicated wing manages the production and processing of the produce, while its marketing is managed by the Odisha Forest Development Corporation Limited (OFDC). The field establishment comprises three kendu leaves (KL) circles, 19 KL divisions, 42 KL sub-divisions and 149 KL ranges. The tendu leaf divisions charge 5 per cent of the sales value as commission for the marketing of leaves post-harvest.

  Over the past decade, the Odisha government has given rights to the Gram Sabhas (the general assembly of all the people of a given village) to collect and sell most NTFPs, except tendu. At present, 69 NTFPs including tamarind, honey, hill brooms, siali leaves, neem, karanj, babool, kusum etc. have been brought under their control. The KL trade in the Nawarangpur Division and Malkangiri district of Jeypore (KL) Division was deregulated during the years 2013 and 2014, respectively. Thereafter, some villages in the Kalahandi district in Bhawanipatna (KL) Division were deregulated between 2017 and 2021 based on the community rights conferred to the Gram Sabhas under the FRA. However, in most other areas, the government has been exercising its state-wide control over tendu leaves even in areas where Community Forest Rights (CFR) have been granted.

- **Deregulation of trade in Maharashtra:** The Government of Maharashtra had monopoly control over tendu leaf trade by virtue of the Maharashtra Forest Produce (Regulation of Trade) Act, 1969. Under this, tendu leaves could only be purchased by authorised officers or appointed agents of the state government. The department would identify contractors through a bidding process for each tendu unit. The contractors procure and pay collection fees to the collectors, bear all expenses and pay royalty to the Forest Department.

  However, tendu trade in the state has been deregulated since enactment of PESA and FRA. Gram Sabhas in predominantly tribal areas of Maharashtra are now allowed to sell NTFPs on their own, and around 2,736,660 acres of forest land is already recognised as community forest area.[7] The Joint Forest Management Committee (JFMC) members have been given rights for collection and sale of 33 types of NTFPs in non-scheduled areas, including tendu. For tendu , the rules were modified in 2014 under which a Gram Sabha can sell tendu leaves on their own or with the support of government departments.

Tendu leaf procurement and sale largely under the monopoly of the Forest Departments whose trade structures vary across states

Table 2.2: Summary of procurement structures in focus states

	Chhattisgarh	Odisha	Maharashtra
Procurement	Through a cooperative society controlled by the state federation	Directly by Forest Department, Odisha	Directly by contractors identified by Forest Department or by the Gram Sabhas (selling autonomously or through the Forest Department)
Sales system	Tender/auction/ negotiation by the state federation	Tender/auction/ negotiation by OFDC	Tender/auction/ negotiation by Forest Department or Gram Sabhas
Settlement payment to collectors	On a daily basis, but there are reported delays of up to one month	Four to six months from the time of procurement	Right after procurement
Role of Forest Department	Facilitates sale of tendu through a three-tier cooperative system	Entire control of production process except in deregulated areas	Collection and auction in non-PESA and non-CFR areas. Gram Sabhas can choose to seek department help in CFR areas
Commission/ royalty to Forest Department	20% of the profits go to the CGMFPFED	4% regular commission and 1% additional commission paid to OFDC	Royalty paid to the department by the contractors. Out of this 40-70% is disbursed as bonus, rest is retained

Source: As per discussion with Forest Department staff and reports[8,9]

FOREST RIGHTS ACT AND STATE STRUCTURES FOR TENDU TRADE

State governments have been reluctant to deregulate the trade of major NTFPs like tendu and bamboo, given that these are important sources of revenue for the Forest Department or the relevant state agency.

For instance, in Chhattisgarh, the revenue from tendu leaves sale was around ₹9.94 billion in 2022. While 80 per cent of the profits are shared with tendu collectors as bonuses and incentives, the remaining 20 per cent is retained by the department as royalty. In case of Odisha, the revenue generated by tendu trade was around ₹4.07 billion in 2020. The Odisha Forest Development Corporation earned ₹380 million as commission from the trade. In Maharashtra, the Forest Department was paid a royalty of ₹0.52 billion by contractors in 2021. Of this, ₹0.19 billion or 36 per cent was disbursed as bonus to the collectors, while the rest was retained by the Forest Department.

Government control over tendu is in direct conflict with the rights bestowed upon communities by PESA and FRA. While Maharashtra has deregulated the tendu trade, other states have been slow in handing over rights to the communities. In Odisha, the trade has been deregulated only in a few divisions – Nawarangpur, Jeypore and Bhawanipatna. In leading tendu-producing states of Madhya Pradesh and Chhattisgarh, the trade remains state-controlled.[10]

This reluctance in deregulating tendu trade in CFR areas is in contravention of Section 3 (i) of FRA that vests in forest dwellers the "right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use".

Deregulation of tendu trade only in some states like Maharashtra and Odisha

2.1.3 Wages and welfare schemes for tendu collectors

State support for the tendu trade has been for the income support it provides to forest-dwelling communities. Under the existing framework, in addition to the wages for collection, the profits made or royalties received by the Forest Department from the sale of tendu leaves are ploughed back to the collectors. The profit-sharing mechanism varies from state to state and typically comprises a fixed percentage of the profits paid as bonus wage and the remaining to a village development/welfare fund. While collection wages are paid usually within a week of collection, the bonus can take several months, often almost a years, to arrive.[11] States have also been introducing a number of health and life insurance and education promotion schemes for tendu plucker families. For instance, Madhya Pradesh had launched a group insurance scheme in 1991 which insures all tendu pluckers between the ages of 18 and 60.[12] In Odisha, Kendu Welfare Fund provides scholarships to girls of collector families.[13]

Profit-sharing mechanism varies across states, but, there is a need to revisit it to ensure better returns for the collectors

Table 2.3: Profit-sharing mechanism from tendu leaves sale

State	Profit/royalty shared with collectors	Utilisation of remaining funds
Chhattisgarh	80% (every year)	15% is utilised for administrative purposes and the rest is for unprofitable Primary Cooperative Societies (PCS)
Maharashtra	38% (in 2021, varies annually)	Royalty for the government
Madhya Pradesh	70% (every year)	20% to the Village Development Fund and 10% towards Forest Development Fund and MPMFPFED corpus
Odisha	80-90% to the Kendu Leaf Development Fund, including 50% transferred to collectors, 10% to seasonal staff, 10% to binders, and remaining for other welfare funds	The rest is retained by the department for infrastructure development and other administrative expenses

Source: Forest department officials and records

2.1.4 Taxation on tendu

For several years, tendu leaf collection as well as bidi production enjoyed lower central and state taxes on the grounds that the activity was supporting livelihoods of economically backward communities. As India entered the Goods and Services Tax (GST) regime in July 2017, a GST of 18 per cent was imposed on tendu leaves, including 9 per cent as State GST and 9 per cent as Central GST. Before GST was introduced, the tax imposed on tendu varied from state to state. In Odisha, the tax imposed on tendu was 7 per cent consisting of 5 per cent Value Added Tax (VAT) and 2 per cent Forest tax. However, in Rajasthan the tax imposed was 5.5 per cent.

Such tax breaks have also been extended to bidi. Bidi manufacturers that produce less than 2 million sticks per annum have been exempted by the Centre from duty. In 2017, the implementation of the GST regime meant that all tobacco products were subject to the highest rate of 28 per cent. However, only cigarettes and smokeless tobacco products were subject to the additional compensation cess. Further, because of the 4 million sales turnover threshold for producers to register under the GST regime, bidis can be both duty-and GST-exempt.[14]

2.2 Trade, revenues and dependence

2.2.1 Collection

Comprehensive estimates on aggregate collection of tendu leaves are difficult to obtain. This is partly due to the different measurement units for tendu leaf used in different states. For instance, Karnataka reports annual tendu production in tonnes, Odisha in quintals, while Madhya Pradesh, Gujarat and Uttar Pradesh report these in standard bags (SB). The measurements of a SB also vary, wherein it may include 50 to 70 bundles of leaves with each bundle containing about 1,000 leaves.

There are also no decisive figures when it comes to the standard weight of the leaves that are traded, because of their non-standardized size. As per Forest Department officials from respective states, a typical SB in Maharashtra and Chhattisgarh weighs 50 kilogram (kg) and 40-45 kg, respectively. Officials in Odisha share that an SB of unprocessed leaves weighs around 35-45 kg.

Typically, a dry bidi leaf weighs around 0.9 gm,[15] based on which an SB containing 50,000 leaves is estimated to weigh 45 kg, while an SB with 70,000 leaves is estimated to weigh 63 kg.

Table 2.4: Measurement units for tendu leaf across major states

State	No. of bundles	No. of leaves in one bundle	Total no. of leaves in an SB	Estimated weight* (kg)
Jharkhand	1,000	50	50,000	45
Rajasthan	1,000	50	50,000	45
Chhattisgarh	1,000	50	50,000	45
Madhya Pradesh	1,000	50	50,000	45
Maharashtra	1,000	70	70,000	63
Uttar Pradesh	1,000	50	50,000	45
Odisha	1,250	40	70,000	63

*Assuming a tendu leaf weight of 0.9 grams based on inputs of forest officials as well as actual weight of sample tendu leaf in a bidi
Source: Relevant state Forest Department websites/reports

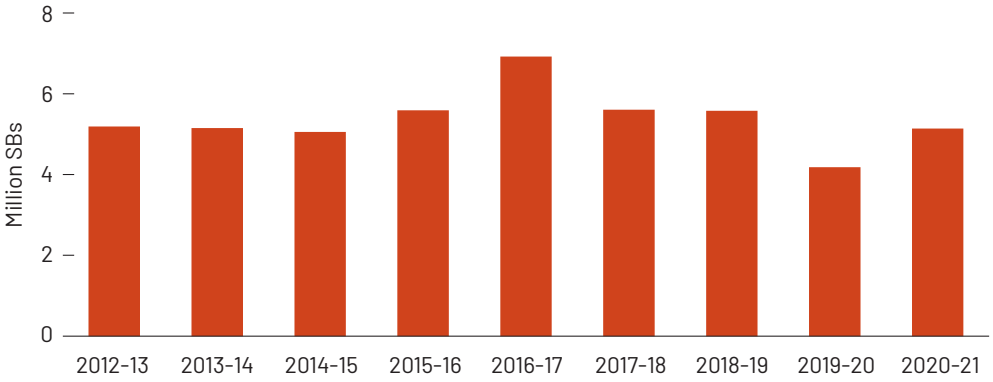
Consolidated data on tendu collection in India unavailable. The study estimates the annual tendu collection to stand at 0.24 million tonnes

Consolidated latest data on tendu collection is not available. Based on data shared by the MoEFCC, Government of India, till 2017, and the data available from a limited number of states after 2017, the study estimates the tendu collection in India to stand at around 5.14 million SBs in 2020-21, weighing about 243,473 tonnes (refer Annexure 1 for the estimation details).

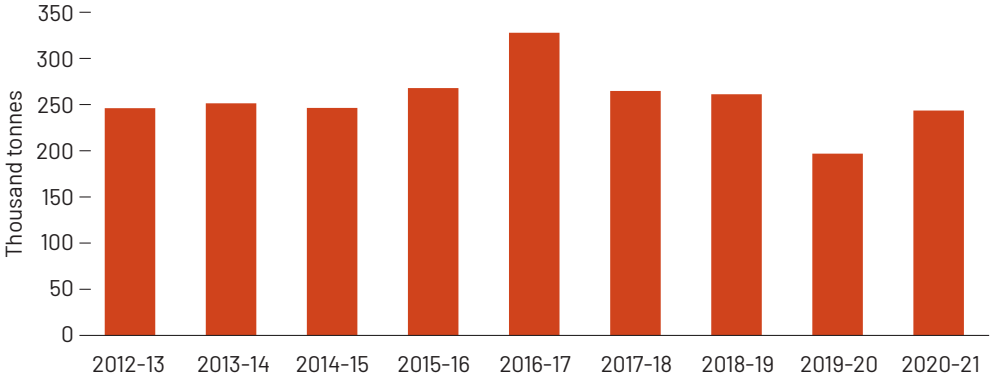
Between 2013 and 2017, tendu collection increased at a compound annual growth rate (CAGR) of about 7.5 per cent. However, since 2017 the collection is estimated to have declined significantly. Between 2017 and 2021, the estimated decline is at a CAGR of 7.16 per cent.

The states of Madhya Pradesh and Chhattisgarh are the highest producers of tendu leaves in India, collectively accounting for 58 per cent of the annual collection. Jharkhand reports the third highest collection with a 10 per cent share, followed by Odisha, Rajasthan and Maharashtra with 8 per cent, 7 per cent and 5 per cent shares, respectively.

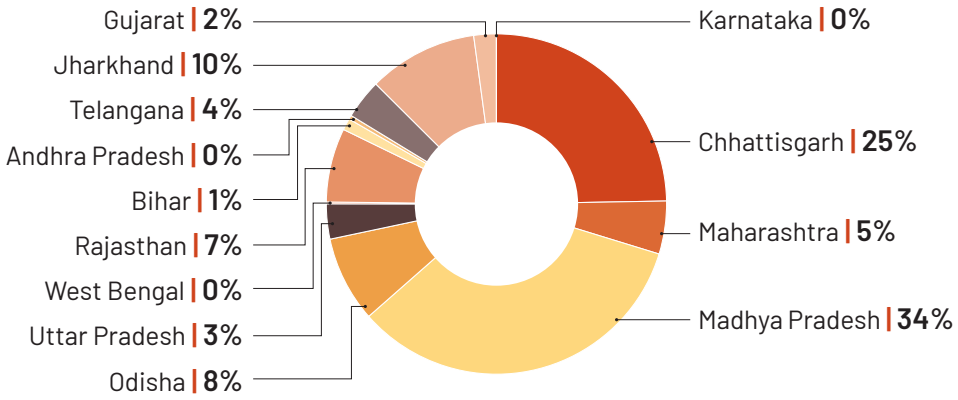
Graph 2.1: Estimated quantity of annual tendu leaf collection in India



Graph 2.2: Estimated weight of annual tendu leaf collection in India



Graph 2.3: State-wise share in tendu leaf collection in India



Current estimates show a significant decline in tendu collection over the past three decades

The current estimates show a significant decline in tendu collection over the past three decades. Since continuous data sets are not available, multiple studies need to be referred for making the comparison. Studies suggest that in the mid-1980s, the annual collection of tendu leaves was stable around 300,000 tonnes, which increased to 450,000-500,000 tonnes in the 1990s and then declined to 400,000 mt in the late 1990s. A World Bank report suggests that 360,000 tonnes were produced in 2002-03. The MoEFCC data for 2017 indicates a collection of 327,746 tonnes, which is further estimated to have declined to 243,473 tonnes (based on the data reported by key states).

The data on tendu leaf collection can be corroborated with bidi production and consumption trends in India, which also show a decline over the years. A study undertaken by researchers from the World Health Organization (WHO) in 2020 estimated bidi consumption in India to be around 400 billion sticks per annum.[16] A more recent study by the All India Institute of Medical Sciences (AIIMS), Jodhpur, notes that bidi production in India has declined from 565 billion annual sticks in 2001 to 425 billion in 2015 based on Ministry of Finance data, Global Adult Tobacco Survey and National Family Health Survey.[17]

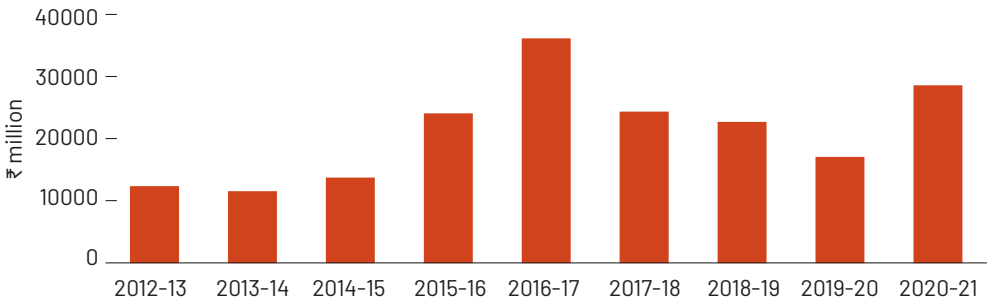
Overall, studies show that the actual and estimated tendu collection differs by a magnitude of about 20 per cent, due to significant illegal trade outside the purview of Forest Departments.[18]

2.2.2 Sale value

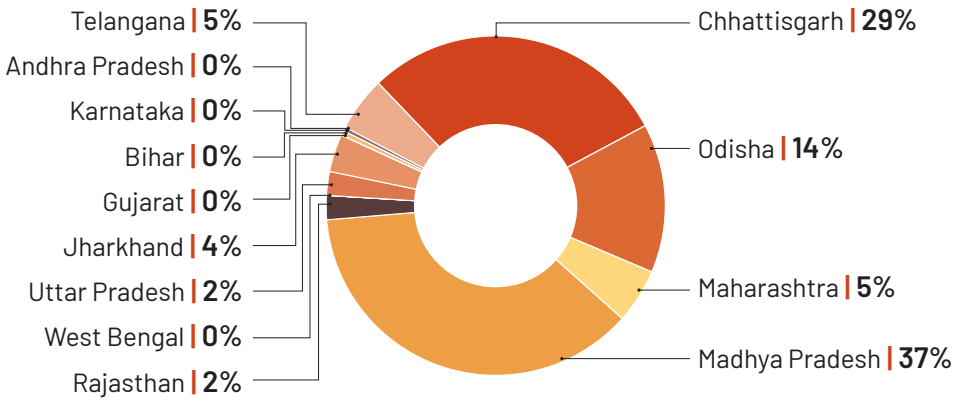
Tendu is an important source of revenue for the state departments and agencies responsible for marketing tendu leaves. Similar to the data on collection quantity, consolidated data on sale value is not available and has to be estimated based on data shared by the MoEFCC till 2017, and the data available from a limited number of states post-2017. The study estimates the tendu sales value to have increased from ₹12.37 billion in 2012-13 to ₹36.12 billion in 2016-17, and then decreased to ₹28.57 billion in 2020-21 (refer Annexure 2 for the estimation details).

Madhya Pradesh and Chhattisgarh collectively account for about 66 per cent of the estimated sales value for 2020-21, followed by Odisha at 14 per cent. The States of Maharashtra, Jharkhand and Telangana account for about 5 per cent share each. As per Forest Department officials, tendu production varies naturally due to climatic conditions; it is dependent upon good rains and the fluctuating climate has an impact upon production. However, it is also possible that the illicit trade in leaves has a bearing on the official figures.

Graph 2.4: Estimated sales value of tendu leaf collection in India



Graph 2.5: State-wise share in tendu sales value in India



The study estimates the sale value of tendu to stand at Rs 28.57 billion in 2020-21

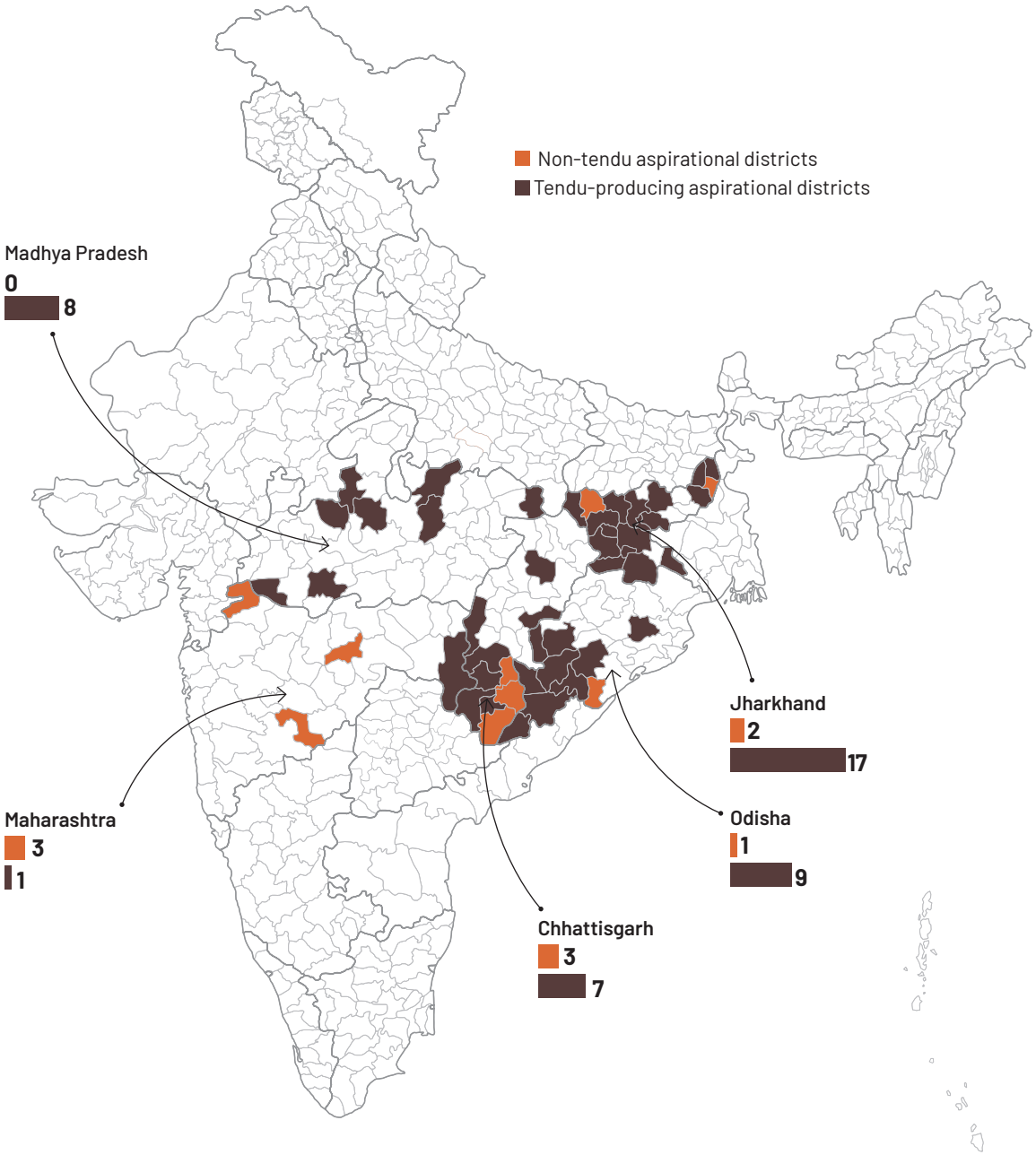
2.2.3 Dependence

Income from tendu collection contributes to supplementary cash for a large number of India's tribal families during the off-peak agricultural season. These households are typically from some of the most economically backward communities, with low education levels, limited livelihood/employment opportunities and meagre earnings.[19,20,21,22]

Around 76 districts where tendu is plucked fall among the 100 poorest districts identified by the Government of India.[23] There is a significant overlap of aspirational districts (most under-developed districts identified by NITI Aayog) and the tendu-collecting districts in major tendu states. For instance, in Madhya Pradesh, Chhattisgarh, Jharkhand, Odisha and Maharashtra, 82 per cent of the aspirational districts are also tendu-producing ones.

Huge overlap between tendu-collecting and aspirational districts highlights the marginalised condition of the collectors

Map 2.1: Aspirational and tendu-producing districts in five major tendu-producing states



Previous studies suggest that tendu leaf collection generates around three to six weeks of seasonal employment for around 7.5 million people.[24] However, recent data from respective Forest Departments and state agencies indicates the dependence to be higher. Madhya Pradesh reports the highest number of tendu collectors at 4.5 million, followed by Chhattisgarh at 1.3 million and Odisha at 0.8 million. Overall, the study estimates the total number of tendu collectors in India to be around 8.57 million, based on the number of collectors in six leading tendu states accounting for over 80 per cent of the total collection. On an average, a major tendu-producing district in India could have around 26,000 collectors. This estimate, however, excludes additional employment generated in processing, transport and trade activities.

Table 2.5: Tendu dependence and income generated

State	Number of tendu collectors (in million) in 2022	Estimated mandays generated (in million) 2022
Madhya Pradesh	4.5*	50.6*
Chhattisgarh	1.3	14
Odisha	0.8**	9**
Maharashtra	0.16 (families)	1.8
Uttar Pradesh	0.04***	0.45***
Rajasthan	0.06****	0.67****

*For the year 2020; **For the year 2021, ***For the year 2020, ****For the year 2020
Note: Mandays for states other than Odisha estimated taking the number of mandays generated per plucker in Odisha in 2021 (11.25 mandays per plucker).

The study estimates the total number of tendu collectors in India to be around 8.5 million

The collection rate, paid to workers per SB, varies considerably across states from as high as ₹4,000 per SB in Chhattisgarh to about ₹1,000 in Rajasthan in 2020-21. There are also intra-state variations in a state like Maharashtra, wherein there are variations at the zone level. The collection price also varies considerably from year to year.

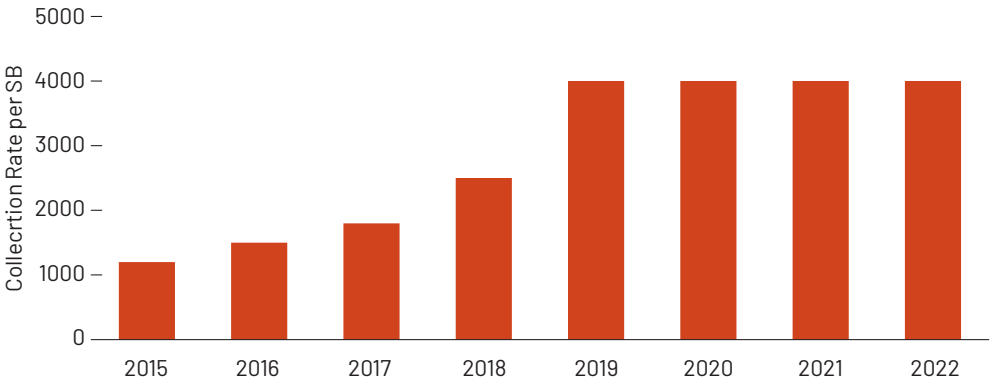
Differing collection rates in states lead to varying incomes for tendu collectors across the country

Table 2.6: Collection rate in major tendu-producing states

State	Year	Collection rate (₹ per SB)
Odisha	2022-23	3,500*
Maharashtra	2021-22	2,250-3,400
Chhattisgarh	2020-21	4,000
Madhya Pradesh	2022-23	3,000
West Bengal	2020-21	3,813
Rajasthan	2020-21	1,010
Uttar Pradesh	2020-21	1,340

*Estimated based on ₹140 per 100 unprocessed kerries.[25]

Graph 2.6: Year-wise tendu collection rate in Chhattisgarh



Source: Forest Department, Government of Chhattisgarh

Overall, the income from tendu leaves collection varies from state to state and is determined by both the quantity and quality of leaves collected as well as the prevailing collection rate. According to past studies, the average family income per season of tendu collection may range from ₹5,000 to ₹10,000.[26] A 2016 study carried out in the five states of Madhya Pradesh, Chhattisgarh, Odisha, Maharashtra and Jharkhand found the annual average household income from tendu to be much lower at ₹2,901, which ranged between 2 and 3 per cent of their yearly income.[27] The collectors from Madhya Pradesh reported having the highest annual income of ₹5,480 whereas Jharkhand reported the lowest income at ₹1,214.

2.3 Conclusion

Tendu is a major if not the most prominent NTFP in terms of dependence and revenue generation in the states where it is collected. Elaborate and well-organised trading infrastructure and welfare support mechanisms set up by the respective state governments are behind this prominence. However, the on-ground reality of these structures is unknown and needs to be examined. While states like Madhya Pradesh and Chhattisgarh have sophisticated three-tier cooperative structures for the trade of tendu leaves, Odisha has KL divisions that are in place to focus exclusively on the management of the tendu trade. Other NTFPs, despite having a higher prominence in terms of availability, have not been accorded an advantage.

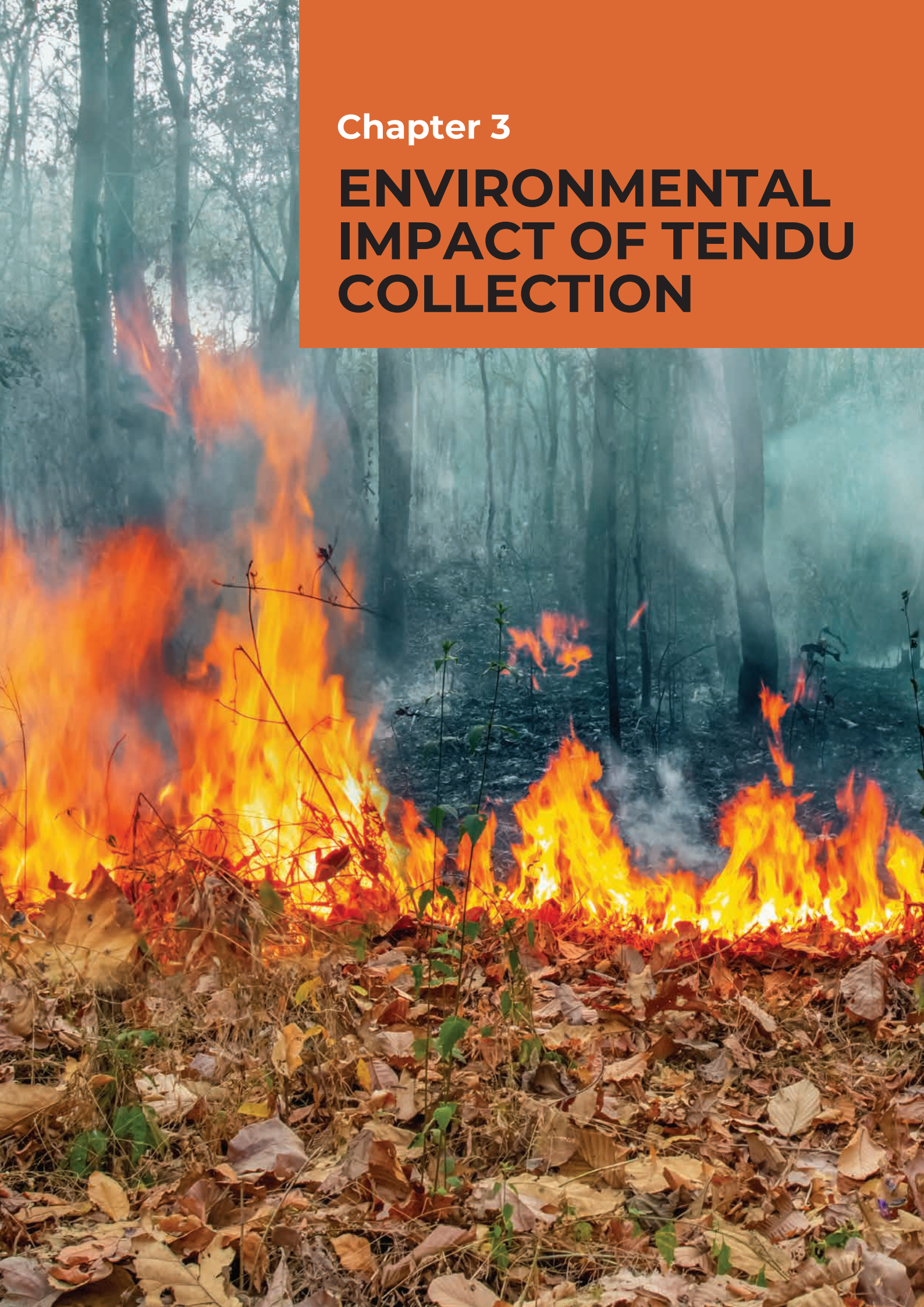
Key observations on tendu trade and dependence explored in the chapter are summarised as follows:

- Tendu collection is concentrated in six Indian states. Madhya Pradesh and Chhattisgarh collectively account for about 60 per cent of the national collection, while Jharkhand, Odisha, Rajasthan and Maharashtra collectively accounts for another 30 per cent.
- Based on available estimates, there is a decline in tendu leaf collection. The average tendu leaf collection for the past three years (2018-19 to 2020-21) is estimated to be 234 billion tonnes by the study, which is nearly half of the collection reported by studies done in the 1990s.
- In all major states, except Jharkhand and Rajasthan where the collection has witnessed a slight increase, the tendu collection is estimated to have declined at a CAGR of 2 per cent to 7 per cent.
- The dependence on tendu leaf collection is substantial, with nearly 9 million to 10 million people engaged in its collection. While this is a large dependence, the per worker value add is low at only about ₹3,000 per collector.
- The income contributed by tendu collection is supplementary to agriculture and other incomes for a household, given the limited numbers of employment days and limited wages. This additional income is inadequate to pull collectors out of poverty, or to contribute towards the socio-economic development of tendu-collecting districts (majority of which remain categorised as aspirational). However, from the Forest Department perspective tendu collection contributes high revenues, with departments retaining part of the profits as royalty.

High dependence on tendu collection, but the returns to the collectors are marginal

Chapter 3

ENVIRONMENTAL IMPACT OF TENDU COLLECTION



The use of fire for the collection of tendu leaves and mahua flowers is well known. While mahua collectors set fire for easier collection of flowers, tendu collection involves the use of fire for the purposes of getting a better flush of leaves in the next season, which makes them more pliable for bidi rolling, and also reduces the competition from the undergrowth.[1] The fires when set at the base of tendu trees cut back its young, exposed shoots and 'injure' its roots.[2,3] This helps yield the best quality leaves. While what is called coppicing[4] by foresters also helps facilitate good quality leaves for bidi-rolling and easier plucking, the use of fires, which are said to attain similar results, are the easier option. Fire season begins in January and most burning operations are concentrated in April and May when forests are at their driest.[5] While these are intended to be limited to spread around tendu trees only, negligence often leads these fires to spread across larger areas due to lack of moisture.[6] Uncontrolled fires are thus frequently reported in states during the tendu collection period.

The practice of using fires for supporting tendu leaf growth has little scientific validity,[7] yet it is widely practised. This is despite penalties prescribed under various national and state-level laws for setting forest fires *(refer to table 4.1)*. While fires have traditionally been used by various communities in India for weed clearance on land and forest management, national laws strictly prohibit them. Two central acts, The Indian Forest Act of 1927 and The Wildlife (Protection) Act of 1972, prohibit the use of fires in forests and penalise violators. The only exception is when Forest Departments use it for controlled burning and for creating fire lines. Implementation of legislation is less robust at the state level. Only a handful of states emphasise the need for forest fire prevention and management (FFPM) in their forest policies. The states that have incorporated some aspects of FFPM are Chhattisgarh, Andhra Pradesh, Telangana, and Madhya Pradesh.

Chhattisgarh's State Forest Policy, for instance, specifically recommends the use of GIS and remote sensing for fire control. Rajasthan and Andhra Pradesh have modified the Indian Forest Act to increase the penalising powers of the state. For instance, under the Rajasthan Forest Act, 1953, the penalty for setting fires in reserved forests includes imprisonment of up to six months and/or a fine of ₹25,000, which is substantially more in comparison to the penalties prescribed by the Indian Forest Act.

Table 3.1: Laws, policies and penalties for kindling forest fires

State/national	Act/rules	Offence	Penalty prescribed
National	The Indian Forest Act, 1927 – Sections 26 & 33	Setting fire in forests	1. Imprisonment up to six months and/or fine of up to ₹500 2. Exercise of any right of pasture or to forest produce shall be suspended for such period as the government thinks fit
	The Wildlife (Protection) Act, 1972 – Section 30	Setting fires in sanctuaries	Imprisonment up to three years and/or fine of up to ₹25,000
Madhya Pradesh	The Indian Forest (Madhya Pradesh Amendment) Act, 2009 – Section 3	Setting fire in forests	Imprisonment up to six months and/or fine of ₹15,000

Fire usage practices associated with tendu leaf collection widely prevalent, however, have little scientific validity

Table 4.1 continued

State/national	Act/rules	Offence	Penalty prescribed
Maharashtra	The Indian Forest (Maharashtra Amendment) Act, 2013 – Section 2	Setting fire in reserved forests	1. Imprisonment up to one year and/ or fine of up to ₹5,000 2. Provided that, in cases where the forest offence is committed after sunset and before sunrise, or after preparation for resistance to lawful authority, or where the offender has been previously convicted for any forest offence the punishment may extend to double the punishment mentioned in this sub-section
	Tendu tendering rules	Controlled burning for tendu leaf growth	Complete prohibition – • If fire breaks out in a tendu unit before auction, the unit is to be withdrawn from bidding process • If the fire breaks out after the auction, the contract is to be cancelled, with no compensation to be paid and the security deposit of the contractor withheld
Odisha	Odisha Forest (Amendment) Act, 1972 – Sections 27 & 28	Setting fire to a forest land	Imprisonment up to one year and fine of up to ₹1,000
		Setting fire in reserved forests	1. Imprisonment between three and seven years and fine up to ₹10,000 2. Exercise of any right of pasture or to forest produce shall be suspended for such period as the government thinks fit
	The Orissa Forest (Fire Protection) Rules, 1979 – Section 6	Controlled burning for tendu leaf growth	Complete prohibition
Chhattisgarh	The Indian Forest (Chhattisgarh) Amendment Act, 2014 – Section 3	Setting fire to a forest land	Imprisonment up to six months and/ or fine of ₹10,000
Rajasthan	The Rajasthan Forest Act, 1953 – Section 26 & 27	Setting fire in reserved forests	1. Imprisonment up to six months and/or fine of ₹25,000 2. Exercise of any right of pasture or to forest produce shall be suspended for such period as the government thinks fit.
Karnataka	The Karnataka Forest Act, 1963 – Sections 24 & 27	Setting fire in reserved forests	1. Imprisonment up to one year and/ or fine of ₹2,000 2. Exercise of any right of pasture or to forest produce shall be suspended for such period as the government thinks fit

Setting of fires in forests proscribed by various central and state-level laws. Laws in place, however, implementation weak

Table 4.1 continued

State/national	Act/rules	Offence	Penalty prescribed
Andhra Pradesh	The Andhra Pradesh Forest Act, 1967 – Sections 20 & 21	Setting fire in reserved forests	1. Imprisonment between three months and five years and fine between ₹5000 and ₹30,000 2. Exercise of any right of pasture or to forest produce shall be suspended for such period as the government thinks fit
Telangana	The Telangana Forest Act, 1967 – Sections 20 & 21	Setting fire in reserved forests	1. Imprisonment up to one year and/or fine of ₹2,000 2. Exercise of any right of pasture or to forest produce shall be suspended for such period as the government thinks fit

Source: Respective laws

Tendu-producing states have also made explicit attempts to control tendu-linked forest fires, including through promotion of pruning of tendu trees (also known as bush cutting). In Odisha, controlled burning for tendu leaf growth is completely prohibited. Every year, the state government sets aside a budget for funding bush cutting of tendu plants to stop collectors from using fires. According to state Forest Department officials, for the crop year 2021, it had disbursed around ₹350 million towards bush cutting. In Maharashtra, contractors, or the party to whom the tendu units are leased, get the bush-cutting done. As per Maharashtra state Forest Department officials, the rate for bush-cutting is ₹100 per day. In Chhattisgarh and Madhya Pradesh, bush-cutting is facilitated by the government and carried out by the Primary Cooperative Societies.[8]

The Maharashtra government had taken one of the most significant steps with regard to the use of fires in 2012. Through this order, it banned the collection and sale of tendu leaves from forest fire-affected areas.[9] The government made tendu contractors and the gram panchayats responsible for preventing and extinguishing any forest fires that occur within their jurisdiction. If a fire breaks out in a tendu unit before the date of the auction, the unit is withdrawn from the bidding process. If a fire breaks out in the unit after the auction, the contract is cancelled. No compensation is paid and the contractor's security deposit is withheld. Despite repeated warnings by the state Forest Department[10], fires are still reported.

States like Maharashtra acknowledge use of fire for tendu collection and prescribe stringent measures to curb this

Despite policy measures by states, local media frequently report forest fires in tendu plucking. There is no official acknowledgment of fires by the Forest Department or the state government which links it to tendu collection. Conversations with tendu collectors across states reveal fires are common, and that these aren't set by them. There is no clear understanding of the scale of these fires as there is no follow-up survey by the Forest Department of the size of the fires.

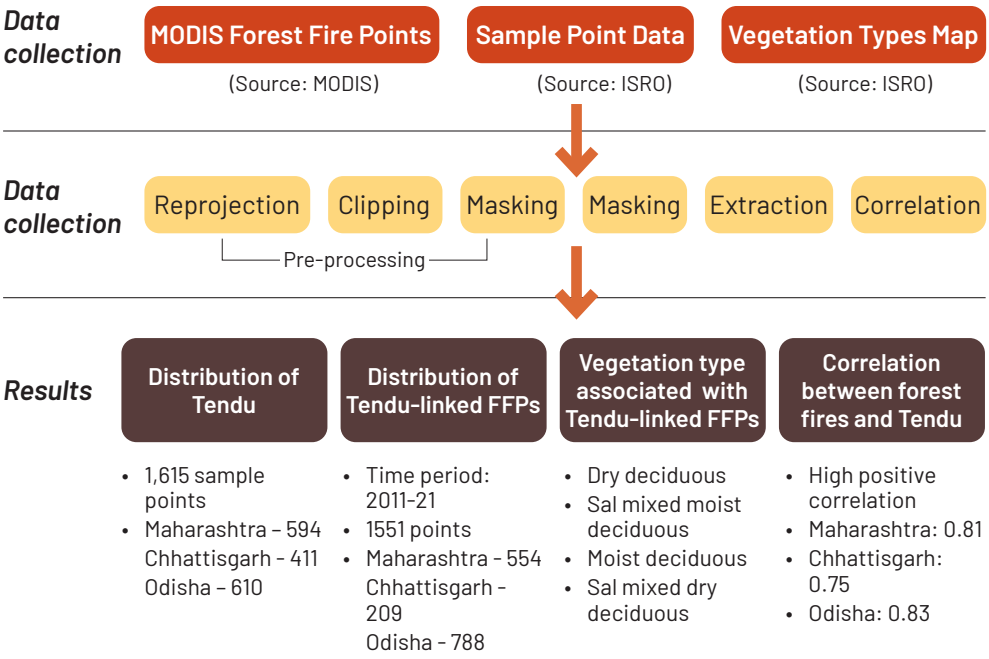
In this chapter, we use satellite data to analyse the connection between tendu leaf collection and forest fires in India. We assess the impact on the extent of burnt area and emissions of greenhouse gases. Our analysis focuses on three states — Chhattisgarh, Odisha, and Maharashtra — which collectively contribute toward 35% of tendu collection and 36% of all forest fires. By examining this data, we aim to understand the relationship between tendu leaf collection, forest fires, and their impact on the environment.

3.1 Tendu and forest fires linkage

Clear linkages between tendu prevalence and FFPs in the three focus states. 1,551 FFPs located around the tendu sample points

The relationship between forest fires and tendu is established by using three data points. First, data on incidents of forest fires during the 2011-21 was sourced from the Moderate Resolution Imaging Spectroradiometer (MODIS) dataset of the National Aeronautics and Space Administration (NASA). Second, the vegetation type, and, third, the tendu sample points maps sourced from the Indian Space Research Organisation (ISRO) database.[11] These location points are extracted, plotted, and overlaid for the three focus states, after clipping and masking as per the study's requirements. We derive our results using mapping and spatial analysis tools with statistical analysis. The methodology for the tendu-forest fires linkage is summarized in Figure 3.1 and detailed in Annexure 3.

Figure 3.1: Summary of methodology and findings on tendu-forest fires correlation



3.1.1 Distribution and trends in tendu-linked forest fires

- Tendu's range is present across 1,615 sample points of the geospatial grid in the three focus states. These sample points are near-equally distributed: 610 sample points are in Odisha, 594 in Maharashtra, and 411 in Chhattisgarh.
- There is strong evidence that tendu-related activities promote forest fires from spatial analysis. A total of 1,551 forest fires points (FFPs) are identified and located around the tendu sample points. The study takes a buffer area of 1,000 metres as consideration. Odisha has 788 tendu-linked FFPs, Maharashtra has 554 and Chhattisgarh has 209.
- Tendu-linked FFPs are observed to be fluctuating during the past decade. There is a general trend of a decline around the mid-years (around 2015) and then in 2020.
  - » In Maharashtra, a sharp decline in the number of FFPs is noticed after 2012. This coincides with the time the state government banned the use of forest fires for tendu collection. FFPs increase after 2015, and decline again after 2017. They drop to near-zero in 2020, due to COVID lockdowns.

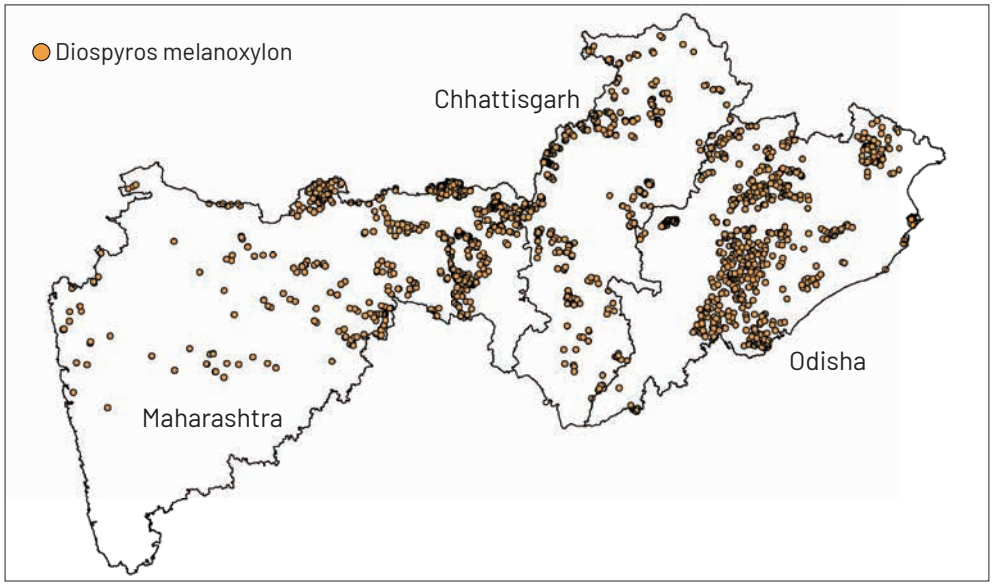
» Similar decline in tendu-linked FFPs is seen in Odisha around 2015 and 2020. Post-2020 COVID phase, the number of FFPs nearly doubles compared to the highest incidences recorded in the previous decade.

» The number of tendu-linked FFPs are observed to be lowest for Chhattisgarh.

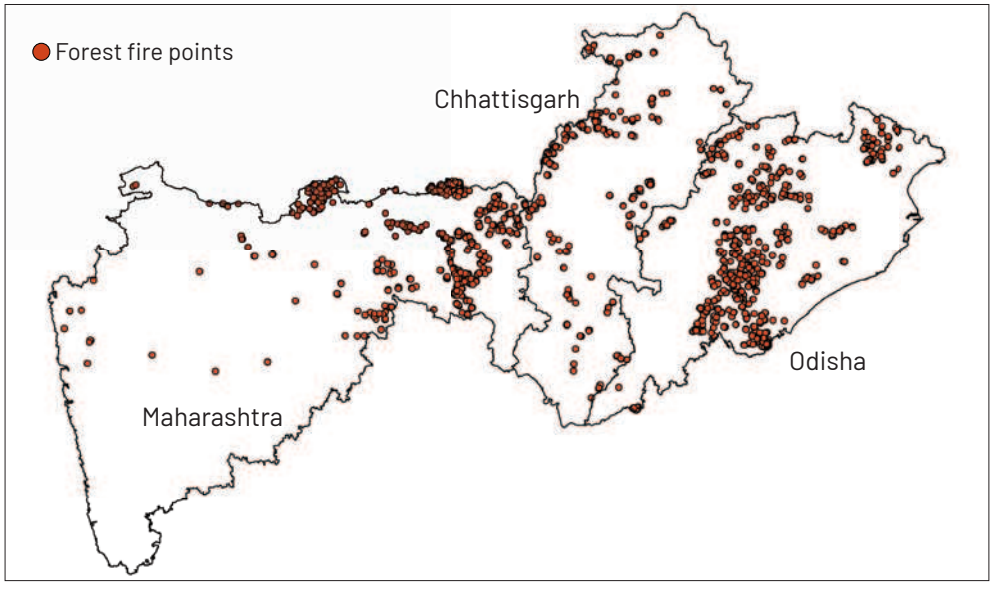
» Our results may be an underestimate since substantial tendu collection is not recorded. This is because some collection and trade is done directly by individuals or the community, or through illicit channels.

- Tendu-linked FFPs predominantly occur in dry deciduous, sal mixed moist deciduous, moist deciduous and sal mixed dry deciduous forest areas. Major vegetation types for tendu occurrence state-wise include dry deciduous and teak mixed dry deciduous for Maharashtra; moist deciduous and sal for Chhattisgarh; and sal mixed moist deciduous and sal mixed dry deciduous for Odisha.

Map 3.1: Distribution of tendu sample points across focus states

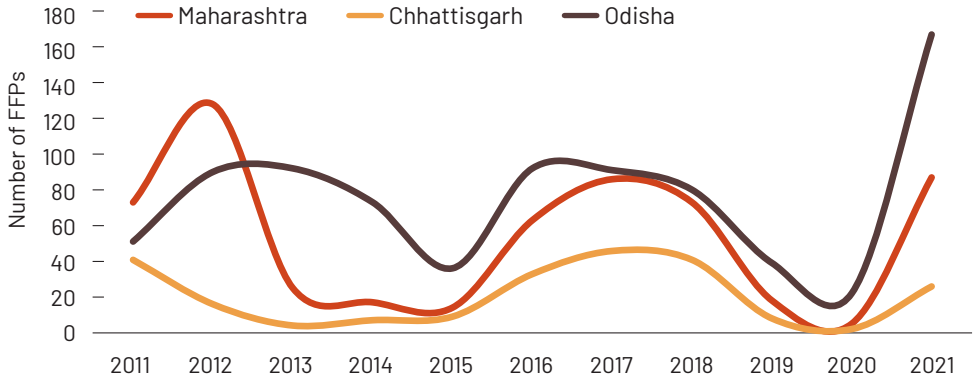


Map 3.2: Distribution of tendu-linked FFPs for 2011-21



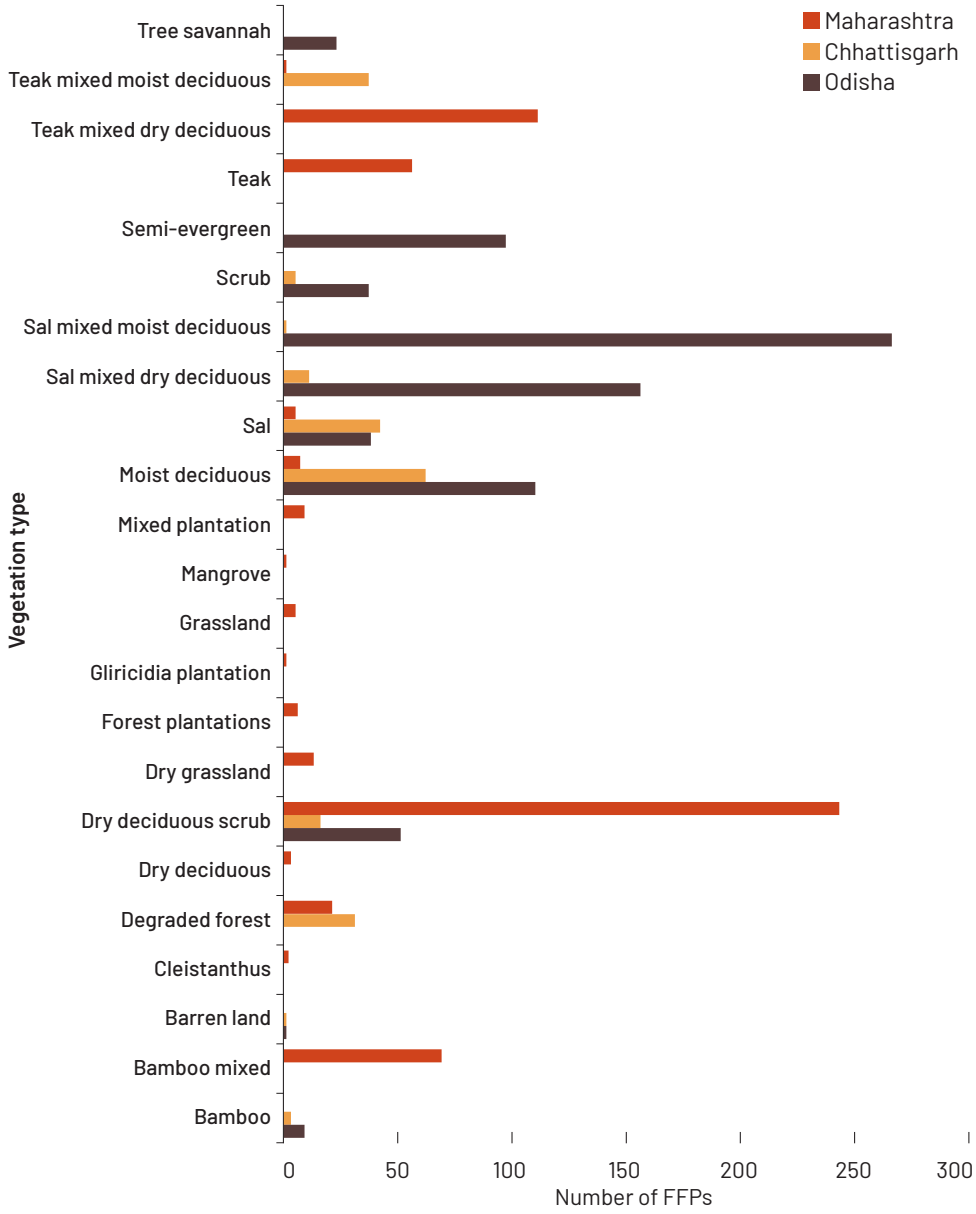
Study findings of forest fire points may be an underestimate

Graph 3.1: Year-wise trend in tendu-linked forest fires during 2011-21 in focus states



Huge fluctuations in tendu-linked forest fires during 2011-21. Substantial increase witnessed post-2020

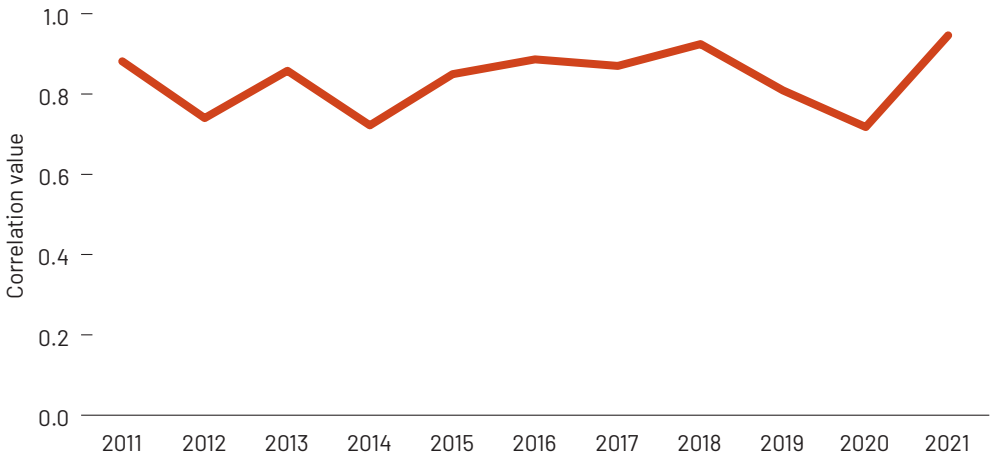
Graph 3.2: State-wise vegetation type associated with tendu-linked forest fire points in 2011-21



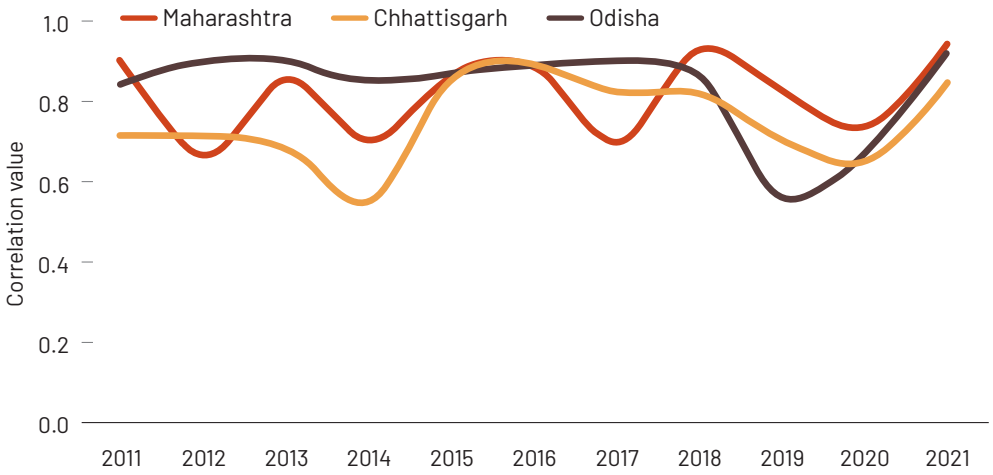
3.1.2 Correlation between forest fires and tendu

- Regression analysis between forest fires and presence of tendu for the decade (2011-21) shows a high positive correlation between the two. Their correlation value is calculated to be very high (over 0.8) for most years of the study period. Only in 2012 and 2020 did the correlation value dip below 0.8 to near 0.7, which is still a high positive correlation. This shows that tendu-producing areas appear to have very high susceptibility to forest fires.
- The average correlation value for Odisha (0.83) and Maharashtra (0.81) indicate that forest fires are very consistent with tendu plucking in tendu collection areas. While the number of FFPs is lowest for Chhattisgarh, the correlation is still high at 0.75.

Graph 3.3: Year-wise correlation between forest fires and tendu in focus states (2011-21)



Graph 3.4: State-wise correlation between forest fires and tendu (2011-21)



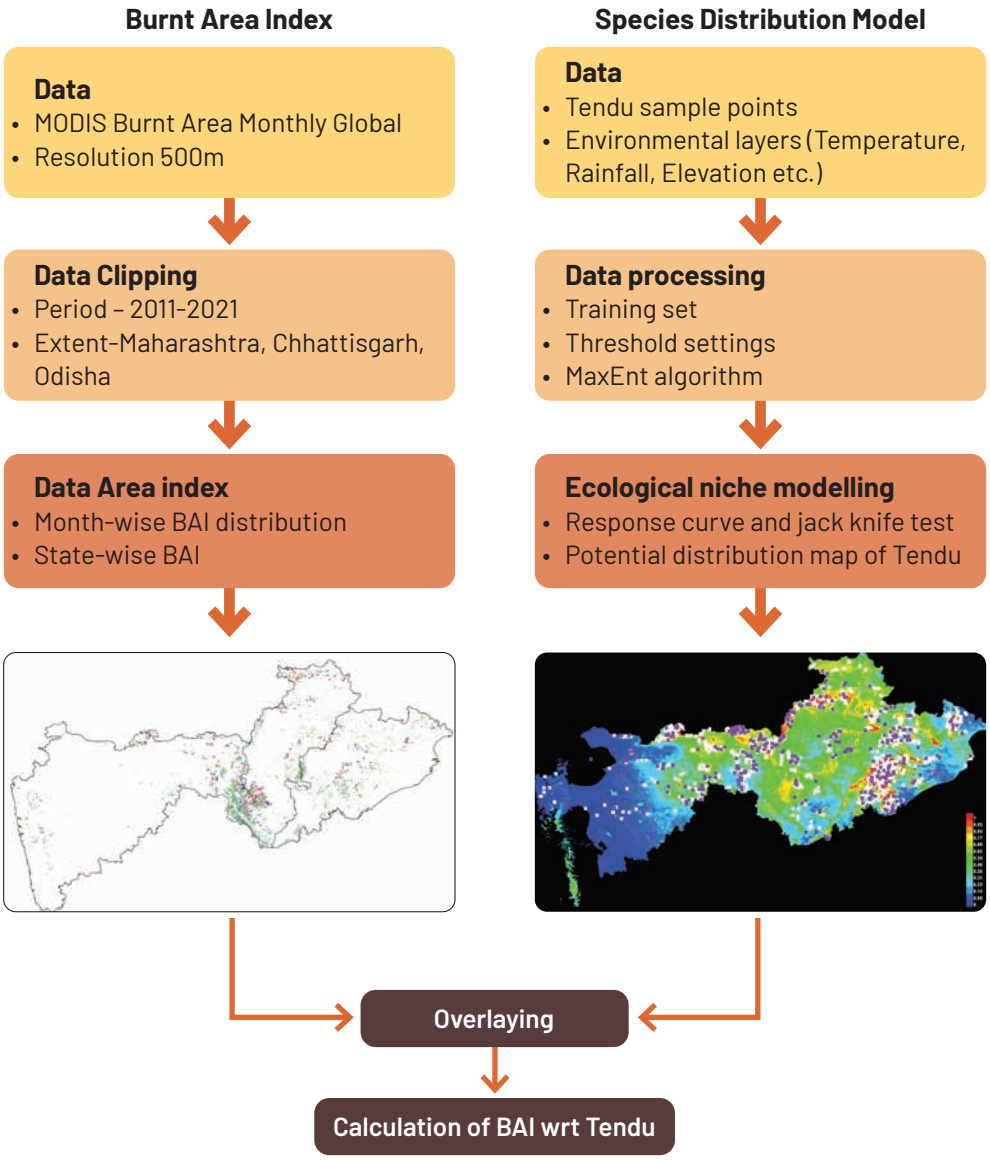
High positive correlation between forest fires and tendu prevalence in focus states. Correlation value over 0.8 for most years

3.2 Tendu distribution and burnt area analysis

Tendu Species Distribution Model and Burnt Area Index for the period 2011-2021 overlaid to estimate burnt area associated with tendu collection

Burnt area estimates are important to understand the extent of damage caused by tendu-linked forest fires. To calculate this, the Burnt Area Index (BAI) for the decade (2011-21) is sourced from MODIS (MCD64A1 Ver. 6) burnt area dataset. To estimate prevalence of tendu within forest areas, a Species Distribution Model (SDM) is developed. This is derived using a maximum entropy model (MaxEnt) and populates data of tendu sample points, bioclimatic data sourced from WorldClim database, receiver operating characteristic (ROC) curve and jackknife test of variable importance. The SDM for tendu and BAI are overlaid to calculate the actual burnt area associated with tendu leaf collection. The methodology for the tendu distribution area and burnt area analysis is summarised in Figure 3.2 and detailed in Annexure 4.

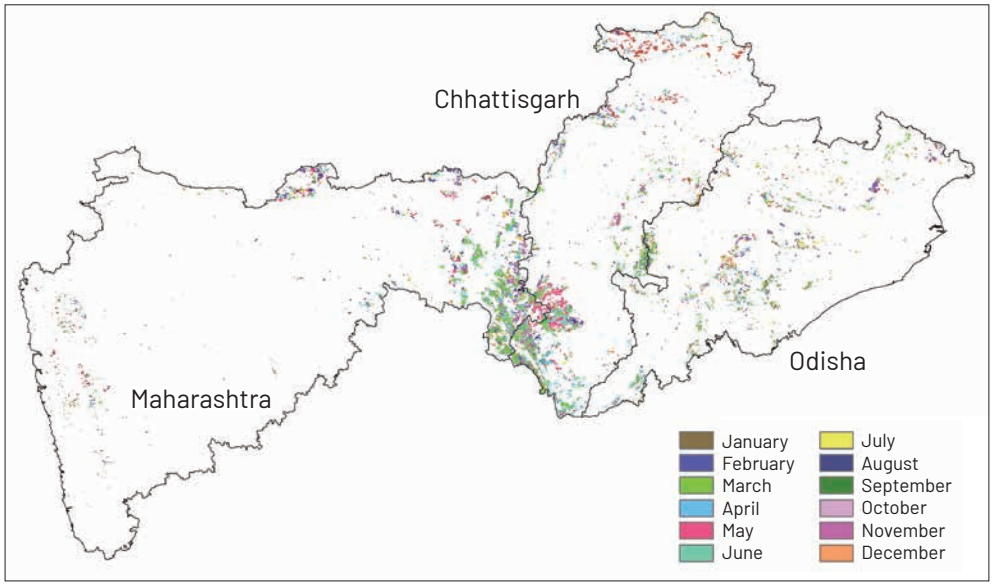
Figure 3.2: Methodology for estimating species distribution and burnt area for tendu



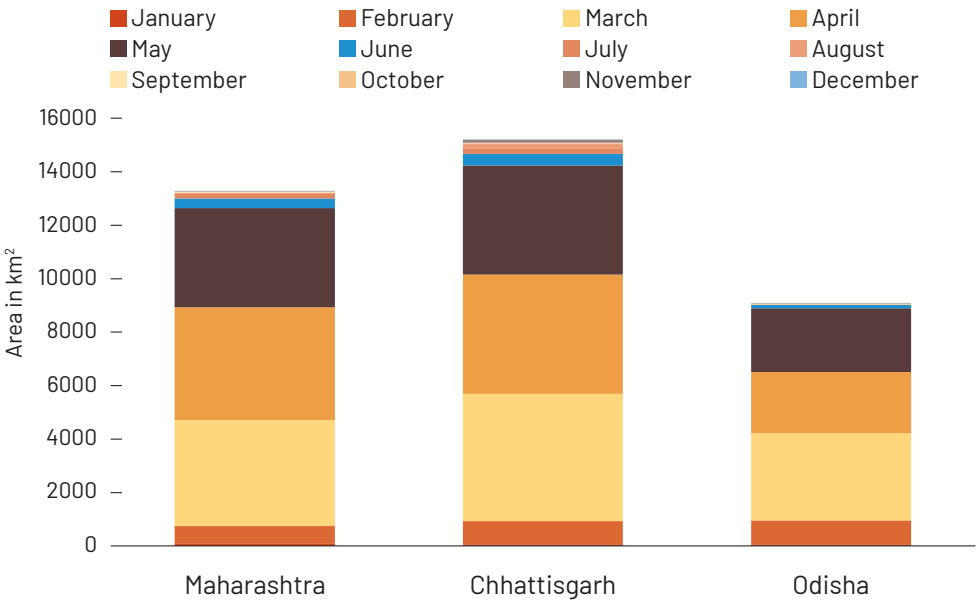
3.2.1 BAI for forest fires and SDM for tendu

- The SDM suggests that the range of tendu is spread across 22,904 sq km of forest land in Chhattisgarh, 16,957 sq km in Odisha, and 13,233 sq km in Maharashtra. Tendu is concentrated in eastern Maharashtra, northern Chhattisgarh, and the south-central part of Odisha.
- Chhattisgarh has the highest BAI with 15,217.5 square kilometre (sq km) of forest area. This is the burnt due to forest fires between 2011 and 2021. This is followed by Maharashtra with 13,284.5 sq km and Odisha with 9,084.75 sq km. Forest fires are most prevalent between February and May.

Map 3.3: Burn Area Index for the three states during 2011-21

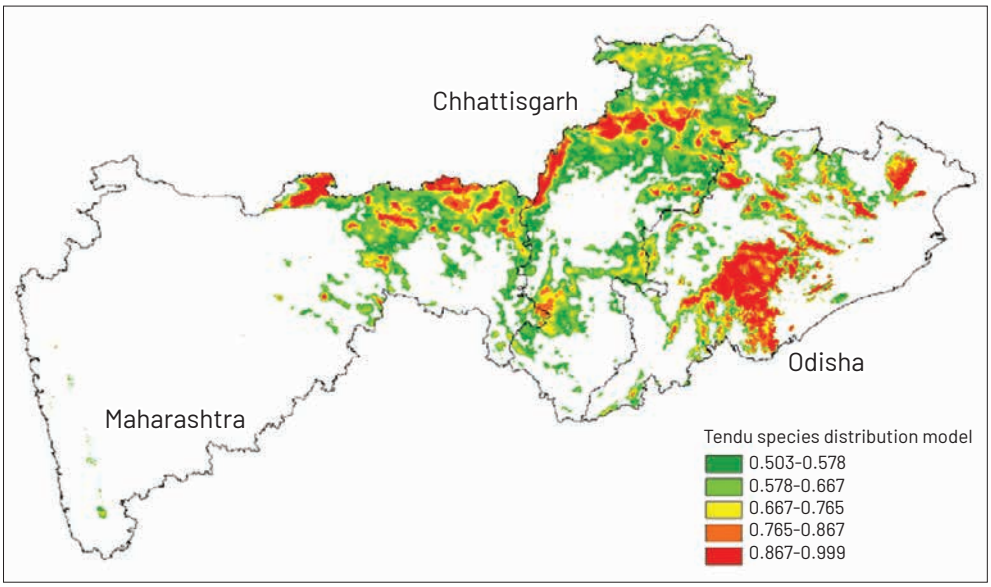


Graph 3.5: State-wise BAI for 2011-21



Chhattisgarh has highest Burnt Area Index with 15,217.5 sq km of forest area, followed by Maharashtra with 13,284.5 sq km and Odisha with 9,084.75 sq km

Map 3.4: Potential species distribution of tendu in the focus states



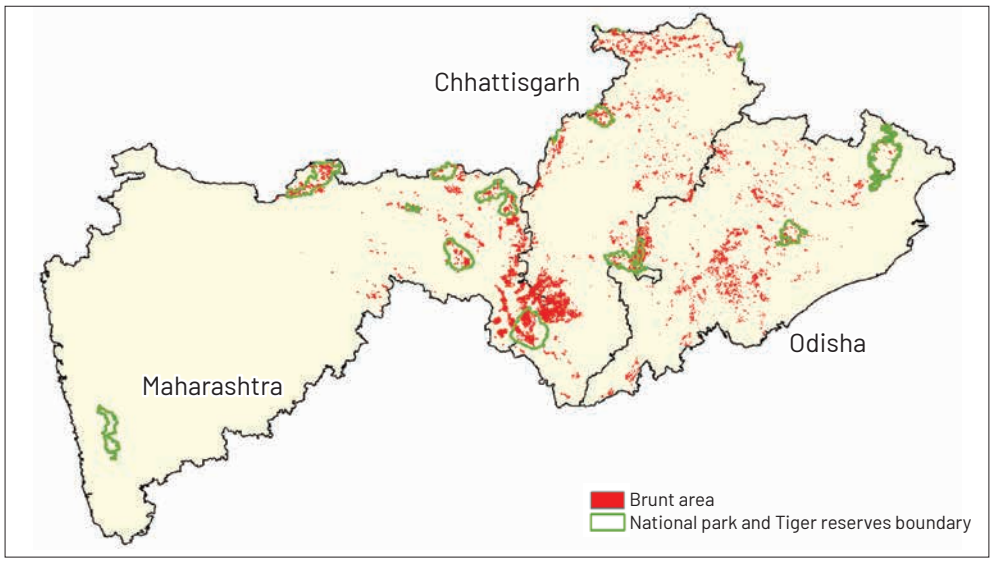
During 2011-21, a total of 13,904.8 sq km of the area was burnt in tendu-prevalent forests. This is roughly the area of Tripura and Goa combined

3.2.1 Burnt area due to tendu-linked forest fires

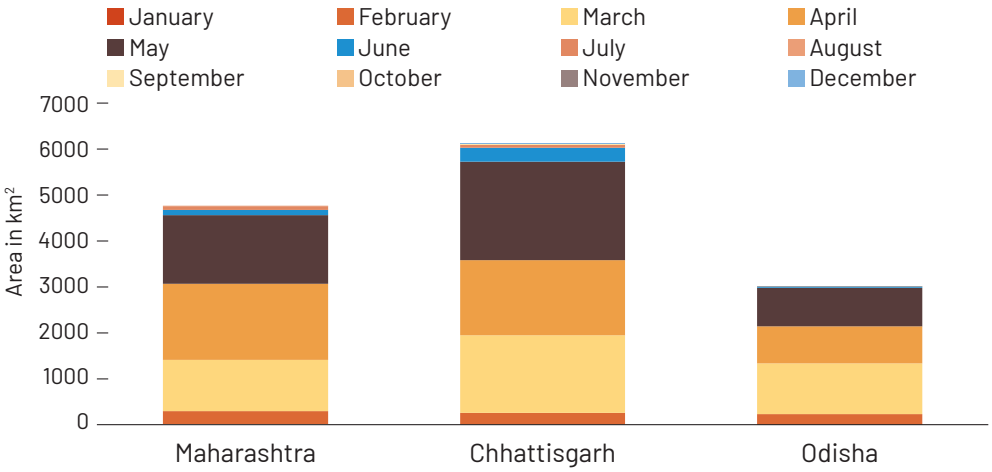
- Overlaying SDM for tendu and the BAI reveals the potential burnt area related to tendu. The results show that during 2011-21, a total 13,904.8 sq km of the area was burnt in tendu-prevalent forests. The area estimated to be burnt due to tendu leaf collection activity is slightly less than the combined area of Tripura (10,486 sq km) and Goa (3,702 sq km).
- Chhattisgarh has the highest tendu-linked burnt area of 6,120 sq km, followed by Maharashtra (4,767 sq km) and Odisha (3,018 sq km).
- The highest annual burnt area for Chhattisgarh (1,292 sq km) was in 2017 which is a little less than the area of the National Capital Territory of Delhi (1,483 sq km).
- Maharashtra recorded the highest burnt area of 855 sq km in 2012, which is more than the size of urban Pune (816 sq km). In 2020, even with the low collections and forest fires, 66 sq km is estimated to have burnt on account of tendu.
- For Odisha, the highest annual burnt area related to tendu is estimated to be 676 sq km, which is 3.7 times the size of Bhubaneswar (185 sq km).

The annual burnt area was highest in the years 2012, 2017, and 2021, amounting to over 2,000 sq km of area. Similar to the trends in tendu-linked FFPs, the annual burnt area with respect to tendu decreased from 2012 to 2015. This was followed by an increase in 2017 and a steady decline to its lowest in 2020.

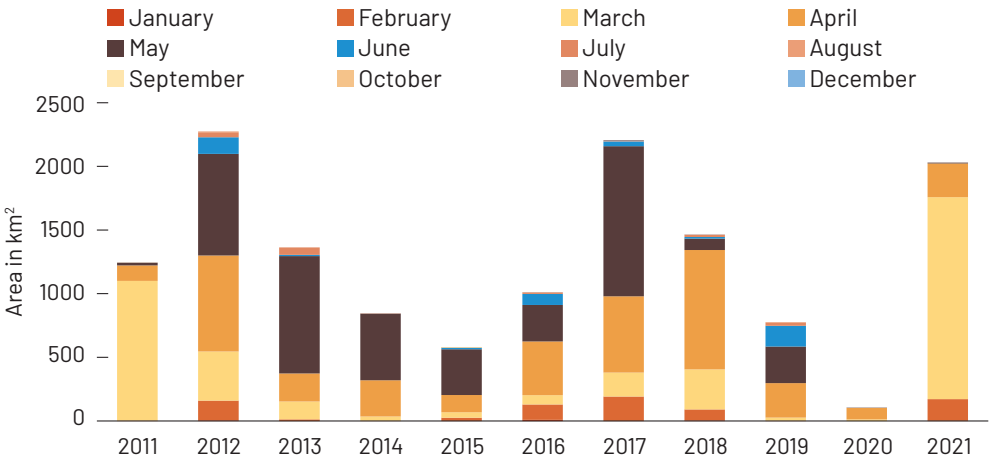
Map 3.5: Burnt area with respect to potential distribution of tendu for 2011-21



Graph 3.6: State-wise tendu-linked BAI for 2011-21



Graph 3.7: Year-wise tendu-linked BAI for the focus states for 2011-21

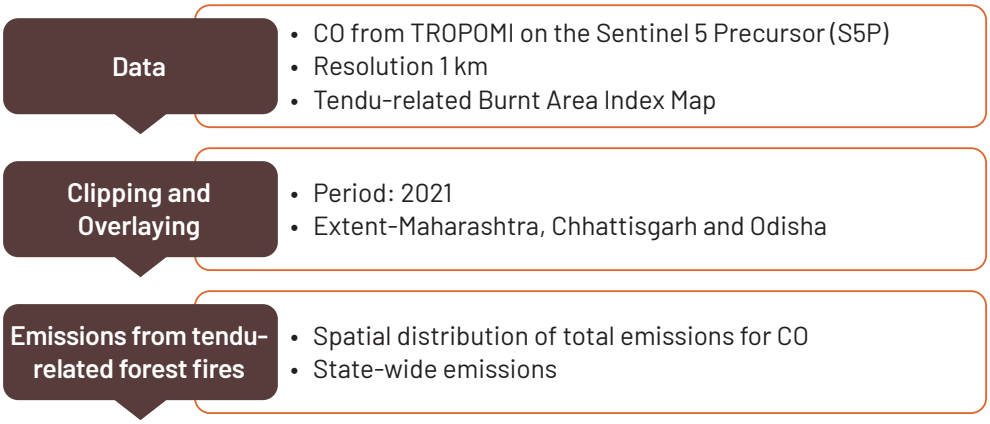


Burnt area highest in the months of February-May, which is when fires are set for tendu collection

3.3 Emissions from tendu-linked fires

Forest fires have a huge impact on local biodiversity, carbon emissions, soil quality, water bodies, etc. There is a moderate to high impact of forest fires on ecosystem production and terrestrial carbon emissions. There is also evidence of a significant impact on NOx, CO, NO_2, CH4, biomass in areas with high forest fires.[12] Thus, the study estimates CO and CO_2 emissions from tendu-related fires to understand the impact of such fires in the context of climate change. CO emissions data, sourced from TROPOMI on the Sentinel 5 Precursor (S5P) satellite, was treated for background emissions and overlaid with tendu-related burnt area. CO_2 emissions were estimated assuming modified combustion efficiency for forest fires with smouldering combustion for dry deciduous forest types.

Figure 3.3: Methodology for calculating emissions from tendu-related forest fires

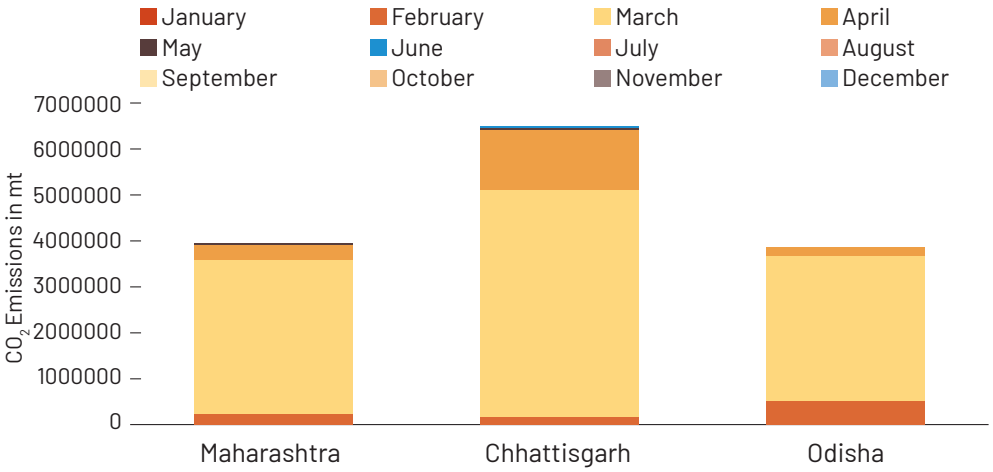


Tendu-related fires contributed to around 14.15 million mt of CO_2 emissions between February and April in 2021, equivalent to emissions from 5.6 million cars in a year

3.3.1 CO_2 emission from tendu-related forest fire

During the fire months (February to April 2021), 14.15 million mt of CO_2 is estimated to be emitted from tendu-related forest fires in Chhattisgarh, Odisha, and Maharashtra. CO_2 emissions were highest in Chhattisgarh at 6.43 million mt which is equivalent to annual emissions from about 2.6 million cars. Tendu fire-related emissions in Maharashtra (3.92 million mt) and Odisha (3.81 million mt) are equivalent to annual emissions from over 1.5 million cars each.

Graph 3.8: State-wise CO_2 emissions from tendu-linked forest fire during February-April 2021



3.4 Conclusion

Fire as a tool for forest clearance and growth promotion in fire climax trees is extensively used, especially in tendu-plucking areas. While this is widely known to foresters and local media and is reported in academic papers, this study quantifies the phenomenon. The study uses satellite datasets (NASA and ISRO) and covers three key states that contribute towards 35 per cent of India's tendu production. The association of forest fires caused by tendu-related activities is strong and positive.

While individual tendu fires do not necessarily affect large tracts of land, their cumulative area is vast. Our estimates when extrapolated to the entire tendu-plucking belt reveals that in the past decade, nearly 60,700 sq km of forest land area was burnt in the past decade (or roughly the size of Himachal Pradesh, 55,673 sq km). On an annual scale, about 10,000 sq km was burnt between 2012 and 2020, the size of the state of Tripura. Even in the COVID year (2020), tendu-associated burnt area was about 750 sq km.

Tendu collection practices have implications for climate change. Climate change cost of tendu plucking 7 times more than revenues generated from tendu collection in the three states

The forest fires also translate into significant CO_2 emissions with implications for climate change. In 2021, 14.15 million mt of CO_2 is estimated to have been emitted from tendu-related forest fires in the three focus states. This is equal to the CO_2 emissions from 5.6 million cars in a year. This translates to a social cost of carbon (SCC) of about ₹99.49 billion.[13,14] The climate change cost of tendu plucking alone is 7 times more than revenues generated from tendu collection in the three states (₹13.93 billion).

To stop and reverse massive damage to climate and ecology, state and central governments need to enforce a comprehensive forest fire ban. As this study shows, these rules have had little impact on the ground. There is a clear need to strengthen the regulatory framework of tendu plucking and trade. As a way forward, the central government must support gainful employment and livelihood for local communities, which result in forest protection, not their destruction.

Chapter 4

ECONOMIC DEPENDENCE ON TENDU: EVIDENCE FROM THE GROUND

It is important to understand the economic contribution of tendu to local communities before making any recommendations to reduce or eliminate the practice, when viewed from the context of environmental impact of tendu plucking and the public health impact of bidi smoking. A few studies have explored the socio-economic impact of tendu collection on the collectors;[1,2,3] however, comprehensive and grassroots-level assessments are missing.

The study designed and undertook in-depth primary research in three states (Maharashtra, Chhattisgarh, and Odisha) to understand the causal association between employment and earnings from tendu versus the annual income of households of collectors. The findings from this research will aid to develop better understanding of the socio-economic dependence of rural communities on tendu collection and to explore feasible and sustainable economic alternatives. Both primary and secondary data sources were used for the study.

4.1 Research methodology

The study conducted rigorous desk and empirical research for the three selected districts, one in each of the focus states. Based on background research, questionnaires were designed, pre-tested and followed by household-level surveys, focus group discussions and semi-structured interviews. These selected districts included:

1. **Angul in Odisha:** Angul district is a major coal-mining and industrial hub in Odisha. Despite this, the district is largely dependent upon agriculture. Moveover, Angul is known for its production of tendu leaves. For instance, Angul kendu leaf (KL) division produced around 44 million kerries (1 kerri = 20 leaves) of tendu leaves in 2020-21, which accounts for 5 per cent of Odisha's total production. The division has 44,350 tendu collectors, which is the fourth highest in the state after Padampur, Nabarangpur and Jeypore districts.[4]
2. **Chandrapur in Maharashtra:** Chandrapur is a district known for its thermal power station and huge reserves of coal. Heavily forested, Chandrapur is known for its production of Non-Timber Forest Products (NTFPs) like tendu and bamboo. Chandrapur district's tendu yield in the 2022-23 tendu season was 72,067 standard bags (SBs) (1 SB in Maharashtra includes 70,000 leaves). The district is also an important one in terms of people exercising their community forest resource (CFR) rights. Pachgaon village in the district is perhaps the only village in the country to have voluntarily stopped tendu leaf collection in light of its adverse environmental and health impacts.
3. **Korba in Chhattisgarh:** Korba, besides being a major power and industrial hub, is a major tendu-producing district in Chhattisgarh and is reported to be producing the best quality leaves in the state. In 2022-23, the district produced total of 126,727 SBs of tendu leaves (1 SB in Chhattisgarh includes 50,000 leaves) with the engagement of around 104,638 tendu collectors. Tendu leaf collection in Korba contributed 7.45 per cent towards the state's total production.

Primary research designed to understand the economic dependence upon tendu and to explore feasible alternatives to it

Table 4.1: Tendu collection and dependence in the three focus districts

	Korba (2022-23)	Chandrapur (2022-23)	Angul (2020-21)
Tendu collection (in SBs)	126,727	72,067	15,303
Share in state production (%)	7.45	24.8	4.9
No. of tendu collectors	104,638	39,988	44,350

Note: For Korba 1 SB is 50,000 leaves, for Angul and Chandrapur 1 SB is 70,000 leaves

Given the objective of the study, the empirical research focused on the following four elements:

Empirical research involved secondary research, household surveys, focus group discussions and stakeholder consultations

1. Secondary research:

Detailed secondary research was conducted to understand the state and district profiles, the dependence on tendu and other NTFPs, and to help develop the survey design. This entailed referring to journal articles as well as government reports and documents sourced from websites and relevant departments. The study referred to documents like the district census handbooks, India State of Forest Reports, forest working plans, Forest Department annual reports, district irrigation plans and Global Adult Tobacco surveys

2. Household surveys:

The sample size for the household surveys in tendu-dependent villages was determined using a representative portion of tendu collectors/households in each district (at 95 per cent confidence level, 5 per cent margin of error). Once numbers of household units were determined, seven tendu-dependent villages in Chandrapur and Korba and eight in Angul were identified using the district Forest Department data on collection centres. The household units were then identified by a survey team using convenience sampling in the identified villages, while ensuring that an almost equal number of households were chosen in each village. The survey team members, all of whom are experienced in conducting surveys, were provided training to help them understand the methodology and the questionnaires. In addition to the tendu-dependent villages, two villages were chosen in each district as control groups which have minimal (less than 5 per cent of total households) or no dependence on tendu.

A total of 1,147 tendu and 60 non-tendu households were surveyed.

- In Angul, 381 tendu-dependent households were surveyed in eight villages and 20 households were surveyed in two non-tendu-dependent villages.
- In Chandrapur, 385 tendu-dependent households were surveyed in seven villages and 20 households were surveyed in two non-tendu-dependent villages.
- In Korba, 381 tendu-dependent households were surveyed in seven villages and 20 households were surveyed in two non-tendu-dependent villages.

3. Focus group discussions:

Focus group discussions (FGDs) were held in each of the surveyed villages in all the districts to understand the overall profile of the village. In total, 54 to 58 people participated in the FGDs in each district. The ground survey members, all of whom are experienced in conducting FGDs, were provided training to help them understand the methodology and the questionnaires. To conduct FGDs, the survey team approached people with good knowledge about the village through word-of-mouth.

In all states except Maharashtra, the survey and the FGDs were conducted in the local language or Hindi. The surveyors were fluent in both languages in the states. In Maharashtra, the survey and the FGD questions were first translated into Marathi from English and then administered. The responses were then translated into English by the survey team.

4. Stakeholder consultations:

Detailed one-on-one meetings were held with Forest Department officials and various civil society members through a series of semi-structured interviews to understand the overall mechanism of trade and the perspectives on tendu leaf and other NTFP collection practices.

Table 4.2: Mapping of stakeholders consulted during research

Government officials	State level	Principal Chief Conservator of Forests (PCCF)
		Additional Principal Chief Conservator of Forests (APCCF)
		Chief Conservators of Forests (CCFs)
		Regional Chief Conservators of Forests (RCCFs)
	District level	District/Divisional Forest Officer (DFO)
		Sub-Divisional Officer (Forests)
Government Institutional heads	State level and district level	Federations
		Corporations
Seasonal government employees	District level	Phadi munshis (collection centre managers)
Civil Society organisations	State and District level	
Academics		
Tendu collectors	District level	

4.2 Key findings

- **Characteristics of tendu-producing districts:** Tendu-producing districts are largely rural. Dependence on agriculture is high, however, the sector is underdeveloped in terms of the development of agricultural and labour productivity, agricultural infrastructure, irrigation etc. Mining and industries present in pockets do not create much employment for the rural/forest dependent population. Rural multi-dimensional poverty is high.

Table 4.3: Characteristics of tendu-producing districts

	Angul, Odisha	Chandrapur, Maharashtra	Korba, Chhattisgarh
Share of primary sector in GDP (%)	31.1	21.2	56.3
Rural multi dimensional poverty* (intensity in %)	43.6	42.9	46.2
Share of forest in land area (%)	45	33.2	66
Share of rural households in total population (%)	81	66.5	63
Share of ST population in total population (%)	17	17.6	40.9
Share of cultivators to total workers (%)	20.4	20.8	21.6
Share of agricultural labourers to total workers (%)	32.7	44.7	42.5

*Multidimensional poverty index captures multiple and simultaneous deprivations faced by households across the three macro dimensions of health, education and living standards.

Tendu-producing districts largely rural, highly forested, multidimensionally poor and highly dependent upon the agricultural sector

- **Characteristics of tendu-producing villages:** Tendu-producing villages are situated near the forests, typically not more than three km away, which explains their dependence upon the forest. A majority of the populace of these villages, largely comprising households from the scheduled tribes (ST) and scheduled castes (SC) categories, hold no or only marginal agricultural land. However, these villages have people largely engaged in agricultural labour. There is high dependence on the Mahatma Gandhi National Rural Employment Guarantee Act 2005 (MGNREGA) which points to lack of employment opportunities within the villages. Their dependence upon tendu and other NTFPs is then unsurprising. As many as half of the total populace in Korba and Angul is engaged in tendu collection.

Surveyed tendu-producing villages situated near forests, predominantly tribal and largely agricultural, with marginal to no landholding

Table 4.4: Characteristics of tendu-producing surveyed villages in the three focus districts

Parameters	Chandrapur	Angul	Korba
Average population	208-3,500	312-2,773	570-5,338
Distance from forests (metres)	50-2,000	100-1,200	200-3,000
Dominant caste	ST	ST and SC	ST
Share of landholding households (% of total)	37.4	47	92
Share of tendu-collecting households (% of total)	54.8	77	74.2
Average number of people involved in tendu collection (per village)	451	409	1,025
Average number of days of MNREGA employment	31	19	57
Major source of employment	Agricultural labour	Cultivation/ agricultural labour	Cultivation/ agricultural labour
Average number of agricultural workers	338	414	1,393

- **Characteristics of tendu collectors:** The tendu collectors are from some of the most marginalised sections of society—primarily from the other backward castes (OBCs) and ST. These are low-income households, primarily dependent upon agriculture (mostly agricultural labour) with either no land or marginal landholding. The dependence upon MNREGA is high, pointing to a lack of employment opportunities in these areas.

Table 4.5: Characteristics of surveyed tendu collectors in three focus districts

Parameters	Chandrapur	Angul	Korba
Caste	ST and Artisan*/ OBC	Artisan/OBC	ST
Dominant monthly income category	Below ₹5,000	Below ₹5,000	₹5,000 to 10,000
Social class (as per Udai Pareekh socio-economic scale)	Lower middle scale	Lower middle scale	Middle scale
Share of landless amongst tendu collectors (%)	60	35.9	11.8
Average landholding (acres)	3	0.36	2.4
Primary occupation	Agricultural labour	Agricultural labour	Cultivation
Share of tendu collectors engaged in MNREGA (%)	70	45	73
Average income generation through MNREGA in a year	₹6,167	₹7,739	₹5,451
Days of MNREGA engagement in a year	29	35	27.9

*Artisan caste is a category that has been referred to in the Udai Pareek SES scale. The scale is a well-accepted measure of Socio Economic Status (SES) that includes nine domains of SES, i.e. Caste, Occupation, House, Land, Education, Social Participation, Farm Power, Material Possessions, and Family Member. Details on the scale can be found in Annexure 5.

- **Income contribution of tendu:** Tendu contributes to about 5 to 15 per cent of the annual income of the collectors. The surveyed tendu collectors earn anywhere between ₹2,195 and ₹8,076 per season of tendu collection in the three focus districts from one to two weeks of engagement.
  - » For families in Angul, the annual estimated income is about ₹55,000, and tendu's contribution towards the total income is ₹2,195 (or about 4 per cent).
  - » For households in Chandrapur, the estimated annual income is also about ₹55,000, with the contribution of tendu is ₹8,076 (or about 14 per cent).
  - » For households in Korba, the estimated average income is around ₹90,000, and the contribution of tendu is ₹5,633 (or about 6.2 per cent).

Tendu contributes to about 5-15% of the annual income of the collectors. Surveyed collectors earn between ₹2,195 and ₹8,076 per year

Table 4.6: Income contribution of tendu as per surveyed tendu collectors

Parameters	Chandrapur	Angul	Korba
Income through tendu collection (per season)	₹8,076	₹2,195	₹5,633
Days of engagement in tendu collection (per season)	13	9	6
Years of engagement in tendu collection	10-20	20-30	10-20

- **Availability of alternatives in tendu villages:** Tendu is not the most prominent NTFP in the tendu-collecting villages. The dependence on forest produce for income generation is high, especially in Angul and Korba where at least 80 per cent of the surveyed households are dependent upon the forests for the collection of non-tendu NTFPs. Mahua has the highest dependence after tendu across the three districts. The income generated per season from mahua is higher than from tendu in Angul and Korba. In Chandrapur, bamboo collection is a major source of income and exceeds gains from tendu collection. Thus, there are NTFPs which can be promoted in lieu of tendu in the three districts with the support of the government. While agriculture should also be promoted, the small landholdings and landlessness pose a challenge.

Dependence upon NTFPs high in the surveyed districts. Some NTFPs like bamboo and mahua offer better returns than tendu, and should be promoted

Table 4.7: Availability of alternatives in surveyed tendu villages

Parameters	Chandrapur	Angul	Korba
Dependence upon forest produce (% of surveyed households)	• Non-tendu NTFPs: 38 • Medicinal plants: 14 • Firewood: 88.8	• Non-tendu NTFPs: 83.2 • Medicinal plants: 35 • Firewood: 98.9	• Non-tendu NTFPs: 99.7 • Medicinal plants: 66.4 • Firewood: 87.6
Dependence upon non-tendu NTFPs (% of surveyed households)	• Mahua: 34.5 • Tendu fruit: 7.8 • Bamboo: 1.8	• Mahua: 67.5 • Mushrooms: 32.8 • Mahua seeds: 15.5	• Mahua: 92 • Char: 33.8 • Dori: 14.6
Income through non-tendu NTFPs (per season)	• Mahua: ₹3,229 • Tendu fruit: ₹1,943 • Bamboo: ₹33,186	• Mahua: ₹3,052 • Mushroom: ₹1,311 • Mahua seeds: ₹1,269	• Mahua: ₹6,642 • Char: ₹2,339 • Dori: ₹860

4.3 Angul district, Odisha

4.3.1 District profile

Angul covers a geographical area of 661,523 hectares (ha). The district has eight administrative blocks or tehsils—Angul, Talcher, Chhendipada, Kaniha, Banarpal, Pallahara, Kishorenagar and Athamallik. There are 1,871 villages and 225 Gram Panchayats spread across the eight blocks.[5] Angul's population is estimated to be nearly 1.4 million. About 81 per cent of the district's population is rural, with the urban population being largely concentrated in industrialised blocks of Talcher, Angul and Banarpal. About 17 per cent of the population belongs to the ST category and is largely concentrated in the district's most forested and rural blocks of Athamallik, Pallahara and Kishorenagar.

Most of the area in Angul district, around 286,934 ha, comes under forest. This is 45.1 per cent of the total geographical area. Another 37,326 ha or 5.8 per cent of the total area comes under wasteland and 51,163.9 ha or 8 per cent comes under 'other uses'. The total gross cropped area is 270,947 ha and net sown area is 259,463 ha.

The forests of Angul are divided into three main divisions—Athamallik, Angul and Satkosia Wildlife Division. Pallahara sub-division, which is a part of Deogarh Forest Division, is also a part of the district. There are two Kendu Leaf divisions (KL)—Athamallik and Angul—within the district which specifically focus on kendu/tendu leaf. The forest area in Angul is categorised as dry to moist deciduous. While sal, teak and bamboo are found prominently, one can also find patches of mixed forests. The forests of Angul

division contain a large number of species which yield a variety of non-timber forest products (NTFP) like fruits, seeds, tubers, barks, leaves, roots and gums. For most rural households, NTFPs provide essential food and nutrition, medicine, fodder, fuel, etc. Some of the important NTFPs of the division are sal, mahua, tendu, hill broom, amla, bahada, siali, tamarind, bel, karanj and kusum.[6]

While agriculture is the mainstay of the people in Angul, with around 53 per cent engaged in the sector, industrial growth has improved employment in recent years. Many public-sector undertakings like National Aluminium Company Limited (NALCO), Mahanadi Coalfields Limited (MCL), National Thermal Power Corporation (NTPC) and Talcher Thermal Power Station (TTPS) and numerous small-scale industries like engineering units, rice mills, fly ash brick units, stone crushers, service units, bleaching units and flour mills contribute to employment.[7]

The total cultivable area of the district is 211,291 hectares, covering around 32 per cent of its geographical area. The major crops are paddy, maize, ragi, oilseeds, pulses, small millets, vegetables, wheat, maize, field pea, sunflower, garlic, ginger, potato, onion, tobacco, sugarcane, and coriander. Paddy is one of the most widely grown crops in the district. It is grown in about 89,765 hectares of land which is 42.48 per cent of the total cultivable land in the district.[8] The development of irrigation potential is not satisfactory, with the total irrigated area of the district being about 24 per cent of the net sown area.[9]

Map 4.1: Angul district, Odisha

Angul district characterised by high coal production, huge dependence upon agriculture, a largely rural populace and high multidimensional poverty

Table 4.8: Demographic details of Angul

Parameter	Number
Total Households	324, 651
Rural Households (%)	81
Urban Households (%)	19
SC population (%)	21
ST population (%)	17
Total population	1,396,000
Multidimensional poor (%)	24.57

Source : Bhushan, C. et al. 2022 ; National Multidimensional Poverty Index Baseline Report, 2021.[10]

4.9: Land use pattern in Angul

Block	Total geographical area (Ha)	Area under forest (%)	Area under wasteland (%)	Net sown area (%)	Area under other uses (%)
Angul	112,257.6	65.2	1.3	30.5	3
Athamallik	102,995.4	48.5	2.2	42.6	2.2
Banarpal	35,119.4	4.7	3.2	76.6	14.4
Chhendipada	86,051.5	37.2	11	46.1	5.1
Kaniha	71,144.4	39.2	12.4	37.1	10.5
Kishorenagar	84,049	52.6	1.2	43.3	2.4
Pallahara	117,395.1	45.8	10.1	31.6	12.4
Talcher	28,487.2	14.7	4.5	52.9	27.3
Total	637,499.9	45	5.9	40.7	7.4

Source: District Irrigation Plan, 2016

High dependence on agriculture with cultivators and agricultural labourers comprising around 20.4% and 32.7% of the total workers, respectively, in the district

Table 4.10: Sector-wise contribution towards GDP in Angul

Sector	Share in GDP (%)
Primary sector	31.1
Agriculture	7.4
Forestry	1.6
Fisheries	0.5
Mining	21.6
Secondary sector	42.8
Manufacturing	32.1
Electricity, Gas and Water supply	7.2
Construction	3.6
Tertiary sector	26.1

Source: Directorate of Economics and Statistics, Odisha. GDP reference year 2011-12

Table 4.11: Category of workers in Angul

Category	Number	Proportion of total workers
Total workers	526,520	100
Main workers	317,547	60.3
Marginal workers	208,973	39.7
Non workers	747,301	NA
Cultivators	107,607	20.4
Agricultural labourers	172,414	32.7
Household industrial workers	35,069	6.7
Other workers	211,430	40.2

Source: Directorate of Economics and Statistics, Odisha. 2020.

4.3.2 NTFP production

NTFP collection in the district is largely concentrated around the collection and sale of tendu leaves. They are engaged in tendu collection due to it being an easy source of income and the government support that is received. While locals collect NTFPs besides tendu, they sell very small quantities of them to supplement their agricultural income; most of it is for self-consumption. The NTFP potential in the district is underutilised due to the absence of processing and storage facilities, and the lack of aggregation for sale to traders. Sal seed and several other non-timber forest products (NTFP) hold the potential to support the livelihood of the forest dwellers. However, as per the Angul District Vision Plan, "the ban on NTFP collection from the sanctuary area, insecure markets, weak implementation of MFP policy and destruction of forest areas are some of the factors because of which this potential is not utilised properly".[11]

There are no Van Dhan Vikas Kendras in the district. There is, however, a large bamboo cluster in Pallahara that is being promoted under the Ambedkar Hastashilp Vikas Yojana (AHVY). There are 15 Self Help Groups in the cluster that have around 195 beneficiaries. The cluster is engaged in the production of cane and bamboo items like baskets, rice and vegetable strainers, and brooms.[12]

With the goal of promoting livelihoods and sustainable forest management in Odisha, Joint Forest Management (JFM) practices are being promoted. In Athamallik, for instance, the project is being funded by the Japan International Cooperation Agency (JICA) and executed through the Odisha Forestry Sector Development Society. Around 249 Van Samrakshana Samities (VSS) and 255 local self-help groups (SHGs) have been mobilised for work on NTFPs in the Athamallik division.[13]

Table 4.12: Common NTFPs found in Odisha

S. No.	Scientific Name	Common Name	Plant part used	Uses
1	Diospyros melanoxylon	Kendu leaves	Leaves	Making of bidi
2	Shorea robusta	Sal leaf	Leaves	Making of leaf plates
3	Shorea robusta	Sal dammar	Resin	Used as astringent in ayurvedic medicines
4	Madhuca longifolia	Mahua	Flower	Used to produce alcoholic drink
5	Bambuseae	Bamboo	Shoots	Used in construction, decorations, cooking, weapon
6	Sterculia urens	Genduli	Gums and resins	Used for medicinal purpose
7	Woodfordia frusticosa	Dhataki	Flower	Used for medicinal purpose
8	Phyllanthus emblica	Amla	Fruit	Used for medicinal purpose
9	Salvia hispanica	Chia seeds	Seeds	Used as food
10	Thysanolaena maxima	Broom grass	Leaves, roots, stem.	Used to feed livestock, for soil conservation, staking in vegetable growing fields.
11	Albizzia procera	Siris	Whole plant	Used as wood

NTFP collection largely centred on tendu. Government support missing for other NTFPs, and thus, potential largely underutilised

Table 4.12 continued

Sl No	Scientific Name	Common Name	Plant part used	Uses
12	Terminalia bellirica	Bahada	Fruits	Used as food and medicine for stomach problem
13	Terminalia chebula	Harida	Fruits	Used as food and medicine
14	Cinnamomum tamala	Tejpatta	Leaves	Used as spice
15	Pongamia pinnata	Karanj	Fruit	Used as herbal medicine
16	Schleichera oleosa	Kusum	Seeds	Used as oilseed and medicine
17	Boswellia serrata	Siali	Fruits	Used as medicine

Source: Panigrahi, S. 2019.[14]

Gradual decline in tendu collection between 2017 and 2021 in Angul KL Division. A marginal increase in collection rates per bundle/ kerry means a marginal increase in income generation

4.3.3 Tendu leaf collection

The tendu leaves in the division, as in most other divisions in the state, are sold in processed form. They are disposed of by the Odisha Forest Development Corporation Ltd. As mentioned, there are two kendu leaf divisions in the district. While Angul KL division encompasses within it the districts of Angul, Dhenkanal and Cuttack, Athamallik KL division covers a part of Angul district and Sambalpur. Most of Angul district comes under the Angul KL division. While Angul division had 44,350 collectors as of 2022, Athamallik had 25,408 collectors. For the purposes of the study, the Angul KL Division was chosen.

There has been a gradual decline in the collection of tendu leaves between 2017 and 2021 in Angul KL division and this is attributed by the Forest Department to natural as well as economic causes. While 23,754 standard bags (SBs) were collected in 2016-17, around 15,303 SBs were collected in 2020-21. As was witnessed in Odisha, Angul witnessed a slight increase in collection of about 11.5 per cent in 2020-21 from the previous year. The revenue generated has declined by half since 2016, from about ₹360 million to about ₹170 million in 2021. The number of beneficiaries has fluctuated in the same period; however, there has been a slight decline in numbers overall.

Table 4.13: Tendu collection and revenue generation in Angul KL Division

	2016-17	2017-18	2018-19	2019-20	2020-21
Total collection (kerries)	68,164,470	79,410,095	57,535,280	39,794,600	44,003,880
Total collection (SBs)	23,754	27,723	19,920	13,713	15,303
Collection rate (₹ per kerry)	0.7	0.8	1.0	1.0	1.2
Revenue collected (₹)	367,028,598	273,763,551	161,471,946	139,233,289	173,586,282
Payment (₹)	23,857,564	27,793,533	20,137,348	13,928,110	15,401,358
Beneficiaries	44,752	49,866	47,588	44,679	44,350

Source: DFO (KL) office, Angul. 2022.

4.3.4 Survey findings

A total of 381 households were surveyed across eight villages in Angul district. The survey aimed at understanding the social aspects of a tendu collector's life and their economic status. It sought to understand various aspects of income, caste, class, occupation, and landholding.

As per Forest Department records, there are around 44,350 tendu pluckers in Angul district within the Angul KL division. The sample size was determined using a 95 per cent confidence level with a margin of error of five per cent. A total of 381 households with a dependence upon tendu were surveyed.

The tendu-dependent villages were chosen from the list of villages that have phadis or collection centres in the Angul Kendu Leaf division. Every 30th phadi was selected from the list and a total of seven phadis and eight villages were shortlisted. Two non-tendu-collecting villages were chosen upon consultation with the survey team to understand the dependence upon forests and to understand livelihood options other than tendu collection. In each of these villages, 10 households were surveyed.

To understand the socio-economic status of tendu and non-tendu collectors, the Udai Pareekh socio-economic scale (SES) was used.[15] The scale determines the socio-economic status of rural populations based on nine parameters: caste, occupation, education, landholding, material possessions, social participation, type of house, number of family members and farm power. After filling in the information, and scoring the individual item list, the total score is added and the result is interpreted in terms of the class.

Surveyed villages

A total of eight tendu-dependent villages were surveyed in Angul district (Nagajharan, under the Dahimal phadi, was also included to make up for the lack of respondents in Dahimal village). The villages are geographically spread out and cover four blocks—Angul, Chhendipada, Pallahara and Kaniha. The two non-tendu-dependent villages that were surveyed were Bhubanpur and Kaleipada.

Table 4.14: List of surveyed tendu villages in Angul

S. No.	Block	Section	Phadi	Village
1	Angul	Tainsi	Nuapada	Nuapada
2	Chhendipada	Chhendipada	Dahimal	Dahimal and Nagajharan
3	Kaniha	Hanumanpur	Sapakata	Sapakata
4	Kaniha	Kaniha	Gandaberena	Gandaberena
5	Kaniha	Burukuna	Kasia	Kasia
6	Pallahara	Badasada	Rohira	Rohira
7	Pallahara	Injidi	Injidi	Injidi

Household-level socio-economic surveys conducted in 381 households in 8 tendu-dependent villages and in 20 households in 2 non-tendu-dependent villages

Survey findings – tendu villages

Demographic profile of tendu collectors

a. 78 per cent of the respondents were women. This is consistent with the inputs received from secondary and primary sources that it is largely women who collect tendu leaves.

b. 40 per cent of the households surveyed were from the artisan caste, categorised as Other Backward Classes (OBCs) in Odisha, and engaged typically in traditional crafts

like pottery and weaving. The Scheduled Tribe category is the second most dominant caste category, comprising around 30 per cent of the total respondents.

c. 41 per cent of the surveyed households held landholding of less than 1 acre, while 36 per cent were landless. Remaining 23 per cent had landholding between 1 and 5 acres.

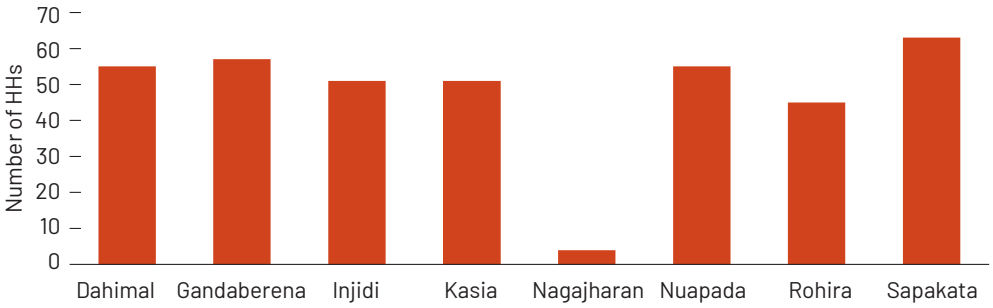
d. Average agricultural landholding among the tendu collectors was around 0.46 acres. This explains why agriculture is subsistence-oriented rather than commercial among the collectors.

e. Around 46 per cent of the households earned less than ₹5,000 per month, thus placing them below the poverty line. Around 40 per cent of the households earned ₹5,000-10,000 on an average (in a month). 13 per cent earned ₹10,000-20,000, and the remaining one per cent earned ₹20,000-40,000.

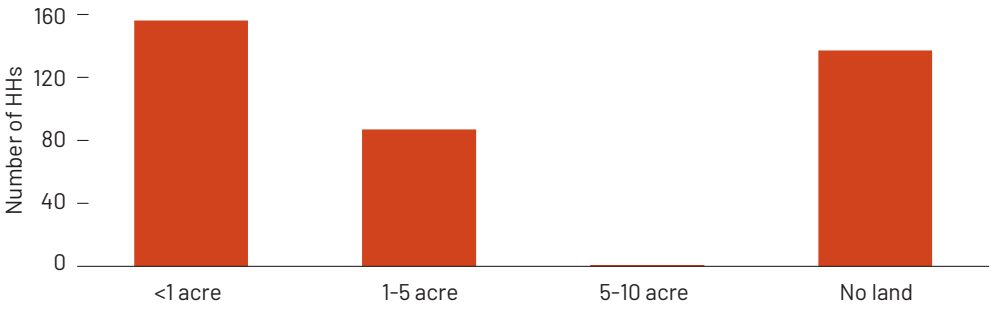
f. On an average households scored around 21.7 on the Udai Pareekh scale which indicates that they are from the 'Lower middle scale class'.

Collectors are socio-economically marginalised. Marginal landholdings and landlessness widely prevalent. 46% of the respondents' earnings stood below ₹5,000 per month

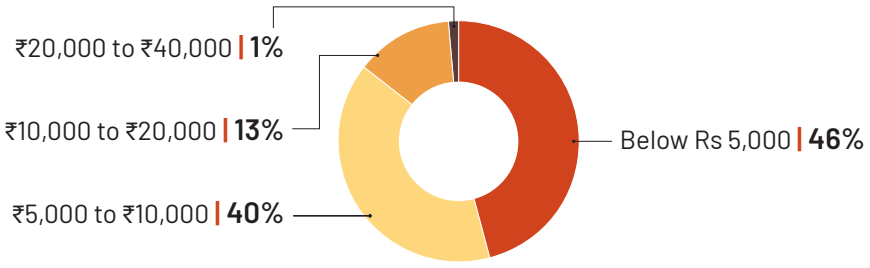
Graph 4.1: Village-wise number of tendu-collecting households surveyed in Angul



Graph 4.2: Landholding pattern of surveyed tendu households in Angul



Graph 4.3: Average monthly income of surveyed tendu households in Angul



Occupation

a. Around 65 per cent of the surveyed collectors were engaged as agricultural labour as their primary occupation. Around 28 per cent were involved primarily in cultivation.

b. 99 per cent of the agriculture was reported to be with rainfed irrigation.

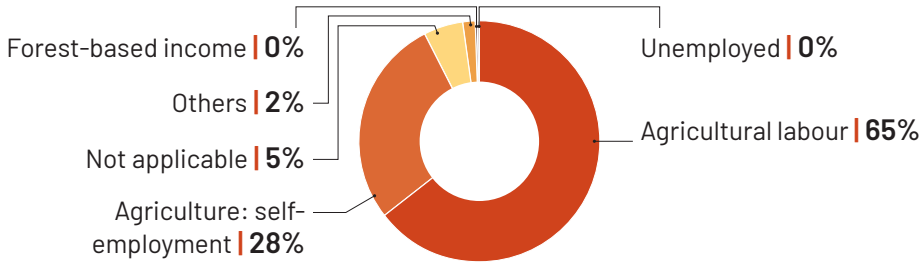
c. Paddy is a major crop and mostly the only crop grown by the households—74 per cent of the respondents grow paddy. This is grown primarily for subsistence, and this is true for around 89 per cent of the paddy cultivators. Vegetables are also grown and around 58 respondents replied to having grown vegetables and this too primarily for subsistence.

d. 34.9 per cent of the respondents were involved in cattle and livestock rearing. 81 per cent of this is primarily for subsistence.

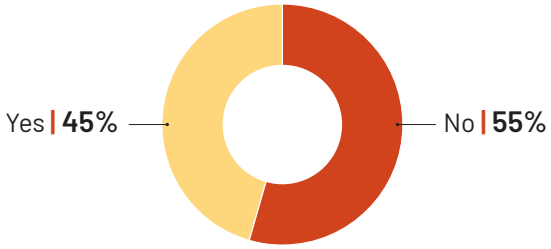
e. Around 45 per cent of the tendu-dependent households have some degree of employment under MNREGA. This figure points to a heavy dependence upon MNREGA for income generation. One can deduce from the data that there is a lack of adequate economic opportunities in the village.

f. The average number of days that MNREGA generated was 35 days. The average income generated was ₹7,739.

Graph 4.4: Occupation of tendu collectors in Angul



Graph 4.5: Employment of collectors under MNREGA in Angul



Collectors largely dependent upon agriculture, especially as labour. With an average landholding of 0.46 acres, gains from agriculture are marginal, forcing collectors into labour

Tendu dependence and challenges

a. Around 36.5 per cent of the households were engaged in tendu collection for 20 to 30 years. 13 per cent of the households were involved in tendu collection for more than 30 years.

b. The average number of tendu leaf bundles collected by the households was 15, with the maximum collection being around 40 bundles.[16]

c. The households earned an average of ₹2,195 for an investment of around 9 days per season. The highest income earned was around ₹5,600.

d. Interestingly, the FGDs revealed that the tendu collectors in five villages (from the seven where FGDs were conducted) felt that tendu leaf collection had improved their economic condition.

e. On an average, one to two members of the household were involved in the collection of tendu.

f. An overwhelming 92 per cent of the respondents said the rate that they got for tendu collection was inadequate.

g. Around 95.5 per cent of the respondents said they collected tendu in the lean agricultural season. The second major reason for the collection of tendu leaves was the government support of tendu collection and was cited by around 65 per cent of the respondents. Tendu collection was cited as a good source of income by around 40 per cent of the respondents. The FGDs also revealed that the two major reasons for tendu collection were government support and it being an easy source of income. Two villages acknowledged there weren't many options for income generation, which made them turn to tendu collection.

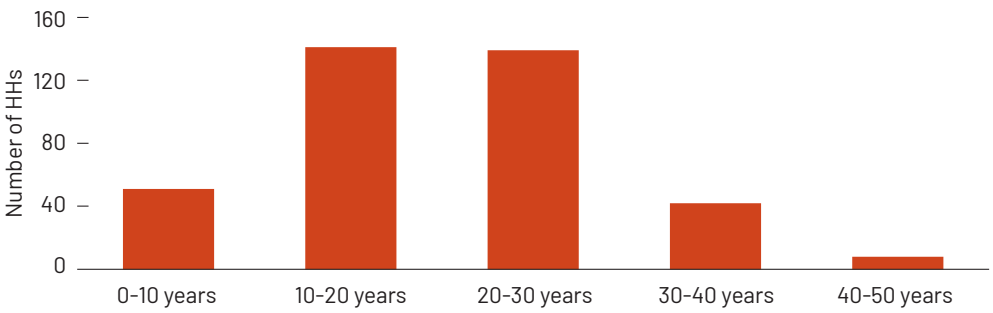
h. Around 66.6 per cent of respondents highlighted animal attacks as the major challenge faced by them whilst collecting tendu. Conversations with the villagers revealed that elephant attacks were the most likely whilst collecting tendu leaves from the forests.

i. Out of the 381 respondents, 378 responded by saying there was no use of fire for facilitating tendu collection. However, when probed about the setting of fires in other villages and who might be responsible, 62 respondents reported the causes being mahua and tendu collectors, the Forest Department staff and even neighbouring villagers. Of these, 52 held the Forest Department responsible.

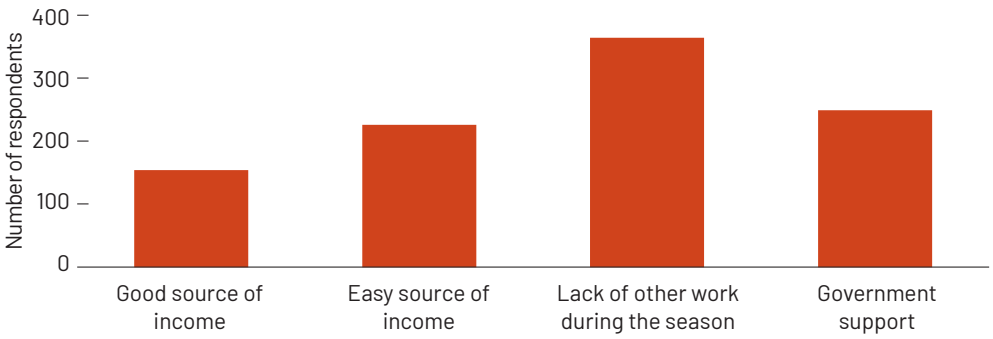
j. Upon being asked about the benefit of fires for tendu collection, 103 out of the 381 respondents said it was beneficial. However, 154 felt it had no benefit. The rest did not have an opinion.

Majority of the households collect tendu due to a lack of work. They earned an average of ₹2,195 from around 9 days of tendu collection in a year

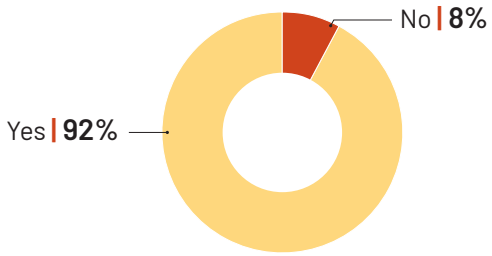
Graph 4.6: Years of engagement in tendu collection in Angul



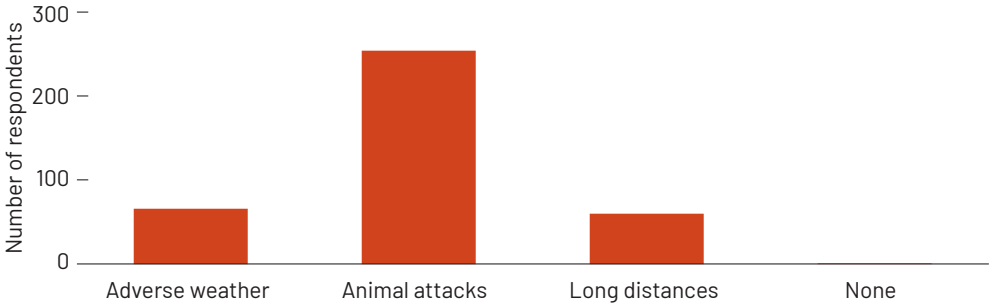
Graph 4.7: Reasons for tendu collection in Angul



Graph 4.8: Adequacy of tendu leaf collection rate in Angul



Graph 4.9: Challenges faced during tendu collection in Angul



Forest and non-tendu NTFP dependence

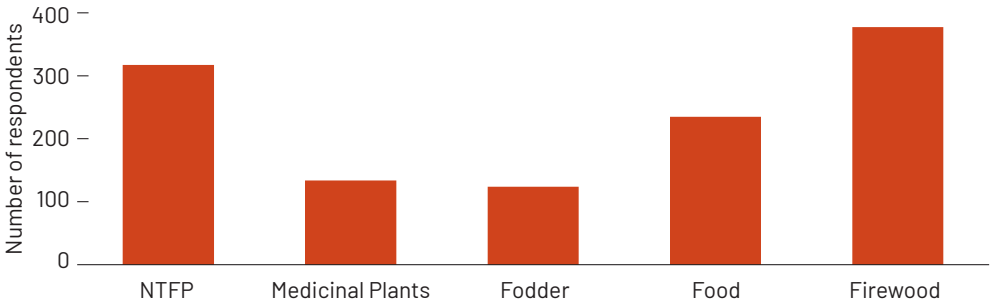
a. The analysis reveals that the dependence upon NTFPs and forest produce in general is very high among tendu-collecting households. A whopping 83.2 per cent of the households responded to being dependent upon the collection of NTFPs; 134 out of the 381 respondents highlighted their dependence upon medicinal plants. Almost all the respondents are dependent upon the collection of firewood.

Dependence upon NTFPs very high. Mahua and mushroom most significant NTFPs after tendu. Collection of mahua yields better returns than tendu at ₹3,027

b. The two most significant NTFPs collected were mahua and mushroom. Around 67.5 per cent of the households collect mahua and 32.8 per cent collect mushrooms. In terms of average annual income, mahua generated the highest. Mushroom is the second highest in this regard. Both hold immense potential in terms of value addition and can be alternatives to tendu. Mahua can be promoted given how various products of the mahua tree are collected, including its seeds, flowers, fruits, etc. Some of the other NTFPs which were collected by a small per centage of the sample populace are mahua seeds, char, mahua fruit, tola and sal seeds.

c. For the 256 respondents, the average collection of mahua was about 127 kg per season and the income generated was about ₹3,027. The average collection of mushrooms among the 74 respondents was around 31 kg and the income generated was around ₹1,370. Around 56 respondents sold mahua seeds and earned around ₹1,269 on an average upon collecting 48 kg. While mahua, tola, mushrooms and mahua seeds are collected primarily to be sold by almost all the respondents, char and mahua fruit are found to be mostly consumed at the household level.

Graph 4.10: Dependence upon forest produce among collectors in Angul



Potential of non-tendu NTFPs lies untapped. NTFPs like mahua, mushroom, sal seed and mahua seeds collected primarily for sale

Graph 4.11: Collection of Non-Timber Forest Products by collectors in Angul

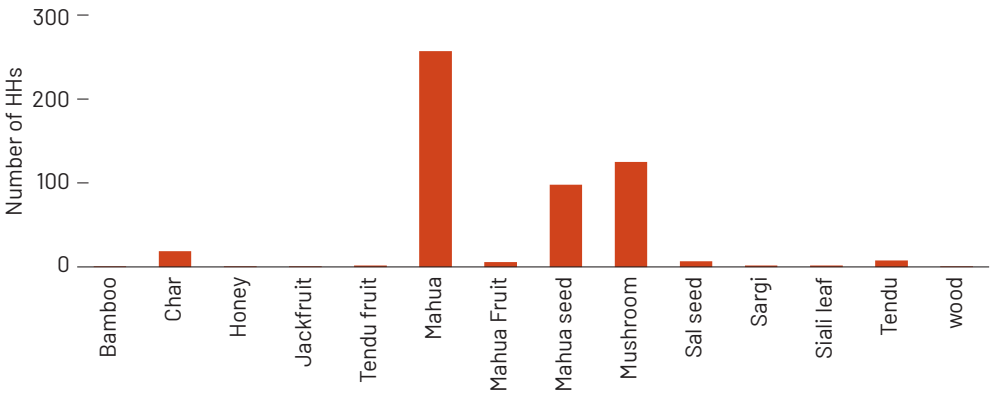


Table 4.15: Collection and sale details of non-tendu NTFPs in Angul

Name of NTFP	Usage	Number of collectors	Annual collection (kg)	Annual income (₹)	Average annual income (₹)
Mahua	Sale	256	32,610	775,126	3,027.8
	Own consumption	1	40	0	NA
Mushroom	Sale	74	2,311	101,450	1,370.9
	Own consumption	51	435	0	NA
Sal seed	Sale	5	288	5,200	1,040.0
	Own consumption	2	60	0	NA
Mahua seeds	Sale	95	3,482	92,830	977
	Own consumption	3	50	0	NA
Char	Sale	9	99	4060	451.1
	Own consumption	10	46	0	NA
Mahua fruit	Own consumption	6	97	0	NA

Alternative livelihoods

The following were the responses towards alternative livelihoods:

a. Around 18 per cent of the respondents wanted some sort of training related to NTFPs. While bamboo crafts and siali plate making figured in the responses, most of them mentioned training in mushroom production.

b. Training and capacity building were mentioned by around 10 per cent of those who responded (334). Almost 87 per cent of those who responded wanted the provision of market linkages and better procurement facilities for NTFPs.

c. 17 per cent of those who responded specified the need for government support in the context of provision of market linkages, procurement, and sale of NTFPs.

d. Around 6 per cent of the 334 respondents mentioned the need for storage and processing facilities for the NTFPs.

e. Almost 77 per cent of the respondents felt that mahua should be promoted. Around 27 per cent felt that mahua seeds could be promoted. 15 respondents mentioned char as a viable NTFP. Other NTFPs like sal and siali barely figured in the responses.

Survey findings - Non-tendu villages

The surveys were done in the two villages of Bhubanpur and Kaleipada. The villages aren't dependent upon tendu, nor are they dependent upon the collection of other NTFPs. The FGDs reveal that this is due to the distance of the village from the forests and the unavailability of tendu near them. They are, however, dependent upon the collection of firewood. While Kaleipada is dependent upon agriculture and daily-wage labour, the people of Bhubanpur are dependent upon agriculture and industrial labour.

Demographic profile of non-tendu collectors

A total of 20 households were surveyed across two villages in Angul district. Bhubanpur and Kaleipada are the two non-tendu villages surveyed. The survey aimed at understanding, besides the social aspects of a non-collector's life, their economic status. It sought to understand various aspects of income, caste, class, occupation and landholding. The following were the findings:

a. 70 per cent of the respondents were women.

b. Half of the respondents were from the Artisan caste. The Artisan caste typically includes those engaged in traditional crafts like pottery and weaving. As per the surveyors, this category majorly includes the Other Backward Classes (OBCs). The lower caste category is the second category, having an equal number of respondents.

c. As per the survey, 60 per cent of the respondents had landholding of less than 1 acre. 25 per cent of those surveyed were landless. Only 15 per cent had landholding between 1 and 10 acres.

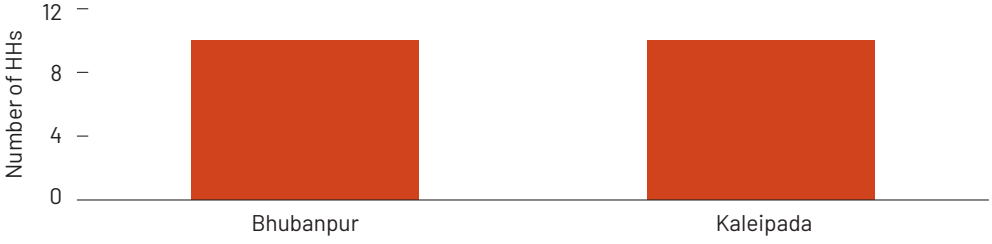
d. Average agricultural landholding among the non-tendu collectors was around 1.17 acres. This explains why agriculture is subsistence-oriented rather than commercially oriented among the collectors.

Majority of non-tendu-dependent respondents landowning. However, landholding is marginal at around 1.17 acres. 75% of the households earned between ₹5,000-₹20,000

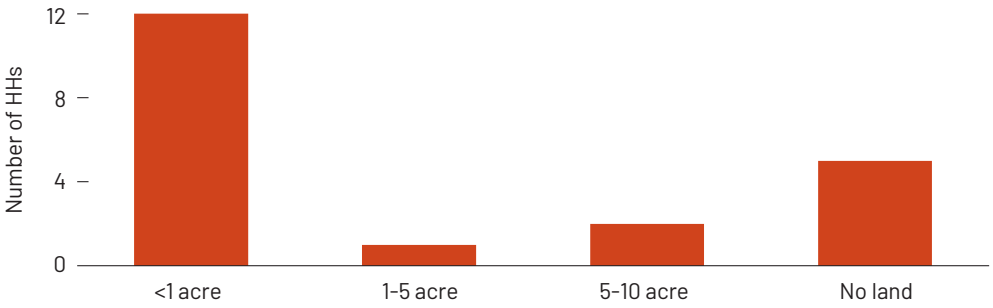
e. An analysis of the average income of the non-tendu-collecting households revealed that around 45 per cent earned between ₹5000 and 10,000 per month. Around 30 per cent of the households earned ₹10,000-20,000 on an average (in a month).

f. The data reveals that on an average households score around 23.95 on the Udai Pareekh scale which indicates that they fall in the 'Middle scale class'.

Graph 4.12: Village-wise number of non-tendu-collecting households in Angul

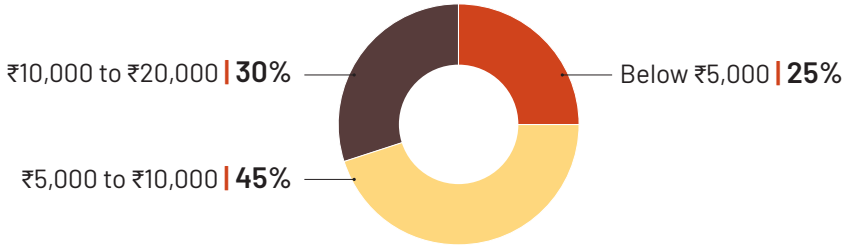


Graph 4.13: Landholding among non-tendu collectors in Angul



Around 50% of respondents engaged in agriculture as their primary occupation. Around 25% involved primarily as agricultural labourers

Graph 4.14: Average monthly income among non-tendu collectors in Angul



Occupation

The following were the findings:

a. Around 50 per cent of the surveyed people were engaged in agricultural as their primary occupation. Around 25 per cent were involved primarily in agricultural labour. The rest are either working in salaried positions or are engaged as casual labourers.

b. In terms of agricultural land, irrigation is primarily rainfed. Six respondents said they could not engage in cultivation despite owing land due to the impact of industrial fallouts, namely ash and wastewater contamination.

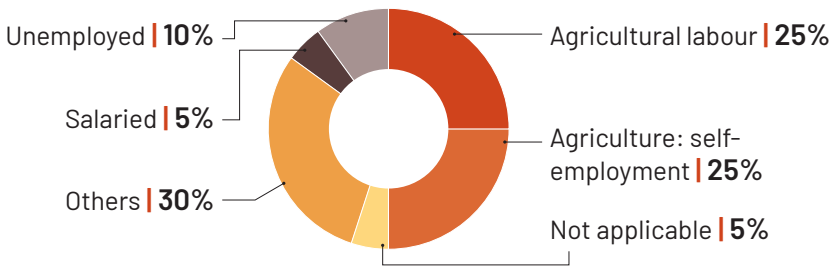
c. Paddy is the only crop that is grown in a substantial quantity by the households. 35.5 per cent of the respondents grow paddy. It is grown primarily for subsistence.

d. 30 per cent of the respondents are involved in cattle and livestock rearing. This is only for subsistence and not for selling.

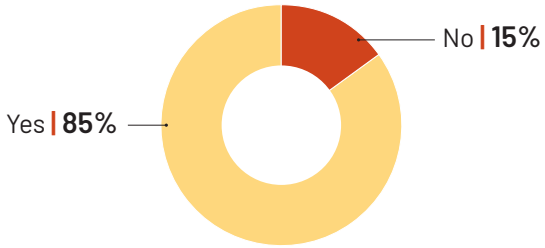
e. Around 85 per cent of the households have some degree of employment under MNREGA. This figure points to a heavy dependence upon MNREGA for income generation.

f. The average number of days the respondents got work under MNREGA was 36. The average income generated was ₹6,997 for the two villages.

Graph 4.15: Job type of a non-tendu collector in Angul



Graph 4.16: Employment under MNREGA among non-tendu collectors in Angul



4.3.5 Key conclusions

Analysis of the survey data reveals the tendu collectors are from some of the most marginalised sections of society. They are primarily from the Scheduled Tribes and the OBC castes and have less than one acre of landholding. Moreover, to holistically understand their socio-economic well-being, they were rated along various parameters as per the socio-economic scale by Udai Pareekh. The tendu collectors unsurprisingly fall within the 'Lower Middle Scale class'. This further reinforces the deprived status of tendu-collecting households in Angul. While they are primarily (around 65 per cent of the respondents) engaged in agricultural labour and have some agricultural land, the heavy dependence upon NTFPs points to the marginal returns that agriculture provides them. Tendu is the biggest source of income that they derive from the sale of NTFPs. While tendu is a good source of supplementary income for the collectors, the returns ought to be much more when viewed in the context of the enormous revenue that comes in from the trade. The collection of mahua, mushroom and mahua seeds is most predominant after tendu and does provide some supplementary income for the households. While tendu with its enormous backing by the government provides higher returns than other NTFPs, NTFPs like sal seeds, mushroom and mahua seeds have the potential to offer better returns than tendu if the necessary structures are in place.

Tendu collectors socio-economically marginalised. While non-tendu-collectingh ouseholds also marginalised, they fare better than the collectors on most fronts

An analysis of the non-tendu-dependent households reveals that while, much like the tendu-collecting households, they are from marginalised sections of society, they fall within the 'Middle scale class' as per the Udai Pareekh scale which points to their relatively better socio-economic status than tendu collectors. These households primarily fall within the ₹5,000-10,000 monthly income bracket as opposed to the tendu-collecting households which primarily earn less than ₹5,000. Even as these households are engaged intensively in agriculture (50% of the respondents) like the tendu-collecting households (93% of the respondents), there is no dependence upon NTFPs amongst them. While landlessness is prevalent among both types of households, 35.9 per cent of the tendu collectors were landless as compared to 20 per cent of the non-tendu collectors; the latter having an average landholding of 0.87 acres as opposed to the former's 0.46 acres.

4.4 Chandrapur district, Maharashtra

4.4.1 District profile

Chandrapur district in Maharashtra lies in the eastern corner of Maharashtra and comprises eight sub-divisions viz. Chandrapur, Ballarpur, Warora, Brahmapuri, Mul, Chimur, Gondpipri and Rajura.[17] The region is further divided into 15 talukas (see map below). The total population, as per the 2011 census, was 2,204,000. The district is primarily rural with rural households comprising 66.5 per cent of the total households. The Scheduled Castes and Scheduled Tribes make up about 15.7 per cent and 17.6 per cent of the total populace, respectively. BPL households make up about 9.2 per cent of the population.

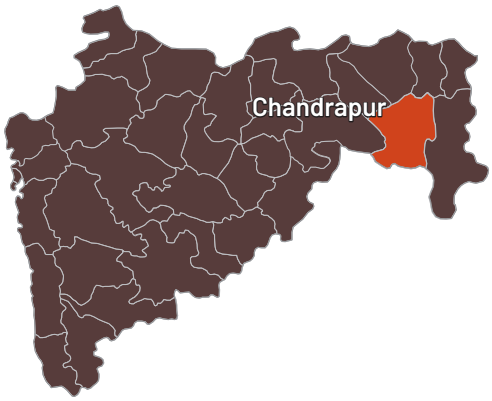
The economy of the district is mainly agricultural with cultivators and agricultural labourers together accounting for 65.7 per cent of the total workers (Census, 2011).[18] As per NABARD's estimates, Chandrapur district, which is predominantly agricultural, has a dependence of around 79 per cent. While the dependence upon agriculture is the highest, it is the tertiary sector that contributes the maximum towards the GDP. The total Gross Value Added of the district at current prices for 2019-20 was ₹378,560 million.[19] As per the 2011 census, the total workers in Chandrapur were around 1,058,172. Of these, agricultural workers comprised 65.7 per cent. Main and marginal workers comprised around 76 per cent and 24 per cent, respectively, of the total workforce.

The major use of land in the district is by the agricultural sector. The huge dependence upon agriculture in the region explains the coverage. Agriculture is the mainstay of the people in Chandrapur. Paddy, cotton and soybean are the major crops grown in this region. Rice is the primary crop grown in Chandrapur. Paddy constitutes a whopping 49.89 per cent of the total crop production. Cotton accounts for 10 per cent of the production, with the rest of the share taken up by soybean, wheat, tur and other crops. Rainfed irrigation is the major source of irrigation in the district.[20]

The forests of Chandrapur district, classified as Southern-Tropical Dry Mixed Deciduous, cover around 33 per cent of the total geographical area. The forests are rich in flora and fauna which accounts for the dependence upon forests by the largely rural populace. There are three forests divisions in Chandrapur: Chandrapur, Brahmapuri and Central Chanda. Teak is an important timber species, and some of its associates are bija, dhaora, ain, semal, moha, tendu, lendia, kullu, siras, haldu, salai, moyen, bhirra, aonla, gongal, hirda, kumbhi and bamboo.[21]

The district is endowed with valuable minerals such as coal, iron and limestone. There are large mining operators present in the district as are power and cement industries. The service sector accounts for more than half of the GDP in the district. Some of the key services in the district are those of trade, hotels and restaurants, real estate, business and legal services, banking and insurance, transport, and storage.[22]

Map 4.2: Chandrapur district



Chandrapur district predominantly an agriculture-dependent one, with a dependence of around 79% . Heavily forested, the district has huge potential in terms of NTFP production

Table 4.16: Demographic details of Chandrapur

Parameter	No.
Total population	2,204,000
Total Households	529,000
Rural Households (%)	66.5
Urban Households (%)	33.5
Multidimensional poor as of 2021 (%)	17.65
SC population (%)	15.7
ST population (%)	17.6

Source: NABARD, 2021[23] and National Multidimensional Poverty Index Baseline Report, 2021.[24]

Table 4.17: Land use pattern in Chandrapur

Particulars	Details
Total Geographical Area	11,443 sq km
Inhabited Area	880 sq km
Agricultural Area	4,870 sq km
Industrial Area	32.34 sq km
Forest Area	3,810 sq km
Wasteland	550 sq km

Source: Chandrapur district website.[25]

Table 4.18: Sector-wise contribution towards GDP in Chandrapur

Sector	Share in economy
Primary (%)	21.2
Secondary (%)	25.2
Tertiary (%)	53.6

Source: NABARD, 2021.

Chandrapur largely rural with rural households comprising around 66.5% of the total households. High dependence upon primary sector, but tertiary sector contributes most towards the GDP

Table 4.19: Worker category in Chandrapur

Category	Number
Total workers	1,058,172
Main workers	804,433
Marginal workers	253,739
Non workers	1,146,135
Cultivators	220,978
Agricultural labourers	473,983
Household industrial workers	21,346
Other workers	341,865

Source: Census, 2011.

4.4.2 NTFP production

Some of the important NTFPs besides tendu in the district are mahua, tad, beheda, char and honey. As per the Divisional Forest Officer, mahua is bought by private traders from Telangana and Chhattisgarh. There are two agencies that source bamboo from Chandrapur: BILT, a private paper-making industry that sources from CFR areas as well, and BRTC (Bamboo Research and Training Centre), the autonomous government agency that promotes the use of bamboo for handicrafts and furniture. Consultations with Paryavaran Mitra, a local NGO working on livelihoods in Maharashtra, revealed that there is a lot of bamboo in Chandrapur that's being used for fencing and supporting other plants. However, the bamboo is unsuitable for use in handicrafts and the furniture market cannot absorb all of it.

Stakeholder consultations revealed that the government doesn't have data on NTFPs in villages in Scheduled Areas and areas with CFRs. The Forest Department in the district auctions bamboo, firewood and tad trees. In previous years, the department also dealt with the sale of gums and mahua flower. In recent years, it has only been facilitating the collection and sale of bamboo and tad trees.

Huge potential of NTFPs in district. Lack of data on production and sale of non-tendu NTFPs in PESA and CFR areas translates into lack of consolidated state data

Table 4.20: NTFP sales amount from non-PESA areas realised by Forest Department in Chandrapur

S. No.	NTFP	Year 2019-20		Year 2020-21		Year 2021-22	
		Production	Value (₹)	Production	Value (₹)	Production	Value (₹)
1.	Firewood (Cubic metre)	396.900	2,057,000	-	-		
2.	Bamboo bundles (Notional tonne)*	9,415.6	48,716,000	726.0	15,361,000	2,554.7	23,463,000
3.	Tad trees (Number)	205	42,500	-	-	205	22,800

* 1 Notional Tonne=2,400 running metres.
Source: District Forest Department, Chandrapur

Besides this some of the other NTFPs in the area are processed in the Van Dhan Vikas Kendras (VDVKs) that have been set up under the 'Prime Minister Van Dhan Yojana' in the district. Chandrapur district has 22 VDVKs that are processing various NTFPs and 6,600 beneficiaries are associated with these. The various NTFPs are listed in the table below.

Table 4.21: List of Van Dhan Vikas Kendras in Chandrapur district

S. No.	VDVK	Beneficiaries	NTFP	Value addition
1	Vanashri VDVK Tulanmendha, Ta. Brahmapuri	300	Mahua flower, Mahua seeds, Neem seeds	
2	Adarsh Lokasanchalit Sadhan Kendra, Brahmapuri	300	Beheda, Myrobalan, Tamarind, Rangini Lac	
3	Disha Lokasanchalit Sandhan Kendra, Nagbhid	300	Beheda, Myrobalan, Tamarind, Rangini Lac	

Table 4.21 continued

S. No.	VDVK	Beneficiaries	NTFP	Value addition
4	Sahyog Lokasanchalit Sandhan Kendra, Gondpipari	300	Tamarind, Mahua seeds, Karanj seeds, Bel, Neem seeds	
5	Adhar Lokasanchalit Sandhan Kendra, Chimur	300	Mahua flower, Beheda, Myrobalan, Neem seeds, tamarind	
6	Maitri CMRC Bhisi, Chimur	300	Tamarind, Neem seed, Bel pulp. Beheda, Gum Karaya	
7	Dhanashri VDVK Chichakheda, Brahmapuri	300	-	
8	Vanashri VDVK Tulanmendha, Ta. Brahmapuri	300	Mahua flower, Mahua seeds, Neem seeds	Mahua flower collection and sale, Neem seed and Mahua seed oil
9	Disha Lokasanchalit Sandhan kendra, Nagbhid	300	Beheda, Myrobalan, Tamarind, Rangini Lac	Myrobalan, Beheda callection and sale, Tamarind Pest and Rangini lac
10	Sahyog Lokasanchalit Sandhan kendra, Gondpipari	300	Tamarind, Mahua Seeds, Karanj seeds, Bell, Neem seeds	Tamarind Pest,Neem seed, Mahua seed, Karanj seed oil extraction
11	Adhar Lokasanchalit Sandhan kendra, Chimur	300	Mahua flower, Beheda, Myrobalan, Neem seeds, tamarind	Mahua flower, Myrobalan Collection and sale,Tamarind Pest
12	Maitri CMRC Bhisi, Chimur	300	Tamarind, Neem seed, Bel pulp, Beheda, Gum Karaya.	Tamarind Pest,Neem seed oil extraction, Gum callection and sale
13	Dhanashri VDVK Chichakheda, Brahmapuri	300		
14	Manikadevi Vandhan Vikas Kendra, Ta. Varora	300	Mahua, Limboli, Gum, Honey	In Process
15	Krushkonnati Vandhan Vikas Kendra ,Ta. Varora	300	Mahua, Limboli, Gum, Honey	In Process
16	Jivan Samrudhi Vandhan Vikas Kendra, Ta. Chimur	300	Mahua, Nimboli, Ran Bhaji	In Process

Table 4.21 continued

S. No.	VDVK	Beneficiaries	NTFP	Value addition
17	Gramsamrudhi Vandhan Vikas Kendra, A/P- Chandankheda, Ta. Bhadravati	300	Mahua, Lac, Limboli, Gum	In Process
18	Saibaba Van Dhan Vikas Kendra, Neri, Ta. Chimur,	300	Neem Seed Ark, Neem Seed Powder, Neem Seed Cake, Neem Seed Oil	In Process
19	Prabhu Vandhan Vikas Kendra, Doni Ta. Mul	300	Mahua Flower,Mahua Seed	In Process
20	Pragati Vandhan Kendra, Brampuri	300	Mahua Flower,Mahua Seed	In Process
21	Dhanashri Vandhan Vikas Kendra, Brampuri	300	Broom Grass, Shatavari Roots	In Process
22	Prakruti Mahila Vandhan Vikas Kendra	300	Broom Grass, Shatavari Roots	In Process

Source: TRIFED website.[26]

While production of tendu leaves has fluctuated between 2019-2021, the revenue has gone up. Bonus disbursal to collectors erratic

4.4.3 Tendu leaf collection

Unlike the total production in Maharashtra, the production in Chandrapur witnessed a sharp decline, falling from 83,420 standard bags in 2019 to 56,420 standard bags in 2021. The production has picked up in 2022, standing at 72,067 SBs. The revenue generated has gone up from 96 million in 2019 to around 177 million in 2022. Out of a total revenue of around 128 million received by the government, around 79 million, that is around 61 per cent, was retained as royalty. While a sum of ₹17.2 million was disbursed as bonus in 2021, there was no bonus distribution in 2020 due to COVID. The disbursal of the bonus for 2021 is currently underway. The per centage of revenue disbursal varies as per the rate determined by the government.

Table 4.22: Year-wise revenue and production of tendu in Chandrapur

	2019	2020	2021	2022
Production (SBs)	83,420	81,370	56,420	72,067
Revenue (₹)	96,152,123	71,833,890	128,144,070	177,514,873
Bonus (₹)	17,290,000	-	28,184,427	-
Beneficiaries	37,533	-	39,988	-

Source: Forest Department, Chandrapur

Table 4.23: Bonus distribution in 2021-July 2022 in Chandrapur

Division	Revenue (₹)	Royalty (₹)	Total beneficiaries	Bonus to be disbursed (₹)	Beneficiaries covered	Bonus disbursed (₹)
Central Chanda	45,740,095	28,331,415	10,124	17,400,600	9,906	17,264,997
Chandrapur	38,339,120	23,747,283	9,252	14,591,837	0	0
Brahmapuri	44,341,676	27,465,234	20,612	16,876,442	12,795	10,919,430
Total	1,28,420,891	79,543,932	39,988	48,876,959	22,701	28,184,427

Source: Forest Department, Chandrapur

4.4.4 Survey findings

Methodology

Household surveys were carried out in seven tendu-and two non-tendu-dependent villages. A focused group discussion was carried out in each of these villages to understand the overall profile of the village. As per Forest Department records, there are 39,988 tendu pluckers in Chandrapur. The sample size determined using a 95 per cent confidence level with a margin of error of 5 per cent was 381 households. A total of 385 households with a dependence upon tendu were surveyed. A total of 42 people participated in the FGDs from the seven tendu-dependent villages, while a total of 12 people participated in the FGDs in the two non-tendu-dependent villages.

The tendu-dependent villages were chosen from the list of villages that have phadis in the three forest divisions of the district. The villages with the highest tendu collection were chosen in each of the forest divisions. Two non-tendu-collecting villages were chosen upon consultation with the survey team to understand the dependence upon forests and to understand livelihood options other than tendu collection. In each of these villages, 10 households were surveyed.

To understand the socio-economic status of tendu and non-tendu collectors, the Udai Pareekh socio-economic scale (SES) was used.[27] The scale determines the socio-economic status based on nine parameters: caste, occupation, education, landholding, material possessions, social participation, type of house, number of family members and farm power.

Surveyed villages

A total of seven tendu-dependent villages were surveyed in Chandrapur district. The villages are geographically spread out and cover five subdivisions—Ballarpur, Chandrapur, Chimur, Gondpipri and Rajura. The two non-tendu-dependent villages that were surveyed were Pachgaon and Virur station.

Table 4.24: List of surveyed tendu villages in Chandrapur

S. No.	Forest Division	Range	Village with phadi	Collection (SBs)
1	Brahmapuri	Chimur	Murpar	500
2	Central Chanda	Rajura	Khambada	500
3	Central Chanda	Ballarshah	Manora	450
4	Central Chanda	Dhaba	Dhaba	400
5	Chandrapur	Bhadravati	Chora	600
6	Chandrapur	Chandrapur	Junona	800
7	Chandrapur	Bhadravati	Savri	400

Source: Chandrapur Forest Department

Household-level socio-economic surveys conducted in 385 households in 7 tendu-dependent villages, and in 20 households in 2 non-tendu-dependent villages

Survey findings – tendu-dependent villages

Demographic profile of tendu collectors

A total of 385 households were surveyed across seven villages in Chandrapur district. The survey aimed at understanding, besides the social aspects of a tendu collector's life, their economic status. It sought to understand various aspects of income, expenditure, and occupation. The following were the findings:

a. The survey revealed that 74 per cent of the tendu collectors were men.

b. Most of the respondents, around 47.7 per cent, were from the artisan caste. The artisan caste typically includes those are engaged in traditional crafts like pottery

and weaving. As per the surveyors, this category mostly includes the Other Backward Classes (OBCs). The Scheduled Tribes category is the second most dominant caste category, comprising around 42.8 per cent of the total respondents.

c. Around 31.6 per cent of the respondents had land between 1 and 5 acres. A whopping 60 per cent of those surveyed were landless. Only 4.4 per cent had land less than one acre.

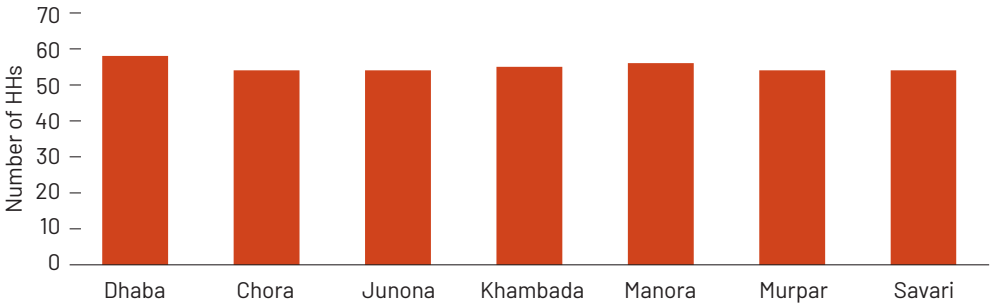
d. An analysis of the average income of the tendu-collecting households revealed that around 74.8 per cent earned less than ₹5,000 per month, placing them below the poverty line. Around 24.4 per cent earned ₹5,000-10,000 on an average (in a month).

e. Average agricultural landholding among the tendu collectors was around 3 acres.

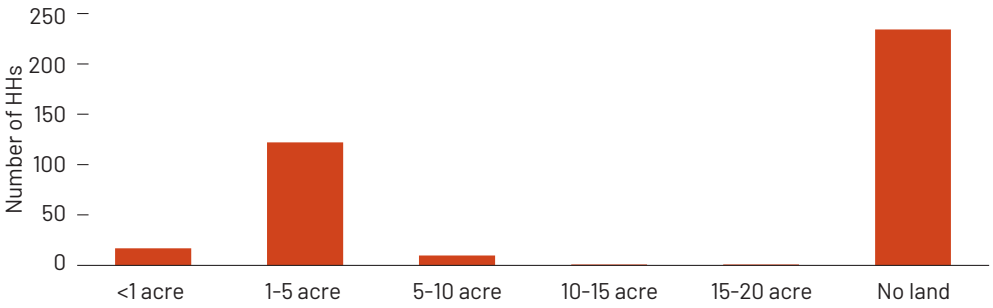
f. The data reveals that on an average households score around 22 on the Udai Pareekh scale which indicates that they are from the 'Lower Middle Scale class'.

Tendu collectors socio-economically marginalised. Majority of collectors, around 60%, landless. 74.8% earn less than ₹5,000 per month

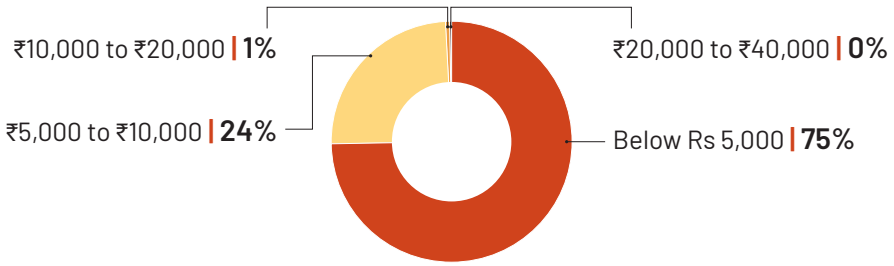
Graph 4.17: Village-wise number of tendu collectors surveyed in Chandrapur



Graph 4.18: Landholding among tendu collectors in Chandrapur



Graph 4.19: Average monthly income among tendu collectors in Chandrapur



Occupation

The tendu collectors are primarily engaged in the agricultural sector. The following were the findings:

a. Around 72 per cent of the surveyed people were engaged in agricultural labour as their primary occupation. Around 20 per cent were involved primarily in cultivation.

b. 39.7 per cent of the total respondents had agricultural land.

c. 55 per cent of the irrigation is rainfed.

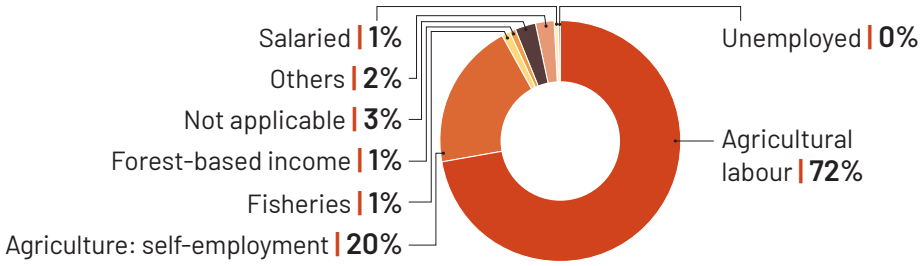
d. Paddy is a major crop and is grown by 58 per cent of those with agricultural land. This is grown for subsistence as well as for selling, and this is true for around 60 per cent of the paddy cultivators. 37 per cent grow cotton.

e. 33 per cent of the respondents were involved in cattle and livestock rearing, 73 per cent primarily for subsistence.

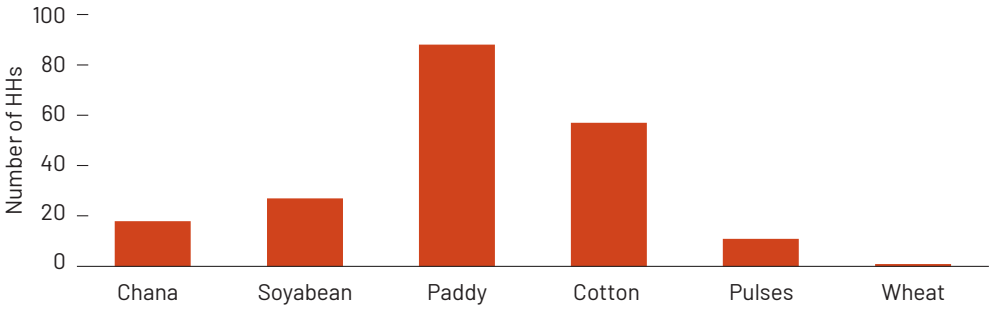
f. Around 70 per cent of the tendu-dependent households have some degree of employment under MNREGA. This figure points to a heavy dependence upon MNREGA for income generation. One can deduce from the data that there is a lack of adequate employment opportunities in the villages.

g. The average number of days that MNREGA generated was 29 days. The average income generated was ₹6,167.

Graph 4.20: Occupation of tendu collectors in Chandrapur

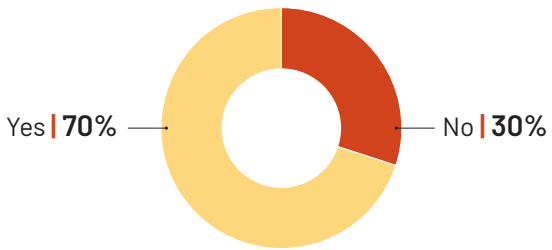


Graph 4.21: Crops grown by tendu collectors in Chandrapur



Majority engaged in agricultural labour for subsistence. Only 40% of respondents landowning and own an average of 3 acres

Graph 4.22: Employment under MNREGA among collectors in Chandrapur



Tendu dependence and challenges

The survey revealed the following findings

a. Around 42.8 per cent of the households were engaged in tendu collection for 10 to 20 years, 21.5 per cent for more than 20 years.

b. The average number of tendu leaf bundles collected by the households last year was 3,334.[28] The households earned an average of ₹8,076 for an investment of around 13 days per season. They earned around ₹2.4 per bundle collected. Besides this, most of the households receive a bonus of around ₹1,000.

c. On an average one or two members of the household were involved in the collection of tendu.

d. An overwhelming 88 per cent of the respondents said the rate that they got for tendu collection was inadequate.

e. Around 61.8 per cent said they collected tendu due to the lack of work during the lean months of the agricultural season. Tendu collection was cited as a good source of income by around 73.5 per cent of the respondents.

f. The FGDs revealed that 78 per cent of the respondents felt that tendu collection was necessary in reducing their financial woes during the lean summer months. A few respondents also cited the inflow of cash as the reason for their dependence

g. Around 85.9 per cent of respondents highlighted animal attacks as the major challenge whilst collecting tendu. Conversations with the villagers revealed that tiger attacks were the most likely whilst collecting tendu leaves from the forests.

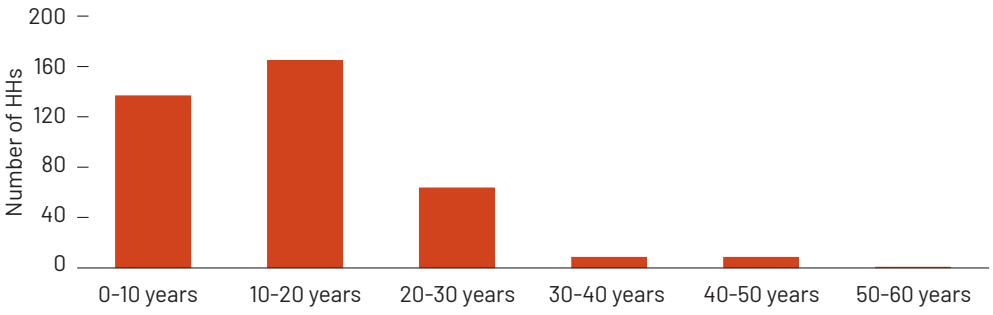
h. FGDs revealed that almost half of the respondents felt that tendu collection had an adverse impact on the environment. Around 26 per cent cited fires to be the reason for the adverse environmental impact, while 16 per cent cited the decline in trees, as a result of unsustainable harvesting practices, to be the reason.

i. 47.7 per cent said tendu collection involved the use of fire. When probed about the setting of fires and who might be responsible, only two respondents said it was the Forest Department staff and tendu collectors who were responsible. The majority said they did not know.

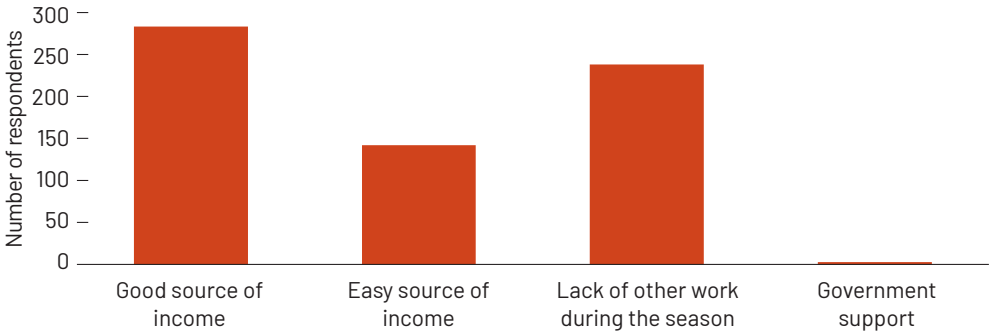
j. Upon being asked about the benefit of fire for tendu collection, 154 respondents said that it wasn't beneficial. Only 57 responded that it was beneficial.

Households earned around ₹8,076 for an investment of 13 days from tendu collection. Around 62% collect tendu due to a lack of alternate work

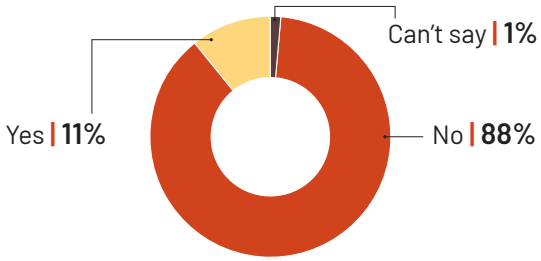
Graph 4.23: Years of engagement in tendu collection in Chandrapur



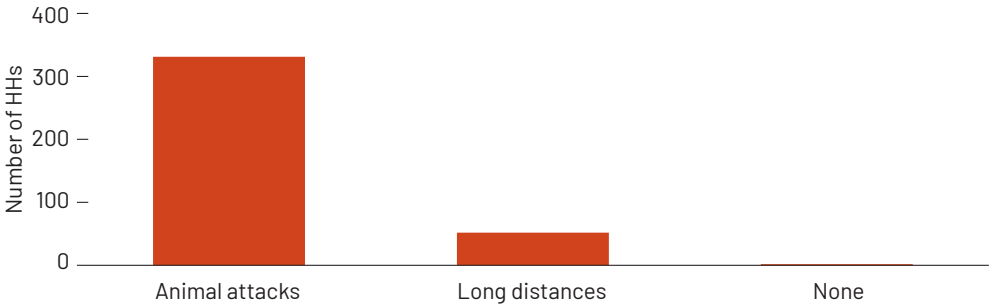
Graph 4.24: Reasons for tendu collection in Chandrapur



Graph 4.25: Adequacy of tendu leaf collection rate in Chandrapur



Graph 4.26: Challenges faced during tendu collection in Chandrapur



Forest and non-tendu NTFP dependence

The survey attempted to measure the community's dependence on other NTFPs and explores alternatives to tendu. The following were the findings:

While dependence upon NTFPs is substantial, dependence predominantly upon tendu. Mahua and tendu fruit most collected after tendu

a. Analysis reveals that the dependence upon NTFPs and forest produce in general is very high amongst the tendu-collecting households. 38 per cent of the households are dependent upon the collection of NTFPs (other than medicinal plants). 54 out of the 385 respondents highlighted their dependence upon medicinal plants. A whopping 88.8 per cent of the respondents are dependent upon the collection of firewood.

b. Mahua and tendu fruit are the most collected NTFPs in the district. Around 34.5 per cent of the households collect mahua. Some of the other NTFPs collected are char and bamboo.

c. While NTFPs like bamboo and mahua are primarily collected to be sold, NTFPs like tendu fruit and char were primarily found to be consumed at the household level.

d. As far as average income generation goes, bamboo collection generates the highest average annual income. At ₹33,185 its economic gains far surpass any other NTFP in the region, even tendu. Mahua is the second largest NTFP in this regard. For the 131

respondents who sold mahua commercially, the average collection of mahua was about 162 kg per season and the income generated was about ₹3,278.

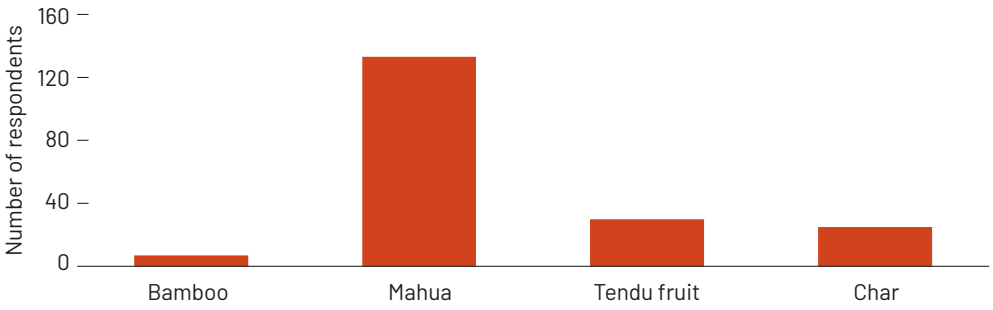
NTFPs like mahua and bamboo primarily collected for sale. Bamboo collection more profitable than tendu collection, and holds huge potential. Mahua holds potential too

Table 4.25: Non-tendu NTFP collection in Chandrapur

NTFP	Usage	Number of collectors	Collection (kg)	Income generated (₹)	Average annual income (₹)
Bamboo	Sale	7	44,010	232,300	33,185.7
Mahua	Sale	131	21,345	429,530	3,278.9
	Own consumption	2	54	0	0.0
Tendu fruit	Sale	7	339	13,600	1,942.9
	Own consumption	23	303	0	0
Char	Sale	2	64	1,700	850
	Own consumption	23	48	0	0

Graph 4.27: Dependence upon forest produce among collectors in Chandrapur

Graph 4.28: Collection of Non-Timber Forest Products among collectors in Chandrapur



Alternative livelihoods

The following were the responses towards alternative livelihoods:

a. Around 38.9 per cent of the respondents mentioned the need for processing facilities for the NTFPs.

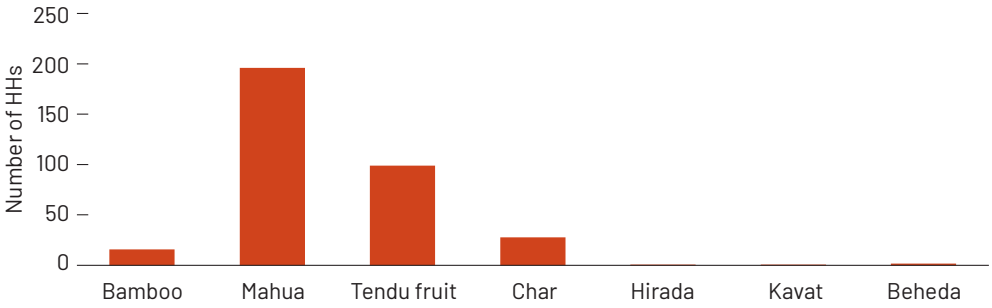
b. Around 5.9 per cent of the respondents wanted some sort of training related to NTFPs.

c. Around 11.6 per cent wanted the provision of market linkages and better procurement facilities for NTFPs.

d. Almost 50.9 per cent of the total respondents felt that mahua should be promoted. Around 25.7 per cent felt that tendu fruits could be promoted. A total of 28 respondents mentioned char as a viable NTFP. Other NTFPs like bamboo, hirada, kavat and beheda barely figured in the responses.

e. FGDs reveal that while most of the respondents of Junona opine that bamboo should be promoted given its relative abundance in the area, the respondents of Murpar, Savri and Dhaba opine that mahua should be promoted. For the respondents of Dhaba, mahua and kavat were NTFPs that could be promoted due to their relative abundance in the area.

Graph 4.29: NTFPs that can be promoted in Chandrapur



Survey findings – non-tendu-dependent villages

Demographic profile of non-tendu collectors

A total of 20 households were surveyed across two villages in Chandrapur. Pachgaon and Virur station are the two non-tendu villages surveyed. The survey aimed at understanding, besides the social aspects of a non-collector's life, their economic status. It sought to understand various aspects of income, landholding, and occupation. The following were the findings:

a. Half of the respondents were from the Scheduled Tribes (ST). 30 per cent of the respondents were from lower castes. As per the surveyors, this category majorly fell in the Scheduled Castes (SC) category.

b. As per the survey, 50 per cent of the respondents were landless; 35 per cent had landholding of less than 5 acres. Only 15 per cent had landholding between 5 and 15 acres.

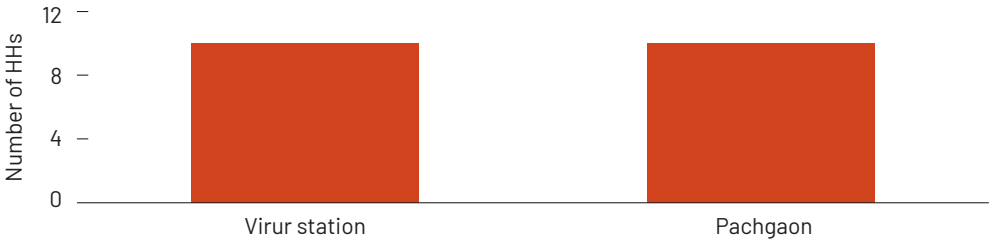
c. A total of 10 respondents owned land. The average agricultural landholding among the 9 landowning respondents with less than 10 acres was around 3.8 acres. Only one respondent owned more than 10 acres of land; he owned 13 acres.

d. An analysis of the average income of the non-tendu-collecting households revealed that 50 per cent of the households earned below ₹5,000 while the other 50 per cent earned between ₹5,000 and ₹10,000 per month.

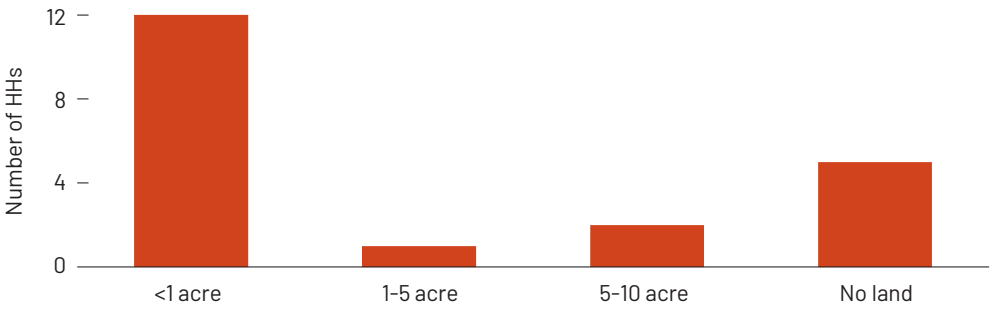
e. The data reveals that on an average households score around 26 on the Udai Pareekh scale which indicates that they are from the 'Middle Scale class'.

Socio-economically not very well off. Landlessness among non-tendu collectors very high. 50% of the households earned less than ₹5,000 per month

Graph 4.30: Village-wise number of non-collectors surveyed in Chandrapur

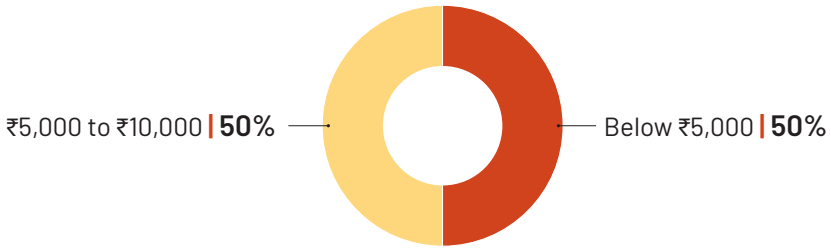


Graph 4.31: Landholding among non-collectors in Chandrapur



Non-tendu-dependent households depend upon agriculture. 95% dependent upon agricultural labour despite an average landholding of 4.7 acres

Graph 4.32: Average monthly income among non-collectors in Chandrapur



Occupation

The respondents in the two non-tendu-collecting villages are primarily engaged in the agricultural sector mostly as agricultural labour. The following were the findings:

a. All respondents were engaged in agriculture as their primary occupation. Around 95 per cent were involved primarily as agricultural labour.

b. Around 70 per cent of the respondents were dependent upon rainfed irrigation.

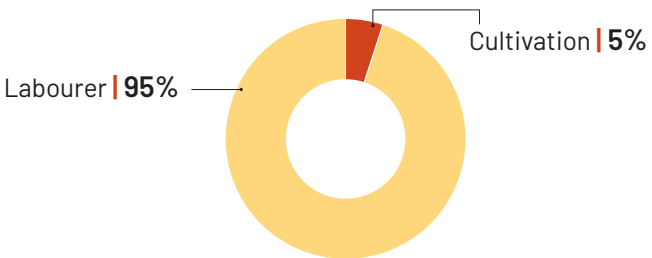
c. Cotton and paddy are the major crops grown by the households. 70 per cent of the landowning respondents grew cotton and 40 per cent grew paddy. While cotton is only grown for commercial purposes, half of those growing paddy depended upon it for commercial and subsistence purposes with the other half dependent upon it primarily for subsistence. Soyabean and pulses were also grown by the households.

d. 35 per cent of the respondents were involved in cattle and livestock rearing. This is only for subsistence.

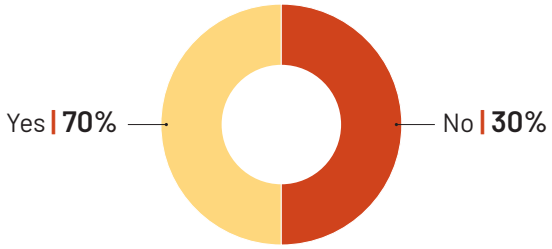
e. 50 per cent of the households have some degree of employment under MNREGA. This figure points to a heavy dependence upon MNREGA for income generation. One can deduce from the data that there is a lack of economic opportunities in the village.

f. The average number of days the households got work under MNREGA was 46. The average income earned was ₹11,860. There is no dependence upon MNREGA in Pachgaon.

Graph 4.33: Job type among non-collectors in Chandrapur



Graph 4.34: Employment under MNREGA among non-collectors in Chandrapur

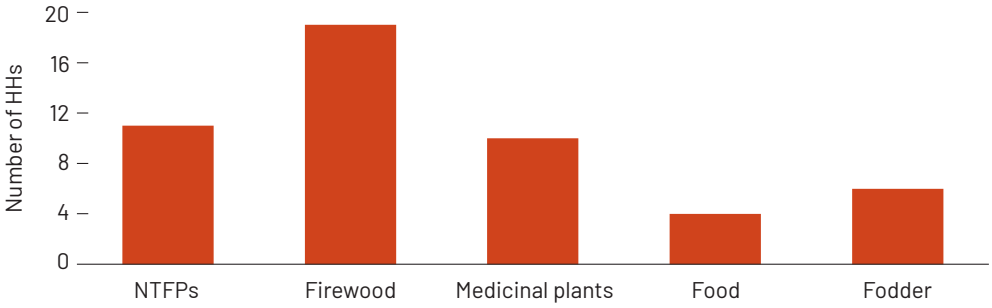


Dependence upon forests

The two non-tendu-collecting villages of Pachgaon and Virur station are alike in many ways yet dissimilar when it comes to the non-dependence upon tendu collection. In Pachgaon, the residents consciously took a decision to stop collecting tendu leaves in light of the adverse health and environmental impact of tendu leaf collection. In Virur station, however, interactions with the residents revealed that the collection had stopped and that animal attacks were a major reason.

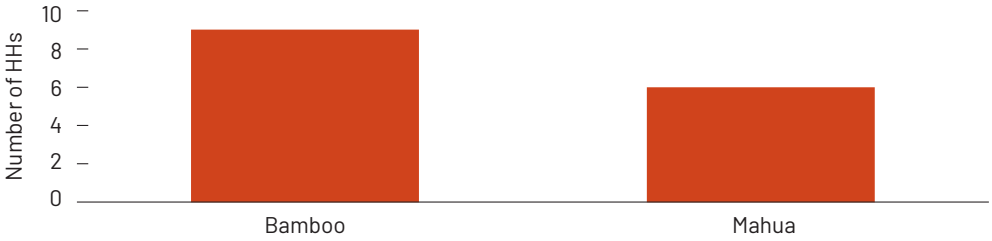
While the residents of Pachgaon are dependent upon various forest produce like NTFPs, medicinal plants, firewood and fodder, residents of Virur station aren't as dependent upon the forests, collecting only firewood from them. The respondents in Pachgaon are highly dependent upon bamboo, collecting around 25,611 kg of bamboo on an average and earning around ₹30,222 for it. The respondents also collect mahua and earn an average ₹4,495.8 for an average collection of 126.5 kg.

Graph 4.35: Dependence upon forest produce among non-collectors in Chandrapur



Tendu collection practices stopped in Pachgaon due to adverse environmental and health impacts of the same. No collection in Virur Station due to animal attacks

Graph 4.36: Non-tendu NTFPs collected among non-collectors in Chandrapur



4.4.5 Key conclusions

The survey findings show that the tendu-collecting households are from some of the most marginalised sections of society. They are primarily from the Scheduled Tribes and Artisan/OBC castes, are predominantly landles, and earn less than ₹5,000 per month. While the non-tendu-collecting households are also primarily from the Scheduled Tribes, the landlessness and income bracket patterns are different and thus, they are set apart from the tendu-collecting villages. In the non-tendu-collecting villages, 50 per cent earn less than ₹5,000 and the rest earn between ₹5,000 and ₹10,000 as opposed to tendu-collecting villages where 74.8 per cent of households earn less than ₹5,000 a month. Moreover, landlessness, which is around 50 per cent, is less prevalent amongst non-tendu households. As per the Udai Pareekh socio-economic scale, while the tendu-collecting households fall under the 'Lower Middle Scale class', the non-tendu households fall within the 'Middle Scale class', indicating that the former are more marginalised than the latter despite earning a decent sum from tendu collection.

The tendu-collecting villages earn a tidy sum through tendu collection every season and this is unsurprising given the well-organised structure of the trade in the state and the relatively high rate for every standard bag collected. The survey findings show that tendu collectors earned around ₹8,076 last season for an investment of 13 days. Besides this, most of the households earn a small sum as bonus. Apart from tendu they collect NTFPs like bamboo and mahua, of which bamboo is significantly more lucrative. As opposed to this, the non-tendu villages primarily get their income from bamboo and mahua collection. While the Forest Department only deals with the collection and sale of bamboo and tad trees, the collection and processing of various NTFPs like mahua flowers, mahua seeds, tamarind, neem seeds etc. in the VDVKs point to the availability of other NTFPs in the district. Thus, there is a huge potential in terms of non-tendu NTFP-based livelihoods in the district and these can be explored and promoted.

Tendu-collecting households marginalised. Non-tendu-collecting households fare better socio-economically. Non-tendu NTFPs show huge potential in tendu-collecting villages and should be promoted

4.5 Korba district, Chhattisgarh

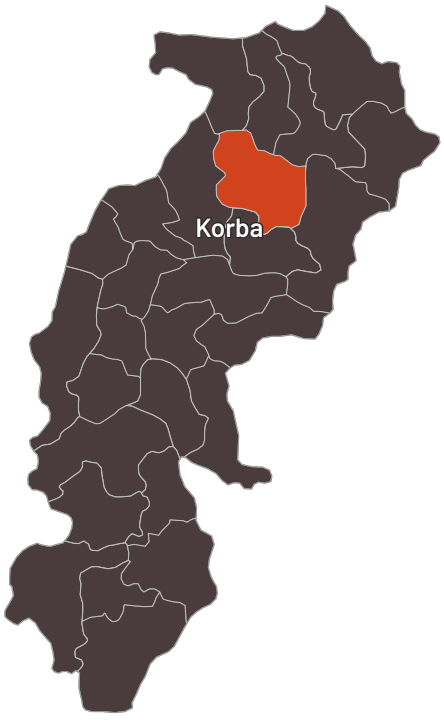
4.5.1 District profile

Korba district, which is known as the power capital of Chhattisgarh, comes under Bilaspur division. Situated in the northern half of Chhattisgarh state, it is surrounded by the districts of Korea, Surguja, Bilaspur and Janjgir. The district is divided into five administrative blocks— Katghora, Korba, Kartala, Pali and Poundi Uproda. These blocks have 390 Gram Panchayats and 769 villages. As per the 2011 census, the district has a population of 1,206,640 and is inhabited largely by a tribal populace which constitutes around 40.9 per cent of the total populace.[29] The tribal populace includes particularly vulnerable tribal groups (PVTGs) such as Birhor and Pahadi Korwas, which constitute about one per cent of the district's tribal population. The district is predominantly rural, with about 63 per cent of the total households being rural.

Of a total geographical area of 714,544 hectares, 283,497 hectares, i.e. 66 per cent, is forest land. The forests in Chhattisgarh belong to two groups—tropical moist deciduous forests and tropical dry deciduous forests, which are further divided into 12 types. The two main tree species are Sal (Shorea robusta) and Teak (Tectona grandis). Other major species are Bija (Pterocarpus marsupium), Saja (Terminalia tomentosa), Dhavdha (Anogeissus latifolia), Mahua (Madhuca indica), Tendu (Diospyros melanoxylon) and bamboo (Dendrocalamus strictus).[30] Some of the major non-timber forest products in the district are tamarind, mahua, bel, lac, palash flower and kosa silk.

Korba's economy is largely dependent upon the primary sector which contributes a little over 56 per cent to the district's GDP. The secondary sector's contribution is about 31%, while the service sector contributes only 12.7% to the GDP. In terms of dependence, the people are primarily dependent upon agriculture. About 19.7% of the total geographical area in Korba (about 140,765 ha) comes under agriculture. Rice, urad, tur, maize, mustard are the prominent crops in the district.[31] Korba is the biggest coal-producing district in India, accounting for over 16% of the country's coal production in 2020-21.[32] Mining and quarrying account for half of Korba's GDP.

Map 4.3: Korba district



Economy of Korba predominantly primary sector-based, with a share of around 56% of the district's GDP. People are primarily dependent upon agriculture

Table 4.26: Demographic profile of Korba

Parameter	Number
Total population	1,206,640
Total Households	280,073
Rural Households (%)	63
Urban Households (%)	37
Multi-Dimensional Poor (%)	31.86
SC population (%)	10.3
ST population (%)	40.9

Source: Census, 2011; National Multidimensional Poverty Index Baseline Report, 2021.[33]

Korba predominantly rural with around 63% of the households in villages. Poverty is high with around 31.8% of populace multidimensionally poor

Table 4.27: Land use pattern in Korba

Particulars	Details
Total geographical area (ha)	714,544
Gross cropped area (%)	19.7
Area under forests (%)	66.0
Area under wastelands (%)	8.3
Area under other uses (%)	7.4

Source: District Irrigation Plan, 2015-2020.[34]

Table 4.28: Share of economic sectors in Korba's GDP

Sector	Share in district GDP (%)
Primary sector	56.3
Agriculture	4.8
Forestry	0.5
Fisheries	0.6
Mining and quarrying	50.4
Secondary sector	31
Manufacturing	10.3
Construction	4.5
Electricity, gas and water	16.2
Tertiary sector	12.7

Source: Directorate of Economics and Statistics, Government of Chhattisgarh.

Table 4.29: Category of workers in Korba

Category of workers	Number of people
Total Workers	521,186
Main Workers	350,314
Marginal Workers	170,872
Cultivators	113,071
Agricultural Labourers	221,806
Household Industrial Workers	7,899
Other Workers	178,410
Non-Workers	685,454

Source: District website.[35]

4.5.2 NTFP production

Korba district with its vast forest cover has enormous NTFP potential. Some of the major NTFPs are lac, tamarind, mahua, bel, honey, mahul and sal. There are a total of 12 Van Dhan Vikas Kendras in the district. The major NTFPs that are collected are tamarind, mahua flower and seeds, char seeds, lac, sal leaves and seeds. Conversations with forest officers in Katghora division revealed that in the village of Churi, SHGs are engaged in the collection and processing of various NTFPs like mahul leaves and kosa silk. It was also revealed that though there was a bamboo-processing centre in the district, it is now defunct. Lac was also mentioned as an important NTFP; however, we were told that the production is low.

Conversations with forest division officials in Korba revealed that the department has been engaged in the sale of non-tendu NTFPs since 2020. For this purpose, 153 cooperative societies have been established which deal in bamboo, lac, silk, etc. These societies are linked to the VDVKs. We were told that Mahua was exported as well.

Table 4.30: Major NTFP production in Korba and Katghora forest divisions in 2022 (April-October)

S. No.	NTFP	Korba		Katghora	
		Production (quintals)	Value (in million ₹)	Production (quintals)	Value (in million ₹)
1	Imli	10.8	0.036	335	1.17
2	Imli flower	7.5	0.05	71.8	0.42
3	Imli seed	-	-	4.2	0.004
4	Mahua flower (dry)	2,380.7	7.85	87.2	0.29
5	Mahua flower (raw)	268	0.268	742	0.74
6	Belwa			1.2	0.001
7	Dhavai flower	37.2	0.125	34.4	0.11
8	Palash flower (dry)	375.5	0.432	402.5	0.46
9	Honey	-	-	0.2	0.01
10	Raili kosa (poli)	-	-	635	0.001
11	Raili kosa (sabut)	-	-	2,585	0.01
12	Sal seed	30.8	-	-	-
13	Kodo	-	-	-	-
14	Mahul leaf	-	-	-	-

Source: Katghora and Korba forest division departments, Korba

An abundance of NTFPs in the district. The government oversees the collection and sale of many non-tendu NTFPs like lac, tamarind, mahua seeds, sal seeds, etc.

Table 4.31: Van Dhan Vikas Kendras in Korba district

S. No.	Division	VDVK	Beneficiaries	NTFPs
1	Korba	Lemaru	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan
2	Korba	Ajgarbahar	300	Mahua flower, Char seed, Mahua leaf, Sal seed, Charota seed
3	Korba	Korkoma	300	Mahua flower, Char seed, Kusumi lac and seed
4	Korba	Farashket	300	Mahua flower and seed, Charota seed, Kusumi lac

Table 4.31 continued

S. No.	Division	VDVK	Beneficiaries	NTFPs
5	Korba	Sendripali	300	Kusumi lac, Chargudhli, Mahua flower and seed, Myrobalan
6	Korba	Kartala	300	Chargudhli, Kusumi lac, Rangini lac, Mahua flower, Sal seed
7	Katghora	Pasan	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan
8	Katghora	Jatanga	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan
9	Katghora	Donganala Pali	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan
10	Katghora	Chatuna Bhavna	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan
11	Katghora	Manikpur	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan
12	Katghora	Katghora Kasania	300	Tamarind, Mahua flower and seeds, Sal leaves and seeds, Honey, Myrobalan

Source: TRIFED website.[36]

Dependence upon tendu collection high in Korba. Collection has fluctuated over the years in the Korba and Katghora divisions of the district. However, collection has picked up post-2020

4.5.3 Tendu leaf collection

Dependence upon tendu in Korba district is high. Around 1,04,638 people are involved in collecting tendu in Korba. Tendu collection and dependence in Katghora forest division is higher than in Korba division. While collection has fluctuated over the years in both divisions, there has been an increase in collection since 2020. While the average collection in Katghora division has been 63,666 SBs between 2015 and 2022, the average collection in Korba division was 46,958 SBs.

Table 4.32: Tendu trade in Katghora forest division, Korba

Year	Collection (SBs)	Beneficiaries	Collection rate	Wages (₹)	Bonus (₹)
2015	60,338.4	52,717	1,200	72,406,092	61,324,709
2016	58,311.4	50,691	1,500	87,467,234	154,086,650
2017	81,729.9	57,453	1,800	147,113,937	397,004,342
2018	65,129.3	59,537	2,500	162,823,488	186,630,609
2019	67,520.4	66,796	4,000	270,081,760	58,093,354
2020	36,424.1	61,058	4,000	145,696,520	26,338,127
2021	65,932.0	61,830	4,000	263,728,080	-
2022	73,949.8	67,284	4,000	295,799,260	-

Source: Katghora forest division department, Korba

Table 4.33: Tendu trade in Korba forest division, Korba

Year	Collection (SBs)	Beneficiaries	Collection rate	Wages (₹)	Bonus (₹)
2015	43,696.4	33,768	1,200	52,435,710	47,154,071
2016	48,091.6	31,206	1,500	72,137,453	130,155,242
2017	52,912.2	32,945	1,800	95,242,032	296,809,511
2018	48,430.9	35,387	2,500	121,077,488	162,887,480
2019	53,344.2	38,413	4,000	213,377,120	63,078,888
2020	33,459.2	37,723	4,000	133,837,160	28,437,741
2021	42,959.8	35,356	4,000	171,839,488	-
2022	52,777.3	37,354	4,000	211,109,440	-

Source: Korba forest division department, Korba

4.5.4 Survey findings

Methodology

Household-level surveys were carried out in seven tendu-and two non-tendu-dependent villages. A focused group discussion was carried out in each of these villages to understand the overall profile of the village. As per Forest Department records, there are 104,638 tendu pluckers in Korba. The sample size determined using a 95 per cent confidence level with a margin of error of five per cent was 383 households. A total of 381 households with a dependence upon tendu were surveyed. A total of 42 people participated in the FGDs from the seven tendu-dependent villages, while a total of 12 people participated in the FGDs in the two non-tendu-dependent villages.

The tendu-dependent villages have been chosen from the list of the Primary Cooperative Societies (PCS) that are engaged in tendu collection. There are a total of 83 PCSs in Korba. Of these, every 10th PCS was chosen. The villages with the PCS were surveyed. Two non-tendu-collecting villages were chosen upon consultation with the survey team to understand the dependence upon forests and to understand livelihood options other than tendu collection. In each of these villages, 10 households were surveyed.

Household-level socio-economic surveys were conducted in 381 households in 7 tendu-dependent villages and in 20 households in 2 non-tendu-dependent villages

To understand the socio-economic status of tendu and non-tendu collectors, the Udai Pareekh socio-economic scale (SES) was used.[37] The scale determines the socio-economic status based on nine parameters: caste, occupation, education, landholding, material possessions, social participation, type of house, number of family members and farm power.

Surveyed villages

A total of seven tendu-dependent villages were surveyed in Korba district. The villages are geographically spread out and cover three blocks of Katghora, Korba and Pali. The two non-tendu-dependent villages that were surveyed were Bata and Japeli.

Table 4.34: List of surveyed tendu villages

S.No.	Forest division	Villages with Primary Cooperative Societies
1	Korba	Badmar
2	Korba	Kolga
3	Korba	Labed
4	Katghora	Utarda
5	Katghora	Baksahi
6	Katghora	Iraf
7	Katghora	Bandhapara

Source: CGMFPFED website.[38]

44% of tendu-collecting households earned between ₹5,000 and ₹10,000 per month. Fare relatively well on various socio-economic indicators

Tendu-dependent villages

Demographic profile of tendu collectors

A total of 381 households were surveyed across seven villages in Korba. The survey aimed at understanding, besides the social aspects of a tendu collector's life, their economic status. It sought to understand various aspects of income, expenditure, and occupation. The following were the findings:

a. The survey revealed that 71 per cent of the respondents were men.

b. Most of the respondents, around 65.8 per cent, were from the Scheduled Tribes. The Artisan category is the second most dominant caste category, comprising around 19.6 per cent of the total respondents. The artisan caste typically includes those engaged in traditional crafts like pottery and weaving. As per the surveyors, this category majorly includes the Other Backward Classes (OBCs).

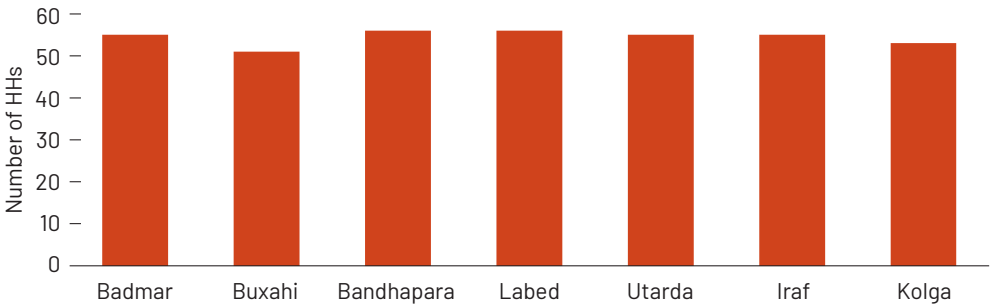
c. Around 66 per cent of the respondents had land between one and five acres. 11.8 per cent were landless. Only 7.3 per cent had more than five acres of land.

d. Average agricultural landholding among tendu collectors was 2.4 acres.

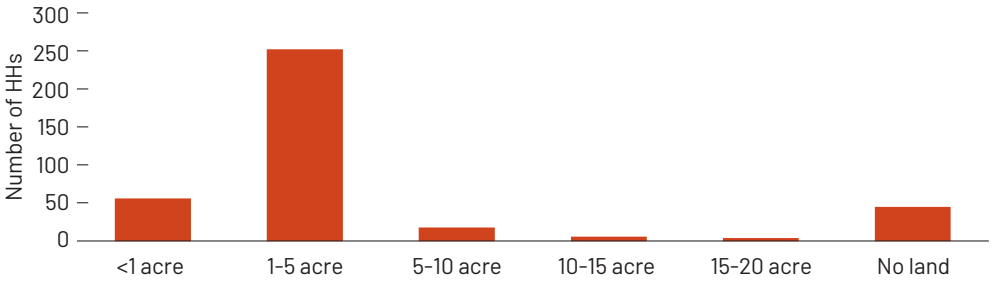
e. An analysis of the average income of the tendu-collecting households revealed that around 12 per cent earned less than ₹5,000 per month, thus placing them below the poverty line. Around 44 per cent earned ₹5,000-10,000 on an average (in a month).

f. The data reveals that on an average households score around 27.4 on the Udai Pareekh scale which indicates that they are from the 'Middle Scale class'.

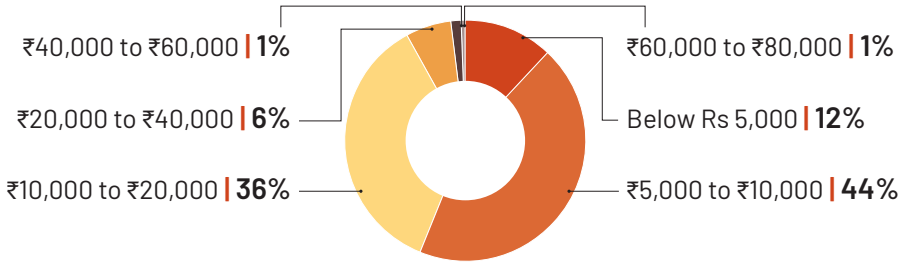
Graph 4.37: Village-wise number of tendu collectors surveyed in Korba



Graph 4.38: Landholding among tendu collectors in Korba



Graph 4.39: Average monthly income among collectors in Korba



Occupation

The tendu collectors are primarily engaged in the agricultural sector. The following were the findings:

a. Around 70 per cent of the surveyed people were engaged in cultivation as their primary occupation. Around 24.9 per cent were involved primarily in agricultural labour.

b. 91 per cent of the total respondents had agricultural land.

c. The source of water for the agricultural land is rainfed irrigation.

d. Paddy is a major crop and is grown by all the cultivators. For 60 per cent of the cultivators, paddy is a subsistence crop. For the rest, it is both a subsistence and commercial crop. 29 per cent of the cultivators grow pulses like tur, urad and kulthi. Corn and sesame are some of the other cultivated crops.

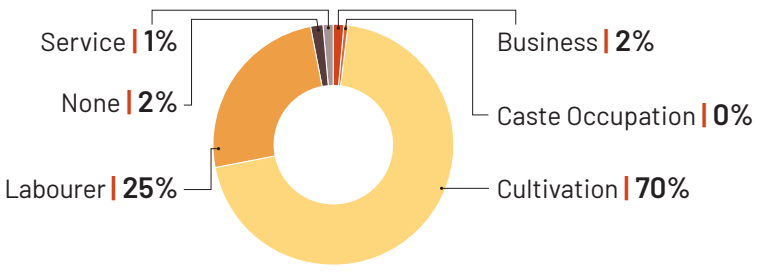
e. 44 per cent of the respondents were involved in cattle and livestock rearing. This is primarily for subsistence.

f. Around 73 per cent of the tendu-dependent households have some degree of employment under MNREGA. This figure points to a heavy dependence upon MNREGA for income generation. One may deduce from the data that there is a lack of adequate economic opportunities in the village.

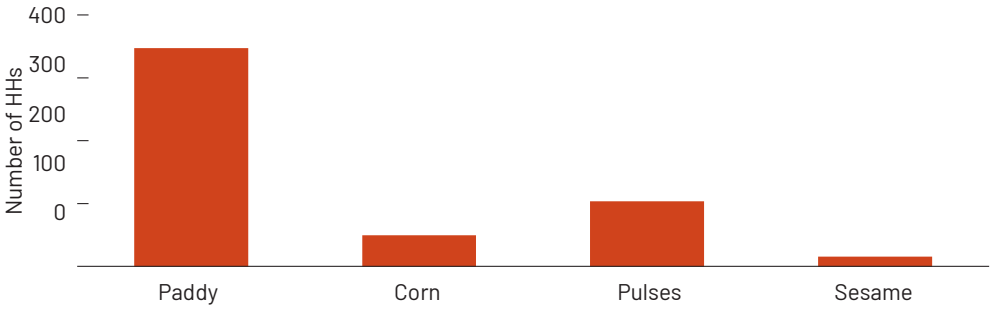
g. The average number of days that MNREGA generated was 27.9 days. The average income generated was ₹5,451.

Huge dependence upon agriculture. Primarily engaged as cultivators, with around 91% of the cultivators owning agricultural land

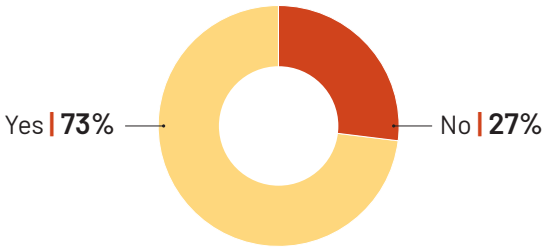
Graph 4.40: Occupation of tendu collectors in Korba



Graph 4.41: Crops grown by tendu collectors in Korba



Graph 4.42: Employment under MNREGA among collectors in Korba



Households earned an average of Rs 5,633 from tendu collection for an investment of around 6 days. Around 86.6% collected tendu due to it being an easy source of income

Tendu dependence and challenges

The survey revealed the following findings:

a. Most of the households, around 43.8 per cent, were engaged in tendu collection for 10 to 20 years. 25.7 per cent of the households were involved in tendu collection for 20 to 30 years.

b. The average number of tendu leaf bundles collected by the households last year was 1,378.[39] The households earned an average of ₹5,633 for an investment of around 5.7 days per season. This translates to ₹4 per bundle.

c. On an average two members of the household were involved in the collection of tendu.

d. 48 per cent of the respondents said the rate that they got for tendu collection was inadequate.

e. Around 86.6 per cent of the respondents said they collected tendu as it is an easy source of income. Tendu collection was cited as a good source of income by 97.6 per cent of the respondents.

f. The FGDs revealed that 54.7 per cent of the respondents felt that tendu collection was a good source of extra income. A few respondents also cited the easy inflow of cash and the availability of easy employment as reasons for their dependence.

g. The FGDs revealed that around 47.6 per cent of the respondents felt that tendu leaves collection had improved the economic situation of the collectors. 14.2 per cent felt it did not do anything to improve their economic situation.

h. An overwhelming 95 per cent of respondents highlighted animal attacks as the major challenge faced whilst collecting tendu. Another challenge cited was the long distances that needed to be travelled for collection.

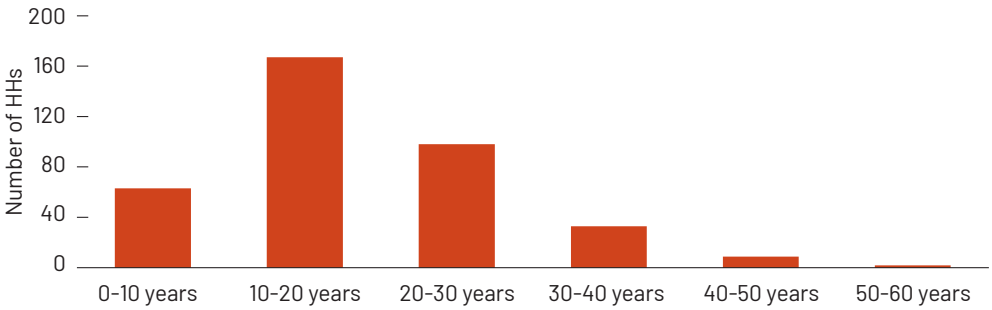
i. FGDs revealed that more than half of the respondents, around 59 per cent, felt that tendu collection had an adverse impact on the environment. Around 32 per cent acknowledged that fires were set by collectors which led to an adverse environmental impact. 32 per cent brought out how a change in the climate and the rains were linked to tendu collection.

j. 18.6 per cent responded by saying that tendu collection involved the use of fire. When probed about the setting of fires and who might be responsible, 70 per cent said the

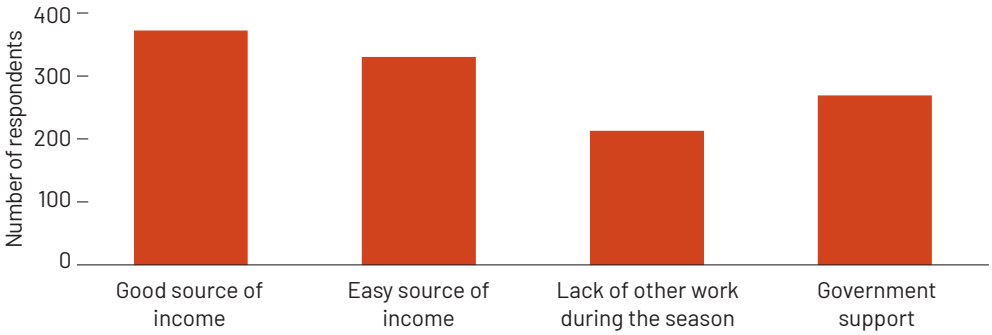
tendu collector were responsible. Some also cited the Forest Department as being responsible.

k. Upon being asked about the benefit of fire for tendu collection, only 7 per cent of the respondents said it was beneficial. They cited the increase in new leaf growth as the outcome of fires. 14 per cent felt that it had no benefit, while the rest said they were unaware of the effects.

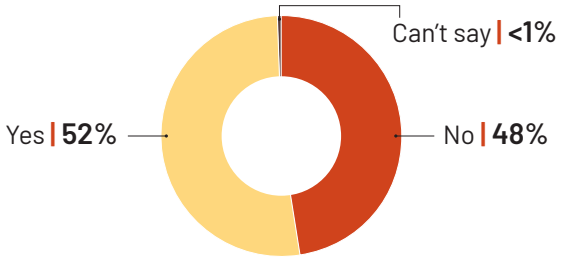
Graph 4.43: Years of engagement in tendu collection in Korba



Graph 4.44: Reasons for tendu collection in Korba

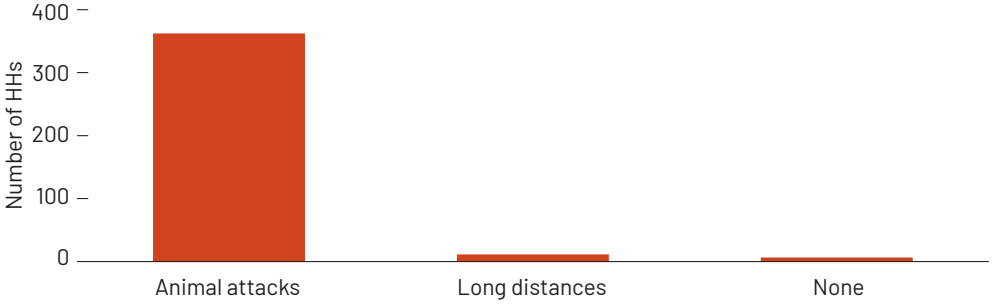


Graph 4.45: Adequacy of tendu leaf collection rate in Korba



For 48% of the respondents, the collection rate per standard bag of tendu wasn't adequate. 95% of respondents stated animal attacks to be a challenge

Graph 4.46: Challenges faced during tendu collection in Korba



Forest and non-tendu NTFP dependence

The survey tried to gauge the dependence upon other NTFPs to explore the viability of promoting them in lieu of tendu. The following were the findings of the survey:

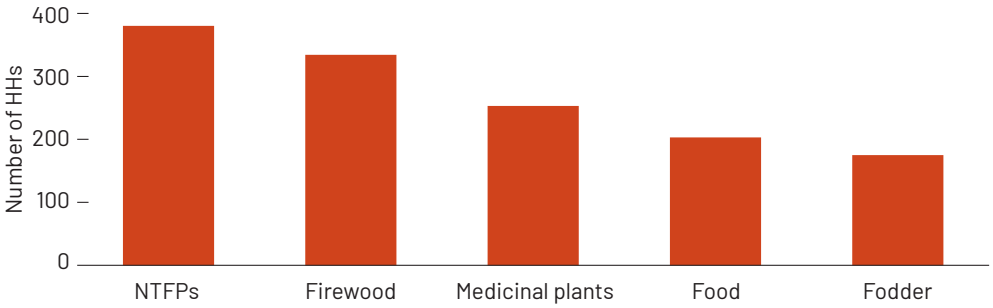
a. Analysis reveals that the dependence upon NTFPs and forest produce in general is very high amongst the tendu-collecting households. Almost all the households responded to being dependent upon the collection of NTFPs (other than medicinal plants). 66 per cent of the respondents highlighted their dependence upon medicinal plants. A whopping 87.6 per cent are dependent upon the collection of firewood.

b. The most significant NTFPs collected are lac and mahua. Around 92 per cent of the households collect mahua. Some of the other NTFPs collected are char, dori, and mango.

c. For the 352 respondents, the average collection of mahua was about 212 kg per season and the income generated was about ₹6,642. The highest generation of annual income is through lac. It generates ₹8,600 on an average. Mahua is the second highest in this regard. It generates around ₹6,641 on an average.

Dependence upon NTFPs is very high. The most significant NTFPs collected are lac and mahua, which offer better returns than tendu

Graph 4.47: Dependence upon forest produce among collectors in Korba



Graph 4.48: Collection of Non-Timber Forest Products by collectors in Korba

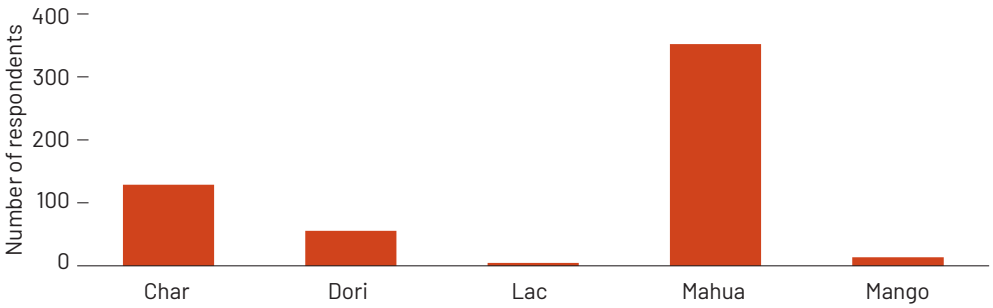


Table 4.35: Collection and sale of non-tendu NTFPs in Korba

NTFP	No. of collectors	Annual Collection (kg)	Annual Income (₹)	Average annual income (₹)
Lac	5	180	43,000	8,600.0
Mahua	352	74,782	2,337,950	6,641.9
Char	129	2,686	301,000	2,333.3
Mango	14	1,001	26,350	1,882.1
Dori	56	1,467	48,190	860.5

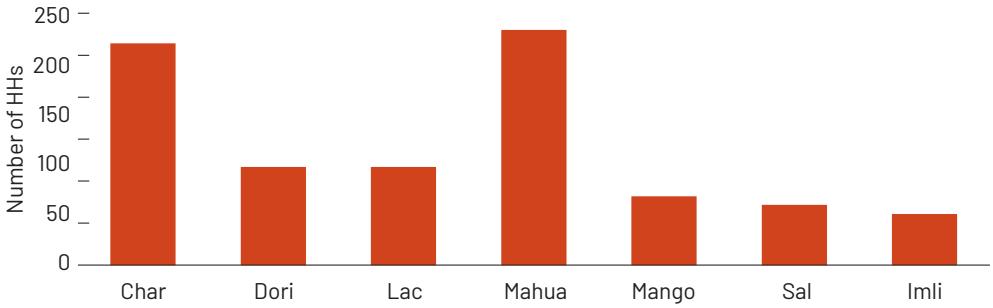
Alternative livelihoods

The following were the responses towards alternative livelihoods:

a. Asked what needed to be done to promote NTFPs, around 86 per cent of the respondents felt the need for more NTFP plantations. Others felt the need for an increase in rates for the NTFPs. Spreading of awareness and timely payments were some of the other responses.

b. 73 per cent of the total respondents felt that mahua should be promoted. Around 69 per cent felt that char should be promoted. The other NTFPs mentioned were dori, lac, sal and tamarind.

Graph 4.49: NTFPs that can be promoted in Korba



Survey findings– non-tendu-dependent villages

A total of 20 households were surveyed across two villages in Korba. Bata and Japeli were the two non-tendu villages surveyed. FGDs revealed that the people in these villages weren't engaged in tendu collection due to the distance between the villages and forests and/or the unavailability of tendu in nearby areas.

Demographic profile of non-tendu collectors

The survey aimed at understanding, besides the social aspects of a non-collector's life, their economic status. It sought to understand various aspects of income, landholding, and occupation. The following were the findings:

Non-tendu-collecting households all owned land, majorly earned between ₹10,000 and ₹20,000, and fared relatively well as per various socio-economic indicators

a. 70 per cent of the respondents were from the Scheduled Tribes (ST). The rest of the respondents were from the Artisan caste. As per the surveyors, this category of people is engaged in artisanal occupations and majorly captured those from the Other Backward Classes (OBC) category.

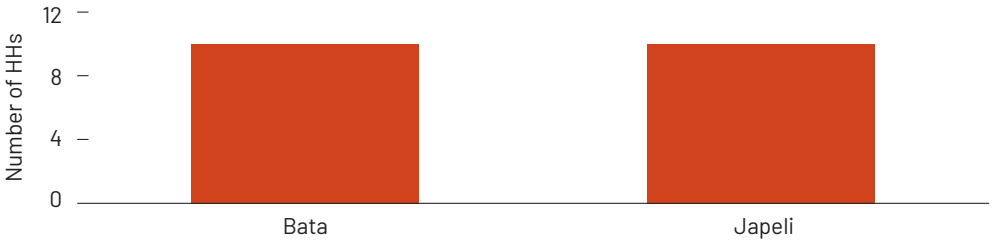
b. As per the survey, 80 per cent of the respondents had land between one and five acres. Only 10 per cent of the respondents had less than two acres of land.

c. All the respondents owned agricultural land. The average agricultural landholding among the respondents was two acres.

d. An analysis of the average income of the non-tendu-collecting households revealed that 45 per cent of the respondents earned between ₹10,000 and ₹20,000 per month. Only 15 per cent of the households earned below ₹5,000 per month.

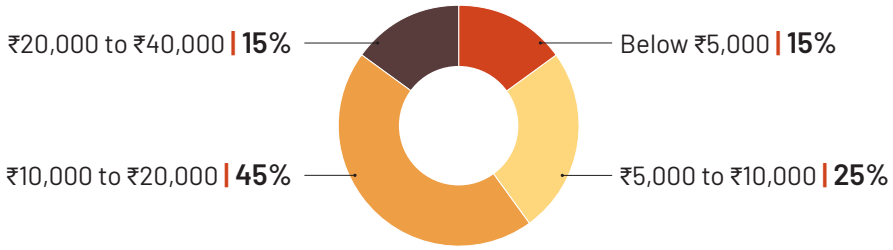
e. The data reveals that on an average households score around 30.9 on the Udai Pareekh scale which indicates that they are from the 'Middle Scale class'.

Graph 4.50: Village-wise number of surveys conducted in non-tendu villages in Korba



Graph 4.51: Landholding among non-collectors in Korba

Graph 4.52: Average monthly income among non-collectors in Korba



Most of the households primarily cultivators. There is also high dependence upon MNREGA for income generation

Occupation

The respondents in the two non-tendu-collecting villages are primarily engaged in the agricultural sector and are mostly engaged in cultivation. The following were the findings:

a. Most of the respondents are engaged in agriculture as their primary occupation. Around 95 per cent are primarily cultivators.

b. All the respondents are dependent upon rainfed irrigation.

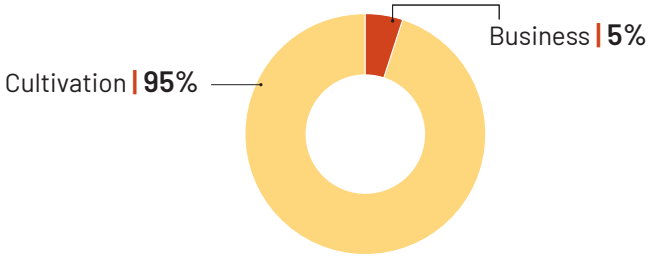
c. Paddy is the only crop that is grown by the households in a substantial quantity. 70 per cent of the respondents grow paddy primarily for subsistence, while the rest grow it for both subsistence and commercial purposes.

d. 25 per cent of the respondents were involved in cattle and livestock rearing. This is only for subsistence.

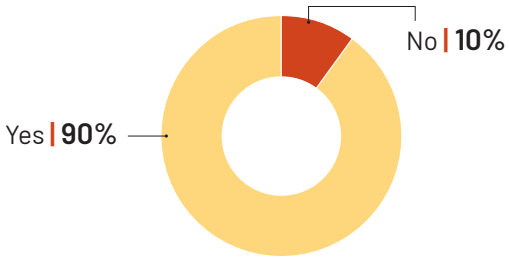
e. 90 per cent of the households have some degree of employment under MNREGA. This figure points to a heavy dependence upon MNREGA for income generation.

f. The average number of days the respondents (out of the eight who responded) got work under MNREGA was 17 days. The average income generated was ₹3,570 in a year.

Graph 4.53: Job type of non-collectors in Korba



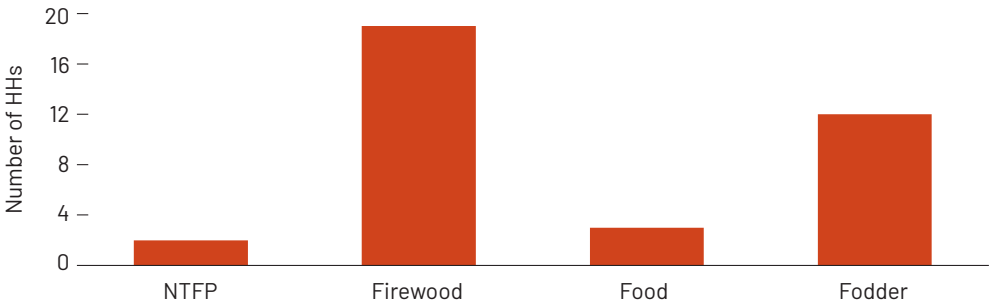
Graph 4.54: Employment under MNREGA among non-collectors in Korba



Dependence upon forests

Dependence upon forest produce is minimal in the non-tendu-dependent villages. Only two out of the 20 respondents were collecting NTFPs like mahua. The survey team reported that in these villages, only those who had trees growing on their land, like those of mahua, collected NTFPs. However, the dependence upon firewood is high in these villages, with 95 per cent of the respondents collecting firewood. 60 per cent of the respondents also depend upon the forests for fodder.

Graph 4.55: Dependence upon forest produce among non-collectors in Korba



Tendu-collecting households in Korba fare better, socio-economically, than those in Angul and Chandrapur

4.5.5 Key conclusions

Consistent with the findings in the previous two districts, the tendu-collecting households are primarily from the Scheduled Tribes category. However, the similarity ends there. In terms of landholding, monthly income and general socio-economic status, the tendu-collecting households in Korba are starkly different. These households have an average landholding of 1-5 acres, earn ₹5,000-10,000 and fall within the 'Middle Scale class' as per the Udai Pareekh socio-economic scale. While the non-tendu households in Korba aren't very different from the tendu-collecting households in terms of the monthly income category—both households falling primarily in the ₹5,000-10,000 monthly income bracket and in the 'Middle Scale class' category—the latter score lower on the socio-

economic scale. However, there is a noticeable difference in terms of landlessness. Around 11.8 per cent of the tendu collectors are landless as compared to the non-tendu collectors amongst whom none is landless.

The analysis reveals that the dependence upon NTFPs and forest produce in general is very high amongst the tendu-collecting households. The non-tendu-collecting households show minimal dependence upon NTFPs, with only a few collecting NTFPs grown on their own land. Tendu-collecting households earn around ₹5,633 per season on an average from tendu collection. However, NTFPs like mahua and lac generate more income annually than does tendu in the surveyed villages. The potential of NTFP-based livelihoods is huge in Chhattisgarh, as is evidenced by the high economic returns from NTFP collection. Going by Forest Department data, NTFPs like tamarind, mahua flower, palash flower and raili kosa are huge in the state in terms of production and revenue. This potential has been and can further be realised by the elaborate structure that has been set up the state for the promotion of the NTFP trade.

Tendu good source of supplementary income, but, does not address the underlying poverty among the collectors. Keeping in mind the adverse environmental and health impacts of tendu collection practices, there is a need to find alternatives to it

4.6 Conclusion

The dependence of communities upon tendu or what is also known as the 'green gold' is very high in the tendu-producing states of Maharashtra, Odisha and Chhattisgarh. Tendu-producing districts in the focus states are largely rural, highly dependent upon agriculture, have limited employment opportunities and have a populace that is multidimensionally poor. As reiterated earlier, around 76 districts where tendu is plucked fall in the 100 poorest districts as identified by the GOI.[40] With a good proportion of land under forests in these districts, and limited income generation avenues, the dependence upon forest produce is high. The tendu-dependent villages are no different. These are situated near the forests and are highly dependent upon the collection of forest produce. The dependence upon agriculture is high; however, agricultural labour is the mainstay of the people given the prevalence of landlessness and marginal landholdings amongst the people. The villages show a high dependence upon tendu collection and this is unsurprising given the easy and ready source of money that tendu collection affords.

However, the income generate while significant for many of these low-income households, is not commensurate with the revenue generation by the government. While the disbursal of bonuses by the various states offers good returns to the collectors, as per our conversations with the district CSOs, bonus disbursal is erratic and often does not reach the people. The findings reveal that despite the years of dependence upon tendu collection, the collecting households have low income, have limited opportunities to generate income and are deprived on many socio-economic levels. We see that while the non-tendu-dependent collectors fall in the low-income bracket as well, they fare much better in terms of various socio-economic parameters like education, landholding and housing.

It is pertinent to mention that the collection of NTFPs like mahua and bamboo yields better returns than tendu collection. However, the lack of support—infrastructural, resource and organisational—by the government prevents the full exploitation of these and other non-tendu NTFPs. The findings unequivocally highlight the potential of non-tendu NTFPs vis-à-vis tendu in tendu-and non-tendu-dependent villages and this should be taken note of. Thus, to sum up, tendu has not helped lift people out of poverty. The support to tendu by the government is lazy policymaking and seems to exist for the sole purpose of furthering the bidi trade. There is a need to promote NTFPs that can provide sustainable and long-term income-generating opportunities to tendu collectors. Only then will change come about.

Chapter 5

LESSONS ON MOVING AWAY FROM TENDU

As has been established through primary and secondary research, some of India's most marginalised forest dwellers collect tendu leaves to support their livelihoods. While earnings from tendu collection are small (about ₹5,300 on average per year), it is crucial supplementary income. The surveys of 1,147 tendu collectors from three tendu-collecting districts described in the previous chapter show this. These communities have depended on these frugal earnings and the donor-backed benefits (food grains, cooking oil, kerosene, even chappals) for over 60 years. Future policy recommendations that roll back tendu plucking must compensate for their loss of livelihood. This chapter presents the case study of three villages that have moved away from this practice in varying circumstances.

The first assessment is of Pachgaon village in Chandrapur district, Maharashtra. The village council (Gram Sabha) banned tendu leaf collection in 2013 as it saw the degradation of its forests. The second case study is from Bidar district in Karnataka. Here, the Government of Karnataka in 2018 imposed a ten-year ban because of excessive pruning, lopping, and burning of tendu trees. In Pachgaon, the intent to protect the local forests and find alternatives to tendu came from within the community. In Bidar, the government's directives forced the ban, and the community took little ownership of the decision.

Few instances of communities moving away from tendu collection on grounds of ecological conservation and health concerns. Pachgaon village and Bidar district good examples

5.1 Tendu collection ban in Pachgaon village, Maharashtra

Banning of tendu collection

Pachgaon is a small village, comprising about 75 households, in Gondpipri taluk of Chandrapur district of Maharashtra. The village provides the only example of voluntary renunciation of tendu leaf collection. The Gram Sabha in Pachgaon, the elected village-governing body, imposed a complete ban on tendu leaf collection in 2013. In 2006, the Government of India passed a landmark law called the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act. The Act bestows upon forest-dwelling communities the right to access and manage forest land and its resources. Vidarbha has been a frontrunner in conferring CFR rights to forest-dwelling communities.[1] Two factors motivated Pachgaon to take this historic step. First, the villagers took over management of forests under the community forest resources (CFR) rights. Second, the villagers were aware of the environmental degradation caused by tendu, and the health effects of bidis.[2]

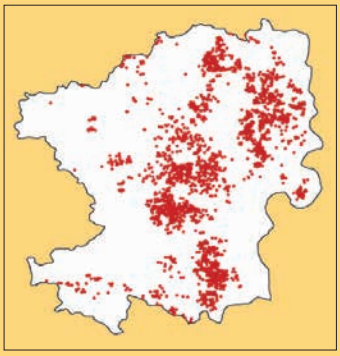
Pachgaon was the first village in Chandrapur district that laid claim to forest land under CFR. The village, through the support of local NGO Paryavaran Mitra, claimed CFR rights to around 1,006 hectares of forest land. Through a democratic process, the Gram Sabha defined rules to ensure sustainable management of the forest. They identified about 34 hectares of protected forest earmarked as sacred (called devrai). The Gram Sabha assigned clear responsibilities to community members for patrolling, fire management, accounts management, labour roster management, payments, dealing with contractors, etc.

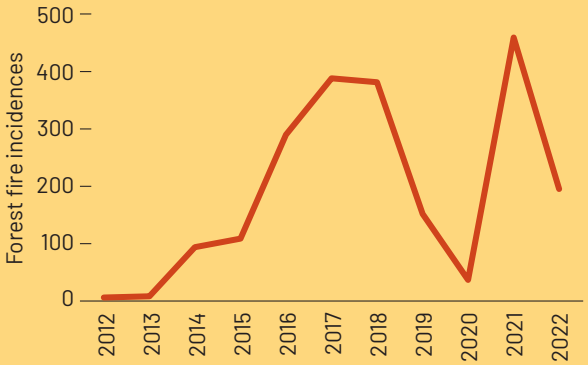
As part of its resolve to improve the local forest quality and rights backed by CFR rules, the Gram Sabha decided to ban tendu leaf collection. The villagers understood that the lopping of tendu leaves and the use of fire for a better leaf flush prevented the regeneration of the trees. There was also growing awareness that tendu was used to make bidi, and its consumption has devastating effects on health.

FOREST FIRES IN CHANDRAPUR

The ban on tendu leaf collection by the community in Pachgaon is a significant step towards forest conservation in light of the rising incidences of forest fire in Chandrapur district. An analysis of the satellite data shows that there have been 2,083 fire incidences in the district between January 2012 and July 2022.[3] These incidences have increased considerably since 2012, which had zero incidences, despite a major dip in 2019 and 2020. However, this was followed by a major surge in 2021 which recorded the highest number of fires that year.

Forest fire points in Chandrapur district in 2012-2022





Note: Data for 2022 is till July

A sustainable alternative NTFP for livelihood

The ban on collection and sale of tendu leaves by the Gram Sabha meant that a source of household revenue was forgone. Before 2012, the village earned ₹0.4-0.5 million per season from tendu collection during the lean agricultural season.[4]

To move out of tendu trade, the Gram Sabha focused on leveraging the abundant bamboo found in its forests. A comprehensive bamboo management plan was developed for sustainable extraction. The plan specified the quantity that could be harvested, techniques, season, and a quota of harvesting 50 bamboo per person.[5] An auction mechanism was adopted based on a pre-decided floor price. The proceeds of the sale were held in a dedicated account for payments of wages and other expenses which benefitted the villagers.

Degradation of forests through fires and excessive lopping and pruning due to tendu collection practices prompted Pachgaon village to voluntarily renounce tendu collection

The bamboo trade since has been flourishing in the village. About 70 per cent of the households are now engaged in bamboo collection. They are paid a fixed rate for each harvested bamboo on a weekly basis. About half the proceeds are used for payment of wages, while the rest is used for forest protection and village infrastructure development.

The Gram Sabha is exploring ways to include other NTFPs and add value through processing. This will help diversify the income of the villagers. Dependence on bamboo alone is risky due to the cyclical nature of the plant. In 2021, the village collected and sold around 50 quintals of mahua flower for about ₹50-80 per kg. An NTFP processing centre is being set up with the aid of Paryavaran Mitra which will process tendu fruit, mahua, and mushrooms.

Livelihood impact

Pachgaon, like most forest-dependent tribal villages of India, was struggling economically until the CFR rights came into force in 2012. Although agriculture is the primary source of employment, it is done on a small scale due to the lack of affordable inputs. The villagers

depended on forests for firewood and tendu, even as the Forest Department policed the area. Income from tendu collection remained limited, as contractors seldom shared profits with the collectors. Government employment schemes like MNREGA and Joint Forest Management (JFM) supported a limited number of people for a few days a year. Distress migration to neighbouring states like Andhra Pradesh and Karnataka was high.

Since the grant of CFR rights, the bamboo trade has generated significant revenues for households and the Gram Sabha. Between 2013 and 2022, 2,278,724 bamboo sticks (4-7 metres) and 118,376 bundles of bamboo (upto 2 metres) were collected and sold for around ₹33 million.

At present, 52 households depend on bamboo collection in the village. As per Paryavaran Mitra, the villagers earn ₹500 per day as wages for bamboo collection. The study survey reveals that the households in Pachgaon are earning around ₹28,422 per annum from the bamboo trade.

Bamboo collection has also contributed towards revenue generation for the Gram Sabha. The revenues are used for development activities and forest conservation. The village has been providing labour work to the Gram Sabha members in return for fixed daily wages. In 2016, the Gram Sabha paid a daily wage of ₹385 to its members, against a MNREGA wage of ₹192.[6]

At present, while the MNREGA wages have increased to ₹256 in the state, villagers are being paid ₹300 by the Gram Sabha for daily wages work which is largely work related to soil and water conservation.

Pachgaon witnessed a shift toward bamboo collection and sale. Between 2013 and 2022, Pachgaon procured and sold bamboo for around ₹33 million, which surpass gains from tendu collection

Table 5.1: Production and sale of bamboo in Pachgaon

Year (Jan-Dec)	Long bamboo sticks* (No.)	Bamboo bundles** (No)	Amount (₹)	VAT	GST	TCS
2013	29,628	8,100	635,208	31,760	-	16,674
2014	136,710	23,200	3,148,993	157,553	-	82,713
2015	222,000	12,450	5,813,999	290,695	-	122,119
2016	333,800	27,450	5,269,950	263,497	-	138,324
2017	86,785	5,700	1,312,350	66,688		32,999
2018	220,241	16,170	4,000,804	0	200,026	162,213
2019	138,440	10,240	4,601,384	0	228,857	114,428
2020	18,900	3,066	790,300	0	39,515	19,757.5
2021	939,090	8,500	2,201,050	0	110,051	55,025.5
2022	153,130	3,500	3,676,770	0	183,837	91,916.5
Total	2,278,724	118,376	31,450,808	810,193	762,286	836,169.5

*4-7 m; **upto 2 m
Source: Pachgaon Gram Sabha records

A small survey of ten former tendu collectors who moved to the bamboo trade in Pachgaon points to a significant improvement in earnings. These collectors earned an average of ₹3,755 from about 22 days of collection in a season prior to the ban. None of them collect tendu, nine harvest bamboo while four collect mahua. The average income from mahua collection is around ₹5,090 for 13 days of work, while bamboo collection brings ₹28,422 per season for an average of 51 days.

Table 5.2: Income contribution of various NTFPs in Pachgaon

Scenario	Type of NTFP	Days spent collecting NTFP	Average annual collection of NTFP	Average annual income generated (₹)	Number of members involved in collection
Pre-2012	Tendu leaf (bundles)	22	5,200	3,755	2-3
2022	Bamboo (kg)	52	25,611	28,422	2
	Mahua (kg)	14	149	5,094	1
	Tendu (bundles)	0	0	0	0

Note: Of the ten villagers surveyed, all were engaging in tendu collection prior to the ban; nine are now engaged in bamboo harvesting and four are engaged in mahua collection.

Ecological impact

Since the time tendu collection has stopped, the regeneration in tendu-collecting areas of the forest has improved. According to an assessment by Paryavaran Mitra, there has been an increase of around 40 per cent of tendu trees in one hectare of land. In the indicative survey of 10 villagers by the study, there was a consensus on the marked improvement in the quality and quantity of forest resources. Some respondents state that the quality of forests has improved so much that there have been instances of nearby villagers illicitly collecting tendu leaves from Pachgaon. In response, the Gram Sabha has begun patrolling of the forests. The village currently spends about ₹0.5-0.6 million per annum to check illicit extraction of NTFPs from the CFR area. This is roughly equivalent to the earnings from the tendu trade prior to the ban.[7]

5.2 Tendu collection ban in Bidar district, Karnataka

Banning of tendu collection

Bidar district in the northern part of Karnataka has a total recorded forest of 45,616 hectares (or 8.4 per cent of its total geographical area).[8] The district's forests fall under the Kalaburgi forest circle (which also covers the forest divisions of Raichur, Kalaburgi and Yadgir districts). These are dry scrub forests with some remnants of dry mixed deciduous. Tupra or tendu is a dominant tree species. Until a few years ago, Bidar supplied tendu leaves to bidi-producing industries in Telangana, Maharashtra, and Karnataka. However, in 2018, the Government of Karnataka imposed a ban on the extraction of tendu leaves from Bidar division for a ten-year period.[9] Based on the observations of Forest Department officials, a ban order was issued to stop destructive harvesting practices, including tree felling or excessive cutting of branches.

Regeneration of forests around Pachgaon post the ban. Ban on tendu collection in Bidar district for the same reason, but for 10 years only

Even historically, the working plans of the forest divisions have stressed the need for stronger conservation measures to reverse the rapid degradation of forests. The Working Plan of 2018-28 has observed that the presence of tree species such as Ficus, Diospyros and Buchanania lanzan suggest that the forests have reached secondary stage of succession. It acknowledged that the local forests were in various stages of degradation due to activities like excessive grazing, fire, lopping for fodder and fuel, timber and pole felling, etc. It stated that destructive harvesting methods like the felling of trees or cutting of branches to collect forest products should be prohibited. It also acknowledged that the excessive pruning and burning around tupra trees was leading to 'the death of the plant' and should be stopped.[10]

Income contribution of tendu

The reliance on forest produce in Bidar is not very high. It is primarily an agricultural district with 84 per cent of its geographical area under cultivation.[11] Agriculture and allied sectors, including farming, animal husbandry, forestry and fishing, contribute 26 per cent towards the district gross domestic product (GDP).[12] Industries contribute less than 23 per cent, while the service sector contributes 51 per cent.

Overall, the forest produce extraction from the Kalaburgi forest circle is low. The key NTFPs being extracted from the Bidar division included tendu leaves, tamarind fruits, mangoes, seetaphal, neem seeds, nerale fruits, chironji, cashew nuts and fodder grass. There are no exclusive plantations of NTFPs in the division. NTFPs like cashew, seetaphal, tamarind and neem have been planted by the Forest Department in the block plantations. A number of medicinal plants have also been planted recently under schemes such as Daivivana, Medicinal Plants Conservation Area (MPCA), etc.[13] Because of the overall limited availability of NTFPs, their sale is being conducted at the Village Forest Committee (VFC) level. The revenue collection from such sales is less than ₹10,000 in each VFC per annum.

Prior to the ban, Bidar division sold tendu leaves through a tender-cum-auction system.[14] The total collection of tendu leaves was around 35,336 standard bags (SBs) between the years 2009 and 2019 (up until the ban). There has been a notable decline in the collection of bags, going down to 3,358 SBs in 2018-19 from the 6,500 SBs collected in 2009-10. The revenue generated also dropped from ₹325,000 to ₹167,893.

Tendu collection in Bidar was banned despite being the highest-produced NTFP. Forest Department data shows that between 2015 and 2021, tendu production aggregated 240 tonnes, despite the ban in 2019. The second-highest NTFP production was only 24 tonnes of fruits.

Tendu collection ban in Bidar despite it being the largest NTFP collected. However, tendu collection was on the decline even before the ban due to degradation of forests

Table 5.3: Tendu trade in Bidar division (2009-2019)

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Collection (SBs)*	6,500	-	-	7,025	7,055	-	4,030	4,000	3,358	3,358
Collection rate (₹ per SB)	50	-	-	40	40	-	50	50	50	50
Revenue collected (in ₹)	325,000	405,000	-	281,000	281,786	-	201,500	201,572	167,893	167,893

*On an average 1 SB = 100,000 leaves
Source: Forest Division, Bidar

Table 5.4: Non-Timber Forest Produce production in Kalaburgi circle

NTFP	Production (2015-21)
Tendu leaves (tonnes)	240.8
Fruits (tonnes)	24.1
Amla (tonnes)	11
Dalchini leaves (tonnes)	15
Tamarind (tonnes)	12.8
Anona Squamosa, Citradora (Million rupees)	0.4

Source: Annual reports of Forest Department, Government of Karnataka

Impact on tendu collectors

The tendu leaf ban in Bidar prioritised ecological concerns over livelihood or economic ones. There was no plan or scheme to provide tendu collectors with an alternative source of income. This has led to discontent among the ex-collectors. Two focused group discussions conducted by the study with 12 ex-collectors in Nandi Bijalgaon and Gaganbid villages of the district point to a decline in their livelihood and their eagerness to recommence tendu leaf collection. The eagerness to recommence collection is due to the lack of alternative livelihoods and does not have to do with a lack of awareness of the adverse environmental practices used for the same.

Table 5:5: Observations from the ex-tendu collectors in Bidar

Economic condition	Primarily engaged as agricultural labourers, 40 per cent of the respondents are daily wage workers.
Income from tendu	Average of ₹6,316 and ₹8,433 per season was being made in Bijalgaon and Gaganbid villages, respectively.
Feedback on tendu ban	11 out of the 12 ex-collectors were unhappy as they lost a source of livelihood. They are quite eager to get back to tendu collection once the ban is lifted.
Alternative livelihoods	Half of the respondents are collecting NTFPs like bamboo and honey, but only for their subsistence.
Ecological impact	25 per cent of the respondents acknowledged that branches were lopped off for tendu collection, while 75 per cent acknowledged the use of fire for facilitating tendu collection.

5.3 Conclusion

The case studies of Pachgaon village and Bidar district are contrasting in their experience. They explicate how the story of the ban on tendu collection has taken very different trajectories. In Pachgaon, tendu collection provided a supplementary source of income for the villagers. Over the past decade, gains from bamboo collection have surpassed those from tendu collection. The bamboo collection has also played a huge role in stopping distress migration and contributed to revenue generation for the Gram Sabha. The study of Pachgaon is not only important for understanding the significance of developing alternatives to tendu collection, but also to recognise how decentralised institutions of governance and promotion of CFR can help promote sustainable management practices in forest resources. In contrast, the ban on tendu collection in Bidar forced collectors to depend upon frugal incomes from agricultural and daily wage schemes. They were unable to substitute the lost income from tendu and attribute this to the government's apathy and lack of support.

Successfully addressing ecological concerns through bans on tendu collection requires the provision of alternative livelihoods for the collectors

While in both cases environmental concerns played a major part in the implementation of the ban, the reception of this ban by the former tendu collectors has been varying. In Bidar, unlike in Pachgaon, the initiative to ban tendu collection was implemented by government and not by the people. The (former) tendu collectors in Pachgaon wanted a ban on it and are happy with the income generated through bamboo collection, whereas the (former) tendu collectors in Bidar are unhappy with the government's decision and would most likely get back to collection when the ban ends. Bidar is a case where the ban on tendu collection was promulgated without a comprehensive plan for livelihood substitution; in Pachgaon, a clear vision outlining gains to people and forests was kept central to their decision.

To conclude, emphasis on developing alternatives to tendu collection is needed before a ban is adopted. While there are NTFPs like bamboo that can be as lucrative as tendu, if not more, proper market structures need to be put in place to ensure their economic viability. Only then can such bans be made truly sustainable and just.

Chapter 6

STRATEGIES FOR TENDU-LINKED FIRE MITIGATION

This study uThis study using satellite data and modelling shows that there is widespread use of fire for tendu leaf collection and that there is a huge threat to the forests and the climate. The study finds that around 13,000 sq of forest land was burnt due to tendu-linked fires during the study period (2011-2021) in the three focus states. On extrapolating the data, our study finds that tendu-linked forest fires have potentially damaged around 60,000 sq km of forest land during the same period.

The overall scale and impact of forest fire occurrences in India, in general, is massive and even graver; around 37,000 sq km of forest area was burnt in the three focus states due to fires during the (study) period alone. While there are many punitive and non-punitive measures to deter the use of fire in forests, it seems that at the ground level, these measures have failed. While a ban on the setting of fires seems to be the solution to the intractable problem of forest fires, the issue is far more complex to address with such measures.

It is important to keep in mind that central to a comprehensive ban on the use of fire in forests are the livelihoods of the poorest of the poor. Roughly 90-100 million people live in areas of forest cover and depend on forests for their livelihoods. Many of the important goods and services that people obtain from forests, such as NTFPs and fodder, are generated or gathered through the use of fire. However, while there is a culture of fire usage among tendu-dependent communities, our study does not heap the burden of the spread of fires on forest-dwelling communities alone. There needs to a nuanced approach to tendu-linked forest fires.

Our study finds through survey that while the role of fires in tendu collection cannot be denied, the role of the contractors and traders in this needs closer examination. It is undeniable that the commercial pressures exerted upon the production of tendu and other NTFPs by the bidi industry has perpetuated the cycle of fire usage. The legal and illegal tendu traders, only to maximise profits and trade volumes, have created systems and scenarios at the village-level where fires are being used blatantly without any scientific evidence of improved produce quality and productively.

While various state governments have implemented bush-cutting to curb the use of forest fires, the use of fire continues to a huge extent. Moreover, the excessive practice of bush-cutting itself has been detrimental to the growth of the tendu tree.

To address this scenario, it is crucial to empower forest-dwelling communities and create alternative opportunities. More effective engagement of local communities, who are the primary forest users in India, is necessary. Forest fire management cannot be a top-down approach and cannot rely on punitive measures. Communities are at frontline of any forest fire suppression and management initiatives, and they should be an integral part of the forest fire management strategy, from knowledge generation, to policymaking, to the implementation of policies and strategies.

Provision of economic opportunities to lift tendu collectors out of poverty necessary to enable their transition away from tendu and related fire-usage practices

Community forest rights have enormous potential in this context. From Nepal to Pachgaon, community forest management has yielded enormous gains from the environmental perspective and needs to be promoted. Communities need to be able manage their forests and the natural resources in them to truly become protectors of their forests. Essentially, forest fire strategies need to ensure the delivery of resources that are necessary for communities while also reducing damaging and unmanaged fires.

However, the implementation of CFR rights is rather poor in India, and the need to address the harmful impact (environmental and health) of tendu collection practices is urgent. With the lopsided benefit to tendu collectors an added impetus, to address the associated forest fires challenge, it is important to create an environment for tendu collectors to move away such practices. While an all-out ban is not a possibility nor feasible, a gradual phase-out can be targeted. To this end, an economic environment needs to be developed for the collectors to move away from tendu collection. The study identifies four major pathways towards this end, and these are highlighted in the coming sections.

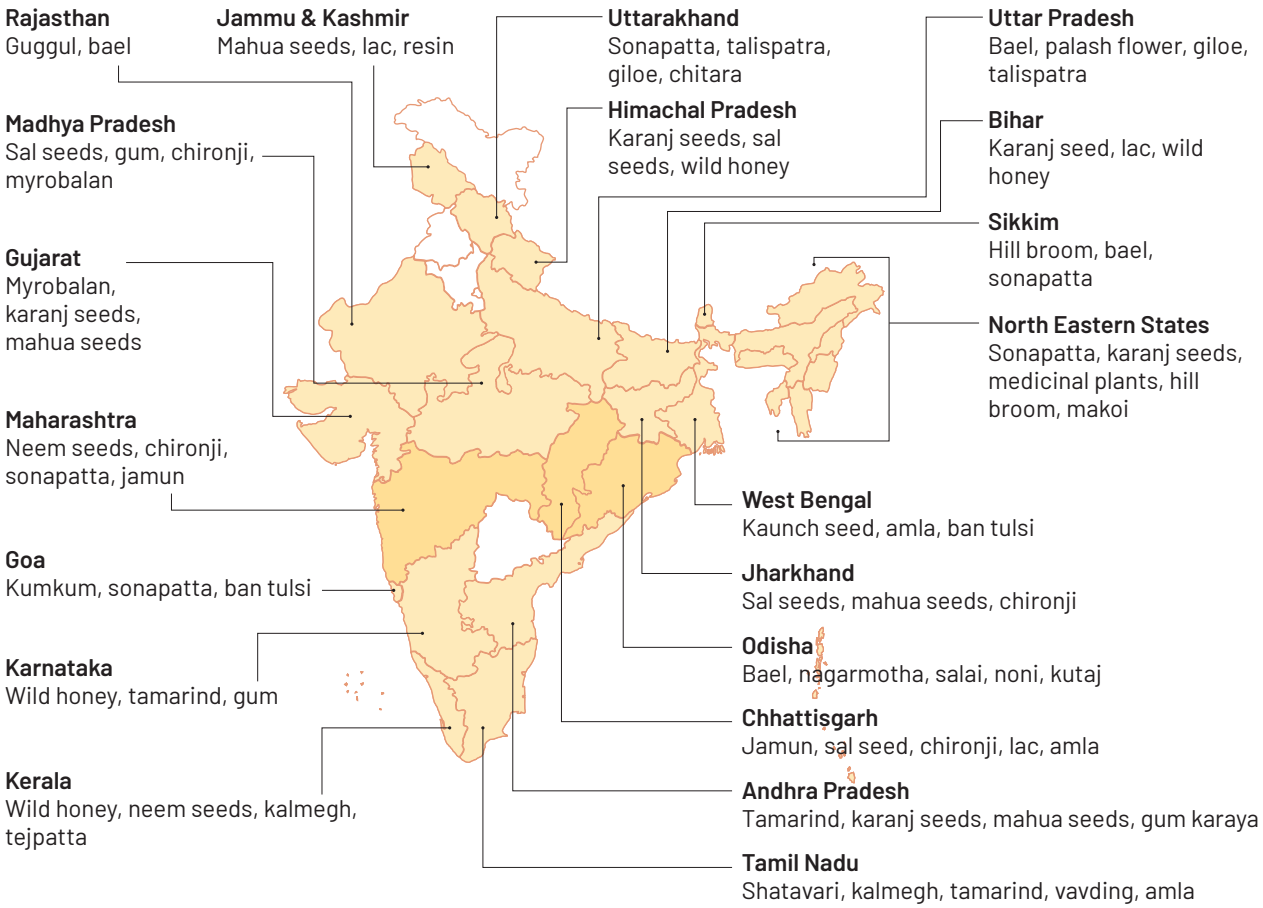
6.1 Developing forest-based alternative livelihoods

NTFPs include a broad range of products foraged from the forests. These include fruits, nuts, medicinal plants, gum, resins, essences, bamboo, rattans, palms, fibres, flosses, grasses, leaves, seeds, mushrooms, honey, lac, etc. They play an important role in the subsistence and cultural identity of India's indigenous population. An estimated 270 million people directly or indirectly depend on forest produce.[1] The collection, processing and trade of NTFPs contributes about $2.7 billion per annum. It accounts for 55 per cent of the total employment in the forestry sector.[2] NTFP collection is the third largest source of income for forest-based communities, after agriculture and daily wage labour, and income dependence varies from less than 5 per cent to over 60 per cent.

Despite this, NTFPs contribute minimally towards the socio-economic growth of the dependent population. One of the primary reasons is that the daily income from NTFP collection is often lower than the official minimum wage rate. NTFP collection is undertaken by communities due to lack of alternative employment and sources of income. But NTFPs have a huge potential to boost the rural economy if better market linkages, processing infrastructure for value addition, and sustainable harvesting protocols are put into place.

Most Indian states, including the tendu-producing states, have adequate availability of NTFPs which can be developed as an alternative to tendu. However, the framework for non-tendu NTFP promotion needs to be made more robust.

Map 6.1: State-wise availability of NTFPs



Source: Ministry of Tribal Affairs, Government of India

6.1.1 Current national framework for NFTP promotion

The existing policy scenario for NTFP regulation has evolved through several acts. These have partially addressed aspects of collection, ownership rights, benefit-sharing mechanisms, and marketing. The Indian Forest Act of 1927, while addressing the collection and trade of forest produce, with regards to collection, transit etc, does not use the term Non-Timber Forest Products. In 1988, the National Forest Policy, for the first time, focused on the importance of NTFPs. It emphasized that NTFPs should be "protected, improved and their production enhanced with due regard to generation of employment and income". The policy put great focus on regeneration, sustainable collection, and creating fair market arrangements. Later, the Panchayat Extension to Scheduled Areas Act (PESA), 1996, gave Gram Sabhas control of forests and ownership over NTFPs. Although the Act was a radical change to enhance tribal livelihoods, it failed to define 'minor forest produce' (MFP, as NTFP was labelled at the time). This narrowed down the scope for implementation of the Act. The definitional hurdle was overcome by another legislation, the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. This Act specified MFP to include all NTFPs of plant origin. It included bamboo, brush wood, stumps, cane, tussar, cocoons, honey, wax, lac, tendu leaves, medicinal plants and herbs, roots, tubers and the like.

In recent years, policy focus has shifted to regulating the NTFP markets in such a way as to ensure fair prices. In 2013, the Ministry of Tribal Affairs formulated a "mechanism for marketing of MFP through minimum support price (MSP) and development of value chain for MFP". The scheme aimed at ensuring a fair price for MFP gatherers while also maintaining the sustainability of the resource base. At present, 87 MFPs are covered under the MSP scheme.[3] The states have powers to fix the price 10 per cent above or below the MSP. As of now, there are 16 states that have successfully implemented the scheme through their procuring agencies.[4]

In 2018, a new national scheme was launched to improve tribal incomes through value addition of tribal products. The Prime Minister Van Dhan Yojana (PMVDY) under the Pradhan Mantri Janajatiya Vikas Mission (PMJVM) promotes livelihood enhancement of tribal communities, while providing adequate market access for forest produce. It is implemented through the Tribal Cooperative Marketing Development Federation of India (TRIFED). Through the scheme, Van Dhan Vikas Kendras (VDVKs) have been set up to act as primary procurement centres. These are managed by self-help groups which comprise at least 20 NTFP gatherers. As of August 2022, ₹4.8 billion had been sanctioned for setting up 3,225 VDVKs having 963,000 beneficiaries in 25 states and 3 UTs. Of these, 921 VDVKs are operational and have recorded a cumulative sale of ₹230 million.

6.1.2 State-level initiatives for NTFP promotion

As forests come under the Concurrent List of the Constitution, there are varying policies and schemes for NTFP promotion across states. These have evolved over the years to protect the rights of the tribal populations but have also proven to limit the development and promotion of non-tendu NTFP markets.

Promotion of NTFP-based (non-tendu) livelihoods necessary to ensure better returns to forest-dependent tendu collectors

Maharashtra: The regulation of NTFPs in Maharashtra started with the Bombay Forest Rules in 1942. The rules put conditional restrictions on movement of forest produce from or within any district of the state. Later, the Maharashtra Minor Forest Produce (Regulation and Trade), 1969, made provisions to regulate trade of certain minor forest produce by creating a state monopoly. The Maharashtra Forest Produce (Regulation of Trade of Tendu Leaves) Rules, 1969, focused particularly on the collection and disposal of tendu leaves. Subsequent acts and rules emphasised strengthening different aspects of NTFP trade, such as regulating the supply, improving tribal economic conditions, and transferring ownership. The Maharashtra Transfer of Ownership of Minor Forest Produce in the Scheduled Areas and Maharashtra Minor

Forest Produce (Regulation of Trade)(Amendment) Act, 1997, grants rights to the community to manage and extract forest resources. Tendu and Apta leaves continue to remain under state control, while for 33 NTFPs, the ownership rights lie with the Gram Sabhas; the rights to purchase are with The Tribal Development Corporation (TDC).

Tendu one of the few nationalised NTFPs in the three states. Detailed state-level policy framework that's in place to promote the tendu needed for other NTFPs as well

Table 6.1: List of major forest policies for NTFPs in Maharashtra

Policy/Law	Objectives for NTFPs
Bombay Forest Rules, 1942	Restriction on the movement of forest produce from or within any district of the state without a pass from the concerned authority
The Maharashtra Minor Forest Produce (Regulation and Trade) Act, 1969	The state government to constitute advisory committee every year for price fixation of forest produce; and the government was bound to purchase the forest produce at the fixed price
The Maharashtra Forest Produce (Regulation of Trade of Tendu Leaves) Rules, 1969	Introduction of state monopoly for tendu in order to check exploitation of labourers by contractors and pilferage of tendu leaves from government land
Maharashtra Minor Forest Produce (Regulation of Trade in Apta Leaves) Rules,1971	Introduction of state monopoly over apta leaves
The Maharashtra Supply of Forest Produce by Government (Revision of Agreements) Rules, 1982	State government to make an agreement to sell or supply any forest produce to any person
The Maharashtra Forest Development (Tax on Sale of Forest produce by Government or Forest Development Corporation) Act, 1983	Tax to be levied and collected by government on the sale of every forest produce
The Maharashtra Transfer of Ownership of Minor Forest Produce in the Scheduled Areas and Maharashtra Minor Forest Produce (Regulation of Trade)(Amendment) Act, 1997	The ownership of minor forest produce found on government lands in scheduled areas to be vested with the Panchayat and the Gram Sabha
Maharashtra State Forest Policy, 2008	Augmenting production of NTFPs to meet the daily domestic requirements of rural and tribal communities living in the vicinity of forests

Chhattisgarh: Further to the National Forest Policy of 1998, Chhattisgarh formulated the Chhattisgarh State Forest Policy in 2001. The objective of the policy was to conserve and promote sustainable use of NTFPs.[5] As per the provisions of the PESA 1996, the policy also aimed at endowing ownership rights of NTFPs on local communities. At present, the Chhattisgarh State Minor Forest Produce (Trading and Development) Cooperative Federation Limited (CGMFPFED) is the nodal agency for administration, marketing, and trading of NTFPs in the state. It also acts as the state procurement agency (SPA) and implements schemes for MSP and develops value chains.

NTFPs are divided into specified forest produce and non-specified forest produce. For specified forest produce, including tendu and gum, the state government (CGMFPFED) holds the monopoly to collect and sell.[6] The state does not have monopolistic control over the non-specified forest produce, which include sal seed, harra, lac and other NTFPs. CGMFPFED also manages and markets the non-specified products. At present, the state government has launched the One District One Product (ODOP) scheme under which NTFPs like mahua, harra and tamarind have been identified in several districts for value addition and marketing.

Table 6.2: List of major forest policies for NTFPs in Chhattisgarh

Policy/Law	Objectives for NTFPs
Chhattisgarh Tendu Patta (Vyapar Viniyaman) Adhiniyam, 1964	Gave the state monopoly control over the tendu trade
Chhattisgarh Tendu Patta (Vyapar Viniyaman) Niyamavali, 1966	Rules formulated to establish monopoly control over the trade of tendu
Chhattisgarh Van Upaj (Vyapar Viniyaman) Adhiniyam, 1969	Empowered the state government to make rules for disposal of certain forest produce such as gum, resin, sal and rosha grass
Chhattisgarh Forest Policy, 2001	Empowered the state to take appropriate measures through Chhattisgarh state MFP cooperative Federation for sustainable use and long-term conservation of MFPs within the state
Chhattisgarh Transit Forest Produce Rules, 2001	Establishes certain quantitative restrictions on transport, production and processing of specified forest produce

Odisha: With its vast forest resources, Odisha has promoted NTFPs through various state schemes at different times. Bamboo and kendu (or tendu) were among the first regulated NTFPs in the state. In the 1960s the state established the erstwhile Odisha Forest Corporation, now the Odisha Forest Development Corporation Limited (OFDC). OFDC's chief aim is to harvest and manage bamboo supply to paper mills at subsidised rates. The Odisha Timber and Other Forest Produce Transit Rules, 1980, provided directives on the collection of NTFPs by the Tribal Development Co-operative Corporation of Odisha Limited (TDCCOL). Similarly, the Orissa Forest Produce (Control of Trade) Act, 1981, created monopolistic state control for certain NTFPs with the intention of protecting the rights of the tribal community. The state created monopolies for all NTFPs by giving exclusive right of collection to TDCCOL, OFDC, cooperatives like Agency Marketing Co-operative Society (AMCS), joint sector companies like Utkal Forest Products Limited and other private business houses. With the coming of PESA and the NTFP policy of 2000, the state gave rights of NTFPs to gram panchayats. Contrary to this, the Orissa Gram Panchayats (Minor Forest Produce Administration) Rules, 2002, specified that priority be given to Vana Samrakshana Samithi (VSS) and its members to collect and trade NTFPs. Currently, the OFDC and TDCCOL purchase NTFPs in return of a fair price to the collectors.

Table 6.3: List of major forest policies for NTFPs in Odisha

Policy/Law	Objectives for NTFPs
The Orissa Kendu Leaves (Control of Trade) Act, 1961	Provided for the regulation of trade in kendu leaves by the creation of state monopoly
The Orissa Kendu Leaves (Control of Trade) Rules, 1962	Established monopoly in the kendu trade in the state
The Orissa Timber and Other Forest Produce Transit Rules, 1980	Ensured that all forest produce, with certain exceptions, in transit by land, rail or water shall be covered by a 'transit permit'
The Orissa Forest Produce (Control of Trade) Act, 1981	Provided for control and regulation of trade in certain forest produce by creation of state monopoly in such trade
The Orissa Forest Produce (Control of Trade) Rules, 1983	Established the control and regulation of trade in certain forest produce by the creation of state monopoly

Proper implementation of central and state-level polices needed if NTFP-based livelihoods are to be remunerative for forest-dependent communities

There are various national and state-level policies that concern the trade of tendu and other forest produce. At the national level, laws like the PESA and FRA empower the Gram Sabhas to collect and dispose of NTFPs in their areas. However, the implementation of these laws in the states is generally slow, with some variation across the states. While states like Maharashtra lead in terms of extending these rights to the Gram Sabhas, states like Odisha and Chhattisgarh are slower to do so. Further, while the MSP scheme for Minor Forest Produce is being implemented in all three focus states, a recent study showed that states like Odisha and Chhattisgarh fare poorly in the implementation of the MSP (for MFPs) scheme.[7] At the state level, out of the three focus states, only Chhattisgarh has a policy-backed organisational structure, i.e. the CGMFPFED, to facilitate the trade in non-tendu NTFPs. Thus, there is a need for specific policies backing the trade of NTFPs in these states, as well as a need for proper implementation of these schemes.

Ample scope for development of non-tendu NTFPs in the focus states. Vast untapped potential of other NTFPs due to absence of support

6.1.2 Availability of non-tendu NTFPs in key states

Promoting alternative livelihoods for tendu provides an opportunity to improve the economic status of communities while advancing sustainable forest management. Since major tendu collection states also harvest other NTFPs, it is important to analyse state policy structures to enable trade and marketing of the alternatives.

Maharashtra: Despite a variety of NTFPs that exist in Maharashtra's forests, there is disproportionate extraction of tendu and apta leaves. Both of these are nationalised NTFPs. Tendu leaf trade has continued to prosper under the rights regime as well, with around 104 CFR villages in Maharashtra estimated to have earned ₹98 million from the sale of tendu leaves annually.[8] The Maharashtra state forest working plan warns that unscientific extraction and excessive and repeated pruning will reduce tendu harvests, and also diminish fruit and seed production.

Bamboo trade is also significant, but other NTFPs such as mahua, gum, etc are not promoted on a large scale. Several NTFPs of value such as climbing palms, palash, and chironji remain untapped. The key challenges in case of bamboo and mahua are presented in Table 6.5, along with the state effort towards their promotion.

Table 6.4: Sale value of key NTFPs in Maharashtra

Items	Value (Million ₹)
Tendu and Apta leaves	384.77
Bamboo	48.11
Gum	1.63
Grass and grazing	1.15
Medicinal plants	0.38
Shikakai	0.14
Harda	0.02
Mahua flowers and Seeds	0.0
Other M.F.P.	4.49

Source: Forest Department, Government of Maharashtra, 2019-20

Table 6.5: Major NTFP species in Maharashtra

Species (common name)	Plant Type	Relative Abundance (%)
Calamus longisetus (climbing palm)	Shrub	46.4
Butea monosperma (Palash)	Tree	14.35
Pterocarpus marsupium (Vijaysar)	Tree	7.2
Acacia catechu (khair)	Tree	6.96
Buchanania lanzan (chironji)	Tree	6.53

Source: India State of Forest Report 2019

Table 6.6: Assessment of key NTFPs as tendu alternatives in Maharashtra

NTFP	Key challenges and gaps	Policy support	Recommendations
Bamboo	• Failure of the Bambusa Balcooa species of bamboo to improve incomes of the farmers in Chandrapur, Yavatmal and Nagpur districts • Lack of attention to processing and value-chain addition of bamboo • Information asymmetry of market demand among local communities	• Establishment of Bamboo Research and Training centre, Chandrapur; Establishment of Maharashtra Bamboo Development Board (MBDB) • Eight common facility centres across the state for making bamboo handicrafts; Establishment of Bamboo Promotion Foundation; Implementation of the Atal Bamboo Samruddhi Yojana by MBDB	• Capacity building and awareness generation workshops • Increased emphasis on bamboo plantations, especially on farmlands • Improved access to markets • Setting up of small-scale processing units
Mahua seeds (Madhuca indica)	• Absence of collective marketing for better returns • Lack of technology upgradation for mahua seed processing	The produce is covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• Development of cooperatives/ federations for better procurement and prices • Higher MSP rates for produce • R&D on the uses of mahua seeds and seed oil • Development of storage and processing facilities • Development of market linkages for the produce
Char	Labour intensive processing; lack of processing facilities	-	• Development of cooperatives/ federations for better procurement and prices • Introduction of MSP for the produce • Development of storage and processing facilities • Development of market linkages for the produce

Bamboo has huge potential in Maharashtra. Proper processing facilities, government support, and better market linkages needed to ensure viability

Table 6.6 continued

NTFP	Key challenges and gaps	Policy support	Recommendations
Tendu fruit	• Lack of value addition • Lack of markets	-	• R&D to help process tendu fruit • Development of cooperatives/ federations for better procurement and prices • Introduction of MSP for the produce • Development of storage and processing facilities • Development of market linkages for the produce
Wild honey	• Lack of processing • Use of labour-intensive methods of extraction	The produce is covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• Development of cooperatives/ federations for better procurement and better prices • Higher MSP for the produce. • Development of storage and processing facilities • Development of market linkages for the produce

Tendu fruit widely collected in Maharashtra and is mostly meant for domestic consumption. Tendu fruit can be promoted as an alternative to tendu leaves with the right support

Chhattisgarh: Chhattisgarh lists around 200 species of NTFPs that are found in its forests. It shows potential to enhance the livelihood of tribal communities. While tendu leaves contribute to the bulk of the NTFP revenue, others like imli, mahua flowers and seeds, chironji, chirota and kosa are also collected on a large scale. However, there is potential to scale up. Challenges in scaling up NTFPs in the state and the support required is summarised in Table 6.9.

Table 6.7: Production and value of major NTFPs in Chhattisgarh

Local name	Production (Quintal)	Value (Million ₹)
Imli	510,000	1300
Mahua flower	500,000	1300
Mahua seeds	300,000	800
Chironji	50,000	600
Chirota	700,000	500
Kusum lac	10,000	400
Mahul leaves	52,000	80
Palas lac	10,000	250
Kusum seed	27,000	40
Palas flower	22,000	30
Palas seeds	2,000	10

Source: Chhattisgarh State Minor Forest Produce Cooperative Federation

Table 6.8: Major NTFP species in Chhattisgarh

Species	Plant Type	Relative Abundance (%)
Shorea robusta-Sal	Tree	41.47
Nervilia aragoana-medicinal	Herb	15.43
Buchanania lanzan-chironji	Tree	7.95
Diospyros melanoxylon-tendu	Tree	7.79
Anogeissus latifolia- bakli, dhau, dhawa, dhawra	Tree	7.64

Source: India State of forest report 2019

Table 6.9: Assessment of key NTFPs as tendu alternatives in Chhattisgarh

NTFP	Key challenges and gaps	Policy support	Recommendations
Harra (terminalia chebula)	Lack of value addition and low-income support to cultivators	The produce is covered under Mechanism for Marketing of MFP through MSP and Development of Value Chain for MFP Scheme	• Higher MSP rates for the produce • Provision of processing facilities
Tassar	Lack of knowledge on disease and pest management; insufficient training facilities, uncertainty of remunerative returns[9]	'Raw material bank' established in Raigarh district to ensure economic support to tassar silk growers; Kosa Resham Yojana being implemented to promote forest-based industry	• Imparting training to people • Establishment of processing centres • Promotion of market linkages
Mahua seeds	Poor research and development for value addition of the produce; lack of developed market infrastructure and storage facilities; lack of suitable post-harvest processing techniques	The produce is covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• Higher MSP rates for the produce • R&D on the uses of mahua seeds and seed oil • Development of storage and processing facilities • Development of market linkages for the produce
Bamboo	Degradation of bamboo forests and lack of production of bamboo; untapped potential as construction material	Regulation and management of the produce through the National Bamboo Mission initiated by the central government.	• Increasing productivity of and restoring bamboo forests • Setting up of nurseries for production of bamboo • Promoting markets

Chhattisgarh one of the few states to facilitate the trade of minor forest produce through a dedicated federated structure

Table 6.9 continued

NTFP	Key challenges and gaps	Policy support	Recommendations
Sal	Declining produce due to erratic rain; inadequate procurement practices leading to stagnating collection prices[10]	The produce is covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• Development of cooperatives/ federations for better procurement and prices • Provision of storage and processing facilities • Development of market linkages for the produce • Higher MSP for the produce

Sal seed trade huge in Odisha and can easily surpass revenues from tendu. Proper processing structures and market linkages needed to ensure its viability

Odisha: Tendu is the most important NTFP in Odisha. It provides seasonal employment to 0.8 million in the state. The Forest Department acknowledges that other NTFPs can be potential alternatives for tendu. Sal is more abundant in the state, while mahua, chironji, kusum and bhela are also found widely. The Odisha government recognises the potential and has set up institutional mechanisms to foster their extraction and development. For example, the state promotes and manages bamboo trade on a large scale through the Odisha Bamboo Development Agency (OBDA). Key challenges with respect to scaling up key NTFPs in Odisha and the existing state support are summarised in Table 6.10.

Table 6.10: Major NTFP species in Odisha

Species	Plant Type	Relative Abundance (%)
Shorea robusta- Sal	Tree	57.91
Madhuca indica-mahua	Tree	17.11
Buchanania lanzan-chironji	Tree	12.48
Schleichera oleosa-kusum	Tree	3.02
Semecarpus anacardium- Bhela	Tree	2.98

Source: India State of Forest Report 2019

Table 6.11: Assessment of key NTFPs as tendu alternatives in Odisha

NTFP	Key challenges and gaps	Policy support	Recommendations
Bamboo	Lack of skill training for bamboo artisans; lack of market linkages; lack of processing centres; lack of bamboo availability	Nationalised NTFP brought under state control; Establishment of Odisha Bamboo Development Agency in 2006 under the National Bamboo Mission; establishment of FPOs, bamboo bazaars, skill development training programme under the same scheme; intercropping with other NTFPs	• Capacity building and awareness generation workshops • Increased emphasis on bamboo plantations, especially on farmlands • Improved access to markets • Setting up of small-scale processing units

Table 6.11 continued

NTFP	Key challenges and gaps	Policy support	Recommendations
Sal seed	Low procurement due to pre-monsoon rains; collection only through operationally profitable areas[11]; lack of storage facilities	Nationalised NTFP brought under state control; Establishment of 3 sal leaf clusters in Baripada, Rairangpur and Karanjia under OFSDP; Produce is covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• Development of cooperatives/ federations for better procurement and prices • Provision of storage and processing facilities • Development of market linkages for the produce
Mahua seeds	Poor research and development for value addition of the produce; lack of developed market infrastructure and storage facilities; lack of suitable post-harvest processing techniques	The produce is covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• R&D on the uses of mahua seeds and seed oil • Development of storage and processing facilities • Development of market linkages for the produce
Tamarind fruit	Low prices for primary producers and problem of middlemen; sometimes barter system with low-value items resulting in major loss for cultivators; non-functionality of private leaseholders	Ownership rights given to panchayats through PESA scheme; Produce covered under Mechanism for Marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and Development of Value Chain for MFP Scheme	• Development of cooperatives/ federations for better procurement and prices • Development of market linkages for the produce • Development of processing facilities

Mahua widely collected in the three states. Mahua seed collection can be promoted instead of mahua flowers given the ecological impact of the latter

6.1.3 Building schemes for promoting alternatives

There are NTFP alternatives to tendu in tendu-producing states which can provide durable and often higher income. An upsurge in demand for natural products, both in the domestic and international markets offer opportunities for several such products. To build an alternative trade for NTFPs needs additional policies and mechanisms to build efficient market linkages for collectors. The new mechanisms would need to be built on the principles of participatory forest management, wherein the state only provides initial handholding support. The Gram Sabhas through village enterprises can directly engage in trade. PMVDY provides an important model in this context. Special schemes build upon government programmes like PMVDY and these can be designed for tendu villages to explore and promote non-tendu NTFPs and provide value addition through processing.

6.2 Developing agriculture and allied sector-based livelihoods

Agricultural sector mainstay of the collectors. To facilitate transition away from tendu and to alleviate poverty among the collectors, the sector needs to be promoted

Tendu leaf collectors are primarily dependent upon agriculture for their livelihood.[12] During the lean agricultural season in summer, they collect tendu leaves. The study survey findings confirm this. Over 90 per cent of the collectors surveyed in tendu-producing villages in the districts of Chandrapur, Angul and Korba depend on agriculture. These collectors are also engaged as agricultural labour, as they have small and marginal landholdings. Moreover, agriculture is characterised by a huge dependence upon rainfed irrigation in the surveyed villages.

Given the large dependence on agriculture, investing in and boosting agricultural output will be important to help collectors move away from tendu collection. State and central-level schemes for agriculture and its allied sectors need to be leveraged to support the collectors.

Table 6.12: Major schemes/projects to support agriculture and allied sectors in focus states

Scheme	Central/ State	Year of launch	Objective
Krishak Samagra Vikas Yojana	Chhattisgarh	2007	Among other objectives, the aim is to ensure provision of updated agricultural technology and seeds at reasonable prices to farmers
Krishi Shramiko Vikas Yojana	Chhattisgarh	2013	To ensure the ease with which agricultural workers carry out their work through the provision of agricultural implements
Mission for Integrated Development of Horticulture (MIDH)	Central	2014-15	Centrally sponsored scheme for the holistic development of horticulture and doubling of farmers' income
Rashtriya Krishi Vikas Yojana (RKVY)	Central	2014-15	Initiated to boost investments and productivity in agriculture and allied sectors; provides states with flexibility and autonomy to undertake various agriculture projects
National Livestock Mission	Central	2014	The focus is on entrepreneurship development and breed improvement in poultry, sheep, goat and piggery including feed and fodder development
Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)	Central	2015	To ensure access to some means of protective irrigation to all agricultural farms in the country
Pradhan Mantri Fasal Bima Yojana (PMFBY)	Central	2016	To provide comprehensive crop insurance coverage from pre-sowing to post-harvest losses against non-preventable natural risks
Pradhan Mantri Kisan SAMPADA Yojana	Central	2017	It is a comprehensive scheme with the aim of creating modern infrastructure with efficient supply chain management systems. It focuses on doubling farmers' income and to create employment potential in rural areas

Table 6.12 continued

Scheme	Central/ State	Year of launch	Objective
Krishonnati Yojana	Central	2017	Aims at enhancing agricultural production, productivity and returns
KALIA	Odisha	2018	The aim is to accelerate agricultural prosperity and reduce poverty in the state
Nanaji Dekhmukh Agriculture Sanjeevani Yojana	Maharashtra	2018	To promote climate flexible and adaptable agricultural practices
Agriculture Infrastructure Fund	Central	2020	To mobilise a medium-long-term debt-financing facility for investment in viable projects relating to post-harvest management, Infrastructure and community-farming assets through incentives and financial support
Restructured Weather Based Horticulture Insurance Scheme	Maharashtra	2020	To offer financial support to farmers who have suffered a loss due to rain and hailstorm
Farmer's Welfare and Innovative projects	Odisha	2022	More inclusive and all-round development in agriculture and welfare of the farmers of the state
Modified Interest Subvention Scheme	Central	2022	Farmers are provided with 3% additional interest subvention on short-term loans. The objective is to provide relief to farmers in times of natural calamity
Price Support Scheme	Central	-	To protect farmers from economic loss. When prices of commodities fall below the MSP, state and central notified procurement nodal agencies purchase commodities directly from farmers at MSP under specified FAQ (Fair Average Quality)

Marginal landholdings and inadequate returns make agriculture unprofitable. Urgent need to boost land and labour productivity

A large number of schemes have been implemented to provide support, to improve productivity and for the welfare of farmers through the provision of remunerative prices, credit facilities, insurance, implements, seeds, irrigation facilities and infrastructure development. Despite the multitude of schemes in place to increase agricultural and labour productivity, the farmer's situation has not drastically improved in many areas. While schemes like the MIDH and the NFSM have been successful, gaps in other initiatives must be addressed.[13] While a lack of adequate budget and dedicated implementing agencies. has and will continue to plague the policy climate in India, the lack of convergence of various schemes and initiatives in the sector is an oversight that needs to be addressed. Thus, convergence between the various national and state-level schemes as well as convergence between various government departments, institutes and CSOs is necessary to ensure that initiatives achieve the desired results and benefit the targeted audience.

There is a need to boost productivity of small and marginal landholdings not only to increase economic earnings, but also to ensure food and nutritional security. Also, a robust post-harvest management system needs to be developed to leverage the potential of the sector. To this end, the agro-processing sector needs to be promoted. In India, only about three per cent of the workforce is engaged in this sector, revealing the vast potential for expansion.[14] However, once properly developed the returns from the agricultural sector can be boosted tremendously. Concomitantly, development of infrastructure at the farmgate and pre-processing facilities, which are linked to packhouses and cold storages, is critical in linking farmers to the markets.

A special package for tendu-producing villages can be designed that brings together all available central and relevant state government agricultural schemes. This can be offered to villages as an incentive to move away from tendu leaf collection and focus instead on agriculture and agro-processing.

Plethora of schemes to promote agriculture and its allied sectors at the central and state levels. Need for better convergence and implementation

6.3 Leveraging livelihood support schemes

Around 65 per cent of India's population is rural and largely dependent upon agriculture to make ends meet.[15] However, this dependence is characterised by a struggle to earn enough from farm-related activities and is evidenced by the high poverty levels, as much as 32.7 per cent in these areas.[16] Tendu-producing states are no different. An analysis of the surveyed tendu-producing districts reveals that they are largely rural and multidimensional poverty in them is as high as 44 per cent. Agriculture is the mainstay of the collectors; however, the returns are marginal, there is high prevalence of landlessness and lack of adequate economic opportunities. Landlessness was found to be around 60 per cent, 35.9 per cent and 11.8 per cent among surveyed collectors in Chandrapur, Angul and Korba, respectively. This also means that engagement as casual labour is high, wherein their economic situation is precarious.

There is thus an urgent requirement to formulate new or leverage existing livelihood support schemes to ensure the economic security of tendu collectors. At present, there are many schemes that are being implemented at the central and state level to offer livelihood support to the rural poor. Livelihood programmes/schemes play an important role in alleviating rural poverty and enhancing economic productivity. While schemes like those for MSP help provide price security, schemes like Micro and Small Enterprises Cluster Development Programme (MSE-CDP) and NRLM lay stress upon the integrated development of poor communities. Further, initiatives like Mission Antyodaya and Pradhan Mantri Adi Adarsh Gram Yojana (PMAAGY) acknowledge and place emphasis on the importance of convergence to bring about the holistic development of the rural poor. Major ongoing schemes are mapped below in Table 6.13.

Table 6.13: Major schemes/programmes/funds to enhance livelihoods of rural poor in focus states

Schemes/ Programmes	Year	Central/ State	Objective
Special Central Assistance to Scheduled Castes Sub-Plan	1980	Central	The scheme supports development programmes relevant for economic development of Scheduled Castes living below the poverty line
Joint Forest Management Plan	1988	Central	Along with the protection and development of forests, the aim is to fulfil the forest-based needs of the local population like small timber, minor forest produce, fuel wood, leaves, grass, fodder, etc.
MNREGA	2006	Central	It is aimed at providing at least 100 days of guaranteed wage employment in a fiscal year to every rural household whose adult members volunteer to do unskilled manual work
Prime Minister Employment Generation Programme (PMEGP)	2008	Central	To facilitate generation of employment opportunities for unemployed youth across the country by assisting in setting up of micro-enterprises in non-farm sector
Compensatory Afforestation Fund Management and Planning Authority (CAMPA)	2008	Central	Compensatory Afforestation Fund Management and Planning Authority (CAMPA) are meant To promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses
Scheme for Development of Primitive Vulnerable Tribal Groups (PVTGs)	2008	Central	Aims at planning for the socio-economic development of PVTGs in a comprehensive manner
NRLM	2010	Central	To promote sustainable livelihoods for the poor and is intended to facilitate (i) Access to formal credit; (ii) Support for diversification and strengthening of livelihoods; (iii) Access to entitlements and public services
Micro and Small Enterprises Cluster Development Programme (MSE-CDP)	2011	Central	To support the sustainability and growth of MSEs by addressing common issues such as improvement of technology, skills and quality, market access, access to capital, etc.
Odisha Tribal Empowerment & Livelihoods Programme Plus	2011	Odisha	To improve the quality of life of tribal households through livelihood support and food security. Includes the sustainable exploitation of natural resources and off-farm/non-farm enterprise development

Prevalence of landlessness and lack of income-generation opportunities among tendu collectors characterise their marginalisation. Need for livelihood support schemes for poverty alleviation

Table 6.13 continued

Schemes/ Programmes	Year	Central/ State	Objective
Marketing of Minor Forest Produce (MFP) Through Minimum Support Price (MSP) and Development of Value Chain for MFP	2013-14	Central	To ensure fair returns to Minor Forest Produce (MFP) gatherers through Minimum Support Price (MSP) for identified MFP along with necessary infrastructure at local level
Institutional support for development and marketing of tribal products/produce	2014	Central	To create institutions for the Scheduled Tribes to support marketing and development of activities they depend on for their livelihood
Mission Antyodaya	2017-18	Central	The aim is to ensure optimum use of resources through the convergence of various schemes that address multiple deprivations of poverty, making gram panchayat the hub of a development plan
Pradhan Mantri Adi Adarsh Gram Yojana (PMAAGY)	2021	Central	It aims at achieving the integrated socio-economic development of selected villages (with a significant tribal population) through the convergence approach
Production Linked Incentive Scheme for Food Processing Industry	2021	Central	It aims at promoting Indian brands of food products, increasing employment opportunities for off-farm jobs, ensuring remunerative prices of farm produce and higher income to farmers. It targets cooperatives, MSMEs and firms
Ama Jangala Yojana	2021	Odisha	To promote sustainable forest management and provide alternative livelihoods for forest fringe communities
CG Indira Van Mitan Yojana	2021	Chhattisgarh	The aim is to make the forest-dwellers of the state self-reliant by organising the youth in 10,000 villages to help promote self-employment in the forest-based sector
Dr. Shyamaprasad Mukherji Jan Van Vikas Yojana	2022	Maharashtra	To bring about the integrated development of villages, to reduce people's dependence upon forests, to create alternative livelihoods and to improve forest management

Rural livelihood programmes can reduce vulnerability to poverty. Need for better implementation and covergence of schemes for real impact

Livelihood insecurity remains a prime concern for Indian states. Despite a plethora of employment-generating schemes by the Centre and the states, there has been little improvement in the status of the poor and marginalised in India. Tendu-dependent families have an overwhelming dependence on the marginal returns. They continue to struggle to make ends meet even 50 years after nationalisation of NTFPs. The lack of new income-generating opportunities and easy access to tendu makes tendu a good option. Tendu offers a short-term solution for gainful employment. Investments to generate long-term employment remain absent.

While it is hard to comprehensively assess whether rural livelihood programmes can reduce vulnerability to poverty, evidence points to the limited success of livelihood support programmes. A study estimated that the households which participated in

livelihood programmes in eastern India showed at least a 3 per cent reduction in their vulnerability to poverty.[17] Schemes like MNREGA and the Odisha Rural Livelihood Mission have also had a positive impact on the lives of rural poor.[18,19] In the case of MNREGA, while there is some evidence of it alleviating the burden of outstanding debt, no state except Tripura, Mizoram and Manipur could provide even one-third of the 100 days of employment assured for every household. The study analysis shows that in the tendu-producing districts the average number of days that MNREGA generated was a mere 35. Thus, livelihood programmes if properly implemented can help alleviate poverty in tendu-producing areas.

There are many schemes and funds to promote forest-based, agricultural, and other livelihoods. Though well-intentioned, these schemes on an individual level are often sub-optimal. This prompts the need for implementation of these schemes collectively. This convergence would not only ensure a sufficient resource base but would also ensure a multi-pronged approach to the alleviation of poverty among tendu collectors.

LEVERAGING CAMPA, DMF AND OTHER FUNDS FOR LIVELIHOOD GENERATION

CAMPA or the Compensatory Afforestation Fund Management and Planning Authority is meant to promote afforestation and regeneration activities to compensate for the diversion of forest land for non-forest activities. Despite the sizeable amount accruing to the fund due to diversion of forest land, CAMPA has not benefited forest-dependent communities in the manner that it should have.[1] Despite this, the fund holds huge potential and should be used appropriately to generate forest-based livelihoods.

In this context, the 2023-24 budget of India holds great promise with regard to environmental conservation and the generation of livelihoods. The government expressed its desire to launch 'Mangrove Initiative for Shoreline Habitats and Tangible Incomes (MISHTI)', an initiative that will focus on mangrove plantations through convergence with MNREGS, CAMPA and other funds. Further, the government announced a scheme for wetland conservation, Amrit Dharohar, which along with conservation needs prioritises the generation of income for local communities.[2]

Besides CAMPA, the DMF or District Mineral Foundation funds are meant to develop mining-affected areas and hold huge potential for generation of forest-based livelihoods in mining-affected areas. For instance, the move to link TRIFED's Van Dhan Vikas scheme with the DMF can be leveraged to support tendu collectors in DMF areas.[3]

Thus, funds like DMF, CAMPA and MNREGA. should be harnessed to uplift the economic condition of tendu collectors and other forest-dependent communities.

1. Asian Centre for Human Rights. (2022). India: Compensatory Afforestation Program evicts more Tribals during COVID-19. https://www.iwgia.org/en/documents-and-publications/documents/publications-pdfs/english-publications/607-achr-compensatory-afforestation-evicts-tribals-covid-report-2022-eng/file.html
2. Padma, T.V. (2023). India budgets for mangroves and wetlands. Mongabay. https://india.mongabay.com/2023/02/india-budgets-for-mangroves-and-wetlands/
3. Ministry of Tribal Affairs. (2021, 16 April). Van Dhan Vikas Yojana – Promoting and backing tribal entrepreneurship. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1712326

Many schemes and funds to promote forest-based, agricultural, and other livelihoods. However, impact often sub-optimal. Overarching scheme can be designed specifically for tendu collectors

6.4 Exploring Payment for Ecosystem Services and carbon markets

PES

Payment for Ecosystem Services (PES) is an effective market mechanism for conservation of nature, wherein beneficiaries of the ecosystem service make payments to the providers. The mechanism is designed to ensure regular flow of services from an ecosystem in exchange of an economic value, and often drives behavioural shifts that are necessary to preserve natural resources. The concept gained international recognition through the Kyoto Protocol and the Reducing Emissions from Deforestation and Forest Degradation (REDD+) framework. The Clean Development Mechanism (CDM) under the Kyoto Protocol is an example of an international PES mechanism wherein polluters in developed countries were able to pay for carbon sequestering projects in developing countries.

In most cases, PES options are available for services like carbon sequestering, biodiversity conservation, and watershed management and protection. These include public schemes, market-based schemes as well as self-organised schemes. For successful implementation of the model, it is vital that there are financing mechanisms in place that gather and distribute funds from beneficiaries. The novel paradigm of PES offers promising prospects for 'contractual conservation', examples of which can be found globally.

Ecuador has several examples of Payment for Ecosystem Services. The focus of PES schemes in Ecuador is to build a decentralised environment payment system at the local level, without government support and coordination. One such scheme was initiated in 2000 in the Ecuadorian region of Pimampiro. The scheme was part of the larger forest community plan to increase the quality of the water supplied in the town of Pimampiro. Through the scheme, a 20 per cent increase of water usage charge was imposed in the town which was compensated to the upstream landowners located in the area of municipality water intake pipe.[20] Through the scheme, there were significant improvements in the water quality and supply to Pimampiro, majorly because of infrastructure improvements undertaken by the municipality.

In the Indian context, similar examples can be found. The preservation of Kuhan reservoirs in the Kangra district of Himanchal Pradesh is a case in point. The PES scheme in this case entailed a formal agreement between two villages: Kuhan and Ooch. In order to prevent silting of reservoirs and dams in downstream Kuhan, grazing was banned in Ooch (which caused the silting) for eight years on a four-hectare common land between the villages. The land was instead planted with fruit trees, fodder bearing grass, bamboo and elephant grass, the cost of which was borne by the beneficiaries of Kuhan village. Kuhan is a successful example under PES, albeit at a small scale. It also reinstates the credibility of implementable buyer-seller agreements for mutual benefit and use of environmental services.

Globally, there are around 550 active PES programmes with an estimated annual transaction of around US$36–42 billion.[21] Ecological systems are complex, and have challenges that can be dealt with if strong institutional and financial mechanisms are in place. PES schemes provide such opportunity to enhance ecosystem capacity for sustainable development. However, these schemes can have several issues, including information asymmetry between buyer and seller; lack of technical skills for implementation; fragmented legal framework; and policy barriers. The schemes, nevertheless, have proved to be effective market arrangements to conserve natural resources and enhance the quality of services provided by the ecosystem.

Payment for Ecosystem Services can prove to be an effective mechanism in promoting conservation of nature as well as ensuring economic benefits for the collectors

Carbon markets

Two types of carbon markets exist: compliance and voluntary markets. The compliance market is used by companies and governments to offset their GHG emissions to meet their legal obligations. A good example is the EU's Emissions Trading Scheme (EU-ETS)[22] and California's cap-and-trade program[23]. The voluntary market, on the other hand, is used by private entities to meet their self-declared commitments. Government-driven compliance and voluntary markets are a significant source of forest carbon funding. There are a few instances of national-level voluntary markets for forest carbon finance like the United Kingdom Woodland Carbon code.[24]

The carbon market in India is overwhelmingly dominated by the offset projects under international carbon markets, especially Clean Development Mechanism (CDM) projects. In fact, India is the leading country in generating CDM credits from Afforestation and Reforestation projects (AR-CDM). But lately, the voluntary carbon market has also started to develop. Between 2010 and June 2022, India issued 35.94 million carbon credits, which constitute nearly 17 per cent of all voluntary carbon market credits issued globally.[25] In Asia, China and India have generally been leaders in generating offsets. However, a majority of the offsets are from wind-based projects and comprised around 91 per cent of total transactions in 2015.[26]

There are many projects in forest protection that are generating carbon credits for the voluntary carbon market. In the Great Himalayan National Park, communities are paid ₹5,000 annually if no fires occur in the areas they patrol, but there is no formal regulatory mechanism. In this case, the private sector was ready to pay for these services as it made their access to resources easier.[27] A voluntary carbon market project is currently underway in the Pench Tiger Reserve, Maharashtra, Dudhwa Tiger Reserve, Uttar Pradesh, and Periyar Tiger Reserve, Kerala, by TERI.[28] The aim is to generate finance to use it for community development and biodiversity conservation activities. This will help enhance carbon sequestration and reduce pressure on forests from the unsustainable collection of fuelwood through sustainable fuelwood management and exploration of energy-efficient technologies.

There is currently one large-scale REDD+ project in India that delivers both carbon and water services. This is situated in the Khasi hills of Meghalaya where 62 villages have come together to protect their forests and to sequester carbon through natural regeneration. The communities have, through the reduction of fuelwood harvesting and slash-and-burn farming, brought down the incidence of forest fires in the region. In 2013, the village federation received carbon credits for roughly 22,000 tons, which were sold for US$6-7/ton (₹495- ₹578).[29]

India's domestic carbon market is poised to develop further with the Energy Conservation (Amendment) Act of 2022. This act provides the legal basis for the development of the domestic carbon market, including the establishment of a voluntary carbon credit trading scheme.[30] Overall, there is a potential to explore the carbon market to reduce forest fires and other ecological impacts from tendu collection. But a sustainable implementation model will have to be devised to tap into the carbon markets to fund village-level projects that can help communities transition away from tendu leaf collection.

While still nascent in India, carbon markets can help accrue economic benefits to tendu collectors and support transition away from tendu collection

Finally, while there are several pathways to bring about a transition towards sustainable livelihoods, which involve myriad stakeholders ranging from government officials to civil society organisations and tendu collectors, there is considerable overlap and not enough synergy. There is a clear need to bridge the gap between these stakeholders to bring out the desired outcome. Some of the key stakeholders and the roles they must perform are outlined in the table below.

Table 6.14: Role of relevant stakeholders

Stakeholder	Role
Ministry of Environment, Forests and Climate Change (MoEFCC); state and district Forest Departments and Forest Development Corporations	• Prioritising policy and governance reforms in the forestry sector to promote conservation with a focus on forest fire management • Bringing about policy and governance reforms to ensure the development of forest-based livelihoods • Development and implementation of policies and programmes to promote forest-based livelihoods and conservation • Implementation of good forest fire management and conservation practices with the support of local communities
National Biodiversity Authority and State Biodiversity Boards	• Advising the government with regard to the conservation of biodiversity—especially in the context of forest fires—and benefit-sharing with communities • Technical support to state and district governments with regard to benefit-sharing and support to forest-dependent communities
Forest Survey of India	• Improving research and dissemination with regard to forests, carbon stocks and emissions, forest fires, Non-Timber Forest Products, etc.
ICFRE, IGNFA, IIFM and similar organisations	• Focus on research and dissemination on issues of forest fire management, carbon stocks and emissions, conservation, forest-based products and sustainable usage • Increased technical assistance and support to states, forest-based industries, etc.
Ministry of Agriculture Cooperation and Farmers Welfare, Ministry of Food Processing Industries and Ministry of Fisheries, Animal Husbandry and Dairying; state and district-level departments	• Prioritising policy and governance reforms in the agriculture and allied sectors to improve the economic condition of the tendu collectors who are primarily dependent upon it • Implementation of policies and programmes. • Ensuring convergence of schemes/programmes across ministries and other departments
Ministry of Rural Development, Ministry of Skill Development and Entrepreneurship, Ministry of Micro, Small and Medium Enterprises and Ministry of Labour and Employment; state and district-level departments	• Prioritising policy and governance reforms to generate employment and livelihood opportunities for tendu collectors • Ensuring convergence of schemes/programmes across ministries and other departments • Implementation of policies and programmes
Ministry of Tribal Affairs; state and district-level departments; TRIFED and similar organisations	• Prioritising policy and governance reforms to generate employment and livelihood opportunities for the tribal communities dependent upon tendu collection • Implementation of policies and programmes • Ensuring convergence of schemes/programmes across ministries and other departments • Facilitating the development of non-tendu, forest-based livelihoods

Need for various stakeholders, from government authorities to civil society members, to synergise efforts towards alternative, sustainable livelihoods for tendu collectors

Table 6.14 continued

Stakeholder	Role
Civil Society Organisations (CSOs)	• Increased engagement in research on forest and biodiversity conservation, livelihood generation, etc. • Engagement with various stakeholders to promote environmental conservation and the development of alternative, sustainable livelihoods • Capacity building of local communities, government and other CSOs with regard to alternative livelihoods
Academic institutions	• To engage in rigorous, empirical research and to disseminate findings on issues of forestry, conservation, climate change, livelihood generation, etc. • Provision of technical support to government, CSOs, etc.
Tendu collectors/ cooperatives	• To move away from the practice of using fire for tendu collection and to help build awareness among other collectors about the adverse impact of these practices • To shift towards the collection of alternative NTFPs

6.5 Conclusion

Transition away from tendu collection cannot take place unless proper mechanisms are in place to support the collectors. A multi-pronged approach necessary

The dependence upon tendu in rural and forest-dependent households in India, especially in the focus states of Chhattisgarh, Maharashtra and Odisha, is high and households use the income generated from tendu collection to supplement their meagre incomes during the lean agricultural months. The income derived from tendu collection along with its concurrent benefits like bonuses and insurance make tendu collection an attractive option for households which are from some of the most poor and marginalised sections of society. However, income from tendu, while a tidy sum, has not helped ameliorate the economic predicament of the tendu collector.

When placed against the backdrop of rising forest fires in the country and the clear-cut evidence of tendu-collection practices contributing to the fires, the need to promote sustainable livelihoods becomes even more important. A complete ban on tendu collection, in light of the adverse environmental and health impacts (through bidi-smoking) it has, while desirable, is a challenge, not only due to the sizeable economy around the trade, but also due to the dependence upon it of millions of poor families. The solution then is to develop an environment for tendu pluckers to have adequate income-generating opportunities which would help them lessen their dependence upon tendu collection.

As explicated in this chapter, a host of agricultural, NTFP-related livelihood schemes as well as PES and carbon markets can be leveraged to ensure that the dependence upon tendu collection for income is lessened. The study reveals that non-tendu NTFPs have huge potential in terms of income and livelihood generation. As highlighted in the study, some non-tendu NTFPs have vast untapped potential and can and do surpass tendu in terms of income generation. What is needed is proper institutional support by the government and private/non-governmental players in developing this sector. Participatory management under the FRA and PESA should be furthered to truly benefit these communities. Further, since agriculture is the mainstay of tendu-producing areas, various agricultural schemes can be converged and leveraged to enhance land and labour productivity within the sector. Various livelihood schemes should be implemented and converged with other livelihood schemes and funds to generate employment. Finally, while still nascent initiatives, PES and carbon markets should be explored for their potential in generating income for tendu-dependent communities whilst also promoting sustainable livelihoods and ecological conservation. A targeted intervention for tendu collectors by one key department may be required to help them move away from tendu collection and to lift them out of poverty.

Annexure

Annexure 1: Methodology for estimation of tendu trade in India

Consolidated data on the total tendu leaf collection in India is not available. The only publicly available data is till 2017—shared by the Ministry of Environment, Forest and Climate Change (MoEFCC) in response to a Lok Sabha question. At the state level, there are disparities in disclosures, with updated data available till 2021 only for the major tendu-producing states of Chhattisgarh, Madhya Pradesh, Odisha, and Maharashtra. These four states collectively account for 72 per cent of the total share, as per the 2017 consolidated dataset. For two additional states, Uttar Pradesh and West Bengal, data is available till 2020, while for Rajasthan the data is available till 2019. For the remaining states of Bihar, Andhra Pradesh, Telangana, Jharkhand, Gujarat, and Karnataka, updated data is not available.

To estimate the year-wise quantity of tendu leaf collection in India, the actual collection available for the given year is used to extrapolate for the rest of the states, assuming the share proportion of 2017 holds. For instance, for 2021, data of four states is used assuming that these states continue to represent 72 per cent of the total collection. Similarly, for 2020, actual available data for six states is used assuming a continued representation of 75 per cent share. For 2019 and 2018, the data available for seven states is used, assuming a continued representation of 82 per cent share. The collection in individual states is then calculated, for the years with missing data, based on their share in the total collection during 2017.

This data is then used to calculate the net weight by converting standard bags (SBs) into the number of leaves. One SB is typically equal to 50,000 leaves, except in Maharashtra and Odisha where it is equal to 70,000 leaves. One million leaves are assumed to weigh 0.9 tonnes based on inputs from Forest Department officials as well as the actual weight of sample tendu leaf in a bidi.

Table A1: Estimated quantity of annual tendu leaf collection in India (million SBs)

State	2013	2014	2015	2016	2017	2018	2019	2020	2021
Chhattisgarh	1.48	1.43	1.30	1.36	1.71	1.48	1.50	0.97	1.30
Maharashtra	-	0.46	0.45	0.39	0.35	0.25	0.25	0.18	0.27
Madhya Pradesh	1.99	1.70	1.61	1.86	2.34	1.90	2.10	1.60	1.70
Odisha	0.70	0.62	0.60	0.52	0.57	0.44	0.32	0.30	0.41
Uttar Pradesh	0.20	0.16	0.15	0.17	0.23	0.18	0.15	0.09	0.17*
West Bengal	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01*
Rajasthan	0.26	0.18	0.26	0.32	0.49	0.35	0.27	0.29*	0.36*
Bihar	-	-	0.03	0.06	0.08*	0.06*	0.06*	0.05*	0.06*
Andhra Pradesh	-	0.03	0.03	0.02	0.03*	0.02*	0.02*	0.02*	0.02*
Telangana	-	0.20	0.22	0.24	0.26*	0.21*	0.21*	0.16*	0.19*
Jharkhand	0.43	0.29	0.31	0.54	0.72*	0.58*	0.58*	0.43*	0.53*
Gujarat	0.11	0.08	0.11	0.11	0.15*	0.12*	0.12*	0.09*	0.11*
Karnataka	0.00	-	-	0.00	0.00*	0.00*	0.00*	0.00*	0.00*
Total	**5.19**	**5.15**	**5.06**	**5.59**	**6.92**	**5.60**	**5.58**	**4.18**	**5.14**

* Estimated

Table A2: Estimated weight of annual tendu leaf collection in India (tonnes)

State	2013	2014	2015	2016	2017	2018	2019	2020	2021
Chhattisgarh	66,375	64,260	58,545	61,245	76,950	66,600	67,500	43,650	58,500
Maharashtra	-	29,106	28,350	24,696	21,924	15,750	15,750	11,340	17,010
Madhya Pradesh	89,685	76,455	72,225	83,565	105,120	85,500	94,500	72,000	76,500
Odisha	44,100	39,200	37,600	32,700	35,600	28,000	20,000	19,000	26,000
Uttar Pradesh	9,090	7,155	6,660	7,650	10,395	7,920	6,615	4,050	7,720
West Bengal	601	386	85	563	528	298	65	124	392
Rajasthan	11,880	8,010	11,700	14,175	21,870	15,750	12,150	13,220	16,241
Bihar	-	-	1,395	2,655	3,465	2,807	2,794	2,094	2,573
Andhra Pradesh	-	1,260	1,440	855	1,170	948	943	707	869
Telangana	-	8,865	9,855	10,620	11,700	9,477	9,433	7,072	8,689
Jharkhand	19,485	13,230	13,725	24,165	32,355	26,207	26,087	19,558	24,027
Gujarat	4,815	3,420	4,770	4,995	6,660	5,395	5,370	4,026	4,946
Karnataka	47	-	-	13	8	7	7	5	6
Total	**246,078**	**251,347**	**246,350**	**267,897**	**327,746**	**264,657**	**261,214**	**196,847**	**243,473**

Annexure 2: Methodology for estimation of revenues from tendu trade in India

The revenues from the tendu leaf trade are estimated following a similar methodology used for estimating the collection. Updated actual data till 2021 is available only for the three states of Chhattisgarh, Odisha and Maharashtra. It is available till 2020 for Madhya Pradesh, Rajasthan and West Bengal, and till 2019 for Uttar Pradesh. For the remaining states of Jharkhand, Gujarat, Bihar, Karnataka, Andhra Pradesh, and Telangana, the data is available only till 2017.

The total sales value for each year is estimated based on the actual sales values available from the limited number of states, assuming that their share in total is maintained as in 2017. For instance, for 2021, data is estimated assuming that the sales value of the three states represents 59 per cent share in the total collection. The sales value for individual states is then calculated, based on their share in the total collection during 2017.

Table A3: Estimated sale value of tendu leaf collection in India (₹ million)

State	2013	2014	2015	2016	2017	2018	2019	2020	2021
Chhattisgarh	3,562	3,341	3,448	6,377	10,596	7,449	7,833	4,673	7,713
Odisha	4,198	3,914	5,419	7,862	5,130	4,617	3,762	4,074	5,689
Maharashtra		553	647	850	1,879	505	388	265	524
Madhya Pradesh	3,949	3,101	3,293	6,273	13,394	8,744	8,159	5,951	10,595*
Rajasthan	97	60	70	241	828	335	109	75	655*
West Bengal	6	12	4	44	2	0	0	1	2*
Uttar Pradesh	262	255	376	734	816	357	252	385*	645*
Jharkhand	240	163	191	598	1,298	875*	815*	613*	1,026*
Gujarat	56	31	45	136	6	4*	4*	3*	5*
Bihar			10	67	161	109*	101*	76*	128*
Karnataka	1	-	-	0	0	0*	0*	0*	0*
Andhra Pradesh		29	46	70	126	85*	79*	59*	100*
Telangana		110	202	812	1,884	1,270*	1,184*	890*	1,491*
Total	**12,371**	**11,569**	**13,752**	**24,062**	**36,119**	**24,350**	**22,685**	**17,065**	**28,573**

*Estimates

Annexure 3: Methodology for estimating forest fires correlation with tendu

The study uses three key data sources to establish a correlation between forest fires and tendu collection:

1. MODIS fire dataset for Maharashtra, Chhattisgarh and Odisha is considered for the time period from 2011 to 2021 for the identification of forest fire points. The spatial and temporal dimensions of forest fire patterns are visualised and evaluated through GIS. In this, only persistent forest fire points are considered, and other warming points/spots are removed.
2. Vegetation type map from ISRO is used for identifying the vegetation pattern in the focus states. This map includes 39 different types of vegetation classes for the study area, and the resolution of the map is 1 km with WGS 1984 projection.
3. For identifying the location points of tendu (Diospyros melanoxylon) across the study area, sample point data is obtained through in-lab analysis.

The data collected from these three sources is analysed using ArcGIS and Google Earth Engine for mapping and spatial analysis. R-studio is used for statistical analysis. Key steps involved in the data analysis and processing:

1. Reprojection - Forest fire points, vegetation type, and sample points data are reprojected to the WGS84 projection for overlaying suitability.
2. Clipping - MODIS fire points, vegetation type map data and sample point data are clipped for the study area.
3. Masking - Some attributes in the vegetation type map like agriculture, riverbeds, riverine, and water bodies are masked to keep only the classes related to forest types. This allows for limiting the data uncertainties when overlaying with forest fire points.
4. Distribution of data points - The forest fire points are then assessed in the R-studio software for statistical analysis and their distribution pattern throughout the 2011-21 period.
5. Overlaying of data points - The reprojected vegetation map is overlayed with forest fire points for identifying the forest fire points' vegetation classes in ArcGIS.
6. Sample point data utilisation - The sample points for tendu for the study area are identified and sequentially, spatial maps are developed in ArcGIS.
7. Correlation analysis - A correlation test is conducted for the forest fire points and sample points of tendu. This is analysed year-wise and state-wise.

Annexure 4: Methodology for developing species distribution model and burnt area index of tendu

Methodology for Burnt Area Index

MODIS (MCD64A1 Ver. 6) Burnt Area data product, a monthly, global gridded 500m product containing per-pixel burnt area and quality information is used to calculate the Burnt Area Index (BAI). The MCD64A1 burnt-area mapping approach employs 500m MODIS Surface Reflectance imagery coupled with 1 km MODIS active fire observations. The algorithm uses a burn-sensitive vegetation index (VI) to create dynamic thresholds that are applied to the composite data. The VI is derived from MODIS shortwave infrared atmospherically corrected surface reflectance bands 5 and 7 with a measure of temporal texture. The algorithm identifies the date of burn for the 500m grid cells within each MODIS tile. The data was collected for the period of 2011-21 for the study area. The obtained results provided the monthly value of BAI for each year for the study area.

Methodology for Species Distribution Model

Bioclimatic data: Bioclimatic data is downloaded from the WorldClim database, available at a spatial resolution of 30 arc seconds (approximately 1 km). The WorldClim data is derived from measurements of altitude, temperature, and rainfall from weather stations across the globe. The study uses 20 bioclimatic variables from the dataset to assess the current climatic conditions (See Table A4). These variables are frequently used in modelling species

distribution. Bioclimatic variables are stored in American Standard Code for Information Interchange (ASCII) file format at 30 arc seconds resolution. These datasets are checked for precise spatial matching as a prerequisite for modelling tools. For the experimental run, the occurrence datasets are split into training datasets. This setting aside of test data enabled independent filtering thereby ensuring the predictive power of the models.

Table A4: Bioclimatic variables used in modelling species distribution of tendu

Sl. No.	Code	Variable
1.	bio_1	Annual Mean Temperature
2.	bio_2	Mean Diurnal Range (Mean of monthly (max temp - min temp))
3.	bio_3	Isothermality (bio_2/bio_7) (×100)
4.	bio_4	Temperature Seasonality (standard deviation ×100)
5.	bio_5	Max Temperature of Warmest Month
6.	bio_6	Min Temperature of Coldest Month
7.	bio_7	Temperature Annual Range (bio_5-bio_6)
8.	bio_8	Mean Temperature of Wettest Quarter
9.	bio_9	Mean Temperature of Driest Quarter
10.	bio_10	Mean Temperature of Warmest Quarter
11.	bio_11	Mean Temperature of Coldest Quarter
12.	bio_12	Annual Precipitation
13.	bio_13	Precipitation of Wettest Month
14.	bio_14	Precipitation of Driest Month
15.	bio_15	Precipitation Seasonality (Coefficient of Variation)
16.	bio_16	Precipitation of Wettest Quarter
17.	bio_17	Precipitation of Driest Quarter
18.	bio_18	Precipitation of Warmest Quarter
19.	bio_19	Precipitation of Coldest Quarter
20.	dem	Elevation

Source: Worldclim, SRTM

Modelling methodology: All the records for Diospyros melanoxylon are plotted using Arc GIS. Maximum entropy model (MaxEnt) accepts datasets in .CSV (comma separated values) file format, which includes three columns. The first one represents the name of the species, second and third columns contain latitude and longitude (X, Y) values of the species presence respectively. MaxEnt is used because it performs better with small sample sizes relative to other modelling methods. MaxEnt uses presence-only data to predict the distribution of a species based on the theory of maximum entropy.

The program attempts to estimate a probability distribution of species occurrence that is close to uniform while still subject to environmental constraints. MaxEnt automatically includes variable intersections and can handle continuous and categorical predictor variables. It uses a set of features that are functions of environmental variables that constrain the geographical distribution of species. It also uses regularisation parameters, which are determined empirically, to control the model overfitting. MaxEnt generates response curves for each predictor variable and has a jack knife option that estimates the relative influence of individual predictors. Using MaxEnt-generated response curves, it also examined relationships between the habitat suitability for a species and bioclimatic variables.

To convert from the continuous suitability index maps to binary habitat and non-habitat maps, a probability threshold is needed to determine potential changes in future habitat for a species. The choice of a threshold value is critical because model results and outputs vary based on the applied threshold. The model used a "25 per cent training presence threshold" to define habitat and non-habitat for all species.

The following settings are used during the modelling run:

- 1,198 presence records were used for training, and 399 for testing.
- 11,184 points were used to determine the MaxEnt distribution (including background points and presence points).

The receiver operating characteristic (ROC) curve for the data is generated as presented in Figure A3. Here, the specificity is defined using predicted area, rather than true commission. This implies that the maximum achievable area under the curve (AUC) is less than 1. If test data is drawn from the MaxEnt distribution itself, then the maximum possible test AUC would be 0.742 rather than 1; in practice, the test AUC may exceed this bound.

Figure A1 represents the MaxEnt model for Diospyros melanoxylon. Warmer colours show areas with better-predicted conditions. White dots show the presence locations used for training, while violet dots show test locations.

The results of the jackknife test of variable importance are presented in Figure A2. The environmental variable with the highest gain, when used in isolation, is bio_3 (Isothermality), which appears to have the most useful information by itself. The environmental variable that decreases the gain the most when it is omitted is bio_17 (Precipitation of Driest Quarter), which appears to have the most information that isn't present in the other variables.

In Figure A3, the potential distribution of the Diospyros melanoxylon is presented based on MaxEnt modelling. The threshold value for the potential presence of Diospyros melanoxylon is taken above 0.5 covering 76.23 per cent of presence.

Figure A1: ROC curve for Diospyros melanoxylon distribution model

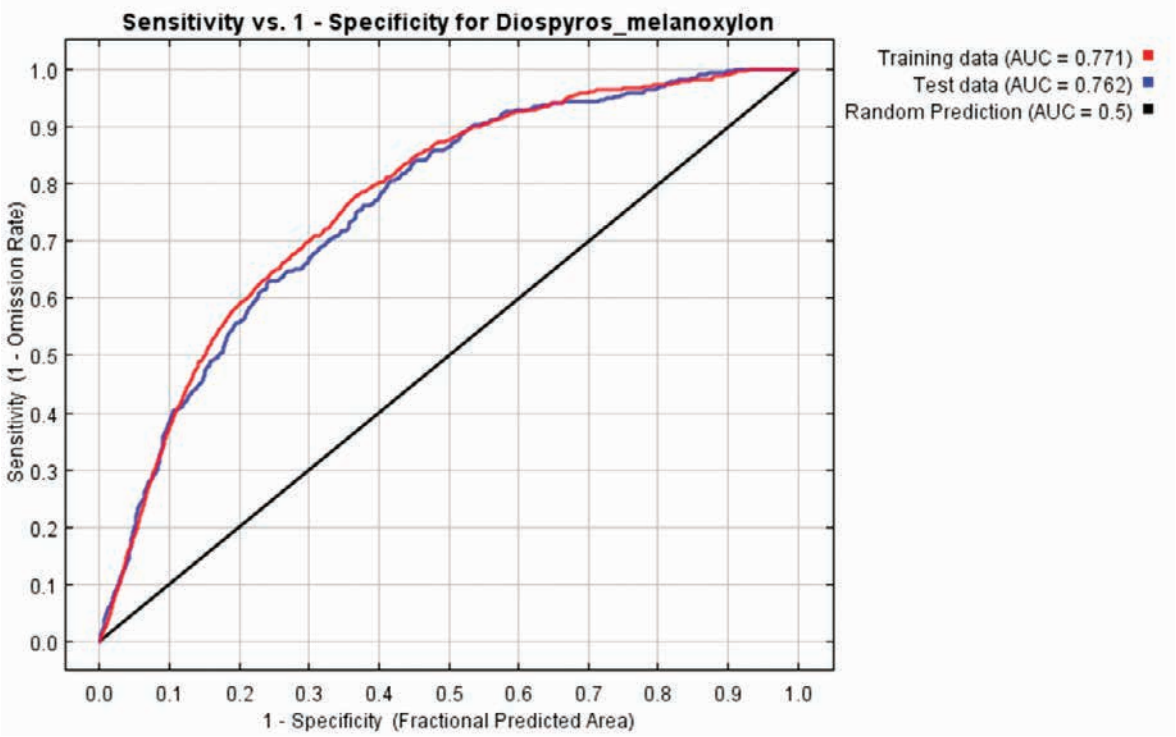


Figure A2: Species Distribution Model of tendu

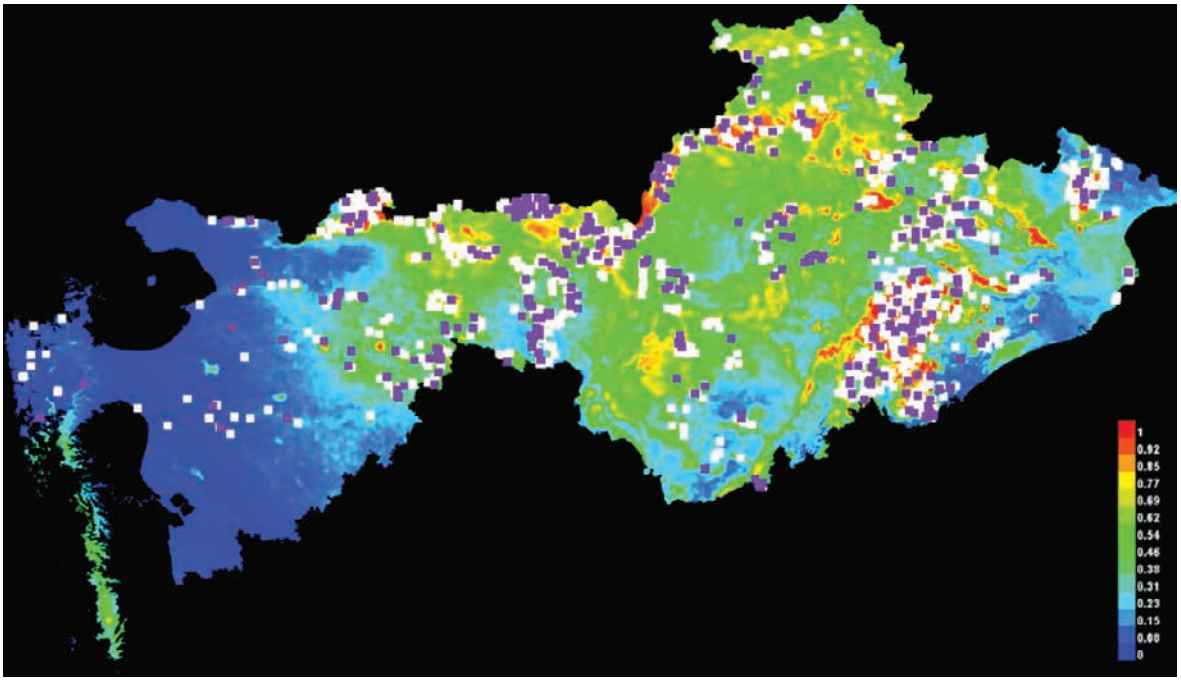
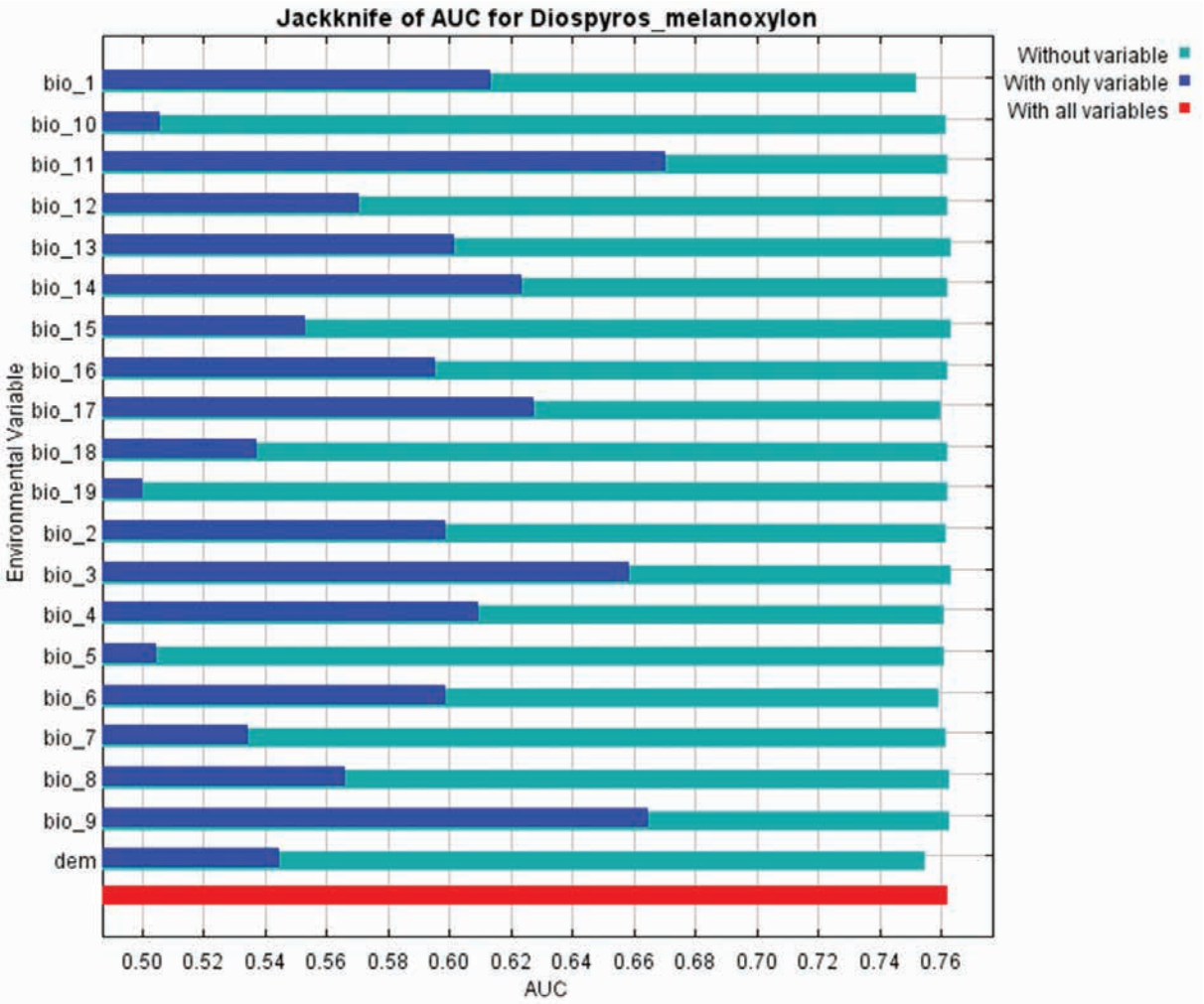


Figure A3. Jackknife test for Diospyros melanoxylon.



Annexure 5: Methodology for developing socio-economic status scale

Socioeconomic status (SES) is an important measure by which an individual's well-being is assessed. An assessment of the same has strong implications for the sustainability of a person's livelihood. While various attempts have been made at making a universal measure for SES, some of the well-accepted ones are the BG Prasad, Udai Pareekh and Kuppuswamy scales. These scales help standardise the process of delineating households into different socio-economic classes. The scales differ, however, in terms of applicability and in terms of the parameters used to determine the SES. For instance, while the Kuppuswamy and the BG Prasad scales have income as an important parameter, the Udai Pareekh scale does not have an income component.

For the study, the revised Udai Pareekh SES scale (Majumdar, 2021) was used. It was chosen for its applicability in rural areas and for its comprehensive use of various socio-economic parameters that are absent in other scales. The Pareekh scale includes nine crucial domains: caste, occupation, house, land, education, social participation, farm power, material possessions, and family members. After filling in the information and scoring the individual item list, the total score is added and the result is interpreted in terms of class: Upper Class, Upper Middle Scale, Middle Scale, Lower Middle Scale and Lower Scale. For the purposes of this study, the caste parameter has been interpreted differently: the Scheduled Tribes have been clubbed with the Scheduled Castes with a score of one; Artisan castes are those traditionally engaged in craft-making and may include the OBCs; the Prestige Class includes those from the Kshatriya and Brahmin castes. The Dominant Class and Lower Caste categories have been taken as is.

This scale has been used to enhance the analysis of the various socio-economic aspects of the surveyed populace to get a better sense of the impact of tendu collection on people's lives. It is especially important in going beyond a simple income analysis of the data. This enables the measurement of the difference in the quality of life of tendu and non-tendu collectors.

Table A5: Revised Udai Pareekh socioeconomic status scale

Components	Score
Caste	
Scheduled Castes	1
Lower Caste	2
Artisan Caste	3
Agriculture Caste	4
Prestige Class	5
Dominant Class	6
Occupation	
None	0
Labourer	1
Caste occupation	2
Business	3
Independent Profession	4
Cultivation	5
Service	6
>20 acre	6
Social Participation	
None	0
Member of one organisation	1
Member of more than one organisation	2
Office holder in such an organisation	3
Wide public leader	4

Components	Score
House	
No house	0
Hut	1
Kutcha house	2
Mixed house	3
Pucca house	4
Mansion	5
Farm Power	
No draft animals	1
1-2 draft animals	2
3-4 draft animals	4
5-6 draft animals	6
Education	
Illiterate	0
Can read only	1
Can read and write	2
Primary	3
Middle	4
High School	5
Graduate and above	6

Components	Score
Land	
No land	0
<1 acre	1
1-5 acre	2
5-10 acre	3
10-15 acre	4
15-20 acre	5
Material Possessions	
Bullock cart	0
Cycle	1
Radio	2
Chairs	3
Mobile Phone	4
Television	5
Refrigerators	6
Family Member	
Up to 5	2
>5	1

Source: S. Majumdar. 2021.

Table A6: Revised Udai Pareekh socioeconomic status class scale

Socioeconomic status class	Total scale
Upper Class	>43
Upper Middle Scale	33-42
Middle Scale	24-32
Lower Middle Scale	13-23
Lower Class	<13

Source: S. Majumdar. 2021.

References

Chapter 1: Introduction

1. IPCC, 2021. The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from: https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/
2. IPCC, 2022. Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from: https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/
3. Moomaw, William R., et al. 2020. Focus on the role of forests and soils in meeting climate change mitigation goals: summary, Environ. Res. Lett. 15 045009. Retrieved from: https://iopscience.iop.org/article/10.1088/1748-9326/ab6b38
4. Forest Survey of India, 2021. India State of Forest Report, 2021. Retrieved from: https://fsi.nic.in/forest-report-2021-details
5. Mohanty, Abinash and Vidur Mithal, 2022. Managing Forest Fires in a Changing Climate. New Delhi: Council on Energy, Environment and Water. Retrieved from: https://www.ceew.in/publications/states-vulnerable-to-forest-fire-events-india-and-mitigation-measures
6. Sannigrahi, S. et al. 2020. Examining the effects of forest fire on terrestrial carbon emission and ecosystem production in India using remote sensing approaches. Science of The Total Environment, Volume 725. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0048969720318441
7. Roy, P.S. 2003. Forest fire and degradation assessment using satellite remote sensing and geographic information system. Satellite Remote sensing and GIS applications in agricultural meteorology. Retrieved from: http://www.wamis.org/agm/pubs/agm8/Paper-18.pdf
8. Dogra, Pyush, Andrew Michael Mitchell, Urvashi Narain, Christopher Sall, Ross Smith, and Shraddha Suresh. 2018. "Strengthening Forest Fire Management in India". World Bank. Washington DC.
9. Lok Sabha Secretariat, 2018. Forest Fire in India. New Delhi, No. 28/RN/Ref./July/2018. Retrieved from: http://164.100.47.193/Refinput/New_Reference_Notes/English/Forest%20Fire%20in%20India.pdf
10. Tomar, J. S., Kanga, S., & Singh, S. K., 2021, Giscience for Forest Fire Modeling: New Advances in Wildland Fires with Management. Plant Archives, 21, No 1, pp. 473-481. Retrieved from: http://plantarchives.org/article/giscience-for-forest-fire-modeling-new-advances-in-wildland-fires-with-management.pdf
11. Mueller-Dombois, D. and Goldammer, J.G.(ed). 1990. Fire in the Tropical Biota: Ecosystem Processes and Global Challenges, Ecological Studies 84, Springer-Verlag.
12. Sharma U.K., 2013. Tendu Leaves—Trade and management practices in India. Indira Gandhi National Forest Academy, Dehradun. Retrieved from: https://www.ignfa.gov.in/document/biodiversity-cell-ntfp-related-issues15.pdf
13. Chaudhry, P., Srivastava, R. L., Apte, A. S., Kumar, P., & Rao, N. S., 2008. The role of non-timber forest products in the rural economy and their quantitative assessment in the Aravali Mountain range of India. International Journal of Green Economics, 2(4), 427-441. Retrieved from: https://www.researchgate.net/publication/24017896_The_role_of_non-timber_forest_products_in_the_rural_economy_and_their_quantitative_assessment_in_the_Aravali_mountain_range_of_India
14. R. Saigal, 1990. Modern forest fire control: The Indian experience. FAO. Retrieved from: https://www.fao.org/3/t9500E/t9500e06.htm
15. Satendra, & Kaushik, A. 2014. Forest Fire Disaster Management. National Institute of Disaster Management. Retrieved from https://nidm.gov.in/pdf/pubs/forest%20fire.pdf.
16. The Global Adult Tobacco Survey (GATS) is a global standard for systematically monitoring adult tobacco use (smoking and smokeless) and tracking key tobacco control indicators
17. Tata Institute of Social Sciences (TISS), Mumbai, and Ministry of Health and Family Welfare, Government of India. Global Adult Tobacco Survey GATS 2 India 2016-17. Retrieved from: https://www.tiss.edu/view/11/research-projects/global-adult-tobacco-survey-round-2-for-india-2016/
18. Arora, M. Datta, P. Barman, A. Sinha, P. Munish, V.G. Bahl, D. Bhaumik, S. Nazar, G.P. and Tullu, F., 2020. The Indian Bidi Industry: Trends in Employment and Wage Differentials. Front. Public Health 8:572638. doi: 10.3389/fpubh.2020.572638
19. Goodchild, M., Munish, V.G., Sinha, P., et al. Tob Control 2022;31:432–437. Retrieved from: https://tobaccocontrol.bmj.com/content/tobaccocontrol/31/3/432.full.pdf
20. Mbulo, L., Palipudi, K. M., Smith, T., Yin, S., Munish, V. G., Sinha, D. N., Gupta, P. C., & Swasticharan, L. (2020). Patterns and related factors of bidi smoking in India. Tobacco prevention & cessation, 6, 28. https://doi.org/10.18332/tpc/119053

21. Lal, P., Wilson, N., & Gupta, P. (2012). Attributable deaths from smoking in the last 100 years in India . Current Science, 103(9). Retrieved from: https://www.currentscience.ac.in/Volumes/103/09/1085.pdf

22. Kamboj, M. Bidi tobacco. Br Dent J. 2008: 205, 639. https://doi.org/10.1038/sj.bdj.2008.1088
Pednekar MS, Gupta PC, Yeole BB, Hébert JR. 2011. Association of tobacco habits, including bidi smoking, with overall and site-specific cancer incidence: results from the Mumbai cohort study. Cancer Causes Control. ;22(6):859-68. doi: 10.1007/s10552-011-9756-1. Epub 2011 Mar 24. PMID: 21431915; PMCID: PMC3756904.

23. Gupta PC, Asma S (eds.) Bidi Smoking and Public Health, New Delhi: Ministry of Health and Family Welfare, Government of India, 2008. Retrieved from: http://www.dphodisha.nic.in/sites/default/files/Download/Bidi%20Smoking%20and%20Public%20Health.pdf

24. P.S. Roy, S.P.S. Kushwaha, M.S.R. Murthy, A. Roy, M.C. Porwal, et al. 2012. Biodiversity Characterization at Landscape Level: National Assessment. Indian Institute of Remote Sensing, ISRO, Dehradun, India, ISBN: 81-901418-8-0. Retrieved from: https://bis.iirs.gov.in/pdf/biodiversity_characterization.pdf

Chapter 2: Tendu Leaf Collection, Trade and Dependence

1. Lal, Pranay. 2009. Bidi - A short history. Retrieved from: http://www.indiaenvironmentportal.org.in/files/Bidi.pdf

2. Sharma, Uttam. Tendu Leaves: Trade and Management Practices in India. IGNFA. Retrieved from: https://www.ignfa.gov.in/document/biodiversity-cell-ntfp-related-issues15.pdf

3. 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. Retrieved from https://agrinenv.com/wp-content/uploads/2021/07/v2i7-19-22.pdf

4. CFR-LA, 2016. Promise and Performance: Ten Years of the Forest Rights Act in India. Citizens' Report on Promise and Performance of The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, after 10 years of its Enactment. December 2016. Produced as part of Community Forest Rights-Learning and Advocacy Process (CFRLA), India, 2016 (www.cfrla.org.in). Retrieved from: https://rightsandresources.org/wp-content/uploads/2017/11/India-Promise-and-Performance-National-Report_CFRLA_2016.pdf

5. ibid

6. Kukreti, I. 2017. Six villages in Odisha can now sell Tendu leaves. Down To Earth. Retrieved from: https://www.downtoearth.org.in/news/forests/six-villages-in-odisha-can-now-sell-tendu -leaves-59206

7. Sahu, G. 2020. https://www.epw.in/journal/2020/18/special-articles/implementation-community-forest-rights.html. Economic and Political Weekly, 55(18). Retrieved from https://www.epw.in/journal/2020/18/special-articles/implementation-community-forest-rights.html.

8. Forest Department. 2022. Highlights of Odisha Forestry Sector. Government of Odisha. Retrieved from: https://www.odishaforest.in/pdf/publications/Highlights%20of%20OFS%202022.pdf

9. CGMFPFED. Chhattisgarh Forest Department. Retrieved from: https://www.cgmfpfed.org/new/tradeofNWFP_Tendu.php

10. Lele et al, Cooperative procurement and marketing of tendu leaves in Madhya Pradesh: Image and Reality. Environment and Development Discussion Paper No. 3. Bengaluru: Ashoka Trust for Research in Ecology and the Environment Retrieved from: https://www.researchgate.net/publication/235356241_Co-operative_procurement_and_marketing_of_tendu _leaves_in_Madhya_Pradesh_Image_and_reality

11. Lele et al, Cooperative procurement and marketing of tendu leaves in Madhya Pradesh: Image and Reality. Environment and Development Discussion Paper No. 3. Bengaluru: Ashoka Trust for Research in Ecology and the Environment Retrieved from: https://www.researchgate.net/publication/235356241_Co-operative_procurement_and_marketing_of_tendu _leaves_in_Madhya_Pradesh_Image_and_reality

12. MFPFED. Tendu patta. Madhya Pradesh Forest Department. Retrieved from: http://www.mfpfederation.org/content/tendu patta.html

13. Based on conversation with Vasundhara, Odisha

14. Goodchild M, Munish VG, Sinha P, et al. 2022. Revisiting the tax treatment of bidis in India Tobacco Control;31:432-437. Retrieved from: https://tobaccocontrol.bmj.com/content/31/3/432

15. The leaf component of a bidi weighs about 0.3 grams, which is about one-third of a typical tendu leaf.

16. Goodchild, M., Munish, V. G., Sinha, P., Tullu, F. T., & Paul, J. 2020. Revisiting the tax treatment of bidis in India. Tobacco Control, 31(3), 432–437. Retrieved from: https://tobaccocontrol.bmj.com/content/early/2020/12/16/tobaccocontrol-2020-056056

17. National Report on the Lifecycle Approach to Beedi Trade in India. New Delhi: School of Public Health, AIIMS Jodhpur and The International Union against Tuberculosis and Lung Diseases (The UNION) South East Asia; 2023 May. https://www.researchgate.net/publication/370934865_National_Report_on_the_Lifecycle_Approach_to_Beedi_Trade_in_India

18. Goodchild, M., Munish, V. G., Sinha, P., Tullu, F. T., & Paul, J. 2020. Revisiting the tax treatment of bidis in India. Tobacco Control, 31(3), 432–437. Retrieved from: https://tobaccocontrol.bmj.com/content/early/2020/12/16/tobaccocontrol-2020-056056
19. Sabar, B., Achoth, L. and Nayak, N. 2016. Tendu Leaves Collection in India: Livelihood, Rights and Challenges for Alternative to Tobacco-Evidences from Five Indian States. Journal of Governance & Public Policy, Volume 6, No 1, Retrieved from: https://www.researchgate.net/publication/320765903_tendu _leaves_collection_in_india_livelihood_rights_and_challenges_For_alternative_to_tobacco-evidences_from_Five_indian_states.
20. Lal P. (2012). Estimating the size of tendu leaf and bidi trade using a simple back-of-the-envelop method. Ambio, 41(3), 315–318. https://doi.org/10.1007/s13280-011-0181-1
21. Human Development Society. 2006. Status of tendu leaf pluckers in Orissa: A study of their socio-economic conditions with special reference to children and the system of bonded labour. Retrieved from: http://hdsindia.org/wp-content/uploads/2018/06/NHRC-Tendu -Leaf-Pluckers-Report.pdf
22. VHAI. 2010. At the Crossroads of Life and Livelihood: The Economics, Poverty and Working Conditions of People Employed in the Tobacco Industry in India.
23. Lal P. (2012). Estimating the size of tendu leaf and bidi trade using a simple back-of-the-envelop method. Ambio, 41(3), 315–318. https://doi.org/10.1007/s13280-011-0181-1
24. Sabar, B., Achoth, L. and Nayak, N. 2016. Tendu Leaves Collection in India: Livelihood, Rights and Challenges for Alternative to Tobacco-Evidences from Five Indian States. Journal of Governance & Public Policy, Volume 6, No 1,Retrieved from: https://www.researchgate.net/publication/320765903_tendu _leaves_collection_in_india_livelihood_rights_and_challenges_For_alternative_to_tobacco-evidences_from_Five_indian_states.
25. In Odisha a small bundle is known as a kerrie. Each kerrie has 20 leaves in processed areas and 40 leaves in unprocessed/phal areas.
26. Vikalp Sangam and CFR-LA, Community Forest Rights and the Pandemic: Gram Sabhas Lead the Way -Volume 2 of the Extraordinary Work of 'Ordinary People – Beyond Pandemics and Lockdowns' Series and Bulletin 5 of COVID 19 & Forest Rights, Vikalp Sangam Core Group, Pune, October 2020.https://rightsandresources.org/wp-content/uploads/2020/10/CFR-and-the-Pandemic_GS-Lead-the-Way-Vol.2_Oct.2020.pdf
27. Sabar, B., Achoth, L. and Nayak, N. 2016. Tendu Leaves Collection in India: Livelihood, Rights and Challenges for Alternative to Tobacco-Evidences from Five Indian States. Journal of Governance & Public Policy, Volume 6, No 1,Retrieved from: https://www.researchgate.net/publication/320765903_tendu _leaves_collection_in_india_livelihood_rights_and_challenges_For_alternative_to_tobacco-evidences_from_Five_indian_states

Chapter3: Environmental Impact of Tendu Collection

1. Sharma U.K., 2013. Tendu Leaves-Trade and management practices in India. Indira Gandhi National Forest Academy, Dehradun.
2. Hunter,J.R., 1981. Tendu (Diospyros Melanoxylon) leaves, bidi, cigarettes, and resource management, Economic Botany 35(4): 450–459.
3. Tomar, J. S., Kanga, S., & Singh, S. K., 2021, Giscience for Forest Fire Modeling: New Advances in Wildland Fires with Management. Plant Archives, 21, No 1, pp. 473-481
4. Note: Coppicing is a method of cutting trees to ground level, leading to a strong vegetative response and the regeneration of new shoots from the base
5. Chaudhry, P., Srivastava, R. L., Apte, A. S., Kumar, P., & Rao, N. S., 2008. The role of non-timber forest products in the rural economy and their quantitative assessment in the Aravali Mountain range of India. International Journal of Green Economics, 2(4), 427-441.
6. R. Saigal, 1990. Modern forest fire control: The Indian experience. FAO.
7. Lal P., 2012. Estimating the size of tendu leaf and bidi trade using a simple back-of-the-envelope method. Ambio, 41(3), 315–318.
8. Lele, S., R. Venkat Ramanujam, J. Rai. 2015. Co-operative procurement and marketing of tendu leaves in Madhya Pradesh: Image and reality. Environment and Development Discussion Paper No. 3. Bengaluru: Ashoka Trust for Research in Ecology and the Environment.
9. Pallavi, A. 2012. Maharashtra Forest Department bans collection of Tendu leaves from areas prone to forest fires. Retrieved from https://www.downtoearth.org.in/news/maharashtra-forest-department-bans-collection-of-tendu-leaves-from-areas-prone-to-forest-fires—35893
10. Pinjarkar,V.2021. Tendu contractors warned against setting forests on fire. Retrieved from https://timesofindia.indiatimes.com/city/nagpur/tendu-contractors-warned-against-setting-forests-on-fire/articleshow/81381714.cms
11. P.S. Roy, S.P.S. Kushwaha, M.S.R. Murthy, A. Roy, M.C. Porwal, et al. 2012. Biodiversity Characterization at Landscape Level: National Assessment. Indian Institute of Remote Sensing, ISRO, Dehradun, India, ISBN: 81-901418-8-0

12. Sannigrahi, S, et al. 2020. Examining the effects of forest fire on terrestrial carbon emission and ecosystem production in India using remote sensing approaches. Science of The Total Environment, Volume 725. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0048969720318441
13. Note: Assuming economic damage of CO2 emissions for India to be around $89 per tonne.
14. Syed, F., & Ullah, A. 2021. Estimation of economic benefits associated with the reduction in the CO2 emission due to COVID-19. Environmental Challenges, 3, 100069. https://doi.org/10.1016/j.envc.2021.100069

Chapter 4: Economic Dependence on Tendu

1. Lele et al. 2015. Cooperative procurement and marketing of tendu leaves in Madhya Pradesh: Image and Reality. Environment and Development Discussion Paper No. 3. Bengaluru: Ashoka Trust for Research in Ecology and the Environment Retrieved from: https://www.researchgate.net/publication/235356241_Co-operative_procurement_and_marketing_of_tendu_leaves_in_Madhya_Pradesh_Image_and_reality
2. Sabar, B., Achoth, L. and Nayak, N. 2016. Tendu Leaves Collection in India: Livelihood, Rights and Challenges for Alternative to Tobacco-Evidences from Five Indian States. Journal of Governance & Public Policy. Volume 6 (1). Retrieved from: https://www.researchgate.net/publication/320765903_tendu_leaves_collection_in_india_livelihood_rights_and_challenges_For_alternative_to_tobacco-evidences_from_Five_indian_states.
3. Human Development Society. (2006). Status of tendu leaf pluckers in Orissa: A study of their socio-economic conditions with special reference to children and the system of bonded labour. Retrieved from: http://hdsindia.org/wp-content/uploads/2018/06/NHRC-Tendu-Leaf-Pluckers-Report.pdf
4. DFO office, Angul. 2022.
5. Department of Agriculture and Farmers Welfare.(2016). District irrigation plan, Angul Pradhan Mantri Krishi Sinchayee Yojana. Government of India. https://pmksy.gov.in/mis/Uploads/2016/20160604095551713-1.pdf
6. Forest Department. Forest Working Plan. Angul.
7. Angul District. About the District. Retrieved from: https://angul.nic.in/about-district/
8. Angul District. Agriculture. Retrieved from: https://angul.nic.in/agriculture/
9. Department of Agriculture and Farmers Welfare.(2016). District irrigation plan, Angul Pradhan Mantri Krishi Sinchayee Yojana. Government of India. https://pmksy.gov.in/mis/Uploads/2016/20160604095551713-1.pdf
10. Census Organisation. (2011). District Census handbook: Korba. Census of India 2011, Government of India National Multidimensional Poverty Index Baseline Report. (2021). Retrieved 18 October 2022, from https://www.niti.gov.in/sites/default/files/2021-11/National_MPI_India-11242021.pdf
11. Angul district administration. Vision 2023. Angul, Government of Odisha. Retrieved from: https://angul.nic.in/document/angul-district-vision-plan-2020/
12. Ministry of Textiles. Craft clusters of India. Retrieved from: http://www.craftclustersofindia.in/site/Cluster_Directory.aspx?mu_id=3idstate=20
13. Chandra Bhushan, Srestha Banerjee, Chinmayi Shalya and Deeksha Pande.2022. Angul: Planning a just energy transition and a new green economy. International Forum for Environment, Sustainability and Technology (iFOREST). New Delhi, India.
14. Panigrahi, S. et al. 2019. Reliance and livelihood significance of non-timber forest products available in Odisha: A review. Journal of Pharmacognosy and Phytochemistry. 8(1): 2428-2432. Retrieved from: https://www.phytojournal.com/archives/2019/vol8issue1/PartAO/8-1-392-280.pdf
15. Majumder S. 2021. Socioeconomic status scales: Revised Kuppuswamy, BG Prasad, and Udai Pareekh's scale updated for 2021. Journal of family medicine and primary care, 10(11), 3964–3967. https://doi.org/10.4103/jfmpc.jfmpc_600_21
16. 1 bundle=100 keris=20,000 leaves
17. Chandrapur district. Subdivision-blocks. Retrieved from: https://chanda.nic.in/en/subdivision-blocks/
18. Directorate of Census Operations, Maharashtra. 2011. District census handbook: Chandrapur. Office of the Registrar General and Census Commissioner, India. India. Retrieved from: https://censusindia.gov.in/nada/index.php/catalog/787
19. NABARD. 2021. Potential Linked Plans: 2022-23. Retrieved from: https://www.nabard.org/auth/writereaddata/tender/1012211759Chandrapur.pdf
20. NABARD. 2021. Potential Linked Plans: 2022-23. Retrieved from: https://www.nabard.org/auth/writereaddata/tender/1012211759Chandrapur.pdf
21. Deputy Conservator of Forests, Chandrapur. Working Plan: Chandrapur Forest Division. 2002. Forest Department, Chandrapur. Retrieved from: https://mahaforest.gov.in/writereaddata/managementpdf/1290166095INTRODUCTION%20Chandrapur.pdf

22. NABARD. 2021. Potential Linked Plans: 2022-23. Retrieved from: https://www.nabard.org/auth/writereaddata/tender/1012211759Chandrapur.pdf
23. NABARD. 2021. Potential Linked Plans: 2022-23. Retrieved from: https://www.nabard.org/auth/writereaddata/tender/1012211759Chandrapur.pdf
24. Directorate of Census Operations, Maharashtra. 2011. District census handbook: Chandrapur. Office of the Registrar General and Census Commissioner, India. India. Retrieved from: https://censusindia.gov.in/nada/index.php/catalog/787
National Multidimensional Poverty Index Baseline Report. 2021. Retrieved 18 October 2022, from https://www.niti.gov.in/sites/default/files/2021-11/National_MPI_India-11242021.pdf
25. Chandrapur district. Demography. Retrieved from: https://chanda.nic.in/en/demography/
26. TRIFED. Van Dhan Yojana. Government of India. Retrieved from: https://trifed.tribal.gov.in/vandhan-kendras-list
27. Majumder S. (2021). Socioeconomic status scales: Revised Kuppuswamy, BG Prasad, and Udai Pareekh's scale updated for 2021. Journal of family medicine and primary care, 10(11), 3964–3967. https://doi.org/10.4103/jfmpc.jfmpc_600_21
28. 1 bundle=70 leaves
29. Korba District. About the District. https://korba.gov.in/about-district/
30. Forest Survey of India. 2019. India State of Forest Report. Volume ii, Chhattisgarh. Retrieved from: https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-chhattisgarh.pdf
31. District Statistical book. 2021-21. Korba district. Retrieved from: http://descg.gov.in/pdf/publications/zsp/5.korba/ZSP_2020-21.pdf
32. Banerjee, S. 2022. Korba: Planning for a just transition in India's biggest coal and power district. International Forum for Environment, Sustainability and Technology, iFOREST, New Delhi, India. https://iforest.global/research/korba-report-request-download/
33. Census Organisation. (2011). District Census handbook: Korba. Census of India 2011, Government of India National Multidimensional Poverty Index Baseline Report. (2021). Retrieved 18 October 2022, from https://www.niti.gov.in/sites/default/files/2021-11/National_MPI_India-11242021.pdf
34. Department of Agriculture. District Irrigation Plan Korba 2015-2020. Government of Chhattisgarh. https://pmksy.gov.in/mis/Uploads/2016/20160505060349246-1.pdf
35. Korba District. About the District. Retrieved from: https://korba.gov.in/about-district/economy/
36. TRIFED. Van Dhan Yojana. Government of India. Retrieved from: https://trifed.tribal.gov.in/vandhan-kendras-list
37. Majumder S. 2021. Socioeconomic status scales: Revised Kuppuswamy, BG Prasad, and Udai Pareekh's scale updated for 2021. Journal of family medicine and primary care, 10(11), 3964–3967. https://doi.org/10.4103/jfmpc.jfmpc_600_21
38. NWFP Tendu. CGMFPFED. Government of Chhattisgarh. Retrieved from: https://www.cgmfpfed.org/new/tradeofNWFP_Tendu.php
39. 1 bundle=50 leaves
40. Lal, P. (2012). Estimating the Size of Tendu Leaf and Bidi Trade Using a Simple Back-of-the-Envelop Method. Ambio. Springer.

Chapter 5: Lessons on moving away from tendu

1. Maharashtra CFR-LA, 2017. Promise and Performance: Ten Years of the Forest Rights Act in Maharashtra. Citizens' Report on Promise and Performance of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. Produced by CFR Learning and Advocacy Group Maharashtra, as part of National Community Forest Rights-Learning and Advocacy Process (CFR-LA). March 2017.
2. Agarwal, S. 2016. Balancing rights and responsibilities: community-based forest governance in Maharashtra. Down To Earth. Retrieved from:https://www.downtoearth.org.in/blog/forests/balancing-rights-and-responsibilities-community-based-forest-governance-in-maharashtra-56435
3. NASA.FIRMS. Retrieved from: https://firms.modaps.eosdis.nasa.gov/country/;https://firms.modaps.eosdis.nasa.gov/download/
4. Agarwal, S. 2016. Balancing rights and responsibilities: community-based forest governance in Maharashtra. Down To Earth.
5. Gedam,S. Pachgaon Village in India Leads Action for Community Forest Management. Cultural Survival. Retrieved from: https://www.culturalsurvival.org/news/pachgaon-village-india-leads-action-community-forest-management
6. Agarwal, S. 2016. Balancing rights and responsibilities: community-based forest governance in Maharashtra. Down To Earth

7. Gutgutia, S., Chowdhary, K., & Patil, R. (2021). Forest Conservation and management in Pachgaon. Vikalp Sangam. Retrieved from: https://vikalpsangam.org/article/forest-conservation-and-management-in-pachgaon/
8. https://aranya.gov.in/aranyacms/(S(3oe04mtjqagypjjepgp50byz))/English/FieldDivision.aspx?u15HOwzBSytoAIZSga/Niw==
9. Kaggere, N. 2019. 10 year ban on extraction of tendu leaves for beedis. The Deccan Herald. Retrieved from: https://www.deccanherald.com/state/top-karnataka-stories/10-year-ban-on-extraction-of-tendu-leaves-for-beedis-706119.html
10. Government of Karnataka. Forest Department. 2018-19. Working Plan of Bidar Forest Division. Volume I. Retrieved from: https://aranya.gov.in/aranyacms/(S(hshesqlcz4nvph4k44z5ldbv))/English/WorkingPlan.aspx
11. Government of Karnataka. Forest Department. 2018-19. Working Plan of Bidar Forest Division. Volume I. Retrieved from: https://aranya.gov.in/aranyacms/(S(hshesqlcz4nvph4k44z5ldbv))/English/WorkingPlan.aspx
12. E-KRISHI. Bidar District Profile. University of Agricultural Sciences, Karnataka. Retrieved from: https://e-krishiuasb.karnataka.gov.in/ItemDetails.aspx?DepID=14&cropID=0&SubDepID=5#
13. Government of Karnataka. Forest Department. 2018-19. Working Plan of Bidar Forest Division. Volume I. Retrieved from: https://aranya.gov.in/aranyacms/(S(hshesqlcz4nvph4k44z5ldbv))/English/WorkingPlan.aspx
14. Note: Tender Cum Auction is a combination of tender Followed by auction. This is normally used to avoid price negotiation with bidders.

Chapter 6: Strategies for Tendu -linked Fire Mitigation

1. A.K. Pandey, Y.C. Tripathi and Ashwani Kumar. (2016). Non timber forest products (NTFPs) for sustained livelihood: Challenges and strategies. Research Journal of Forestry. https://www.researchgate.net/publication/307867756_Non_Timber_Forest_Products_NTFPs_for_Sustained_Livelihood_Challenges_and_Strategies
2. Singh, S., et al.(2020).Role of Non-Timber Forest Products in Rural Economy of Farmers. International Journal of Economic Plants.https://www.pphouse.org/upload_article/512250_3_IJEP_Nov_2020_Singh_et_al.pdf
3. Tribal Co-Operative Marketing Development Federation of India Limited Ministry of Tribal Affairs, Govt. of India. 2020. Introduction to Minimum Support Price (MSP) for Minor Forest Produces (MFP).Tribal Co-Operative Marketing Development Federation of India Limited (TRIFED). Retrieved from: https://trifed.tribal.gov.in/program/non-timber#:~:text=Under%20Forest%20Rights%20Act%2C%202006,roots%2C%20tubers%20and%20the%20like
4. Tribal Co-Operative Marketing Development Federation of India Limited Ministry of Tribal Affairs, Govt. of India. 2020. MSP for MFP Scheme has Successfully Strengthened Tribal Economy; Infusing more than Rs 3000 Crore in the Past Few Months. TRIFED. Retrieved from: https://trifed.tribal.gov.in/node/1335#:~:text=Among%20the%20States%2C%20Chhattisgarh%20has,worth%20Rs%203.41%20crores%20respectively
5. Banajata.org. Chattisgarh. www.banajata.org. Retrieved from: http://www.banajata.org/pdf/state-level/chattisgarh.pdf
6. https://www.cgmfpfed.org/new/tradeofNWFP.php
7. Tribal Co-Operative Marketing Development Federation of India Limited Ministry of Tribal Affairs, Govt. of India. Revised MSP for MFP Price List for 2020-21. TRIFED. Retrieved from: https://trifed.tribal.gov.in/iipa
8. Pinjarkar, Vijay. 2017. 104 Villages Net Rs 9.8 Crore via Sale of Tendu Leaves. The Times of India, January 28. Retrieved from: https://timesofindia.indiatimes.com/city/nagpur/104-villages-net-rs-9-8-crore-via-sale-of-tendu -leaves/articleshow/56816562.cms
9. Kori, Rakhi, MK Dubey, Ajay Raut, A. Shrivastava, Kamini Bisht, and Kalpana Shrivastava. 2022. Constraints Faced by Silkworm Rearing Farmers during Tasar Silk Cultivation in Bastar District of Chhattisgarh. The Pharma Innovation Journal 11(8). Retrieved from: https://www.thepharmajournal.com/archives/2022/vol11issue8S/PartM/S-11-8-85-275.pdf
10. http://www.banajata.org/pdf/articles/Sal_Seed_A_losing_proposition_or_an_untapped_resource.pdf
11. Mohapatra, Ajay, and Sanjoy Patnaik. 2004. Sal Seed Procurement and Trade Operations: Issues and Challenges. Regional Centre for Development Cooperation. Retrieved from: https://rcdcindia.org/PbDocument/4348674baf47f27-675a-4886-9766-bb7f8e6d88c5SalSeed.pdf
12. Sabar, B., Achoth, L. and Nayak, N. 2016. Tendu Leaves Collection in India: Livelihood, Rights and Challenges for Alternative to Tobacco-Evidences from Five Indian States. Retrieved from: https://www.researchgate.net/publication/320765903_tendu _leaves_collection_in_india_livelihood_rights_and_challenges_For_alternative_to_tobacco-evidences_from_Five_indian_states.
13. Balkrishna, Acharya, et al. 2022. Situational Analysis of Government Initiatives for the Welfare of Farmers in India: Impact and Futuristic Insights. Indian Journal of Ecology. Retrieved from: https://www.researchgate.net/publication/362056273_Situational_Analysis_of_Government_Initiatives_for_the_Welfare_of_Farmers_in_India_Impact_and_Futuristic_Insights .

14. TNAU Agritech Portal. Agricultural Marketing and Agri-Business. Retrieved from: https://agritech.tnau.ac.in/agricultural_marketing/agrimark_AgroProcessing.html#:~:text=Agro%20processing%20could%20be%20defined,fuel%20or%20industrial%20raw%20material.
15. The World Bank. Rural population (% of total population) - India. World Bank Open Data. (n.d.). Retrieved from: https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?name_desc=false&locations=IN
16. Dhasmana, I. 2021. Poverty ratio 32.75% in rural areas against 8.81% in urban: NITI report. Business Standard. Retrieved from: https://www.business-standard.com/article/economy-policy/poverty-ratio-32-75-in-rural-areas-against-8-81-in-urban-niti-report-121120500971_1.html#:~:text=%C2%ABBack-,Poverty%20ratio%2032.75%25%20in%20rural%20areas,8.81%25%20in%20urban%3A%20NITI%20report
17. Khosla, Sunil et al. 2023. Can rural livelihood programs enhance capabilities and reduce vulnerability to poverty? Evidence from a tribal region of eastern India. Economic Analysis and Policy. Elsevier. Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S0313592622001849#!
18. Mishra, A et al. 2019. Livelihood security among rural poor: Evaluating the impact of Rural Livelihood Mission in Odisha, India. Cogent Economics and Finance. Volume 9. Taylor & Francis Online. Retrieved from: https://www.tandfonline.com/doi/full/10.1080/23322039.2021.1978705
19. Patwardhan, Sharvari. 2022. The effect of the Mahatma Gandhi National Rural Employment Guarantee Act on the size of outstanding debts in rural India. Journal of Development Effectiveness. Retrieved from: https://www.tandfonline.com/doi/full/10.1080/19439342.2022.2103169
20. Porras, Ina, and Nanete Neves. 2006. Nueva America Forest Management Plan: Payments for Environmental Services (PES) Component. Markets for Watershed Services -Country Profile. Retrieved from: https://watershedmarkets.org/documents/Ecuador_Pimampiro_E.pdf
21. Salzman, J., Bennett, G., Carroll, N., Goldstein, A., & Jenkins, M. (2018). The global status and trends of Payments for Ecosystem Services. Nature Sustainability, 1(3), 136-144. Retrieved from: https://www.nature.com/articles/s41893-018-0033-0?WT.mc_id=COM_NSustain_1803_Salzman
22. Directorate-General for Climate Action. n.d. EU Emissions Trading System (EU ETS). Climate Action- European Commission. Retrieved from: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en
23. Note: The policy allows for the carbon offsets to be used to fulfil a portion of regulated entities' compliance obligations. Companies may then purchase these offsets in the private market.
24. Note: Companies operating within the UK have the option of offsetting their UK based emissions by purchasing Woodland Carbon Units through the Woodland Carbon Code. These units correspond to carbon sequestration achieved through reforestation and forest management projects within the UK. The purchase of these is voluntary.
25. Yarlagadda, Kavitha. 2022.Carbon Credits and India's Carbon Market. Deccan Herald, November 21. Retrieved from: https://www.deccanherald.com/science-and-environment/carbon-credits-and-india-s-carbon-market-1163828.html
26. Hamrick, K., & Goldstein, A. (2016). Raising ambition: State of the voluntary carbon markets 2016. Ecosystem Marketplace Washington DC. Retrieved from: https://www.forest-trends.org/publications/raising-ambition/
27. CSE. Payment for Ecosystem Services (PES) in India from the Bottom-Up. Retrieved from: https://ceecec.net/case-studies/payment-for-ecosystem-services-pes-in-india-from-the-bottom-up/
28. Edake, S. 2021. Developing voluntary carbon market project for Pench Tiger Reserve (PTR), Maharashtra. TERI. Retrieved from: https://www.teriin.org/project/developing-voluntary-carbon-market-project-pench-tiger-reserve-ptr-maharashtra
29. Ranjan, Ram. 2021. Can combining two environmental services under a single PES program result in better environmental outcomes and lower costs? Retrieved from: https://onlinelibrary.wiley.com/doi/full/10.1111/nrm.12303
30. International Carbon Action Partnership. 2022. India establishes framework for voluntary carbon market and outlines pathway towards Cap-and-Trade System. Retrieved from: https://icapcarbonaction.com/en/news/india-establishes-framework-voluntary-carbon-market-and-outlines-pathway-towards-cap-and-trade